International Journal of Science, Engineering and Technology

ISSN(O): 2348-4098 – ISSN(P): 2395-4752

Home

International Journal of Science, Engineering and Technology ; IJSET's portfolio has grown tremendously since its launch in 2013, so that we now offer researchers from all areas of Science, Engineering, Technology, Management, Humanities and Social Sciences a place to publish open access in an Internationl journal. Publishing with IJSET makes your work freely available online for everyone, immediately upon publication, and our high-level peer-review and production processes guarantee the quality and reliability of the work.

The aim and scope of the journal is to provide an academic medium and an important reference for the advancement and dissemination of research results that support high-level learning, teaching and research. This Journal follow International Publication Ethics and UGC Approved Journal Guideline for the authors benefits. As per India publication in UGC Approved guideline Journal help high reach of citation.

Low Publication Fee

We provide Publication fee waiver for Scholars for promote their Research

Reach the Right Thing at the Right Time

Promotions on Google Scholar, Academia.edu and many more portals for outbound linking for the Purpose of Citation.

Licensing

We are having license for Online Publication (ISSN: 2348-4098) and Print Publication (ISSN: 2395-4752).

Submission using Online Manuscript Submission system/ Email on editor@ijset.in or ijset.publication@gmail.com

Within few Working Days, Author's will Receive Acceptance / Review Report for submitted Manuscript.

nor will receive Paper ID and Manuscript will get upload on Peer Review System.

Co-ordinator
IQAC, Shri Ram College
Muzaffarnagar

Chairman
IQAC, Shri Ram College,
Muzaffarnagar

International Journal of Science, Engineering and Technology is happy to announce that electronic submission of papers is now available via the widely used Online Submission system. This new submission process will facilitate access to Manuscripts by Authors, Reviewers and Members of the Editorial Board, and will lead to a smooth reviewing process.

Publishing your research in **International Journal of Science, Engineering and Technology** is simple and efficient. You will be guided through the submission process step-by-step and can interrupt this at any time and continue via **Submit Online Now.**

What you will need to complete the submission of your manuscript:

1. Email address of Primary Author (in case more than One Author)
2. Name of the Author for your manuscript.
3. Correctly formatted manuscript
4. Correctly formatted figures in one of the acceptable formats; see Preparing your manuscript
5. Compliance with journal editor's policies

If you have any queries, kindly get in touch through Email on editor@ijset.in or ijset.publication@gmail.com

Author required to submit their Manuscript in Prescribed Template.

You can also Submit, Manuscript in MS Word file extension (.Doc/ .Docx) in Two Column format (IEEE)

Search Paper By Title

Search

Impact Factor

H-Index: 4.0

DOWNLOAD FOR AUTHORS

Manuscript Template

Copyright Form

Upload Copyright Form

rnal Indexing

I-E

Chairman
IQAC, Shri Ram College,
Muzaffarnagar

Chairman
IQAC, Shri Ram College
Muzaffarnagar

DOI: 10.61463

Peer Review Journal

ISSN-P

Academia

Cite-Factor

Google Scholar

Publons

Authors

Author Guideline

Publication Charges

Copyright Transfer Form

Privacy Policy

Paper Template

Pay Now

Indian Authors:

PAY NOW

Foreign Authors:

PAYPAL

ABOUT US

ISSN (Online): 2348-4098
ISSN (Print): 2395-4752
Impact Factor- 6.09
Frequency- Bi-Monthly

Co-ordinator
IQAC, Shri Ram College
Muzaffarnagar

Chairman
, Shri Ram College,
Muzaffarnagar

Online e-International Journal, Indexed in Google Scholar (e-Google), Index Copernicus, Europe (Journal ID-5369), EBSCO Publishing. In

Sat, January 25, 2C
5:42:55 pm

INDEXED IN

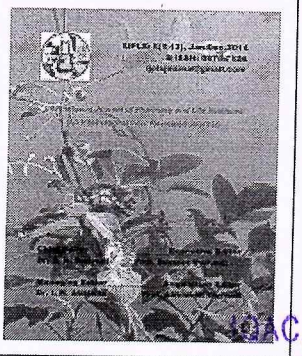
* Google Scholar(e-Google)
* Index Copernicus, Europe(Journal ID-5369)
* EBSCO Publishing, Inc., USA
* Research Gate (Germany)
* CAS,USA
* CAB, London , UK(CABI Publishing House)
* PSOAR(Pharmaceutical Sciences Open Access Resources)
* Open J Gate
* MAPA (Medicinal and Aromatic Plant Abstract)
* ISA (Indian Science Abstract))
* Ulrich's International Periodical Directory, USA

View More>>

Our Associates

* IJDDHR: (ISSN: 2231 – 6078), International Journal of Drug Discovery & Herbal Research (www.ijddhrjournal.com)
* IJESM : (ISSN: 2277–5528), International Journal of Engineering Science & Management (www.ijesmjournal.com)
* SAKUN PUBLISHING HOUSE

IJPLS Cover



Welcome to (IJPLS)

IJPLS is a peer-reviewed, monthly, online International Journal which publishes original articles, research articles, review articles and short communications in following themes:

PHARMACEUTICAL SCIENCES:

PHARMACOGNOSY:

Formulation & Standarization of Herbals.
Biological screening of Herbals.
Phytochemistry, Pharmacognostical & Biotechnological aspects of Medicinal Plants.
Herbal Medicines: Traditional & Folk remedies.
Phytohormones role in yield of medicinal plants.
Cultivation practices.
Microbiological assays in herbs and herbal products.
Cheomo-profiling of herbals.

PHARMACEUTICS:

Novel drug delivery system.
BA and BE Studies.
Formulation and evaluation of dosage form.
Stability studies.

PHARMACOLOGY:

Clinical Studies.
Pharmacological screening.
Pharmacovigilance.
Drug-Drug Interactions.
Toxicological studies including Pharmacogenomics and toxicogenomics.
Surveillance of drugs.
Absorption, distribution, metabolism and elimination of drugs.

PHARMACEUTICAL CHEMISTRY:

Synthesis and biological studies.
QSAR.
Novel drug design.
Rational drug design combinatorial and parallel synthesis.

PHARMACEUTICAL ANALYSIS:

Estimation of drug.
Method developments.
Analysis of various pharmaceutical drugs.

PHARMACEUTICAL BIOTECHNOLOGY:

Plant edible vaccines.
Biotechnological aspects of plants.
Genetic variations.

CLINICAL AND HOSPITAL PHARMACY.

Co-ordinator
IQAC, Shri Ram College
Muzaffarnagar

Chairman
IQAC, Shri Ram College,
Muzaffarnagar

INDEXED IN Logos













View More>>

QUALITY ASSURANCE.

PHARMACY PRACTICE.

DRUG REGULATORY AFFAIRS AND IPR.

LIFE SCIENCES:

Chemistry.
Botany.
Zoology.
Microbiology.
Biochemistry.
Biotechnology.
Agronomy.
Cytology.
Physiology.
Ecology.



Copyright © 2010, Sakun Publishing House, Int. J. of Pharm. & Life Sci., All rights reserved

Co-ordinator
IQAC, Shri Ram College
Muzaffarnagar

Chairman
IQAC, Shri Ram College,
Muzaffarnagar

ijset journal
www.ijset.in

ISSN (Online): 2348-4098
ISSN (Print): 2395-4752

Certificate of Publication

This is to certify that Manuscript, entitled by

Integrating Soft Skills: A Holistic Approach to Cultural Values and Ethos

Authored by

Assistant Professor Garima Singh

has satisfactory Reviewed and Published in Volume 12, Issue 2, 2024.

Managing Editor
International Journal of Science, Engineering and Technology

Co-ordinator
IQAC, Shri Ram College
Muzaffarnagar

Chairman
IQAC, Shri Ram College,
Muzaffarnagar

ijset journal
www.ijset.in

ISSN (Online): 2348-4098
ISSN (Print): 2395-4752

Certificate of Publication

This is to certify that Manuscript, entitled by

Integrating Soft Skills: A Holistic Approach to Cultural Values and Ethos

Authored by

Assistant Professor Madhvi Kaushik

has satisfactory Reviewed and Published in Volume 12, Issue 2, 2024.

Managing Editor
International Journal of Science, Engineering and Technology

Co-ordinator
IQAC, Shri Ram College
Muzaffarnagar

IQAC, Shri Ram College,
Muzaffarnagar

ijset journal
www.ijset.in

ISSN (Online): 2348-4098
ISSN (Print): 2395-4752

Certificate of Publication

This is to certify that Manuscript, entitled by

Ethical Marketing Practices: A Comprehensive Exploration

Authored by

Assistant Professor Vivek Kumar Tyagi

has satisfactory Reviewed and Published in Volume 12, Issue 1, 2024.

International Journal of Science, Engineering and Technology

Co-ordinator
I.Q.A.C, Shri Ram College
Muzaffarnagar

Chairman
I. Q. C, Shri Ram College,
Muzaffarnagar

ijset journal
www.ijset.in

ISSN [Online]: 2348-4098
ISSN [Print]: 2395-4752

Certificate of Publication

This is to certify that Manuscript, entitled by

Ethical Marketing Practices: A Comprehensive Exploration

Authored by

Associate Professor Dr. Pankaj Kumar

has satisfactory Reviewed and Published in Volume 12, Issue 1, 2024.

International Journal of Science, Engineering and Technology

Co-ordinator
IQAC, Shri Ram College
Muzaffarnagar

Chairman
IQAC, Shri Ram College,
Muzaffarnagar

ISSN (Online): 2348-4098
ISSN (Print): 2395-4752

ijset journal
www.ijset.in

Certificate of Publication

This is to certify that Manuscript, entitled by

Strategy of Performance Evaluation-A Review

Authored by

Assistant Professor Deepak Chaudhary

has satisfactory Reviewed and Published in Volume 11, Issue 6, 2023.

International Journal of Science, Engineering and Technology

Co-ordinator
IQAC, Shri Ram College
Muzaffarnagar

Chairman
IQAC, Shri Ram College,
Muzaffarnagar

ijset journal
www.ijset.in

ISSN [Online]: 2348-4098
ISSN [Print]: 2395-4752

Certificate of Publication

This is to certify that Manuscript, entitled by

Strategy of Performance Evaluation-A Review

Authored by

Assistant Professor Shruti Mittal

has satisfactory Reviewed and Published in Volume 11, Issue 6, 2023.

International Journal of Science, Engineering and Technology

Co-ordinator
IQAC, Shri Ram College
Muzaffarnagar

Chairman
IQAC, Shri Ram College,
Muzaffarnagar

ijset journal
www.ijset.in

ISSN (Online): 2348-4098
ISSN (Print): 2395-4752

Certificate of Publication

This is to certify that Manuscript, entitled by

Reassessing Capital Inflows and Income Inequality: Global Trends and Future Challenges

Authored by

Associate Professor Dr Saurabh Mittal

has satisfactory Reviewed and Published in Volume 11, Issue 4, 2023.

Managing Editor
International Journal of Science, Engineering and Technology

Co-ordinator
IQAC, Shri Ram College
Muzaffarnagar

Chairman
IQAC, Shri Ram College,
Muzaffarnagar

ISSN (Online): 2348-4098
ISSN (Print): 2395-4752

ijset journal
www.ijset.in

Certificate of Publication

This is to certify that Manuscript, entitled by

Advancing Leadership in Physical Education

Authored by

Assistant Professor Mr. Pramod Kumar

has satisfactory Reviewed and Published in Volume 11, Issue 4, 2023.

International Journal of Science, Engineering and Technology

Co-ordinator
IQAC, Shri Ram College
Muzaffarnagar

Chairman
IQAC, Shri Ram College,
Muzaffarnagar

ijset journal
www.ijset.in

ISSN (Online): 2348-4098
ISSN (Print): 2395-4752

Certificate of Publication

This is to certify that Manuscript, entitled by

Advancing Leadership in Physical Education

Authored by

Assistant Professor Amardeep

has satisfactory Reviewed and Published in Volume 11, Issue 4, 2023.

International Journal of Science, Engineering and Technology

Co-ordinator
IQAC, Shri Ram College
Muzaffarnagar

Chairman
IQAC, Shri Ram College,
Muzaffarnagar

ijset journal
www.ijset.in

ISSN [Online]: 2348-4098
ISSN [Print]: 2395-4752

Certificate of Publication

This is to certify that Manuscript, entitled by

The Reuse of Polluted Water after Recycling Treatment

Authored by

Dr. Prerna Mittal

has satisfactory Reviewed and Published in Volume 11, Issue 5, 2023.

International Journal of Science, Engineering and Technology

Co-ordinator
IQAC, Shri Ram College
Muzaffarnagar

Chairman
IQAC, Shri Ram College,
Muzaffarnagar

ijset journal
www.ijset.in

ISSN (Online): 2348-4098
ISSN (Print): 2395-4752

Certificate of Publication

This is to certify that Manuscript, entitled by

The Reuse of Polluted Water after Recycling Treatment

Authored by

Assistant Professor Dr. Jugmaheer Gautam

has satisfactory Reviewed and Published in Volume 11, Issue 5, 2023.

International Journal of Science, Engineering and Technology

Co-ordinator
IQAC, Shri Ram College
Muzaffarnagar

Chairman
I. C, Shri Ram College,
Muzaffarnagar

ijset journal
www.ijset.in

ISSN (Online): 2348-4098
ISSN (Print): 2395-4752

Certificate of Publication

This is to certify that Manuscript, entitled by

A Study of Solid Waste Management in Current Indian Prespective

Authored by

Dr. Prerna Mittal

has satisfactory Reviewed and Published in Volume 11, Issue 6, 2023.

Managing Editor
International Journal of Science, Engineering and Technology

Co-ordinator
IQAC, Shri Ram College
Muzaffarnagar

Chairman
IQAC, Shri Ram College,
Muzaffarnagar

ijset journal
www.ijset.in

ISSN (Online): 2348-4098
ISSN (Print): 2395-4752

Certificate of Publication

This is to certify that Manuscript, entitled by

A Study of Solid Waste Management in Current Indian Prespective

Authored by

Assistant Professor Dr. Jugmaheer Gautam

has satisfactory Reviewed and Published in Volume 11, Issue 6, 2023.

Managing Editor
International Journal of Science, Engineering and Technology

Co-ordinator
IQAC, Shri Ram College
Muzaffarnagar

Chairman
IQAC, Shri Ram College,
Muzaffarnagar

ISSN [Online]: 2348-4098
ISSN [Print]: 2395-4752

ijset journal
www.ijset.in

Certificate of Publication

This is to certify that Manuscript, entitled by

Developing Conceptual Skill Strategies in Physical Education

Authored by

Assistant Professor Dr. Abdul Azeej Khan

has satisfactory Reviewed and Published in Volume 11, Issue 5, 2023.

International Journal of Science, Engineering and Technology

Co-ordinator
IQAC, Shri Ram College
Muzaffarnagar

Chairman
IQAC, Shri Ram College,
Muzaffarnagar

ijset journal
www.ijset.in

ISSN [Online]: 2348-4098
ISSN [Print]: 2395-4752

Certificate of Publication

This is to certify that Manuscript, entitled by

A Detailed Study on Television Commercials' on Consumer Durable Goods Purchase Decisions

Authored by

Assistant Professor Ankush Rawal

has satisfactory Reviewed and Published in Volume 11, Issue 5, 2023.

Managing Editor
International Journal of Science, Engineering and Technology

Co-ordinator
IQAC, Shri Ram College
Muzaffarnagar

Chairman
IQAC, Shri Ram College,
Muzaffarnagar

ijset journal
www.ijset.in

ISSN (Online): 2348-4098
ISSN (Print): 2395-4752

Certificate of Publication

This is to certify that Manuscript, entitled by

A Detailed Study on Television Commercials' on Consumer Durable Goods Purchase Decisions

Authored by

Assistant Professor Kapil Dev Dhiman

has satisfactory Reviewed and Published in Volume 11, Issue 5, 2023.

Managing Editor
International Journal of Science, Engineering and Technology

Co-ordinator
IQAC, Shri Ram College
Muzaffarnagar

Chairman
IQAC, Shri Ram College,
Muzaffarnagar

ijset journal
www.ijset.in

ISSN (Online): 2348-4098
ISSN (Print): 2395-4752

Certificate of Publication

This is to certify that Manuscript, entitled by

Indian IT Department: Moon Light Review

Authored by

Assistant Professor Atul Kumar

has satisfactory Reviewed and Published in Volume 12, Issue 3, 2024.

International Journal of Science, Engineering and Technology

Co-ordinator
IQAC, Shri Ram College
Muzaffarnagar

Chairman
IQAC, Shri Ram College,
Muzaffarnagar

ISSN (Online): 2348-4098
ISSN (Print): 2395-4752

ijset journal
www.ijset.in

Certificate of Publication

This is to certify that Manuscript, entitled by

Indian IT Department: Moon Light Review

Authored by

Assistant Professor Nishi Thakur

has satisfactory Reviewed and Published in Volume 12, Issue 3, 2024.

International Journal of Science, Engineering and Technology

Co-ordinator
IQAC, Shri Ram College
Muzaffarnagar

Chairman
IQAC, Shri Ram College,
Muzaffarnagar

ISSN (Online): 2348-4098
ISSN (Print): 2395-4752

ijset journal
www.ijset.in

Certificate of Publication

This is to certify that Manuscript. entitled by

Indian IT Department: Moon Light Review

Authored by

Assistant Professor Nutan Singhwal

has satisfactory Reviewed and Published in Volume 12, Issue 3, 2024.

International Journal of Science, Engineering and Technology

Co-ordinator
IQAC, Shri Ram College
Muzaffarnagar

Chairman
IQAC, Shri Ram College,
Muzaffarnagar

ijset journal
www.ijset.in

ISSN [Online]: 2348-4098
ISSN [Print]: 2395-4752

Certificate of Publication

This is to certify that Manuscript. entitled by

PAPR Reduction and Improvement of OFDM System Performance Using Artificial Intelligence Machine Learning Algorithm

Authored by

Assistant Professor Nutan Singhwal

has satisfactory Reviewed and Published in Volume 13, Issue 1, 2025.

Managing Editor
International Journal of Science, Engineering and Technology

Co-ordinator
IQAC, Shri Ram College
Muzaffarnagar

Chairman
IQAC, Shri Ram College,
Muzaffarnagar

ISSN (Online): 2348-4098
ISSN (Print): 2395-4752

ijset journal

www.ijset.in

Certificate of Publication

This is to certify that Manuscript. entitled by

Marketing Strategy in Improving Product Competitiveness in the Global Market

Authored by

Assistant Professor Deepak Kumar

has satisfactory Reviewed and Published in Volume 12, Issue 1, 2024.

Managing Editor
International Journal of Science, Engineering and Technology

Co-ordinator
IQAC, Shri Ram College
Muzaffarnagar

Chairman
IQAC, Shri Ram College,
Muzaffarnagar

ijset journal
www.ijset.in

ISSN [Online]: 2348-4098
ISSN [Print]: 2395-4752

Certificate of Publication

This is to certify that Manuscript, entitled by

Marketing Strategy in Improving Product Competitiveness in the Global Market

Authored by

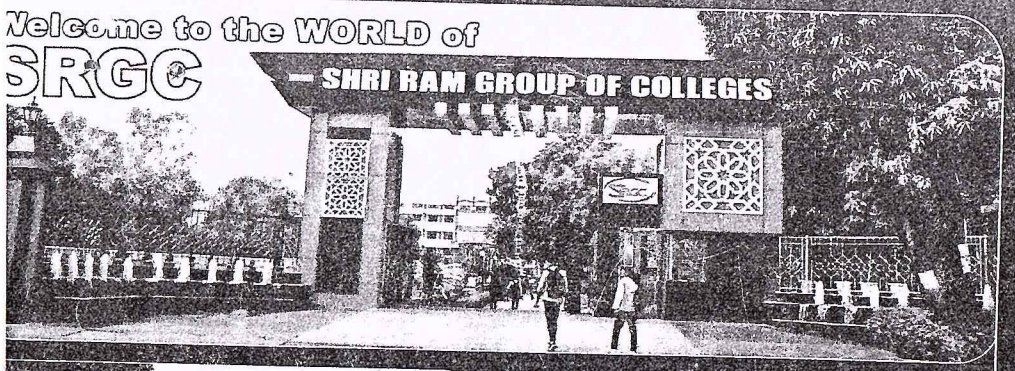
Assistant Professor Atul Kumar

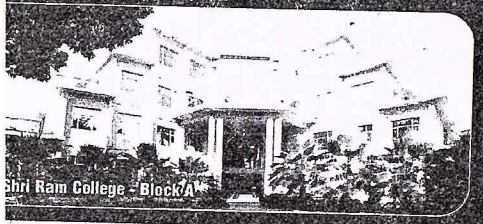
has satisfactory Reviewed and Published in Volume 12, Issue 1, 2024.

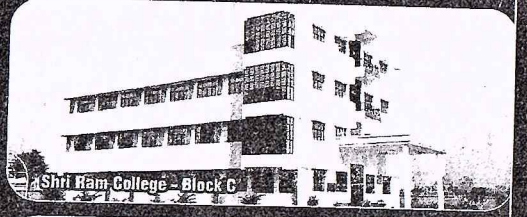
Managing Editor
International Journal of Science, Engineering and Technology

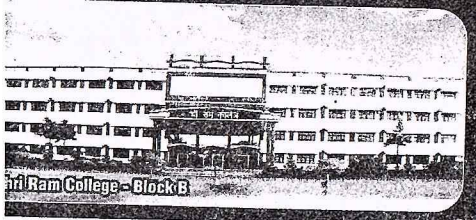
Co-ordinator
IQAC, Shri Ram College
Muzaffarnagar

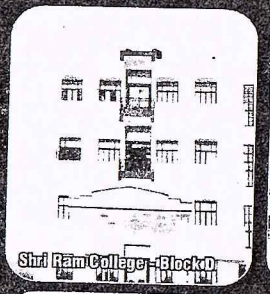
Chairman
IQAC, Shri Ram College,
Muzaffarnagar



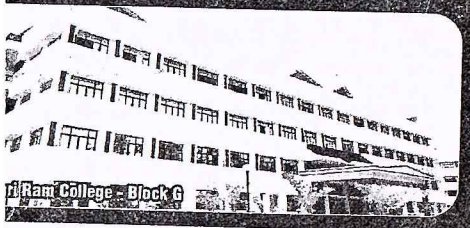


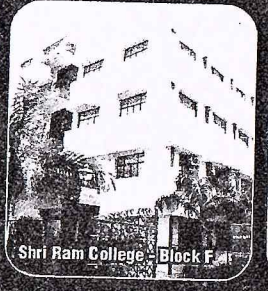


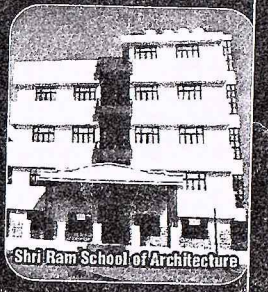


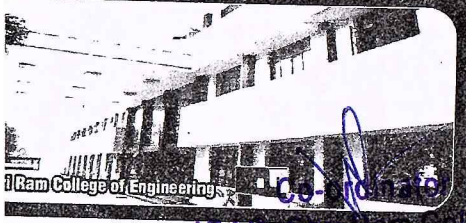




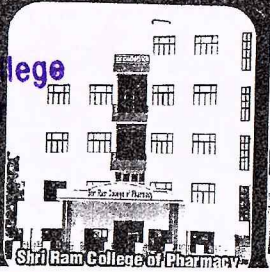














Co-ordinator
IQAC, Shri Ram College
Muzaffarnagar

Prabandhan Guru
प्रबन्धन गुरु

(A Research Journal of Management & Information Technology)

321-4295
UPENG/2010/38376

Volume : XIV, Issue : 1
January - June 2023

Title	Author
The Application of Metaverse in Education: A Promising Frontier in India	Dr. Himanshu Hora
Theories, Factors Influencing and Type of Nano Emulsion : Formulation	Ankur Rohila Akansha Nirwal
"The Metaverse's Impact on Education : Integrating Content and Bibliometric Perspectives"	Naved Alam Ruchi Rai
Review of Clinical Symptoms, Diagnosis, and Management of Pediatric Conjunctivitis	Abhishek Rai Avi Dubey
A Review On Novel Drug Delivery System	Tarannum Fatima
Diabetes Mellitus: A Comprehensive Review of Classification, Etiology, Epidemiology, Diagnosis, Clinical and Non-Clinical Management	Himanshu Sharma
"A Community based Analysis of Osteoporosis problem in Hindu & Muslim women by Calcium & Vitamin D Test"	Ms. Alina Siddiqui
Review article on: The Chemical and Pharmacological evaluation of Croton	Musayyab Khan
A Review On Biological Activities And Chemical Synthesis Of Schiff Base 1,2,4-Triazole Derivatives	Sabiya praveen
A Study on the future of OTT Platforms	Ravi Gautam Kehkasha Mirza
A Review on Green Entrepreneurship Practices in India	Shruti Mittal & Vivek Tyagi
Identify Drivers of Consumer's Satisfaction of Luxury Lifestyle	Nivedita Chaturvedi Jatin Singhal
Aim of digital India is to promote digital marketing	Dr. Pushpender Kumar
Impact of online Teaching/Learning on Students of Higher Educational System	Hansika Jain Pooja Chaudhary
Marriage of Minors : Rising Crimerate and Legislation	Dr. Hina Gupta
A comparative study on the analysis of health status between taking and non- taking breakfast	Dr. Shweta Rathi Rubi Poswal
Indian Sugar Sector: A Way Forward	Anshuman Kaler
Use of Kurt Lewin's Participative Leadership Style with Gandhian Standpoint of Leadership for The Better Management of Rural Institutions	Bhavin Gohil, Dr. Lokesh Jain
अहिंसक सम्भोषीय जीवन शैली के शिक्षण – प्रशिक्षण की उर्वरा प्रयोग भूमि गुजराज विद्यापीठ : एक वैयक्तिक अध्ययन	डॉ. लोकेश जैन, डॉ. देवेन्द्र नाथ दास

Chairman
IQAC, Shri Ram College,
Muzaffarnagar

Shri Ram Group of Colleges

Review of Complex Formation of 1,2,4-triazole Derivatives and Prospects for Their Application-

Researchers looked at five novel, complex compounds based on the heterocyclic system of palladium and the 1,2,4-triazole. The anti-cancer properties of enantiomeric pairings were discovered. All synthetic complexes already had antiproliferative qualities. This was particularly evident in the inactivation of MCF7 cells. The research found that the enantiomers of all produced complexes have nearly identical activity, indicating that chirality has no impact on their antiproliferative action. The chemicals have relatively low toxicity to non-cancerous cell lines, it is vital to emphasize.[6]

CONCLUSION

The triazole moiety displayed promising results in the majority of pharmacological activity, and we also have exciting results available under its belt, according to the review of the numerous outcomes produced by active compounds[7]. As in clubbed mode, included moieties, microwave synthesis, aided reactions, cycloaddition, and by many more mechanisms presented in this review, triazole demonstrated a favorable result. As it is currently being revealed and more are expected to become available soon due to the ongoing study, we anticipate that many additional pharmacological profiles will be added to it in the future.

REFERENCE

1. Deepu gupta et. al Synthesis, antifungal, antibacterial activity of novel 1,2,4- triazole derivative jouranal of pharmaceutical technology and research.
2. Jinlian daiet. al synthesis and methods of 1,2,3/ 1,2,3,4-triazoles Egypt publication.
3. Sabiya Praveen et al Synthesis and biological evaluation of some new Schiff base 1,2,4-triazole derivatives International Journal of Pharmaceutical Chemistry.
4. Feng Gao et al Antibacterial activity study of 1,2,4-triazole derivatives European Journal of Medicinal Chemistry.
5. Alimamad H Malani et. al a brief review article: Various synthesis and therapeutic importance of 1, 2, 4-triazole and its derivatives. Moroccan Journal of Chemistry.
6. Yurii G et. al 1,2,4-triazole derivatives in medicine and pharmacy and application prospects J. Fac. Pharm. Ankara / Ankara Ecz. Fak. Derg.
7. Gurkirpal singhet. al triazoles impinging the bioactivities international journal of current pharmaceutical research
8. Abderrahmen Abdelli et. al Recent advances in the chemistry of 1,2,4-triazoles: Synthesis, reactivity and biological activities hal open science.

Co-ordinator
IQAC, Shri Ram College
Muzaffarnagar

Prabandhan Guru, ISSN : 2321-4295
Vol: XIV, Issue: 1, Jan-June 2023
RNI : UPENG / 2010 / 38376

A STUDY ON THE FUTURE OF OTT PLATFORMS

Ravi Gautam
(Hod JMC Dept Shri Ram College,Muzaffarnagar)
Kehkasha Mirza
Asst.Professor,JMC Dept. Shri Ram College, Muzaffarnagar

ABSTRACT

OTT or over the top platforms has seen a likely boom in recent years with hordes of new content and original shows. It has engulfed the entire world of digital content. The primary focus of this research paper is to know the future of OTT platform how much people's trend towards OTT increases in the coming time, along with how much time people spend on OTT and what content they like to watch fathom this tidal wave of new mode of entertainment and how it has impacted the viewers and how people are flocking towards this new generation of digital entertainment. The data on the research was acquired through a questionnaire which was floated among the people through goggle forms. And the data revealed the change in the behavior, cost, convenience, and demand of original and new contents for the new generation. Particularly the original and new content and convenience playing a major role. This research paper sheds light into the changing behavior of the consumers and how OTT has a major role in that change.

Keywords : *OTT, Content variety, Future of OTT, Digital content*

I. INTRODUCTION

When we think of OTT, I remember the older days when CD player and VCR used to be popular and people were crazy & love to see the programs or movies through DVD player. Slowly it transforms to the availability of cable connection then the technology brought the concept of pen drive and the YouTube which grow as major channel for viewers. TV, itself brought major evolution as LED, touch screen, inbuilt internet availability, etc. With these variations the recent trends in market is OTT video streaming, The availability of content, easy access to variety of shows, user friendly nature and continuity in shows compels the users to subscription of OTT video streaming.

In the recent year, the work culture of organizations due to Covid19 has also created an impact on OTT video streaming subscription. Covid19 has generated leisure time to families in India.

People started to spend more time on online streaming services and get engaged with content on television. Chats on different platforms, video calls, web-series and movies turn out to be most favorite choices of people to spend time. OTT platform boomed to get quality content. It has grown as a convenient and easy option for people. It casts quality content with variety of options and without any advertisement. The easy availability of smart phones has also enabled large part of the population to gain access to online platforms. This point made lot of people from urban area to subscribe the OTT platform. 500 million Smartphone users exist currently in India.

II. LITERATURE REVIEW :

The literature review is a crucial aspect of the research study which provides necessary input for the researcher to carry out a research study on the subject area. The basic purpose of this research is

Chairman
IQAC, Shri Ram College,
Muzaffarnagar

to better understand earlier studies to better identify gaps in past findings and to investigate problems chosen for the study.

'Understanding adoption factors of over-the-top video services among millennial consumers' a study by Dr. Sabyasachi Dasgupta and Dr. Priya Grover - takes note that Indian audiences have swayed towards OTT content and are willing to spend for easy and unlimited access to content without a place and time limitation. It again notes the inverse impact of pricing strategy of OTT on its popularity. Data consumption is another attribute that makes it a tough choice for Indian viewers and so are habits and preferences for TV as a medium.

'Digital Media: Rise of on-demand Content' a report by Deloitte - it is noted that the rise of internet- enabled digital devices capable of supporting digitized content has led to an increase in the use of digital content globally. In India, this trend is observed across diverse platforms such as audio, visual, news, music etc. It mentions that an Indian youth, on an average spends 14% of their time and nearly 17% of their monthly expenditures on entertainment. An internet content consumer in India consumes an average of 6.2 hours of content on an everyday basis out of which 21% of the time is spent on audio-visual entertainment. A shift in consumer attitude with regard to a favoritism for OTT content and easy access to vast libraries at any time and place over content ownership is notable.

A study by Sidneyeve Matrix on 'Netflix' - observes that viewers especially youth are becoming active curators of content than couch potatoes taking in 'whatever producers 14 feed them'. Supporting this paradigm shift in consumers is the need to share, stay connected and discuss the content on social media forums. In the process of these social media transactions, the viewers are setting new standards of expectations from producers thereby becoming an active catalyst in the production process too.

III. STATEMENT OF THE PROBLEM:

The purpose of this research is to evaluate the influence of OTT platforms and their increasing application and to achieve this, a hypothesis has been formed. A quantitative approach has been adopted for that very same method. The focus was on people, who used OTT platforms for entertainment. The importance of this research is to underline the context of the OTT platforms and the level of their human consumption. This research will help us better understand how OTT platforms have taken root in the world of interactive content. This is going to help us fully comprehend how OTT grew and eventually took over other popular media.

IV. RESERCH OBJECTIVE:

1. A study on " Future of OTT platform"
2. To find out the audience of different age group on OTT platform.
3. To find out the future and scope of the OTT platform.
4. To find out the audience experience for using OTT platform.
5. To discover the higher consumption of OTT platform.

V. HYPOTHESIS:

(A) In today's competitive environment, we discover that technological advances are ever-changing, which is why problems arise, especially in older age groups who have not grown up using some of these fresh streaming channels. Some genuinely think that there are several users There presently who will not explore different online content streaming options if it is too difficult to understand.

H0 There is a positive relationship between ease of use and the adoption of OTT platforms.

H1 There is a positive relationship between ease of use and the adoption of Cable TV/Cinema

(B) Availability of content plays a very important role in selecting a media service and is a key element. Sports programming, Original content, Web series which have a massive influence among consumers are major factors and it is understood

Co-ordinator
IQAC, Shri Ram College
Muzaffarnagar

Prabandhan Guru, ISSN : 2321-4295
Vol: XIV, Issue: 1, Jan-June 2023
RNI : UPENG / 2010 / 38376

that many streaming options provide such offerings.

H0 Content options available positively relate to the use of OTT platforms.

H1 Content options available positively relate to the use of Cable TV/Cinema.

(C) As the world continues to develop, there is a significant increase in the use of Smartphone devices. Smartphone enhance the watching process of online services like Netflix. Social trends play a critical role in how consumers embrace OTT and what they watch. Social networking mixed with technological advances makes it easier for people to access see what everyone else wants to watch.

H0 Social trends have a positive relationship with the adoption of OTT platforms.

H1 Social trends have a positive relationship with the adoption of Cable TV/Multiplexes.

VI. Research Methodology

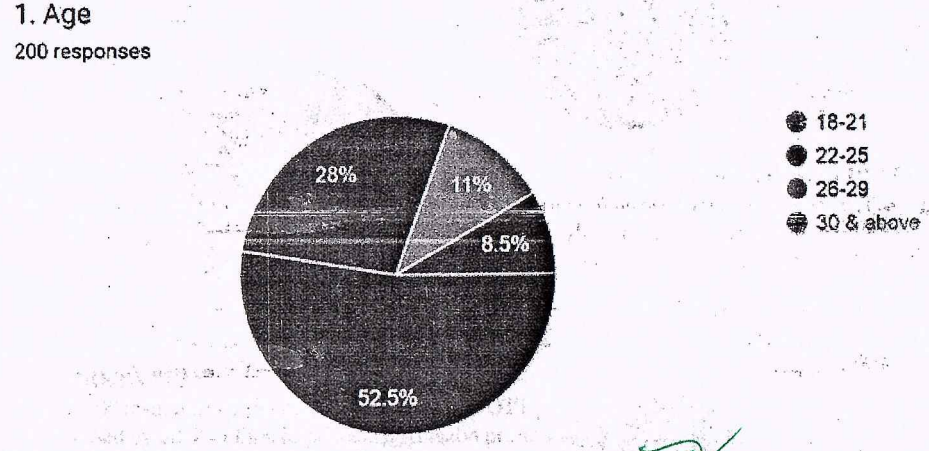
The study is intended to analyze the impact of various attributes such as ease of access and variety of content in the growth of OTT platform, international exposure, price sensitivity and its effect on high usage of OTT among consumers. The study has supported the primary research approach by survey. The survey was online and spread through social media such as WhatsApp, Email and LinkedIn. The sample size for the survey is 200.

6.2 Process of data collection:

The collection of data will be done through Google forms. The response of the respondents will be recorded and a proper analysis will be done based on the responses. This will help us in understanding the changed behavior patterns of the respondents and the impact of OTT.

VII. DATA ANALYIS AND INTERPRITATION :

We used a questionnaire to collect data in this study; the collection of questions was created after a thorough investigation of the topic, and the set of questions intends to provide us with insights about the A study on " Future of OTT platform" In this analysis, we will focus on the primary data that is gathered. The aim is to analyze the data collected from 200 respondents.

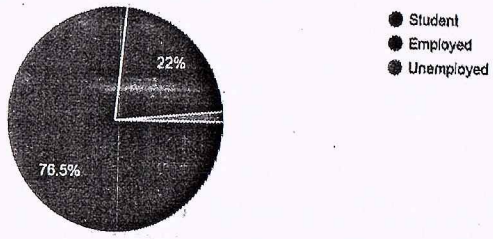


INTERPRETATION

- 52.5% of the respondents are in age group of 18-21 years
- 28% of the respondents are in age group of 22-25 years
- 11% of the respondents are aged 26-29years & above
- 8.5% of the respondents are aged above 30 years

Chairman
IQAC, Shri Ram College,
Muzaffarnagar

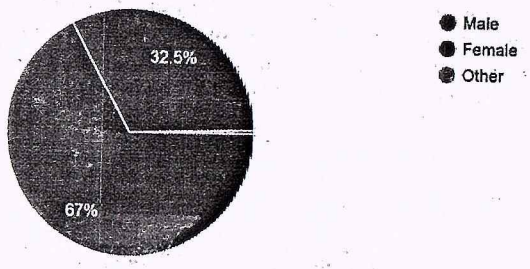
2. Occupational Status
200 responses



INTERPRETATION

- The majority of the respondents are students which consists of 76.5%
- 22% of the respondents are employed
- 0% of respondents are unemployed

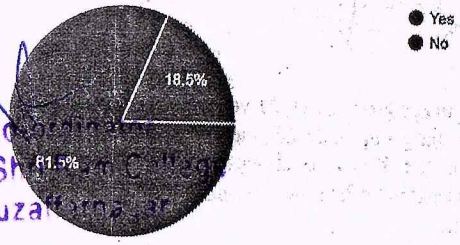
3.Gender
200 responses



INTERPRETATION

- The primary data is collected from a total of 200 respondents
- 32% of the respondents are female
- 67% of the respondents are male

4. Do you use OTT platform?
200 responses



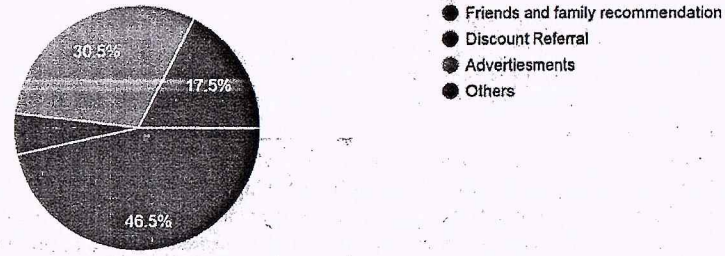
Coordinator
IQAC, Shri Ram College,
Muzaffarnagar

Prabandhan Guru, ISSN : 2321-4295
Vol: XIV, Issue: 1, Jan-June 2023
RNI : UPENG / 2010 / 38376

INTERPRETATION

The chart shows that 81.5% of respondents use OTT while 18.5 % of respondents don't. This was a screening question to filter out the required population who watch OTT and can proceed to answer the further questions. Through this, we could get the desired population who qualify for the research.

5. How did you come to know about OTT services?
200 responses



INTERPRETATION

The above chart shows the source of awareness for the OTT medium. The figure shows that 46.5% of respondents out of 200 came to know about OTT through their friends and family recommendations. Advertisements also played a major role in the awareness of OTT in respondents as 30.5% of them endorsed the advertisement. While 17.5% of respondents came to know through others.

6. Which OTT platforms do you like most?
200 responses



INTERPRETATION

Out of the 200 respondents, Hotstar is the most popular OTT platform is used by 30.9% of the respondents. Netflix is used by 30.4% of the respondents. Amazon prime video is used by 13.2% of respondents. The other OTT platforms used by 17.6% include Voot, Mx player Neestream, ErosNow, SunNXT etc.

Chairman
IQAC, Shri Ram College,
Muzaffarnagar

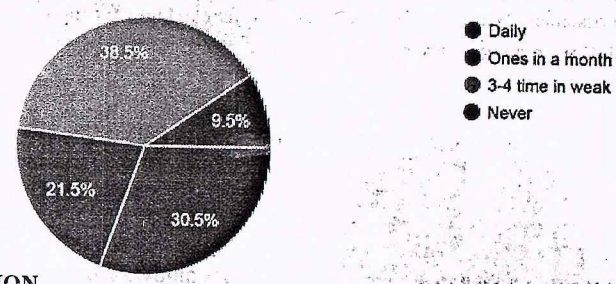
7. Why do you like this platform?
200 responses



INTERPRETATION

The user friendliness of the OTT platforms is the main attraction & benefit majority of the respondents have. 37.5% of the respondents loved the benefit of having quality of the content in the usage of OTT platforms. 22.5% of the respondents are attracted with the availability of worldwide content via these platforms and 17.5% of total respondents likes the free of cost entertainment provided via these OTT platforms.

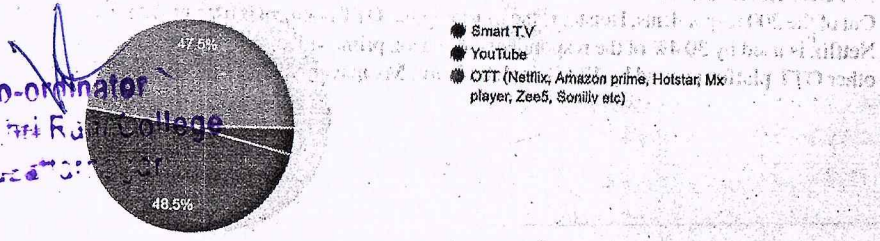
8. How frequently do you use the OTT platform?
200 responses



INTERPRETATION

The above charts show how captivating OTT Platforms are to users. The above inquiry was posed, the discovery states that 38.5 % use it 3-4 times in a week. Over 30.5% of them use it daily. Just 21.5 % of the users use it once a month.

9. Out of these options which medium do you use most for relaxing on weekend?
200 responses



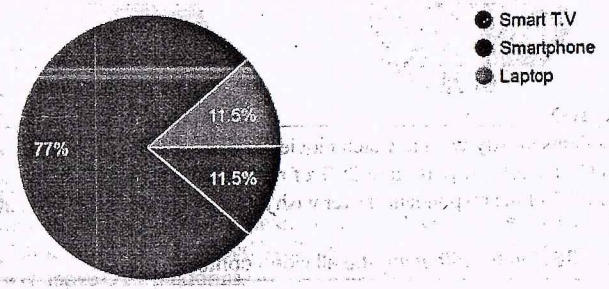
Co-ordinator
IQAC, Shri Ram College
Muzaffarnagar

Prabandhan Guru, ISSN : 2321-4295
Vol: XIV, Issue: 1, Jan-June 2023
RNI : UPENG / 2010 / 38376

INTERPRETATION

The chart shows that 47.5 % of respondents use OTT on weekends for relaxing while the use of OTT and You tube was 48.5% Through this, we get a notion of how there has been a significant increase in the consumption of OTT platforms. As more and more people flock towards OTT we see a significant reduction in consumption of Cable T.V among the respondents.

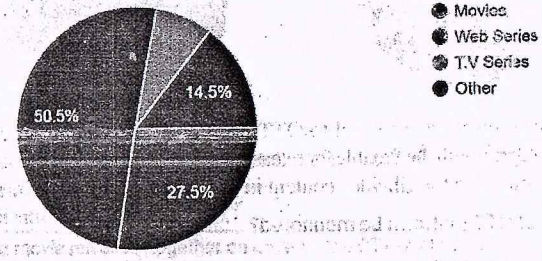
10. How do you consume OTT most of the time?
200 responses



INTERPRETATION

From the above chart, it is evident that a maximum i.e. 77% of respondents consume OTT through their smart phones. 11.5% of respondents prefer laptops and the remaining 11.5% of Users consume through Smart T.V.

11. Which of these do you usually watch on OTT platform?
200 responses

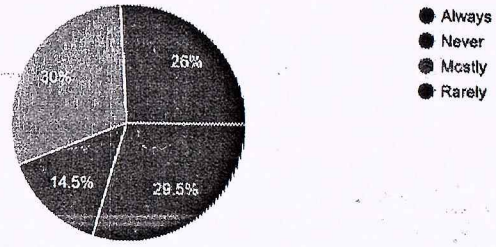


INTERPRETATION

The above chart shows the result of their preferences on OTT platforms. Approx. 50.5%People prefer watching web series. While 27.45% like to watch movies on the OTT, 14.5.% of respondents like to watch other things on OTT platforms like Documentaries and reality shows.

Chairman
IQAC, Shri Ram College,
Muzaffarnagar

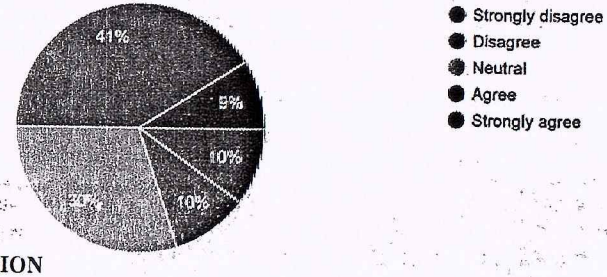
12. Do you prefer to watch movies on OTT than in theaters?
200 responses



INTERPRETATION

30% of the respondents mostly wish to watch movies on OTT than in theatres. 26% of the respondents watch movies on OTT rarely. A portion of 29% of respondents always wish to watch movies on OTT than in theatres. 14.5% of the respondents never wish to watch movies on OTT than in comparison with theatres.

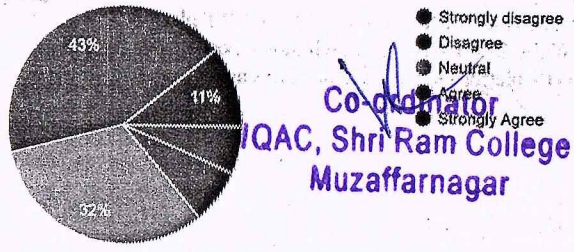
13. OTT platform flexible for releasing the all video content.
200 responses



INTERPRETATION

30% of the respondents have responded neutral to OTT platforms flexible for releasing the all video content. 41% of respondents agree with the flexible for releasing the all video content. 10% of the respondents are against the flexible for releasing the all video content in which 9% of respondents strongly agree.

14. Should video content of OTT platform be monitored?
200 responses



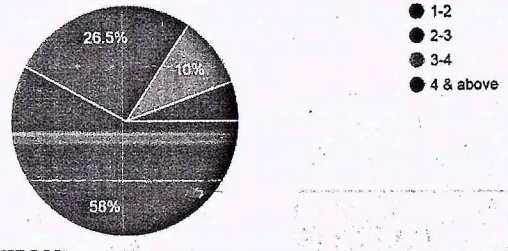
Co-ordinator
IQAC, Shri Ram College
Muzaffarnagar

Prabandhan Guru, ISSN : 2321-4295
Vol: XIV, Issue: 1, Jan-June 2023
RNI : UPENG / 2010 / 38376

INTERPRETATION

43% of the respondents agree with the monitored of OTT platforms. 11% of the respondents are strongly agree. 32% of the respondents have responded neutral to monitored of OTT platforms.

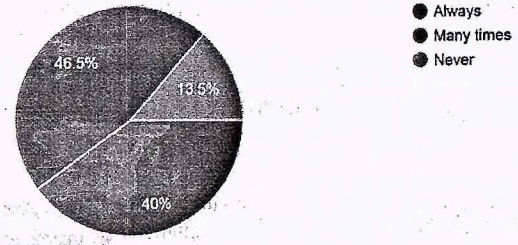
15. How many OTT platform do you watch regularly ?
200 responses



INTERPRETATION

58% of the respondents use 1-2 OTT platform regularly. 26% of the respondents use 2-3 OTT platforms regularly. 3-4 OTT platforms are regularly used by 10% of the respondents and none of the respondents are using more than 4 & above OTT platforms.

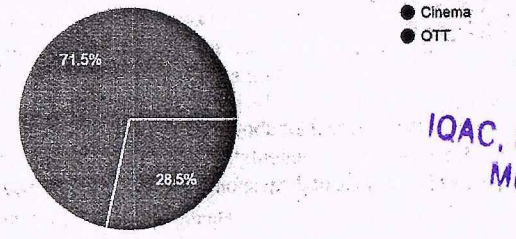
16. Do you think movies should be released together on OTT and Cinema?
200 responses



INTERPRETATION

46.5% of the respondents many times wish to watch movies on OTT than in theatres. 40% of the respondents watch movies on OTT always. 13% of the respondents never wish to watch movie on OTT than in comparison with theatres.

17. In the future, if a movie releases together on Cinema and OTT platform, what would you prefer?
200 responses



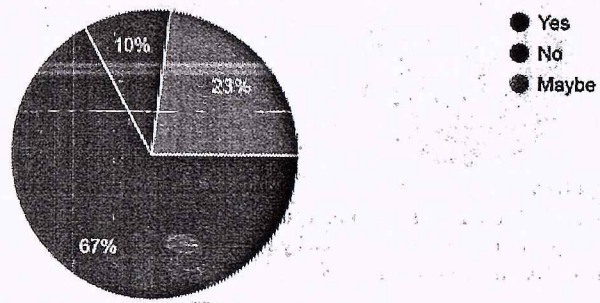
Chairman
IQAC, Shri Ram College,
Muzaffarnagar

INTERPRETATION

The above chart states a futuristic question on the choices of the users. 71.5% of respondents says they will choose OTT to watch a movie instead of cinema while 28.5% of users still prefer Cinema over OTT platforms.

18.Are you satisfied with the content of online streaming?

200 responses

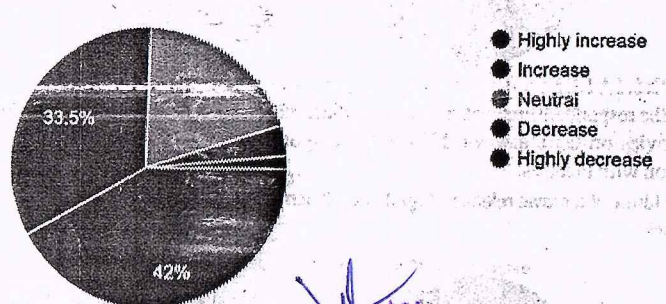


INTERPRETATION

As per the chart shown above, 8% people are satisfied with online streaming content. Whereas 30% people say. Maybe and 10% disagree.

19.What do you think about usage of OTT platform in future.

200 responses



INTERPRETATION

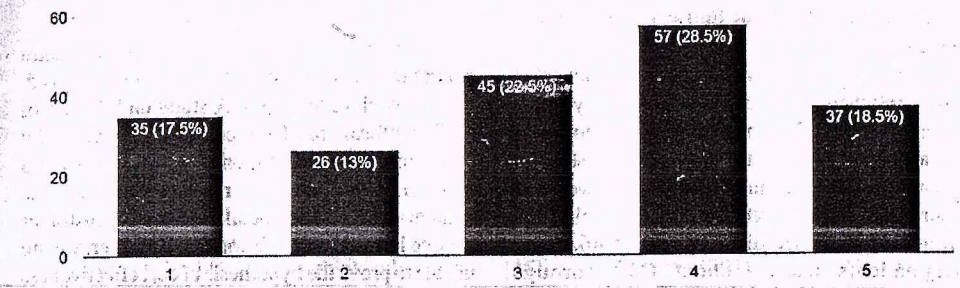
42%, majority of the respondents has highly increase their about usage of OTT platforms in future 33.5% of the respondents have increase. 19.5% of the respondents have been staying neutral on their OTT platforms usage. The most important fact is that none of the respondents have decrease and highly decrease their OTT usage.

Co-ordinator
IQAC, Shri Ram College
Muzaffarnagar

Prabandhan Guru, ISSN : 2321-4295
Vol: XIV, Issue: 1, Jan-June 2023
RNI : UPENG / 2010 / 38376

20. Rate your experience of using OTT platform.

200 responses



INTERPRETATION

28.5% of the respondents have given a rating of 4 out of 5 as their OTT experience. 18.5% of the respondents were fully satisfied with their experience and they gave a 5 star rating. 22.5% of the respondents gave a 3 star rating and 26.13% of the respondents gave a 2 star rating and 17.5% respondents weren't happy with the experience & they gave 1 star ratings.

VIII. RESULTS & FINDINGS:

A survey was conducted to analyze the Impact of OTT platforms on the viewing experience. This chapter deals with the findings we have received through the data analysis. These findings are further discussed in details Over the last few years, the explosion of OTT streaming services in India has resulted in the emergence of distinct patterns of content consumption. The information gathered by the survey shows that over 94.5% of respondents are aware of the OTT medium implying that OTT is a popular medium in India.

1. The first hypothesis we'll look at in these findings is the ease of use.

Our survey clearly shows that 200 out of 163 respondents are comfortable using OTT platforms. Furthermore, it demonstrates that OTT is the preferred platform for entertainment for the majority of people in India, as the survey shows that 47.5% of respondents use OTT on weekends for relaxing, while only 6.1% and 9.1% use cinema and TV, respectively. This demonstrates how there has been a massive increase in the consumption of OTT platforms. As more people migrate to OTT, we see a significant decrease in consumption of cable television and cinema among respondents.

2. The availability of content on OTT platforms is the next hypothesis we'll look at.

OTT platforms are very popular among users, with 38.5% of them using them 3-4 times per week. Over 30.5% of them use it on a daily basis. Only 21.5% of users use it once per month. Speaking of content available on OTT platforms, we can clearly see from our findings that more people prefer OTT platforms rather than TV or cinema, as in the survey we asked a question related to the consumer's futuristic choice and we can clearly see that 71.5% [illegible]ondents say they will choose OTT to watch a movie instead of T.V and cinema due to content availability. Furthermore, OTT platforms offer a variety of content options to users, such as movies, exclusive/original content, web series, and television series. We attempted to analyze consumer preferences for various contents available on OTT platforms, and the survey results showed that approximately 50.5% of respondents prefer watching Web series on OTT, while 27.5% prefer watching Movies on OTT, and the remaining respondents prefer watching other things on OTT platforms like Documentaries and reality shows. user responses clearly showed that people prefer more content availability on OTT platforms rather

Chairman
IQAC, Shri Ram College
Muzaffarnagar

Prabandhan Guru, ISSN : 2321-4295
Vol: XIV, Issue: 1, Jan-June 2023
RNI : UPENG / 2010 / 38376

than TV or cinema, as we can see that 46.5% said yes, and only 13.% said no.

3. The third hypothesis that we will look at is Social Trends.

Social trends have a significant impact on how consumers embrace OTT and what they watch. Social networking, combined with technological advancements, makes it easier for people to see what everyone else is watching. In the survey, we asked users about the source of their OTT platform awareness, and we discovered that 46.5% of respondents learned about OTT through recommendations from friends and family. The advertisement also played a significant role in respondents' OTT awareness, with 30.5% of them endorsing the advertisement. While 17.% of respondents learned about the OTT platforms through others. From this, we can clearly see that social trends play a significant role in the selection of OTT platforms, as social trends influence customers to either choose or reject OTT platforms. The use of Smartphone devices is increasing significantly as the world evolves. Smartphone enhance the viewing experience of online services like Netflix and Amazon Prime. When it comes to mode of consumption, people prefer Smartphone (77.%) to laptops (11%) and Smart televisions (11.%). lean more toward OTT platforms due to the additional features and facilities that OTT platforms provide.

IX. LIMITATIONS AND RECOMMENDATIONS OF THE STUDY:

1. The sample size for the survey was limited to 200 respondents. A larger population survey can be conducted for a more detailed study and understanding. And the respondents were mostly students and working professionals.
2. The survey results may be biased in favor of OTT platforms, as we can see that there has been a substantial increase in the viewership of OTT platforms during the lockdown period due to the closure of multiplexes and a lack of content available on televisions. And the also the majority of were not the general crowd but students and working professionals.

X. CONCLUSION:

The data collected from the questionnaire survey was successfully interpreted and analyzed. The research on the topic A study on " Future of OTT platform" has been completed successfully based on the analysis. When compared to OTT and Cinema , the hypothesis regarding ease of use, content availability, social trends, and customer service has proven to be correct. However, we are unable to prove the hypothesis of cost effectiveness in favor of OTT platforms due to the mixed responses we received in our survey; as a result, there was no conclusion. This shows that even though OTT platforms cannot replace cinema but certainly is creating its own segment. We can say that in the future, there might be few people who would prefer OTT over cinema.

According to all of the reports and articles that we have read and reviewed, OTT platforms will continue to spread in India and will have a significant impact in terms of viewership on our traditional mediums such as television and Cinema. Although some respondents who enjoy watching movies in a theatre will continue to do so, but this number is also bound to fall. The future footfalls of cinema and televisions will undoubtedly be influenced by OTT platform services. So, at last we like to conclude by saying that OTT platform services will be regarded as the technology of the future, having a significant impact on our collective viewing habits, the future of OTT is bright.

REFERENCE

1. https://en.wikipedia.org/wiki/Over-the-top_media_service
[1]. Dixit, D. (2020, March 6). The rise and desification' of Indian OTT. Retrieved from Television post: https://www.televisionpost.com /the-rise-and-desification-of-indian-ott/Purdy, s.c. (2018). KPMG's annual cable & OTT report.
[2]. Kaushal, S. (2020, May 26). OTT Platforms In India See Subscriber Bases Surge Up To 80% Amid Corona virus Lockdown. Retrieved from Forbes.
[3]. OTT Platforms in India See Subscriber Bases Surge Up To 80% amid Corona virus Lockdown:https://www.forbes.com/sites/swetakaushal/2020/05/26/good-news-amid-lockdown- ott-platforms-register-60-80-surgein-subscription-base/?sh=711b9141413a
[4]. Sharma, K. (2020, May 19). Will movies releasing directly on OTT platforms become a norm post-Covid? Experts think otherwise. Retrieved from a Business insider:
[5]. https://www.businessinsider.in/advertising/media/article/will-movies-releasing-directly-on-ott-platforms-become-a-norm-postcovid-experts-think-otherwise/articleshow/75808931.cms
[6]. Laghate, G. (2017, March 02). How OTT players are geared up to woo Indian viewers. Retrieved from Brand equity:
[7]. https://brandequity. economictimes. indiatimes.com /news/media/how-ott-players-are-geared- up-to-woo-indian-viewers/57275909
[8]. Article on Matrix, s. (2014). The Netflix Effect: Teens, Binge Watching, and On-Demand Digital Media Trends. Jeunesse: young people, texts, culture.
[9]. Gevers, A. (2019). Video Streaming in India: Hot! ComScore, Inc. Retrieved from February 3, 2020, Article.
[10]. Das, H. (2019). Online Streaming Platforms Trending in India. Retrieved from January 18, 2020, Article.
[11]. Deloitte (2019). 5G Ecosystem The digital haven of opportunities. Retrieved from January 18, 2020, Article.
[12]. IAMAI (2019).India Internet 2019. Retrieved from January 20, 2020, Article.
[13]. PwC India. (2019). Global Entertainment & Media Outlook 2019-2023. Retrieved from February 3, 2020, Article.
[14]. KPMG (2019). India's Digital Future article.
[15]. News18.com (2019). Four Out of Five Smartphone Owners in India Use At Least One OTT Entertainment App. Retrieved from February 3, 2020, Article.
[16]. Mitter, S. (2019). How OTT platform SonyLIV rode cricket, FIFA, and international content to record 100 million downloads. Retrieved from January 18, 2020, Article.
[17]. Begum, F. (2018). In India, localized content is as important as pricing when choosing a video service - IHS Technology. Retrieved from January 30, 2020, Article.
[18]. Bilbil, E. T. (2018). Methodology for the Regulation of Over-the-top (OTT) Services: the need of a multi-dimensional perspective published in International Journal of Economics and Financial Times.
[19]. Bezos, J. (2019). 2018 Letter to Shareholders. Retrieved December from 12, 2019, Article. [20]. BW Online Bureau (2019). A Holistic Entertainment Experience: Karan Bedi, CEO, MX Player. Retrieved from January 18, 2020, Article.

Co-ordinator
IQAC, Shri Ram College
Muzaffarnagar

Chairman
IQAC, Shri Ram College,
Muzaffarnagar

International Journal of Scientific Research & Engineering Trends
Volume 9, Issue 6, Nov-Dec-2023, ISSN (Online): 2395-566X

Role of NGO's in Women Empowerment

Ms. Ruby Poswal, Dr Shweta Rathi
Department of Home Science
Shri Ram College MZN

Abstract- This research explores the multifaceted role of Non-Governmental Organizations (NGOs) in promoting women's empowerment globally. Drawing upon a comprehensive analysis of existing studies and literature, the review examines the diverse interventions and strategies employed by NGOs to address gender disparities and advance women's rights. Key themes include advocacy and awareness-raising, capacity building, economic empowerment, health and reproductive rights, legal aid, education, political participation, community development, research, and partnerships. Through a systematic review methodology, the study synthesizes findings to provide insights into the effectiveness and significance of NGO initiatives in empowering women across different contexts. The review contributes to a deeper understanding of the complex dynamics shaping women's empowerment efforts and highlights the pivotal role of NGOs in fostering gender equality and inclusive development.

Index Terms- NGOs, Women Empowerment, Gender Equality, Women's Rights, Empowerment Interventions, Advocacy, Capacity Building, Economic Empowerment, Health, Reproductive Rights, Legal Aid, Education, Political Participation, Community Development, Research, Partnerships.

I. INTRODUCTION

The empowerment of women is not only a fundamental human right but also a critical component of sustainable development. Despite significant progress in recent decades, gender disparities persist globally, hindering women's full participation and contribution to society. Non-Governmental Organizations (NGOs) have emerged as key actors in addressing these challenges and promoting women's empowerment through various interventions and initiatives. This review aims to explore and analyze the role of NGOs in women's empowerment based on existing studies and literature. By examining the diverse activities, strategies, and impacts of NGOs in this field, this review seeks to provide insights into the effectiveness and significance of NGO interventions in advancing gender equality and empowering women worldwide.

1. Advocacy and Awareness
NGOs often advocate for women's rights and raise awareness about issues such as gender-based violence, access to education, healthcare, and economic opportunities. Through campaigns, workshops, and outreach programs, they educate communities and policymakers on the importance of women's empowerment.

2. Capacity Building
Many NGOs provide training and skill-building programs tailored to women's needs. These programs equip women with the skills necessary to participate in the workforce, start businesses, and engage in decision-making processes within their communities.

3. Economic Empowerment
NGOs implement microfinance initiatives, entrepreneurship training, and vocational skills development programs aimed at economically empowering women. By providing access to credit, resources, and market linkages, they enable women to generate income and become financially independent.

4. Health and Reproductive Rights
NGOs work to improve women's health outcomes by offering healthcare services, reproductive health education, and access to family planning resources. They also address issues such as maternal mortality, HIV/AIDS prevention, and access to clean water and sanitation, which disproportionately affect women.

5. Legal Aid and Justice
NGOs provide legal aid services to women who have experienced discrimination, violence, or injustice. They offer support in navigating legal systems, filing complaints, and accessing justice. Additionally, they advocate for policy reforms to strengthen women's legal rights and protections.

6. Education and Literacy
NGOs promote access to education for girls and women, addressing barriers such as poverty, cultural norms, and gender discrimination. They establish schools, provide

© 2023 IJSRET

Co-ordinator
IQAC, Shri Ram College
Muzaffarnagar

Chairman
IQAC, Shri Ram College,
Muzaffarnagar

scholarships, and develop programs to improve literacy rates among women, empowering them to make informed decisions and pursue their aspirations.

7. Political Participation
NGOs encourage women's participation in political processes and leadership roles. They offer training on civic engagement, leadership development, and political campaigning. Additionally, they advocate for gender-sensitive policies and electoral reforms to enhance women's representation and influence in governance structures.

8. Community Development
NGOs engage in community development initiatives that empower women as agents of change. They facilitate women's participation in decision-making forums, community development projects, and grassroots organizations, fostering their leadership skills and enhancing their roles in local development efforts.

9. Research and Documentation
NGOs conduct research and gather data on issues related to women's empowerment, helping to identify trends, challenges, and best practices. They use this evidence to inform their programs, advocate for policy changes, and contribute to broader knowledge sharing and awareness-raising efforts.

10. Partnerships and Networking
NGOs collaborate with governments, businesses, other NGOs, and international agencies to leverage resources, expertise, and influence for women's empowerment. Through strategic partnerships and networking, they amplify their impact and create synergies to address complex challenges effectively.

Features of NGOs
NGO s is basically focused towards improving the socio economic conditions of the people with whom they work. The following are the important characteristics that an NGO requires to have in order to be effective:

Voluntary
NGOs are voluntary organizations and are formed by a few concerned people who have their own self-interest towards societal development. They are not formed out of anybody's compulsion. If formed so, then it will not be effective in its functions.

Legal Status
NGOs are registered with the Government under the Societies Act, Trust Act, and Companies Act etc. They are also registered under Foreign Contribution Regulation Act (FCRA) with the ministry of Home Affairs of The Government of India. This enrollment with FCRA is required to be entitled to obtain funds from abroad.

Independent
NGOs need to be independent in planning and implementation of their programs. Any other sort of external intervention may not allow the NGO to perform to its fullest capacity.

Flexible
NGOs must be flexible to interventions. They are not bound by redtapism and other bureaucratic obstacles.

Quicker in Decision Making
NGOs take quick decisions in response to the needs of the society. The more quickly the decisions are taken, the faster the services reach the deprived

High Motivation
The members and the staff are endowed with high motivation and inspiration to work for the cause of the people. They strive tirelessly to achieve their purpose for the benefit of the target groups.

Freedom in Work
NGO workers need to enjoy freedom in their field work, in organizing the community and carrying out the development schemes.

Catalytic
NGOs enhance and induce the communities into social action but they do not dilute and distort themselves in the process of intervention.

People-Centered
NGOs encourage people's participation. They plan things for the people and implement the same through the people. They make decisions by discussing with voluntary people and implement a decision that is the most effective towards helping people develop.

Non-profit Oriented
NGOs are not run with intentions of profit. The surplus and gains from economic projects, if any, are not distributed amongst the members or stakeholders. They are re-used for some other development purposes.

II. REVIEW OF LITERATURE

Kumran, 2014 analyzed that the only GDP is not a factor for nations' growth, other factors also matter. For NGO to have full efficacy they should have the organizational capacity to operate effectively and efficiently. They should have revenues from diversified sources. They should have active strategic planning and provide awareness on gender inequality and inequity in the society, networking among women welfare NGOs is the key to increase awareness on issues, address various causes and consequences of women's rights abuse,

Co-ordinator
IQAC, Shri Ram College
Muzaffarnagar

© 2023 IJSRET

Chairman
IQAC, Shri Ram College,
Muzaffarnagar

and promote overall women empowerment throughout the nation.

(Handy et al., 2006) researched different occupational females, supervisors, field workers, recipients with different data and found out that the Empowerment index depends only on the time spent by the female in NGOs.

Diriba Ayele, Sori Tefera(2020) emphasizes to investigate the effects of NGOs on socio-economic empowerment of women by conceptualizing and developing five basic dimensions of women empowerment including income, saving, decision-making ability, expenditure level, and assets ownership rights of women based on empirical evidence from some NGOs operating in Ethiopia.

Devaraj Dutta (2020) study is an attempt to evaluate the role of Non-Governmental Organizations in protection and promotion of child rights. The study was carried out in North Lakhimpur Sub-Division of Lakhimpur District of Assam State. The study is based on both theoretical and empirical data.

Sharda jai haryani, bharati motwani(2020) The study identified a positive impact of NGO initiatives on the empowerment of rural women. Thus we can conclude that NGOs in India are effectively working towards upliftment of socioeconomic status of the poor women in the rural areas thereby attaining the goal of rural management.

Dr. Kunhi Sikha Bhuyan(2020) states about women empowerment through education; the problems, the historical background of women education, constitutional provision and also forwarded some suggestions. Hope that our paper will help about to understanding the women educational scenario and importance of education in her development and empowerment.

III. METHODOLOGY

Literature Search
A comprehensive search was conducted across academic databases, including PubMed, Google Scholar, JSTOR, and Web of Science, using keywords such as "NGOs," "women empowerment," "gender equality," "women's rights," and "gender empowerment programs." The search included peer-reviewed articles, reports, and studies published within the last decade to capture recent developments and trends in NGO initiatives for women's empowerment.

Inclusion Criteria
Studies and literature focusing on the role of NGOs in women's empowerment were included in the review. Both qualitative and quantitative studies were considered, encompassing a range of geographical locations and cultural contexts to provide a comprehensive understanding of NGO interventions.

Data Extraction and Analysis
Relevant data from selected studies were extracted, including key findings, methodologies, geographical focus, target populations, intervention strategies, and outcomes. A thematic analysis approach was employed to identify common themes, patterns, and insights regarding the role of NGOs in women's empowerment across different contexts

Synthesis and Interpretation
The extracted data were synthesized and interpreted to provide a nuanced understanding of the diverse roles and contributions of NGOs in promoting women's empowerment. Comparative analysis was conducted to identify similarities, differences, and best practices in NGO interventions, highlighting factors influencing effectiveness and sustainability.

Limitations
The review acknowledges potential limitations, including language bias, publication bias, and the scope of included studies. Efforts were made to mitigate bias through comprehensive search strategies and inclusion criteria, although some studies may have been overlooked. Additionally, the review focuses primarily on published literature, thereby potentially overlooking unpublished reports or grey literature.

IV. CONCLUSION

NGOs play a pivotal role in women's empowerment through a multifaceted approach encompassing advocacy, capacity building, access to education and healthcare, economic empowerment, legal aid, community development, and policy advocacy. By addressing gender disparities and challenging societal norms, NGOs empower women to assert their rights, access opportunities, and participate actively in decision-making processes at various levels. Through their tireless efforts, NGOs contribute significantly to creating a more equitable and inclusive society where women can thrive and fulfill their potential. However, continued collaboration, resource mobilization, and strategic interventions are essential to sustain and amplify the impact of NGO initiatives in advancing women's empowerment globally.

REFERENCES

1. Mayoux, L. (2001). Tackling the Down Side: Social Capital, Women's Empowerment and Micro-Finance in Cameroon. Development and Change, 32(3), 435-464.

Co-ordinator
IQAC, Shri Ram College
Muzaffarnagar

Chairman
IQAC, Shri Ram College,
Muzaffarnagar

2. Agarwal, B. (1997). Bargaining and Gender Relations: Within and Beyond the Household. Feminist Economics, 3(1), 1-51.
3. Molyneux, M. (1985). Mobilization without Emancipation? Women's Interests, the State, and Revolution in Nicaragua. Feminist Studies, 11(2), 227-254.
4. A.K. Patel, MV. Dubey, NGOs and Social Work, Crescent Publishing Corporation, 2010.
5. Chowdry D.D.Paul, Voluntary Social Welfare in India, New Delhi, Sterling Publication 1971.
6. Dhillon, D.S and B.S Hansra, Role of Voluntary Organization in Rural Development, Kurukshetra, 43, 1995.
7. Femida Handy PHD & Meenazkassam PhD(2006) Practice What you Preach? The Role of Rural NGO in Women's Empowerment, Journal of Community Practice, 14:3, 69-91.
8. Jain, NGO in India; Their Role Influence and Problems in NGOs in Development; Theory and Practice, edited BavaNoorjahan . New Delhi, Kanishka, 1997.
9. Muthusamikumaran (2014) Roles, Responsibilities, and Trends of NGO in Women Empowerment, Indian Journal of Public Administration, Vol. Lx,No.3.
10. Alsop, R., Bertelsen, M. F., & Holland, J. (2006). Empowerment in Practice: From Analysis to Implementation. The World Bank.
11. Moser, C. (1993). Gender Planning and Development: Theory, Practice and Training. Routledge.
12. Pearson, R., & Sweetman, C. (2011). Gender and the Power of Relationship: 'Post-Consensus' Development in Côte d'Ivoire. Development and Change, 42(4), 887-909.

Chairman
IQAC, Shri Ram College,
Muzaffarnagar

Co-ordinator
IQAC, Shri Ram College
Muzaffarnagar

Eco. Env. & Cons. 30 (August Suppl. Issue) : 2024; pp. (S346-S350)
Copyright@ EM International
ISSN 0971–765X

DOI No.: http://doi.org/10.53550/EEC.2024.v30i05s.053

Investigating Benzene and Derivatives in Edible Oils: Impact of Heating Duration Analysed through VOC Examination

Krishna Pyare[1], Ruby Rani[2], Basant Shubhankar[3*], Suchitra Tyagi[4], Kavita Kumari[5] and Annapurna Kumari[6]

[1]Department of Botany, K.S. College, Seraikella, Kolhan University, Chaibasa, Jharkhand, India
[2]PG Department of Home Science, Kolhan University, Chaibasa, Jharkhand, India
[3]University Department of Chemistry, Kolhan University, Chaibasa, Jharkhand, India
[4]Shri Ram Group of College, Muzaffarnagar, U.P., India
[5]Department of Home Science, LN Mithila University, Madhubani, Bihar, India
[6]Department of Home Science, JMDPL Mahila College, Madhubani, Bihar, India

(Received 3 February 2024; Accepted 27 April, 2024)

ABSTRACT

This study investigates the concentration of volatile organic compounds (VOC) in various edible oils and their behaviour when subjected to heat. Building on the limited data available on the effects of heating on these compounds, the research provides a comprehensive analysis of benzene and its derivatives in fresh and heated edible oils. Utilizing High-Performance Liquid Chromatography (HPLC) with a UV detector at 254 nm wavelength. Our findings demonstrate that fresh mustard, cottonseed, rice bran, and palm oils possess higher initial concentrations of benzene and substituted benzenes. These concentrations decrease significantly upon heating, which is likely due to the volatilization of low-boiling organic compounds. Furthermore, the study explores the emissions of VOC during deep frying with edible oils, which is a significant concern given their mutagenic and carcinogenic potential. The vapours captured 2, 4, 6 hours of heating were analysed, revealing high levels of benzene and its derivatives, particularly from mustard oil. The intense emissions from frying mustard oil suggest potential health risks for individuals exposed to these fumes, especially cooks.

Key words: VOC, Edible Oils, Heating effects, Carcinogenicity, Indoor Air Pollution

Introduction

In India, people often use cooking oil in their food, either by directly consuming it with meals or by frying food in it. When oil is heated for cooking, it releases vapours that can make indoor air dirty (Dangal *et al.*, 2024). These vapours can also change the colour of the oil to a dark brown shade. Some studies have talked about these vapours and how they affect the quality of the oil, but none have looked at all the different oils commonly used. So, the author decided to do a thorough study on this topic (Fetisov *et al.*, 2023).

Cooking with oil is a common activity in Indian kitchens, whether in rural or urban areas. But this can release harmful substances into the air. It's a

([1]Associate Prof., [2]Assistant Prof., [3*]Assistant Prof., [4]Dean, [5]Research Scholar, [6]Assistant Prof.)

Co-ordinator
IQAC, Shri Ram College
Muzaffarnagar

Chairman
IQAC, Shri Ram College,
Muzaffarnagar

Plant Archives Vol. 24, No. 1, 2024 pp. 1421-1424 e-ISSN:2581-6063 (online), ISSN:0972-5210

Plant Archives

Journal homepage: http://www.plantarchives.org

DOI Url : https://doi.org/10.51470/PLANTARCHIVES.2024.v24.no.1.198

EXTRACTION AND CHARACTERIZATION OF ACID PHOSPHATASE ENZYME FROM GERMINATED PEANUT SEEDS

Suchitra Tyagi[1]* and Vichitra Tyagi[2]

[1]Shri Ram Group of Colleges, Muzaffarnagar - 251 001, Uttar Pradesh, India.

[2]D.A.V. College, Muzaffarnagar - 251 001, Uttar Pradesh, India.

*Corresponding author E-mail : tyagisuchitra@gmail.com

(Date of Receiving-17-01-2024; Date of Acceptance-28-03-2024)

ABSTRACT

Peanut (*Arachis hypogaea* L.), is one of the important food crop largely cultivated in China, Africa, USA, Brazil and India. In the present study, acid phosphatase enzyme was isolated and partially purified from germinated peanut seeds. The partial purification process was performed using ammonium sulphate precipitation method. The crude enzyme having a specific activity of 3.5 U/mg was purified using 80% ammonium sulphate precipitation method. The specific activity of the partially purified was found to be 9.7units/mg.The enzyme activity was measured at different incubation time, pH, temperature and substrate concentration. The maximum activity was obtained at 30 minutes of incubation. The enzyme was most active at pH 5.0 and 50^{0}C. There was a corresponding increase in the rate of reaction with the increase in the substrate concentration from 0.25 to 1 mM.

Key words : Acid phosphatase, peanut, *Arachis hypogaea*, enzyme purification, enzyme characterization.

Introduction

Acid phosphatases are group of enzymes that catalyzed the hydrolysis of a number of phosphate esters and have pH optima below 6.0 (Vincent *et al.*, 1992; Shahbazkia *et al.*, 2009). Acid phosphatases are widely distributed in plants and animals. They are found in yeasts, fungi, seeds of higher plants, fruits as well as in many animal tissues (Nicanuzia dos Prazeres *et al.*, 2004; Sambuk *et al.*, 2011; Tabaldi *et al.*, 2007). They are presumed to convert organic phosphorous into available phosphorous (Eshanpour and Amini, 2003; Amlabu *et al.*, 2009) during active cellular growth (Carswell *et al.*, 1997). Acid phosphatases are believed to be important for many physiological processes, including the regulation of soluble phosphorous (Pi) (Yan *et al.*, 2001). Phosphorus (Pi) is an essential macronutrient for plant growth and development that plays a key role in many processes, including energy metabolism and the synthesis of nucleic acids and membranes (Ehsanpour and Amini, 2003). Acid phosphatases are constitutively expressed in seeds during germination and their activities increase with germination to release the reserve materials for the growing embryo (Biswas and Cundiff, 1991). During germination different phosphate esters of sugars and substrates stored in seed and seedling need to be hydrolyzed for cellular growth (Hoehamer *et al.*, 2005).

Although, a number of acid phosphatases from plant source have been reported, detailed studies on the kinetic parameters of only a few acid phosphatases have been explored. Thus, in the present study, acid phosphatase extracted from peanut seedlings was partially purified and different kinetic parameters were examined.

Peanut (*Arachis hypogaea* L.), is a tropical food crop cultivated in large scale in China, Africa, USA, Brazil and India. Peanut seeds are rich in fats and proteins, as well as some vitamins (E and B complex) and several minerals (Castro *et al.*, 2011).

Materials and Methods

Mature healthy peanut seeds were washed

Co-ordinator
IQAC, Shri Ram College
Muzaffarnagar

Chairman
IQAC, Shri Ram College,
Muzaffarnagar

Shivani Berman, 2023, 11:3
ISSN (Online): 2348-4098
ISSN (Print): 2395-4752

International Journal of Science, Engineering and Technology

An Open Access Journal

The Development of 5g Technology and its Implications for the Industry

Asst. Prof. Shivani Berman, Asst. Prof. Kehkasha Mirza, Asst. Prof. Mayank Verma, Asst. Prof. Ravi Gautam
JMC Department
Shri Ram College Muzaffarnagar

Abstract- The development of 5G technology is very important in today's technological world. These technologies are bringing about significant changes in the way we interact with the digital world and are changing the way we use technology. The speed offered by 5G technology makes it possible to carry out data transfers very quickly, opening up opportunities for new applications and services in various sectors. The implications of the development of 5G technology on industry are huge and can affect various aspects, such as productivity, efficiency, and innovation. In the production sector, 5G technology makes it possible to speed up the production process and increase efficiency by using industrial technology 4.0. Within the service sector, 5G technology makes it possible to provide faster and high-quality services, such as more stable and faster video streaming services. On the other hand, the development of 5G technology also carries implications that must be considered, such as security and privacy issues. However, it is important for the industry to ensure that the 5G technology used meets established security standards to avoid security and privacy concerns. The development of 5G technology is very important in today's technological world. These technologies are bringing about significant changes in the way we interact with the digital world and are changing the way we use technology. The speed offered by 5G technology makes it possible to carry out data transfers very quickly, opening up opportunities for new applications and services in various sectors. The implication of the development of 5G technology on industry are huge and can affect various aspects, such as productivity, efficiency, and innovation. In the production sector, 5G technology makes it possible to speed up the production process and increase efficiency by using industrial technology 4.0. Within the service sector, 5G technology makes it possible to provide faster and high-quality services, such as more stable and faster video streaming services. On the other hand, the development of 5G technology also carries implications that must be considered, such as security and privacy issues. The speed offered by 5G technology makes it easier to carry out attacks and access personal data. Therefore, it is important for the industry to ensure that the 5G technology used meets the established security standards. The development of 5G technology brings significant changes in the industry and opens up new opportunities in various sectors. The implication of the development of 5G technology is huge and affect productivity, efficiency, and innovation. However, it is important for the industry to ensure that the 5G technology used meets established security standards to avoid security and privacy concerns.

Keywords- productivity, efficiency, and innovation

© 2023 Shivani Berman. This is an Open Access article distributed under the terms of the Creative Commons Attribution License (http://creativecommons.org/licenses/by/4.0), which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly credited.

Co-ordinator
IQAC, Shri Ram College
Muzaffarnagar

Chairman
IQAC, Shri Ram College,
Muzaffarnagar

I. INTRODUCTION

5G technology is bringing about a major change in the world of technology. Higher speeds and lower latency allow new applications and services to emerge and change the way we work, communicate, and play. In the industry, the development of 5G technology carries significant implications for the information and communication technology (ICT) sector (Trikolas, Sungkowo, Al Hakim, & Jaenul, 2022). Companies around the world are currently vying to adopt 5G technology and harness its potential to improve efficiency and productivity. However, as with other technologies, 5G also poses some challenges, such as privacy and data security issues. Therefore, it is important to understand the development of 5G technology and its implications for the industry (Jamaludin et al., 2020). In this paper, we will discuss the development of 5G technology, its implications for the ICT industry, as well as the associated challenges and potentials. The purpose of this paper is to provide a clear picture of the development of 5G technology and its implications for the industry, thus helping companies and individuals understand how this technology can affect their business and lives (Hayati &Krisnadi,2018). This study aims to find out the development of 5g technology and its implications for the industry. It is hoped that the benefits of this research can become one of the references for the impact of 5g and its implications for the industry (Jan, 2018).

II. RESEARCH METHODOLOGY

This research uses qualitative research methods that can be used to examine the topic "The Development of 5G Technology and Its Implications for Industry Conducting case studies on several companies that have applied 5G technology to their operations. Case studies can be carried out by directly observing the activities and use of 5G technology in the company. Observe firsthand how 5G technology is applied to the industry by observing the work environment in companies that use 5G technology. Conduct interviews with various related parties such as business people, technology experts, and company employees who have applied 5G technology to their operational activities. Interviews can be conducted in person or via telephone or video call. Conducting discussions with a group of people who have experience and knowledge related to the development of 5G technology and its implications for the industry. Group focus discussions can provide different views from a variety of different perspectives. Document Analysis: Analyze documents such as financial statements, operational activity reports, and other related documents related to the application of 5G technology to the industry. Analysis of the document can provide an idea of the extent to which 5G technology is making an impact on the industry. After the data is collected, in-depth data analysis is carried out using qualitative analysis techniques such as Content Analysis and Grounded Theory to produce findings and conclusions that are reliable and relevant to the research topic.

III. RESULT AND DISCUSSION

1. Result

The speed of the 5G network is significantly improved compared to the previous generation. It enables faster and seamless data transfer and delivery of multimedia content. Lower latency: 5G latency is much lower compared to the previous generation, which enables a more responsive, real-time user experience (Sri Adiningsih, 2019). Better IoT connectivity: 5G enables broader, integrated connectivity for IoT (Internet of Things) devices, which makes the industry more efficient and helps solve problems in several sectors, such as transportation, healthcare, and environmental monitoring. Increased productivity: 5G helps improve business productivity and efficiency through improved connectivity and faster data transfer (Sugiono, 2021). New innovations: 5G paves the way for new innovations and businesses that were not possible with previous generations, such as virtual and augsmented reality, autonomous vehicles, and more sophisticated environmental monitoring. Social and economic implications: 5G has major implications on society and the economy, including increased opportunity 7. work, business growth, and improved quality of

Co-ordinator
IQAC, Shri Ram College
Muzaffarnagar

Chairman
IQAC, Shri Ram College,
Muzaffarnagar

life through better access to technology and information. Challenges: While it has many benefits, 5G also has some challenges, such as data privacy and security issues, increased infrastructure costs, and greater reliance on technology (Paulus & Permatasari,2020).

In conclusion, the development of 5G technology brings many changes and positive implications to the industry, but it also has challenges that must be overcome (Wijaya, 2021). Therefore, it needs intensive cooperation and effort from the government, industry, and society to ensure that the benefits of 5G technology can be enjoyed equally and wisely (Rahmadana, 2021).

2. Discussion

The influence of the development of 5G technology on the industry, especially in increasing productivity and operational efficiency. The development of 5G technology is considered a paradigm shift in the industry, as it offers much better speeds and data transmission compared to previous technologies. One of the most important effects of 5G technology on the industry is the improvement and reduction of business processes (Alfaresi, Ardianto, Hurairah, Barlian, & Noverianty, 2020). operating expenses. Thanks to faster and more stable 5G capabilities, the production and delivery processes of goods can be completed faster and more accurately, which reduces production costs and increases the company's profits.

In addition, 5G technology also opens up new opportunities for industrial innovation and new product development. Companies can use 5G technology to develop more advanced and efficient products that meet the evolving needs of the market (Zahra, 2021). However, the application of 5G technology in the industry also presents challenges that must be overcome. Some of these are security concerns, restrictions on 5G networks in some areas and limitations of devices that support 5G technology. Therefore, companies should consider their operations carefully before adopting 5G technology. Overall, this article provides a better understanding of the impact of the development of 5G technology on the industry (Usman, 2021). Companies can use the information in this document to weigh the benefits and challenges of implementing 5G technology so that they can make better decisions to guide their operations (Rojabi, 2019). The development of 5G technology is becoming an increasingly important topic in the industrial context, because it has a significant impact on the productivity and operational efficiency of companies.

In this discussion, we discuss the impact and implications of the development of 5G technology on the industry. In the industry, 5G technology has a positive impact on operational efficiency and productivity. Compared to previous technologies, better data transfer speed and capabilities allow companies to speed up production and delivery processes and reduce operating costs (Anggraini, 2020). This of course has a positive impact on the company's bottom line. Related to innovation, 5G technology also opens up new opportunities for the development of new products. Companies can leverage 5G technology to develop more advanced and efficient products that meet the evolving needs of the market, but the application of 5G technology in the industry also presents challenges. One of the biggest challenges is the issue of data security.

The more data sent over the network, the more vulnerable it is to cybercrime (Wijanto, 2017). In addition, companies are also faced with the limitations of 5G networks in some regions and the limitations of devices that can support 5G technology. Therefore, companies should consider their operations carefully before adopting 5G technology. Companies must ensure their infrastructure and data security support 5G technology (Yuniarto, 2019). In addition, companies must also consider the presence of 5G technology supporting devices in their operating areas. Overall, the development of 5G technology has a huge impact on the industry. Companies should carefully consider the benefits and challenges of 5G technology before implementing them in their operations. This can help businesses maximize the benefits of 5G technology and minimize potential risks.

Co-ordinator
IQAC, Shri Ram College
Muzaffarnagar

Chairman
IQAC, Shri Ram College,
Muzaffarnagar

IV. CONCLUSION

The development of 5G technology has a significant impact on the industry. 5G technology provides significantly better data communication speed and capability than previous technologies, enabling companies to improve their operational efficiency and productivity. With the application of 5G technology, companies can reduce production costs and increase profits. In addition, 5G technology also opens up new opportunities for innovation and development of new products in the industry. However, the application of 5G technology to the industry also brings challenges such as data security issues, limitations of 5G networks in some regions, and limitations of devices that can support 5G technology. Therefore, companies need to consider carefully before applying 5G technology to their operations. Making informed decisions can help companies maximize the benefits of 5G technology and minimize possible risks. In a broader context, the development of 5G technology has a positive impact on the industrial sector and has the potential to become a key driver in digital transformation. Therefore, companies need to keep abreast of the development of 5G technology and make optimal use of it to face increasingly fierce market competition and improve their operational performance.

REFERENCES

1. Alfaresi, Bengawan, Ardianto, Feby, Hurairah, Muhammad, Barlian, Taufik, & Noverianty, Rika. (2020). Pengenalan Teknologi Telekomunikasi Pada Generasi Muda Dalam Menyongsong Era Baru Teknologi Generasi Kelima (5g). Jurnal Gema Ngabdi, 2(2), 161–169.
2. Anggraini, Riska Putri. (2020). Perkembangan Teknologi 5g.
3. Hayati, Dian, & Krisnadi, Iwan. (2018). Era 5g Dan Pengaruhnya Terhadap Ecommerce Di Indonesia.
4. Jamaludin, Jamaludin, Purba, Ramen A., Effendy, Faried, Muttaqin, Muttaqin, Raynonto,
5. M. Yusril, Chamidah, Dina, Rahman, M. Arif, Simarmata, Janner, Abdillah, Leon A., & Masrul, Masrul. (2020). Tren Teknologi Masa Depan. Yayasan Kita Menulis.
6. Jan, Bams. (2018). Teknologi 5g Dan Internet Of Things (Iot).
7. Paulus, Morry Zefanya, & Permatasari, Yunita. (2020). Teknologi Keantariksaan Untuk
8. Memajukan Perekonomian Negara Studi Kasus: Korea Selatan, India, Dan Indonesia. Prosiding Seminar Nasional Kebijakan Penerbangan Dan Antariksa V (Sinas Kpa-V) 2020, 94–102. Pusat Kajian Kebijakan Penerbangan Dan Antariksa.
9. Rahmadana, Muhammad Fitri. (2021). Ekonomi Digital. Nilacakra.
10. Rojabi, Alpiyan Arif. (2019). Perkembangan Teknologi 5g.
11. Sri Adiningsih, S. E. (2019). Transformasi Ekonomi Berbasis Digital Di Indonesia: Lahirnya Tren Baru Teknologi, Bisnis, Ekonomi, Dan Kebijakan Di Indonesia. Gramedia Pustaka Utama.
12. Sugiono, Shiddiq. (2021). Pemanfaatan Chatbot Pada Masa Pandemi Covid-19: Kajian Fenomena Society 5.0. Jurnal Penelitian Komunikasi Dan Pembangunan, 22(2), 133–148.
13. Trikolas, Trikolas, Sungkowo, Aming, Al Hakim, Rosyid Ridlo, & Jaenul, Ariep. (2022).
14. Kelebihan, Kekurangan, Peluang Teknologi 5g Di Indonesia. Insologi: Jurnal Sains Dan Teknologi, 1(1), 43–49.
15. Usman, Uke K. (2021). Mengenal Teknologi 5g. 2017, 345–348.
16. Wijanto, Eddy. (2017). Analisis Kesiapan Teknologi Dalam Penerapan Teknologi
17. Telekomunikasi Generasi Kelima (5g). Jurnal Teknik Dan Ilmu Komputer.
18. Wijaya, Anggie. (2021). Perkembangan Teknologi 5g. Universitas Pendidikan Indonesia, 1(1), 2–5.
19. Yuniarto, Topan. (2019). Masa Depan Jaringan 5g Dan Perilaku Komunikasi Digital.
20. Warta Ikatan Sarjana Komunikasi Indonesia, 2(01), 1–7.
21. Zahra, Hana Fatimah. (2021). Evolusi Teknologi 5g. Artikel Mahasiswa Sistem Telekomunikasi.

Co-ordinator
IQAC, Shri Ram College
Muzaffarnagar

Chairman
IQAC, Shri Ram College,
Muzaffarnagar

Mayank Verma, 2023, 11:3
ISSN (Online): 2348-4098
ISSN (Print): 2395-4752

International Journal of Science, Engineering and Technology

An Open Access Journal

Role of Caste Category in Indian Politics

Assistant Professor Mayank Verma, Assistant Professor Shivani Burman, kehkasha Mirza, Ravi Gautam

Department Of Journalism and Mass Communication
Shri Ram College Muzaffarnagar

Abstract- Caste is an essential part of Indian society. Caste is almost present in every political and social process in India. Caste has played both integrative and disintegrative role in Indian society. Identity politics has lead to emergence of caste in electoral politics. Some scholars see rise of caste in political process as a factor which has strengthened the democracy in India, because a large section of people come out to cast their votes to support their candidates who belongs to their caste. Caste based politics gave voices to those section of people who were underrepresented .While on the other hand many scholars see caste as a disintegrative factor for long term development of Indian society. They are opined of instead of caste, development should be an integrative factor in Indian political system. It is reality of our Indian societies that caste has deeply rooted in almost every aspect of our life. Many political parties have been emerged along the caste lines. Their whole politics is based on their caste group instead of developmental politics. Our many public policies are caste driven, while at same time we are trying to make caste free Indian societies. In contemporary time in electoral politics caste has entrenched too much. Political parties give ticket to candidates keeping the caste equations. Even the compositions of council of ministers are formed along keeping all type of caste calculated cost-benefit. Dr. Bhim Rao Ambedkar in a constituent assembly debate had said that caste is not a positive factor for development of Indian societies.

Keywords- Caste politics. Democratic Values in India. Instability. Vote Bank Politics.

I. INTRODUCTION

It is said that Indians do not cast their votes, they vote their caste. Christophe Jaffrelot writes caste form the mosaic of Indian politics. Caste word has been derived from the Portuguese word casta which mean 'lineage'. There is no exact translation of word jaati in English word. caste is hereditary determined, it comes attached with birth. Caste has become the essence of Indian society. Caste system is based on the purity and pollution concept. Caste system is not only present in Hindu but it also crept into Muslims, Christians, Sikhs. Caste is so deep rooted in Indian society, caste has become essential features of Indian societies. It has become identity of Indian society.

Indian society are mainly divided in four varnas these are Brahim, Kshatriysa, Vaishya, Shudra. Within a varna there are different castes. There are different perspectives regarding origin of caste system in India Manu Smriti writes all four varnas are born from different body parts of avirat purush (LordBrahma) . Brahmin originated from mouth of Brahma who performs the functions of priest and teachers. Kashtriya was born from arm of Lord Brahma, who is a warrior class. Vaishya was born from thigh of Lord Brahma who is a merchant and traders class. Shudras was born from feet, who are

© 2023 Mayank Verma. This is an Open Access article distributed under the terms of the Creative Commons Attribution License (http://creativecommons.org/licenses/by/4.0), which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly credited.

Co-ordinator
IQAC, Shri Ram College
Muzaffarnagar

Chairman
IQAC, Shri Ram College,
Muzaffarnagar

peasants and laborers and those who did not come under above mentioned four varnas they were untouchables. If anyone come in contact with untouchables they were considered polluted.

Mahatma Gandhi is of opined that originally varna system was based on functional specialisation and there was mobility among varnas, but at the time of moral degradation of Hinduism caste discrimination like concept of untouchable entered.

Dr. Bhim Rao Ambedkar writes about the origin of caste system is a conspiracy of Brahmin class against rebel Kshatriya class who challenged the hegemony of Brahmin, few among Kashtriya are Gautam Buddha and Jaininism like Mahavir Jain. To separate them Brahminism started upnayan and became vegetarian as a symbol of purity and started discrimination against those who did not perform upnayan and eating meat. This division became very deep in hundreds of years and practise of discrimination against lower caste by upper caste became a part of caste system.

Objective of study

- To analyze the impact cast on Indian politics.
- To study the constitutional provisions for casteless society.
- To provide valuable suggestions.

II. CASTE AS INTEGRATIVE AND DISINTEGRATIVE FORCE IN POLITICS

Different scholars have worked on caste system in India like Louis Dumont. He treats caste and class two different things. Dumont writes class of a person is determined by their economic status, education, power.He says caste is based on birth whereas class is based on worth and merit. Caste is a rigid system, where as there is mobility in class.

M.N.Srinivas challenged Louis Dumont's view that caste and class is two different things. M.N.Srinivas is opined of there is not much difference between caste and class. Class is also rigid and based on birth. He gave the concept of dominant caste. According to him dominant caste are those caste which have numerical majority and ownership of land. Many OBCs are dominant caste .There are different dominant caste in different regions for example Yadav in Uttar Pradesh and Bihar, Marathas in Maharashtra, Reddys, Kammas and kapus in Andhra, Lingayat and Vokkaligas in Karnataka, Jats in Haryana and west UP. Caste was also a prime factor in politics even before independence. There were many parties which were represented different castes like congress was considered party of upper caste like Brahmin, and Vaishyas. Republican party of India was representing the Dalits. DMK was party of OBC of South India.

Pandit Nehru held that casteism and communalism are the greatest threat for integrity of India. Nehru tried his best to suppress the casteism and communalism, but he could not get success. One reason of this was in Indian constitution many articles and provisions were solely based on caste particularly the affirmative action (reservation) mentioned in the constitution. This affirmative actions lead to emergence of consciousness of caste identity. Andre Betille observed that at one side Nehru asks about eradication of caste identity from societies while on the other hand he included caste in his policy of governance.

On the other hand scholars like Rajni Kothari see caste in positive sense, caste as an instrument to bring positive changes in some sections of society particularly among Other Backward Class and scheduled caste. He sees caste as a factor which has strengthened democracy in India. On the basis of caste people are mobilised. India is a prismatic society where caste has been an integrative force .In India where a section is illiterate, they do not understand the essence and purpose of election but they come out to cast their vote for their candidate who belong to their caste.

Prof. Yogendra Yadav also thinks that caste has strengthened the Indian democracy. He considers caste behind the democratic upsurge. As consciousness of caste identity increased among people. It makes them more aware about their caste, they started using their caste as an assertive

Co-ordinator
IQAC, Shri Ram College
Muzaffarnagar

Chairman
IQAC, Shri Ram College,
Muzaffarnagar

identity. Many caste groups have formed their political parties on the basis of political equations. Caste became prevalent in later phase more particularly after 1980s. After implementation of Mandal Commission Report a new section strongly emerged,it was Other Backward Class. It led to division of Hindus castes, in response to this BJP tried to consolidated Hindus on basis of politics of Hindutva. This party started Rath Yatra from Somnath to Gujarat, which ultimately lead to demolition of Babri Mosque.

Many regional parties were solely formed on the basis of caste equations like in Bihar and Uttar Pradesh the combination of Muslim and Yadav (MYEquation) led to the formation of government by Samajwadi Party in Uttar Pradesh and Bihar respectively some other caste equations were made by regional parties in other different state of India to come power. Coalition like AJGAR (Ahir,Jaat,Gurjar,Rajput) by Sir Chottu Ram, later on by Choudhary Charan Singh. This is how politics of caste has integrated different caste, which could not be integrated by social reformers of India .

Many scholars did not see caste as a positive factors for development of Indian societies in long term. C.P.Bhambri is of opined if one political parties tries to mobilise voters on caste lines then other political partiestry to mobilise voters on religious line and this ultimately leads to disintegration of societies. Example of this is, after implementation of Mandal Commission, V.P.Singh tried to make vote bank politics of other backward class ,in response to Mandal Commission, BJP started the issue of Ram Temple in Ayodhya.

Other negative factor of caste based politics is that political parties easily manipulate voters by emotional appealto caste vote in their favours. Political parties know that, they are going to get votes on caste based pattern so they don't care much for development, they are busy only in making caste equation at the time of election. Voters also strongly associate themselves with the caste of contesting candidates. It reduces the accountability of representative, because they think that they can win by consolidating votes of some caste, so they do not pay attention on development. Other negative aspect related to caste politics is that it also brings instability in government. Many times due to some caste issues, ministers from that particular caste gives resign to show solidarity with people of his or her caste and vote bank politics, it may bring instability in government particularly in coalition government. Within, political parties , many important posts of party are given, in keeping caste of post bearer in background.

Election commission is responsible to conduct free and fair election. There are many provisions in The Representation of People Act 1951, and Model code of conduct which prohibit candidate to ask voters to give votes in the name of caste and religion. In reality there are many loopholes in these provisions. It has failed to curb the menace of political parties from manipulation of voters' caste in election. There is urgent need to address the loopholes of The Representation of People Act 1951 along with new laws to prevent use of castein elections.

III. CONCLUSION

Caste has deeply rooted in our societies. Too much assertive on caste based identity politics is certainly going to hamper our development, instead of strengthening our democracies. Caste based electoral politics kill the spirit of democratic values. Caste based politics may lead to hatred in our societies among different caste group of societies. Political Parties always tries to get benefit by manipulating the voters. We should not forget what Dr. Ambedkar has written in his book Annihilation of Caste .He writes caste has killed the public spirit. Caste has taken away the sense of charity. Caste has made public opinion impossible, virtue has become caste ridden, morality has become caste bound, this is what we feel today in caste ridden societies. This is very sad thing that role of caste is increasing day by day. Caste and politics both influences each other. This will certainly going to be a hurdle for our country's development. There is need to give value education to children so that in future they will not give undue importance to their caste. Increasing literacy rate of people will also

Co-ordinator
IQAC, Shri Ram College
Muzaffarnagar

Chairman
IQAC, Shri Ram College,
Muzaffarnagar

help in reducing the values of caste in societies. There is need of awareness among voters to prevent their manipulation during time of election by candidates and political parties. It is also expected from political parties that they should not see election as an opportunity to gain power by winning through any immoral means. Political parties should not forget what Mahatma Gandhi has said that politics should not be separated from ethics. Elected representatives must think that they are representative of people, if they do politics of caste for power game, then he or she is not doing justice with themselves and people, and ultimately weakening the democracy of India. We must strive to save idea of India.

REFERENCES

1. Fadia,B.L,IndiangovernmentandPolitics,SahityaBhawanPublication,2010
2. Kothari, Rajni, Caste in Indian Politics , Orient Blackswan Publication ,2010
3. Kothari, Rajni, Politics In India , Orient Black swan Publication,2012
4. Kothari, Rajni, Politics and People: In search of ahumane india, Apex Prspublisher,1989
5. Rudolph, L.I, & Rudolph, S.H, The modernity of Tradation: Political development in india, University of Chicago Press ,1967
6. Yadav, Yogendra, Suri, K.C, Shastri, Sandeep, Electoral Politics in India Loksabha Elections in 2004 and Beyond ,Oxford Piblication ,2009
7. Jaffrelot, Christophie, The Caste based mosaicof Indian Politics, Seminar, University Of Toronto Press, 2012
8. Ambedkar, Dr.B.R, Annihilation of Caste, Rupa Publication, 2015
9. Ambedkar, Dr.B.R,, Whowere Shudras, Gautam Book Centre, 2017
10. Frankel, R. Francine, Hasan, Zoya, Arora, Balveer, Bhargava, Rajeev, Transforming India, Oxford Publication ,2000
11. Palshikar, Suhas, Suri, K.C, Yadav, Yogendra Party Competition and Indian States , Oxford Press 2014
12. Dumont, Louis, Homo Hierarchicus: The Caste System and Its implications, University of Chicago, 1981
13. Dumobt, Louis, Religion, Politics and History in India, Collected Papers in Indian Sociology, Cambridge University Press,1970

Co-ordinator
IQAC, Shri Ram College
Muzaffarnagar

Chairman
IQAC, Shri Ram College,
Muzaffarnagar

International Journal For Multidisciplinary Research

An International Open Access Peer Reviewed Journal • Impact Factor: 9.24 • E-ISSN: 2582-2160

Certificate of Publication

The editorial board of IJFMR is hereby awarding the certificate of publication to

Madhvi Kaushik

in recognition of publication of the paper titled

An Analysis of Demonetization and Its Effects on the Indian Economy

Published In: Volume 6, Issue 3 (May-June 2024)

Paper Id: 22567

www.ijfmr.com • editor@ijfmr.com

Editor / Publisher
IJFMR

Co-ordinator
IQAC, Shri Ram College
Muzaffarnagar

Chairman
IQAC, Shri Ram College,
Muzaffarnagar



International Journal of Applied Research

International Journal of Applied Research

Peer Reviewed Journal, Refereed Journal, Indexed Journal

ISSN Print: 2394-7500, ISSN Online: 2394-5869, CODEN: IJARPF

Publication Certificate

This certificate confirms that **"Madhvi Kaushik"** has published manuscript titled **"Fundamental analysis and technical analysis of stocks: A comparative study".**

Details of Published Article as follow:

Volume	:	**10**
Issue	:	**2**
Year	:	**2024**
Page Number	:	**01-04**

Certificate No.: **10-1-77**

Yours Sincerely,

Akhil Gupta

AKINIK Director Publications

Akhil Gupta
Publisher
International Journal of Applied Research
www.allresearchjournal.com
Tel: +91-9711224068

Co-ordinator
IQAC, Shri Ram College
Muzaffarnagar

Chairman
IQAC, Shri Ram College,
Muzaffarnagar

Prabandhan Guru, ISSN 2321-4295
Vol. XIV, Issue: 1, Jan-June 2023
RNI - UPENG/2010/38376

A COMPARATIVE STUDY ON THE ANALYSIS OF HEALTH STATUS BETWEEN TAKING AND NON- TAKING BREAKFAST

Dr. Shweta Rathi
HOD, Department of Home Science, Shri Ram College, Muzaffarnagar
Rubi Poswal
Assistant Professor, Department of Home Science, Shri Ram College, Muzaffarnagar

ABSTRACT

TO STUDY THE IMPORTANCE OF BREAKFAST FOR HEALTHY LIFE FOR COLLEGE GOING GIRLS IN MUZAFFARNAGAR.

A comparative study on the analysis of health status between taking & non taking breakfast. Breakfast is often called 'the most important meal of the day', and for good reason. As the name suggests, breakfast breaks the overnight fasting period. It replenishes your supply of glucose to boost your energy levels and alertness, while also providing other essential nutrients required for good health.Rise and shine! Our bodies use the simple sugar called glucose for fuel. Glucose is stored in the liver and released as needed. Healthful nutrition has a positive connection with both physical and mental health. The aim of this study was to comparatively analysis health status taking and non taking breakfast & the role of breakfast for healthy life.The data was collected through questionnaire that is formed in English language. It is a questionnaire consisting of multiple choice type questions. Interview method was used in survey. The data was collected by both face to face interview and by questionnaire supply.A discriptived survey was conducted to access the difference of breakfast habits and health issuse 100 respondent were taken data was analysis through tables and graphs.In this study, we saw that many types of health issues were seen in the girls who did not taking breakfast regularly if we compared to that girls who have taking breakfast daily, Physical and mentally changes were seen in the girls who skipped breakfast regularly. Such as headache, not feeling hungry on time. BP low, lack of concentration, low immunity, Dizziness, Mood swing, also was seems. Craving to eat sweets.And it is also known is this study that many types of benefits have been seen in the girls who were taking breakfast regularly such as , weight is maintained not feel hungry frequently , eating healthy & nutritious breakfast improves their concentration and increase energy level. And improves metabolism, or energy is boosted.And also know that most of the girls feel active after having breakfast. But some feel laziness may be due to bad digestive systems.

INTRODUCTION

Breakfast is often called 'the most important meal of the day', and for good reason. As the name suggests, breakfast breaks the overnight fasting period. It replenishes your supply of glucose to boost your energy levels and alertness, while also providing other essential nutrients required for good health.

Many studies have shown the health benefits of eating breakfast. It improves your energy levels and ability to concentrate in the short term, and can help with better weight management, reduced risk of type 2 diabetes and heart disease in the long term.

Despite the benefits of breakfast for your health and wellbeing, many people often skip it, for a variety of reasons. The good news is there are plenty of ways to make it easier to fit breakfast into your day.

The importance of breakfast: Start your day off strong- Rise and shine! Our bodies use the simple sugar called glucose for fuel. Glucose is stored in the liver and released as needed. When glucose

Co-ordinator
IQAC, Shri Ram College
Muzaffarnagar

stores are depleted, usually by mid-morning after a night of sleeping, this source of quick energy is not available.

The result is the sensation of hunger, decreased concentration and fatigue, all of which can make learning more difficult. This is why it is important to be sure your children "break the fast" and refuel their bodies to start the school day - and every day - right.

When you wake up from your overnight sleep, you may not have eaten for up to 10 hours. Breakfast replenishes the stores of energy and nutrients in your body.

Energy- In the morning, after you have gone without food for as long as 12 hours, your glycogen stores are low. Once all of the energy from your glycogen stores is used up, your body starts to break down fatty acids to produce the energy it needs. But without carbohydrate, fatty acids are only partially oxidised, which can reduce your energy levels.

During times of fasting (not eating), such as overnight, the liver breaks down glycogen and releases it into your bloodstream as glucose to keep your blood sugar levels stable. This is especially important for your brain, which relies almost entirely on glucose for energy.

Eating breakfast boosts your energy levels and restores your glycogen levels ready to keep your metabolism up for the day.

Breakfast helps you control your weight- People who regularly eat breakfast are less likely to be overweight or obese. Research is ongoing as to why this is the case. It is thought that eating breakfast may help you control your weight because:

Breakfast boosts brainpower - Studies suggest that not having breakfast affects your mental performance, including your attention, ability to concentrate and memory. This can make some tasks feel harder than they normally would.

Children and adolescents who regularly eat breakfast also tend to perform better academically compared with those who skip breakfast.

Improved Concentration

Students who eat a healthy breakfast tend to have better concentration than students who skip breakfast altogether.

It's not just about test scores and concentration, though. Eating breakfast can help students meet their daily nutrient needs more easily Breakfast eaters also tend to take in more daily fiber and lower total fat and dietary cholesterol.

Regularly eating breakfast is also associated with a healthier body mass index, or BMI, and a decreased likelihood of obesity. Research shows that students who regularly eat breakfast have an easier time maintaining a healthy body weight than students who are regular breakfast skippers.https://www.weekand.com/healthy-living/article/benefits-eating-breakfast-students-18003450.php

PROBLEMS ARISING WITH SKIPPING BREAKFAST

Skipping breakfast was shown to be common in the most recent national nutrition survey of Australian children and adolescents, although the majority did not skip breakfast consistently.

Those most likely to skip breakfast were older females, and people who:

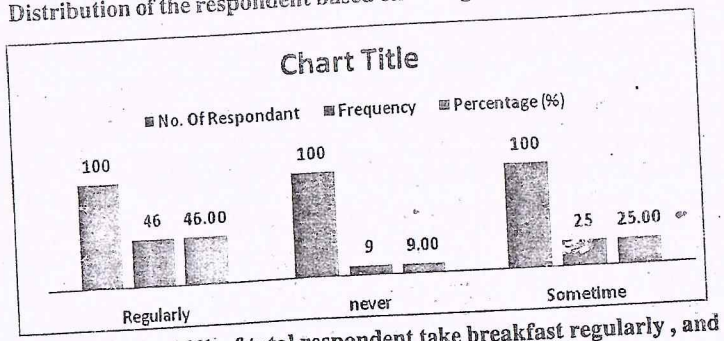
- are under or overweight
- have a poor diet
- have lower physical activity levels
- do not get enough sleep
- are from single-parent or lower income households.

Some common reasons for skipping breakfast include:

- not having enough time or wanting to spend the extra time being in bed
- trying to lose weight
- too tired to bother
- bored of the same breakfast foods
- don't feel hungry in the morning

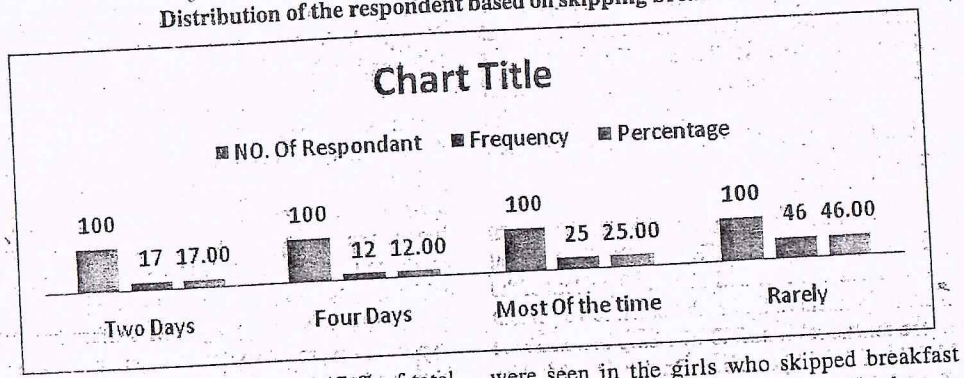
IQAC, Shri Ram College,
Muzaffarnagar

Distribution of the respondent based on taking breakfast regularly



Graph No. 2 shows that 46% of total respondent take breakfast regularly , and 9 % of respondent never take breakfast , also shows that 25% of respondent sometime takes breakfast.

Distribution of the respondent based on skipping breakfast



The above graph shows that 17 % of total respondent skip breakfast for two days, 12% for four days , 25% for most of the time and 46% of respondent rarely skip breakfast.

In this study, It has been found that 55% of the girls taking breakfast regularly but 45% girls did not take breakfast daily. Because they did not have the habit of taking breakfast daily and some girls did not few girls skip breakfast sometime due to lake of time, some families found where breakfast pattern in their lifestyle the girls belonging from families also a lot having breakfast.

Study shows that many types of health issues were seen in the girls who did not taking breakfast regularly if we compared to that girls who have taking breakfast daily, Physical and mentally chnges were seen in the girls who skipped breakfast regularly. Such as Headache, Not feeling hungry on time. BP low, lack of concentration, low immunity, Dizziness, Mood swing, also were seens. Craving to eat sweets.

It is revealed that many types of benefits have been seen in the girls who were taking breakfast regularly such as , weight is maintained not feel hungry frequently , eating healthy & nutritious breakfast improves their concentration and increase energy level. And improves metabolism, or energy is boosted.

And also know that most of the girls feel active after having breakfast. But some feel lazyness may be due to bad digestive system.

Co-ordinator
IQAC, Shri Ram College
Muzaffarnagar

CONCLUSION

In this study it has been seen that the health status of the adolescent girls who used to have breakfast was seen to be good & minor health issues were seen but whose girls not taking daily breakfast who had faced many health related problems like- Lake of energy, Dizziness, Low B.P, Headache, Vomiting. So that breakfast is important meal for us.

BIBLIOGRAPHY

- Ogata H, Kayaba M, Tanaka Y, Yajima K, Iwayama K, Ando A et al, 2019, 'Effect of skipping breakfast for 6 days on energy metabolism and diurnal rhythm of blood glucose in young healthy Japanese males', The American Journal of Clinical Nutrition.
- Betts JA, Richardson JD, Chowdhury EA, Holman GD, Tsintzas K, Thompson D, 2014, The causal role of breakfast in energy balance and health: a randomized controlled trial in lean adults, The American Journal of Clinical Nutrition, vol. 100, no. 2, pp. 539-547.
- Garrido AAG, Brofman-Epelbaum JJ, Gómez-Velázquez FR, Balart-Sánchez SA, Ramos-Loyo J, 2019, Skipping breakfast affects the early steps of cognitive processing: an event-related brain potentials study, Journal of Psychophysiology, vol. 33, no. 2, pp. 109-118
- Sampasa-Kanyinga H, Hamilton HA, 2017, Eating breakfast regularly is related to higher school connectedness and academic performance in Canadian middle- and high-school students, Public Health, vol. 145, pp. 120-123
- Adolphus K, Lawton CL, Champ CL, Dye L, 2016, The effects of breakfast and breakfast composition on cognition in children and adolescents: a systematic review, Advances in Nutrition, vol. 7, no. 3, pp. 590S-612S
- Zipp A, Eissing G, 2019, Studies on the influence of breakfast on the mental performance of school children and adolescents, Journal of Public Health, vol. 27, no. 1, pp. 103-110.
- Brikou D, Zannidi D, Karfopoulou E, Anastasiou CA, Yannakoulia M, 2016, Breakfast consumption and weight-loss maintenance: results from the MedWeight study, The British Journal of Nutrition, vol. 115, no. 12, pp. 2246-2251.

Chairman
IQAC, Shri Ram College,
Muzaffarnagar

JETIR.ORG ISSN: 2349-5162 | ESTD Year : 2014 | Monthly Issue
JOURNAL OF EMERGING TECHNOLOGIES AND INNOVATIVE RESEARCH (JETIR)
An International Scholarly Open Access, Peer-reviewed, Refereed Journal

EFFECT OF LIFE SKILLS EDUCATION ON EMOTIONAL INTELLIGENCE OF PUPIL TEACHERS- A META ANALYTICAL STUDY

*Dr. Pramod Kumar Rajput[1]
*Dr. Jugmaheer Gautam[2]
1. Associate Professor, P.G. Dept. Teacher Education, I.P. College, Campus-2, Bulandshahar
2. Assistant Professor, Faculty of Education, Shri Ram College, Muzaffarnagar

Abstract

This examination paper has a place with the Meta logical investigation of Fundamental abilities' Schooling and its impact on their Capacity to understand people on a profound level. A student educator is a youngster who spends a piece of their time undertaking showing obligations under the oversight of the head-instructor. The capacity to understand individuals on a profound level is the capacity to figure out some kind of harmony among feeling and reason. Concentrate on uncovered that Fundamental abilities Training accommodating in expanding The capacity to appreciate people on a profound level of student educators and juvenile students. Meta investigation is the review including different examinations focussing a similar problem. This research paper has a place with the Meta logical investigation of Fundamental abilities' Schooling and its impact on their Capacity to understand individuals on a profound level. A student educator is a youngster who spends a piece of their time undertaking showing obligations under the oversight of the head-instructor. The capacity to understand individuals on a deeper level is the capacity to figure out some kind of harmony among feeling and reason. Concentrate on uncovered that Fundamental abilities Training accommodating in expanding The capacity to understand anyone on a deeper level of understudy educators and juvenile students. Meta examination is the review including various investigations focussing a similar issue.

Key words: **Life Skills Education, Emotional Intelligence, Pupil Teachers and Meta Analysis.**

Introduction:

An individual's life is impacted by the promising and less promising times that happen in their way of

Co-ordinator
IQAC, Shri Ram College
Muzaffarnagar

Chairman
IQAC, Shri Ram College,
Muzaffarnagar

The capacity to appreciate individuals on a deeper level (at times alluded to as EQ) is the capacity to see, figure out, express, and control feelings. The idea was promoted in a 1995 book by Daniel Goleman, in which he contends that capacity to understand people on a deeper level includes more for progress in life than intelligence level does. The book was specifically driven by the perception that individuals with high level of intelligence scores now and again neglect to achieve a lot, while individuals with less noteworthy scholarly gifts flourish. One reason intelligence level tests neglect to foresee achievement is that they don't quantify profound skill. The idea of the ability to understand anyone on a deeper level is promising, in any case, and it has reverberations in numerous different speculations of knowledge. Howard Gardner's hypothesis of numerous insights, for instance, integrates the ideas of relational and intrapersonal insights as something past the extent of conventional intelligence level. (Odukoya, 2020)

The capacity to understand people on a deeper level is plainly a quality on which huge individual contrasts exist in the human populace, as are different sorts of knowledge estimated by standard insight tests. Goleman's Capacity to understand people on a deeper level, as most famous brain research books, has motivated a ton of difficult work that is devoted to spreading the good news of the capacity to understand individuals at their core, yet not quite a bit of it depends on science. Numerous primary schools have embraced the idea, with illustrations pointed toward bringing up youngsters' EQ. After Goleman's contributions, a ton of books emerged about how to apply his plans to function. In Working with The capacity to understand people on a profound level, Goleman says EQ is a preferable indicator of progress over level of intelligence for any work and is basically the main valuable determinant of authority capacity. A ton of human characteristics other than intelligence level are remembered for Goleman's meaning of the capacity to understand people at their core, including things like certainty, principles, administration direction, and reliability, which are typically more character qualities than knowledge. (Odukoya, 2020)

A person with an elevated degree of the capacity to understand people on a deeper level is bound to be happy with their lives. Individuals with high capacity to understand people at their core are less inclined to pressure which prompts experience better physical and mental prosperity, and show better administration execution (Slaski and Cartwright, 2002). In this manner the capacity to appreciate anyone on a profound level and life direction emphatically related with the fundamental abilities of student educators and students. This view has been upheld by various investigations.

Review Of Related Litrature:

Katyal and Awasthi (2005) directed a concentrate on distinctions in sexual orientation in capacity to understand people on a deeper level among teenagers of Chandigarh. Numerous teachers and clinicians accept that understudies who get alselolar scholastic climate might be unprepared for future difficulties, both as people as well as individuals from the general public. The target of this study is to figure out distinctions in sexual orientation in this crucial variable like ability to understand people on a profound level among male young

Co-ordinator
IQAC, Shri Ram College
Muzaffarnagar

Chairman
IQAC, Shri Ram College
Muzaffarnagar

partook in the Bar-on Close to home Remainder Stock. A while later, the case and control bunches took part in the Bar-on Close to home Remainder Stock once more.

Utilizing SPSS programming rendition 15, expressive insights, for example, Chi-square tests, matched and autonomous t-tests were utilized to examine the information. It was observed that there was a huge improvement in the capacity to understand people on a deeper level scores of the case bunch after fundamental abilities preparing, though no critical improvement was seen in the benchmark group. It is feasible to expand the degree of the capacity to appreciate people on a deeper level of the understudies with the assistance of fundamental abilities preparing programs, which thus can prompt scholastic achievement, diminished substance misuse, and expanded pressure resistance in the understudies too.

Lee and Gu (2014) directed a concentrate on the turn of events and impacts of the capacity to understand people on a deeper level program for undergrad nursing understudies. This review pointed toward creating and testing the impacts of an ability to appreciate individuals on a profound level program for undergrad nursing understudies. The review configuration was a blended strategy research. Members were 36 nursing understudies (mediation bunch: 17, control bunch: 19). A four-week the capacity to understand people on a deeper level program was given (8 meetings, 20 hours).Quantitative information were dissected utilizing Chi-square, Fisher's test, t-test, rehashed measure ANOVA, and matched t-test with SPSS/WIN 18.0. To investigate subjective information, content examination was utilized. Quantitative outcomes showed that ability to appreciate people on a profound level, relational abilities, strength, stress method for dealing with especially difficult times, and clinical skill were essentially better in the exploratory gathering contrasted with the benchmark group. Because of the capacity to understand people on a profound level program, nursing understudies showed worked on capacity to understand anyone on a profound level, relational connections, and strengthening, as well as a decrease in clinical practice pressure. Concentrate on discoveries demonstrated that the ability to understand individuals on a profound level program for undergrad nursing understudies was compelling.

Li et al. (2015) directed a concentrate on nursing understudies' post-horrendous development, the capacity to understand people on a profound level and mental versatility. To look at the connection between post-awful development, the capacity to understand anyone on a profound level, and mental flexibility in professional school nursing understudies who have encountered youth difficulty. Self-report information were dissected utilizing a cross-sectional examination plan with mysterious polls. A sum of 202 Chinese professional school nursing understudies were studied during 2011 and the youth difficulties agenda, posttraumatic development stock, the capacity to understand people on a deeper level scale, and the Connor-Davison versatility scale were utilized. Because of the review, post-awful development was related with the ability to appreciate people on a deeper level and mental versatility. As indicated by the consequences of the review, there was a curvilinear connection between the capacity to understand people on a profound level and post-horrible development, and between mental strength and post-horrendous development. The best degrees of development were most firmly

Co-ordinator
IQAC, Shri Ram College
Muzaffarnagar
Chairman
IQAC, Shri Ram College,
Muzaffarnagar

(78%) finished the polls. An affiliation was found between the generally EI and ASICS scores. The EI scores stayed steady no matter what the orientation of the understudy or the extended period of study. In any case, no measurably critical relationship was seen among EI and scholarly achievement regardless of the orientation or scholastic year of the understudy. Contrasted with understudies in the other two review years, last year understudies scored higher on outer inspiration and profession choice capacity since they learned at various levels. This study offers essential information on the effect of EI scores on scholarly outcome in clinical schooling, and it recognizes a few elements related with EI and scholastic achievement, as well as a few variables related with EI and scholarly achievement. As per the discoveries of this review, EI and scholarly achievement are firmly connected, and both are significant for expanding scholastic execution in understudies, advising to assist understudies with psychological wellness issues, laying out understudy drop-in communities for such administrations, and advancing social and sporting exercises for understudies to alleviate pressure and disappointments connected with their examinations and lives.

Wijesekara (2022) has directed a review at the College of Ruhuna to examine risk factors and solutions for mental sicknesses among understudies. This study is led to figure out the relationship among understudies those are encountering mental misery, pervasiveness of mental diseases, related risk elements, and manners by which they can beat these issues. Mental ailments are screened utilizing standard polls, and the reactions are investigated utilizing twofold calculated relapse examination to recognize segment factors, scholarly elements, and natural variables. Mental sicknesses were found to have a moderate relationship among illnesses despite the fact that prosperity factors are common among understudies. To lessen the effect of these gamble factors, colleges need to plan educational programs, extend assets, and give directing administrations to diminish the effect of natural and scholarly gamble factors related with mental diseases. This study tracked down mental cures viable in lessening mental disease among understudies.

A few examinations have been led to know the impact of the capacity to understand individuals on a deeper level on different variables like mental prosperity, mental misery and different abilities of life among students. These examinations contributed in connoting the need and significance of the capacity to understand anyone on a profound level among youth. It has been finished up by various examinations like Katyal and Awasthi (2005) and Thakkar (2007) underscored contrast in the degree of the ability to understand people on a deeper level based on orientation however they researched that young men's capacity to understand people on a deeper level can be expanded with the assistance of fundamental abilities schooling as young ladies are more delicate towards connections so they have better degree of the capacity to appreciate people at their core when contrasted with young men.

Based on previously mentioned examinations as Shah et al. (2008), Lolaty et al. (2012), Altwijri et al. (2021), Li et al. (2014), Graner and Cerqueria (2019), Kikanloo (2019) and Li and Gu (2014) observed that fundamental abilities training is useful in improving capacity to appreciate anyone at their core of students. The capacity to

Co-ordinator
IQAC, Shri Ram College
Muzaffarnagar

Chairman
IQAC Shri Ram College.
Muzaffarnagar

Thakkar, J.S (2007), Construction and standardization of emotional intelligence test for the students of the secondary schools of Gujarat state. Dept. of Edn, Gujarat University.

UNICEF. (2017). Conceptual and Programmatic Framework on Life Skills and Citizenship Education Initiative: Middle East and North Africa. Reimagining Life Skills and Citizenship Education (LSCE). A Four-Dimensional and Systems Approach to 21st Century Skills in the Middle East and North Africa. Available from: http://www.lscemena.org/uploads/resources/lsce_(171002)/171020_CPF_Report_(website).pdf. Retrieved on 7. 8. 2018.

Wijesekara P. (2022). A study in University of Ruhuna for investigating prevalence, risk factors and remedies for psychiatric illnesses among students. *Scientific reports*, *12*(1), 12763. https://doi.org/10.1038/s41598-022-16838-4

Zeidner (2019). Sources of academic stress: nurses' stress levels and professional competence related to their training in emotional intelligence: Case of first year Jewish and Arab college students in Israel, Higher Education July 2019, Volume 24, Issue 1, pp 25-40.

Co-ordinator
IQAC, Shri Ram College
Muzaffarnagar

Chairman
IQAC, Shri Ram College,
Muzaffarnagar

INTERNATIONAL JOURNAL OF NOVEL RESEARCH AND DEVELOPMENT (IJNRD) | IJNRD.ORG

An International Open Access, Peer-reviewed, Refereed Journal

ISSN : 2456-4184

The Board of

International Journal of Novel Research and Development

Is hereby awarding this certificate to

Jatin Singhal

In recognition of the publication of the paper entitled

insights into fintech(financial technology): a bibliometric analysis

Published In IJNRD (www.ijnrd.org) ISSN Approved & 8.76 Impact Factor

Published in Volume 9 Issue 2, February-2024 | Date of Publication: 2024-02-28

Co-Authors - Hansika Jain

Registration ID : 211312 Paper ID - IJNRD2402307

Editor-In Chief

INTERNATIONAL JOURNAL OF NOVEL RESEARCH AND DEVELOPMENT | IJNRD

An International Scholarly, Open Access, Multi-disciplinary, Indexed Journal

Website: www.ijnrd.org | Email: editor@ijnrd.org | ESTD: 2016

Co-ordinator IQAC, Shri Ram College Muzaffarnagar

Chairman IQAC, Shri Ram College Muzaffarnagar

Certificate of Publication

IJNRD | ISSN : 2456-4184

Certificate of Publication

IJNRD | ISSN : 2456-4184

INTERNATIONAL JOURNAL OF NOVEL RESEARCH AND DEVELOPMENT (IJNRD) | IJNRD.ORG

An International Open Access, Peer-reviewed, Refereed Journal

ISSN : 2456-4184

The Board of

International Journal of Novel Research and Development

Is hereby awarding this certificate to

Hansika Jain

In recognition of the publication of the paper entitled

insights into fintech(financial technology): a bibliometric analysis

Published In IJNRD (www.ijnrd.org) ISSN Approved & 8.76 Impact Factor

Published in Volume 9 Issue 2, February-2024 | Date of Publication: 2024-02-28

Co-Authors - Jatin Singhal

Registration ID : 211312 Paper ID - IJNRD2402307

Editor-In Chief

INTERNATIONAL JOURNAL OF NOVEL RESEARCH AND DEVELOPMENT | IJNRD

An International Scholarly, Open Access, Multi-disciplinary, Indexed Journal

Website: www.ijnrd.org | Email: editor@ijnrd.org | ESTD: 2016

Co-ordinator QAC, Shri Ram College Muzaffarnagar

Chairman Shri Ram College Muzaffarnagar

Certificate of Publication

IJNRD | ISSN : 2456-4184

INTERNATIONAL JOURNAL OF NOVEL RESEARCH AND DEVELOPMENT (IJNRD) | IJNRD.ORG

An International Open Access, Peer-reviewed, Refereed Journal

ISSN : 2456-4184

The Board of

International Journal of Novel Research and Development

Is hereby awarding this certificate to

SAGAR SHUKLA

In recognition of the publication of the paper entitled

Role of Digital Marketing and its Recent Trends in India: Challenges & Opportunities

Published In IJNRD (www.ijnrd.org) ISSN Approved & 8.76 Impact Factor

Published in Volume 8 Issue 5, May-2023 | Date of Publication: 2023-05-13

Co-Authors -

Registration ID : 194887 Paper ID - IJNRD2305303

Editor-In Chief

INTERNATIONAL JOURNAL OF NOVEL RESEARCH AND DEVELOPMENT | IJNRD

An International Scholarly, Open Access, Multi-disciplinary, Indexed Journal

Website: www.ijnrd.org | Email: editor@ijnrd.org | ESTD: 2016

Co-Ordinator IQAC, Shri Ram College Muzaffarnagar

Chairman IQAC Shri Ram College, Muzaffarnagar

INTERNATIONAL JOURNAL OF CURRENT SCIENCE

ISSN: 2250-1770 | IJCS PUBLICATION

IJCS PUBLICATION (IJCSPUB.ORG) *An International Open Access, Peer-reviewed, Refereed Journal*

Certificate of Publication

The Board of

International Journal of Current Science

Is hereby awarding this certificate to

SAGAR SHUKLA

In recognition of the publication of the paper entitled

EFFECT OF YOGA ON STRESS MANAGEMENT OF EMPLOYEES IN CORPORATE WORLD.

Published In IJCSPUB (www.ijcspub.org) & 8.17 Impact Factor by Google Scholar

Volume 13 Issue 3 July 2023, Date of Publication: 03-July-2023

ISSN 2250-1770 IJCSPUB

PAPER ID : IJCSP23C1001

Registration ID : 216873

EDITOR IN CHIEF

Scholarly open access journals, Peer-reviewed, and Refereed Journals, Impact factor 8.17 (Calculate by google scholar and Semantic Scholar | AI-Powered Research Tool), Multidisciplinary, Monthly Journal

INTERNATIONAL JOURNAL OF CURRENT SCIENCE | IJCSPUB

An International Scholarly, Open Access, Multi-disciplinary, Indexed Journal

Website: www.ijcspub.org | Email: editor@ijcspub.org | ESTD: 2011

Manage By: IJPUBLICATION Website: www.ijcspub.org | Email ID: editor@ijcspub.org

IJCSPUB | ISSN: 2250-1770 | IJCSPUB.ORG

IQAC, Shri Ram College Muzaffarnagar

Chairman IQAC Shri Ram College Muzaffarnagar

Certificate of Publication

INTERNATIONAL JOURNAL OF CREATIVE RESEARCH THOUGHTS | ISSN: 2320 - 2882

An International Open Access, Peer-reviewed, Refereed Journal

The Board of

International Journal of Creative Research Thoughts

Is hereby awarding this certificate to

SAGAR SHUKLA

In recognition of the publication of the paper entitled

AN ANALYSIS OF THE IMPACT OF THE LOCKDOWN ON INDIAN START-UPS OR BUSINESSES BOTH DURING AND AFTER COVID-19

Published In IJCRT (www.ijcrt.org) & 7.97 Impact Factor by Google Scholar

Volume 11 Issue 9 September 2023 , Date of Publication: 08-September-2023

UGC Approved Journal No: 49023 (18)

ISSN 2320-2882 IJCRT

EDITOR IN CHIEF

PAPER ID : IJCRT2309165

Registration ID : 243837

Scholarly open access journals, Peer-reviewed, and Refereed Journals, Impact factor 7.97 (Calculate by google scholar and Semantic Scholar | AI-Powered Research Tool) , Multidisciplinary, Monthly Journal

Co-ordinator IQAC, Shri Ram College Muzaffarnagar

INTERNATIONAL JOURNAL OF CREATIVE RESEARCH THOUGHTS | IJCRT

An International Scholarly, Open Access, Multi-disciplinary, Indexed Journal

Website: www.ijcrt.org | Email id: editor@ijcrt.org | ESTD: 2013

Chairman IQAC, Shri Ram College Muzaffarnagar

IJCRT | ISSN: 2320-2882 | IJCRT.ORG

Certificate of Publication

INTERNATIONAL JOURNAL OF CREATIVE RESEARCH THOUGHTS | ISSN: 2320 - 2882

An International Open Access, Peer-reviewed, Refereed Journal

The Board of

International Journal of Creative Research Thoughts

Is hereby awarding this certificate to

ANKUSH RAWAL

In recognition of the publication of the paper entitled

AN ANALYSIS OF THE IMPACT OF THE LOCKDOWN ON INDIAN START-UPS OR BUSINESSES BOTH DURING AND AFTER COVID-19

Published in IJCRT (www.ijcrt.org) & 7.97 Impact Factor by Google Scholar

Volume 11 Issue 9 September 2023 , Date of Publication: 08-September-2023

UGC Approved Journal No: 49023 (18)

ISSN 2320-2882 IJCRT

EDITOR IN CHIEF

PAPER ID : IJCRT2309165

Registration ID : 243837

Scholarly open access journals, Peer-reviewed, and Refereed Journals, Impact factor 7.97 (Calculate by google scholar and Semantic Scholar | AI-Powered Research Tool) , Multidisciplinary, Monthly Journal

Co-ordinator IQAC, Shri Ram College Muzaffarnagar

INTERNATIONAL JOURNAL OF CREATIVE RESEARCH THOUGHTS | IJCRT

An International Scholarly, Open Access, Multi-disciplinary, Indexed Journal

Website: www.ijcrt.org | Email id: editor@ijcrt.org | ESTD: 2013

Chairman IQAC, Shri Ram College Muzaffarnagar

IJCRT | ISSN: 2320-2882 | IJCRT.ORG

International Journal For Multidisciplinary Research

An International Open Access Peer Reviewed Journal E-ISSN: 2582-2160

Certificate of Publication

The editorial board of IJFMR is hereby awarding the certificate of publication to

Rajeev Kumar

in recognition of publication of paper titled

Conflict and Commerce in a Post-pandemic World: Unraveling the Impacts of the Russia-ukraine War on Global Supply Chains

Co-Authors: Atul Kumar

Published In: Volume 5, Issue 4 (July-August 2023)

Paper Id: 5481

Co-ordinator
IQAC, Shri Ram College
Muzaffarnagar

Editor / Publisher
IJFMR

Chairman
IQAC, Shri Ram College,
Muzaffarnagar

International Journal For Multidisciplinary Research

An International Open Access Peer Reviewed Journal E-ISSN: 2582-2160

Certificate of Publication

The editorial board of IJFMR is hereby awarding the certificate of publication to

Atul Kumar

in recognition of publication of paper titled

Conflict and Commerce in a Post-pandemic World: Unraveling the Impacts of the Russia-ukraine War on Global Supply Chains

Co-Authors: Rajeev Kumar

Published In: Volume 5, Issue 4 (July-August 2023)

Paper Id: 5481

Co-ordinator
IQAC, Shri Ram College
Muzaffarnagar

Chairman
IQAC, Shri Ram College
Muzaffarnagar

Editor / Publisher
IJFMR

Certificate of Publication

INTERNATIONAL JOURNAL OF RESEARCH AND ANALYTICAL REVIEWS (IJRAR) | IJRAR.ORG

An International Open Access, Peer-reviewed, Refereed Journal

E-ISSN: 2348-1269, P-ISSN: 2349-5138

The Board of

International Journal of Research and Analytical Reviews (IJRAR)

Is hereby awarding this certificate to

Atul Kumar

In recognition of the publication of the paper entitled

TRANSFORMATION IN THE FUTURE OF WORKFORCE: A REVIEW OF EMERGING TECHNOLOGIES AND TRENDS IN PEOPLE ANALYTICS

Published In IJRAR (www.ijrar.org) UGC Approved - Journal No : 43602 & 7.17 Impact Factor

Volume 10 Issue 3 August 2023, Date of Publication: 08-August-2023

PAPER ID : IJRAR23C2059

Registration ID : 272100

R.B.Joshi

EDITOR IN CHIEF

Co-ordinator IQAC, Shri Ram College Muzaffarnagar

Chairman IQAC, Shri Ram College, Muzaffarnagar

UGC and ISSN Approved - Scholarly open access journals, Peer-reviewed, and Refereed Journals, Impact factor 7.17 (Calculate by google scholar and Semantic Scholar | AI-Powered Research Tool) , Multidisciplinary, Monthly Journal

INTERNATIONAL JOURNAL OF RESEARCH AND ANALYTICAL REVIEWS | IJRAR

An International Scholarly, Open Access, Multi-disciplinary, Indexed Journal

Website: www.ijrar.org | Email: editor@ijrar.org | ESTD: 2014

Manage By: IJPUBLICATION Website: www.ijrar.org | Email ID: editor@ijrar.org

IJRAR | E-ISSN: 2348-1269, P-ISSN: 2349-5138

Human Rights & Teacher Educators

Dr P.K.Pandia
Incharge, Department of Education
IASE (Deemed To Be University)
Sardarshahar, Churu (Rajasthan)

Jugmaheer Gautam
Research Scholar (Education)
IASE (Deemed To Be University)
Sardarshahar, Churu Rajasthan)

Abstract

Prison luminaries have defined human rights because the inherent, inalienable, interrelated and generic rights of individuals and organizations guaranteed to them below both domestic and international felony frameworks. Human Rights education is described as "the mastering of regulation of human rights, its records, theory, etc." training is necessary to broaden human persona and it's far beneficial to reinforce human rights & essential freedom of the man or woman. A good way to ensure the truthful practice of human rights the teacher educators play a completely crucial function. The venture of educators is to generate cognizance about these rights and for this, curriculum as its center is first designed after which additionally predicted occasionally to be restructured or repacked across the 4 pillars of learning: mastering to recognize, gaining knowledge of to do, studying to stay collectively, and studying to be. Schooling is a fundamental human right that works to elevate ladies and men out of poverty, degree inequalities and ensure sustainable development. However unfortunately there are 244 million children and youngsters at the worldwide degree who're still out of school for social, economic and cultural motives. Even Human Rights schooling is also taught with the aid of the academics at school and these teachers are educated via teacher educators, within the course in their teaching they assist college students to learn law of human rights, its records, principle, and so on. The goal of a trainer educator while adopting a human rights-based technique to training is straightforward: to assure each toddler a best training that respects and promotes her or his right to dignity and premiere improvement. The instructor educators convey to their trainees about essential human rights concepts, along with equality and non-discrimination, while declaring their interdependence, indivisibility and universality. On this regard, the trainer educators are quite aware that civilization is fragile and education sustains it, that schooling is for all, that education isn't utilitarian, it's miles emancipatory. Like another us of a in, India, too, UNESCO has a role in human rights laws. It talks about the Indian human rights education machine and UDHR's (accepted announcement of Human Rights) provisions guide it & UNESCO affords recommendations in the context of Human Rights in India.

Co-ordinator
IQAC, Shri Ram College
Muzaffarnagar

Chairman
IQAC, Shri Ram College,
Muzaffarnagar

India has installation numerous countrywide education commissions and formulated countrywide schooling policies derived by way of Indian Parliament. Trainer educators make an try and educate their trainees to put into effect them in the education system, Human rights training is part of Indian education system both schooling and better education.

Key Words: Human, Rights, Teacher, educators

Background of Human Rights Education in India

Education has been a major contributor to human awakening, education, and empowerment ever since the beginning of human civilization. Trainees have been trained to perform a variety of societal tasks by teacher educators, either directly or indirectly. In a way, education is generally regarded as a means of enhancing people's quality of life and as an indicator of human development, resulting in desired changes in economic, cultural, and social policies. Human dignity, its recognition, fulfillment, and universalization form the foundation of human rights education. The social, political, and economic conditions that are most likely to provide the environment and process for social cohesion and nonviolent conflict resolution are associated with human rights. Also, The Vienna Statement (2001) states that States ought to try to annihilate ignorance and direct training towards the full improvement of the human character and to the reinforcing of regard for common liberties and key opportunities. Human rights, humanitarian law, democracy, and the rule of law were also urged by the World Conference on Human Rights to be taught in all formal and non-formal educational establishments as subjects.

In India Human Rights Education and its need

India has adopted an extremely utilitarian educational model. The majority of Indians pursue education with the intention of obtaining a lucrative job. As a result, parents put too much pressure on their children and teachers to do well on tests. This one-dimensional perspective has also been adopted by schools, which advertise the number of rank holders and professional college placements. As a result of this process, education has lost its soul in terms of quality and its capacity to develop capacities for functioning fully as citizens and, above all, as good people, maximizing the potential of each child.

Co-ordinator
IQAC, Shri Ram College
Muzaffarnagar

Chairman
IQAC, Shri Ram College
Muzaffarnagar

Human rights abuses frequently garner major media attention for the schools. Teachers sometimes use violence against students, and students and parents sometimes use violence against teachers. A situation like this is not healthy for any society. Teacher educators must take a more active role in society in order to effect qualitative change, involving all stakeholders. Their efforts should focus on creating an environment of real-life scenarios and role plays, which will directly or indirectly require children to refer to and comprehend various subjects related to practicing human rights. An incident involving the brutal murder of a school teacher has sparked serious concerns about our education system, which has lost importance in this regard.

Numerous incidents are a poor indicator of the country's declining moral and ethical standards in education. Students need to be taught how to deal with the pressures and strains of daily life in this setting. We can't ignore our interests and feelings if we want a holistic education because feelings are a part of who we are. As a society, we need to learn to be more emotionally mature, empathetic, and receptive to one another. Human rights education will, in turn, reflect our humanity and humanity, preparing us to be good people in the new millennium (Public Opinion Survey, 2012).

Various Phases of Human Rights Education

Human rights education is gaining traction all over the world. It has a wide range of applications and is constantly evolving to keep up with changes in society around the world and, to some extent, new insights from research and development. As polished in rudimentary and optional schools and introduced in the college programs that get ready homeroom educators, basic liberties training is referred to by different names, for example, compromise, multicultural instruction, improvement training, world request review, and, all the more as of late, natural edu¬cation and Elective Question goal and supportive equity instruction. Each of these strategies addresses a specific set of issues that have been identified as the root causes of social injustice, war, and conflict. Because they strive to prevent the occurrence of the issues that motivate them, each could also be categorized as "preventive education." Importantly, each acknowledges that it is intended to be a means to the realization of a set of social values because it is conceived as education for searching for peace through ensuring the human rights of conflict

Co-ordinator
IQAC, Shri Ram College
Muzaffarnagar

Chairman
IQAC, Shri Ram College
Muzaffarnagar

stakeholders. Each is related to building and structuring peace in terms of social cohesion and avoiding the type of violence that it responds to. However, both peace activists and researchers, as well as advocates for human rights, can agree that violence in any form is an assault on human dignity.

Education is now more widely recognized as a human right and an essential component of the right to education in the modern era. According to the Indian Constitution, knowledge of one's own rights and freedoms, as well as those of others, is considered a fundamental tool for ensuring that every person's rights are respected. True teacher educators will work hard to ensure that human rights education aims to instill values of peace and tolerance for a higher purpose in addition to producing qualified teachers. Human rights education aims to equip individuals and students with the skills necessary to effect societal change and respond to social reality in order to realize a sense of social justice for the poor, marginalized, and weak (NHRC, 2007).

Concept of Human Rights Education

Through the acquisition of knowledge and skills as well as the shaping of attitudes, the goal of human rights education is to establish a universal culture of human rights. Human rights education ought to focus on:

Understanding, tolerance, gender equality, and friendship among people of all nations, indigenous people, marginalized groups, and racial, national, ethnic, religious, and linguistic communities are all encouraged. respect for human rights and fundamental freedoms being raised; the full growth of a person's personality and their sense of dignity; enabling everyone to effectively participate in a free society. Human rights education is the primary focus of teacher educators, as it contributes to the personality development of trainee teachers in terms of literacy as well as a world in which all people would live in dignity with one another without being humiliated, exploited, or discriminated against. Sadly, it has come to light that the distributional aspects of human development have been missed by the measurement of human development. There are significant disparities in the population as a whole, particularly among marginalized groups based on sex, ethnicity, religion, and caste. As a result, educators should increase their efforts to ensure that individuals participate in life-determinating decision-making processes

Co-ordinator
IQAC, Shri Ram College
Muzaffarnagar

Chairman
IQAC, Shri Ram College
Muzaffarnagar

in a creative and productive manner that promotes peace and harmonizes multicultural society without hatred or violence.

Human rights education models and the function of teacher educators in India:

1. Generation of Awareness about Value System

Based on its philosophical-historical approach, teacher educators must concentrate on passing on "basic knowledge of human rights issues and fostering its integration into public values." They are required to instruct their trainees on what people typically associate with human rights, with the target audience being the general public, on topics such as global human rights and more culturally based issues. Environmental awareness, hygiene, and consumer rights in day-to-day market transactions are all included.

2. Inculcation of Sense of Responsibility

The legal and political approach to human rights that is used to prepare trainees for professional roles should be the primary focus of teacher educators. The inclusion of such training and networking is the primary focus, with topics such as court cases, ethical codes, the practice of transparency, accountability, justice, and the right to information, among others, covered.

3. Change in Human Behaviour

The psychological and sociological aspects of human rights are emphasized by educator educators. This model works well on topics like children's, women's, minority, and dalit rights rights, vulnerable populations, and individuals whose lives have been impacted by these issues. They intend to enable the individual, like casualties of misuse and injury. Human rights violations are acknowledged, but the initiative is also committed to preventing them and addressing conflict resolution issues.

Human Rights Education & Legal Framework

Human rights education is based on our Indian Constitution. The Constitution's preamble makes it abundantly clear that citizens have the freedom and rights to achieve social, economic, and political justice. In addition, Articles 14 to 32 of the third section of the Constitution guarantee certain fundamental rights, while

Co-ordinator
IQAC, Shri Ram College
Muzaffarnagar

Chairman
IQAC, Shri Ram College
Muzaffarnagar

Articles -51A of the fourth section focus on certain responsibilities owed to citizens. As a result, the two components are interdependent, interconnected, and related. However, the Constitution imposes a moral obligation on citizens to carry out these responsibilities. However, as with the Directive Principles, these are unjustifiable and cannot be enforced if they are broken (Basu, 1993).

However, some unsuccessful efforts to promote human rights education in India were only made in the middle of the 1980s. In this regard, in 1980, the University Grants Commission (UGC) established a committee on Human Rights Education, with Mr. Justice S.M. Sikri, the then-justice of the Supreme Court of India, serving as chairman. In 1985, the comprehensive report titled "Blueprint for Promotion of Human Rights in India at All Levels" was presented by the Sikri Committee. The Report offered a plan for teaching human rights in adult and continuing education facilities as well as higher education institutions. In order to carry out any necessary follow-up in this regard, the Sikri Committee Report was sent to NCERT as well as a number of universities. However, the universities, NCERT, and UGC did not take any effective action until the late 1980s. In 1985, the Human Rights Centre of the Jawaharlal Nehru University in New Delhi organized a national symposium with support from UNESCO and the UGC in an effort to implement human rights education in all universities. The Symposium made a few suggestions for teaching human rights at all levels, from elementary school to college and universities, including professional levels. Its recommendations were then published and widely distributed to all educational establishments. The University Grants Commission eventually agreed to implement human rights education at the university level. As a result, national law schools and a number of universities and colleges across the country now offer human rights education (Tiwari, 2004).

Historical Human Rights Act, 1993

The Human Rights Protection Act of 1993 was approved by the Indian Parliament. The National Human Rights Commission (NHRC), State Human Rights Commission (SHRC), and Human Rights Court were all established as a result of the Act's provisions. In accordance with Section 12(g) of the Act, the Commission's Statute is required to collaborate with universities, institutions, non-governmental organizations, and media to carry out research, promote it, and raise awareness and literacy in the field of human rights.

Co-ordinator
IQAC, Shri Ram College
Muzaffarnagar

Chairman
IQAC, Shri Ram College,
Muzaffarnagar

A Source Book on Human Rights was published in 1996 by the National Human Rights Commission and the NCERT. Dossiers on Human Rights Education for Beginners (2005) was written for the college and university levels, and the source book was written for the country's promotion of human rights education at the school level. In addition, the National Human Rights Commission (NHRC) recommended Modules on Human Rights Education for Teaching Professionals at the Primary, Secondary, and Higher Secondary Levels (2007) and the National Curriculum Framework for University Students on Human Rights Education (NHRC 2007), which highlights the significance of teacher educators.

CONCLUSION

In India, teacher educators are required to play a number of important roles in defending and advancing human rights. In addition, it is expected of them to uphold human rights in local bodies, PRIs, and human rights courts. Their awareness can assist in the search for missing children and witch-hunting (crime against women in rural areas) investigations. They may be able to significantly contribute to the prohibition of honor killings. In informal industries, they can assist daily laborers in maintaining their wages. Their training can assist disabled women and reduce acid throwing cases against girls. They can train human rights defenders and make people more aware of the importance of electing the right candidate. By taking action to combat terrorism, they can establish themselves as the society's watchdog. They can help in tending to the wrongs, for example, kid Work, Limited Work, Exiles, Unlawful Movement, vagrancy, hunger, neediness, Lack of education, and manage the issues connected with Minority, Ancestral, Debacle The board, Environmental Change, Climate, Sloppy Area, Media and some more. In a nutshell, the hopes that society has set for them are limitless.

Reference:

NHRC, 2007: *Recommendations of National Human Rights Commission for Human Rights Education at the University and College levels*; New Delhi: National Human Rights Commission

NHRC, 2004: *Report on Atrocities on SCs/STs,* New Delhi: National Human Rights Commission; New Delhi: National Human Rights Commission

Co-ordinator
IQAC, Shri Ram College
Muzaffarnagar

Chairman
IQAC, Shri Ram College,
Muzaffarnagar

The Hindu, 2012: Murder in Classroom, Chennai: Editorial, *The Hindu,* Feb.2012

NHRC, 2005: *Human Rights Education for Beginners,* New Delhi: National Human Rights Commission; New Delhi: National Human Rights Commission

NHRC, 2007: *Recommendations of National Human Rights Commission for Module on Human Rights Education for Teaching Professionals imparting Education in Primary, Higher Secondary Levels*; New Delhi: National Human Rights Commission

Basu, Durga Das (1993). *Introduction to the Constitution of India* (15th ed.). New Delhi : Prentice Hall of India

NHRC, 2015: National Human Rights Commission, *NHRC Newsletter,* Vol.22,No.9,p.1 Sept.2015.

Public Opinion Survey, 2012 : What You Loose When You Buy and Education, *Monthly Public Opinion Surveys,* Vol. LVII, No.6 March,2012,pp.13-14

Tiwari, A 2004 : Human Rights Education :Role of Teaching and Training Institution, *The Indian Journal of Social Work,* Vol.65, Issue 3, July,423-445

Co-ordinator
IQAC, Shri Ram College
Muzaffarnagar

Chairman
IQAC, Shri Ram College,
Muzaffarnagar

ISSN — 2023

Minakshi Kakran, 2023, 11:3
ISSN (Online): 2348-4098
ISSN (Print): 2395-4752

International Journal of Science, Engineering and Technology

An Open Access Journal

Applique Craft of Orissa in India: Continuty, Changes & Challenges

Asst. Prof. Minakshi Kakran, Asst. Prof. Anu Devi, Asst. Prof. Binnu Pundir
Fine Arts Department
Shri Ram College, Muzaffarnagar

Abstract- Appliqué, originating from French culture, is a distinctive form of embroidery that involves attaching smaller pieces or patches of fabric onto a larger fabric or surface. Unlike traditional embroidery, which often involves stitching onto the fabric directly, appliqué typically utilizes one entire piece of fabric. The term "appliqué" itself denotes "something applied" or an addition that has been affixed onto the base fabric. This technique offers a versatile way to embellish textiles, adding depth, texture, and visual interest to various items like Tarasa banners, Chandua canopies, Chhattri umbrellas, animal puppets, wall hangings, shrine covers, parasols, bags, pouches, cushion covers, and lanterns. The most intricate appliqué techniques are seen in Samiana canopies and Chhattri umbrellas, showcasing remarkable artistic skills. These crafts are typically passed down through generations within families. The Pipli appliqué style predominantly features cut cloth patches fashioned into floral, avian, and animal motifs, which are then sewn onto items like bedcovers, cushions, and lampshades. Traditionally, the primary colors of black, white, red, and yellow are used, although additional hues have been incorporated over time to enhance the craft's vibrancy.

Keywords- Appliqué, Puppets, Traditional embroidery, Primery colours

I. INTRODUCTION

Pipili is a small town, situated about 40 kilometers from Puri and Bhubaneshwar is the capital of Orissa, The income of this town is essentially dependent on the business of its handicrafts of which the appliqué works are the main source. Nowadays, Pipili is globally known as the destination of appliqué and is where many workers and workshops continue to practice the technique, creating both traditional and contemporary items. Pipili is a village where all houses and shops along the roads have one thing in common: beautiful appliqué work, in the making or on display, all giving out a loud burst of colour. Founded by the King of Orissa to house the artisans crafting appliqué umbrellas and canopies for the yearly Jagannath Yatra. Pipili has an entry in 2004 in the Guinness Book of Records, for the world's largest thematic appliqué work. The 54-metre (177 ft) long work is filled with depictions of India's struggle for independence.

II. METHODOLOGY

This study relies on secondary data analysis from various sources, including scholarly articles, and Google Websites. The data collected from these sources and analyzed to identify trends, patterns, and insights regarding the Appliqué Craft Work of Odisha.

1. Origin and History

The exact origins of appliqué cannot be definitively traced; rather, it emerged as a practical solution during challenging times rather than as a deliberate art form. Its inception can be attributed to the necessity of repairing torn garments to maintain

© 2023 Minakshi Kakran. This is an Open Access article distributed under the terms of the Creative Commons Attribution License (http://creativecommons.org/licenses/by/4.0), which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly credited.

Co-ordinator
IQAC, Shri Ram College
Muzaffarnagar

Chairman
IQAC, Shri Ram College,
Muzaffarnagar

their decency and wearability. Craftsmen of yore ingeniously sewed over the damaged areas, utilizing patches of various materials readily available, a technique later recognized as patchwork. Notably, the tradition of appliqué flourished in Benin, West Africa, particularly in the vicinity of Abomey, where it has been deeply ingrained since the early 18th century. Similarly, within the kingdom of Danhomè and its surrounding regions, appliquéd cloth holds significant cultural and artistic importance, showcasing the skilled craftsmanship and creative expression of its artisans.

2. Making Process

When it comes to sewing, an Appliqué basically refers to a type of needlework technique in which, various pieces of embroidery, fabric, or other materials are sewn onto another piece of fabric to create different designs, abstract patterns or pictures. It is particularly suitable for the work or textile which is to be seen from a distance, such as in banner-making. Appliqué is used extensively in quilting. "Sunbonnet Sue" and "Dresden Plate" are two examples of traditional native American quilt blocks that are constructed with both Applique and patchwork Baltimore album quilts, Hawaiian quilts, Broderieperse, Egyptian Khayamiya, Amish quilts, and the Ralli quilts of India and Pakistan also use Appliqué. Apart from that, Appliqué is also a famous form of embroidery used to adorn sarees with elaborate and vibrant looking borders.

III. DESIGN

The main items are listed Below

The vibrant appliqué work finds its most prominent display in the ornate cloth covers adorning the three chariots carrying the presiding deities during the annual Ratha Yatra or Chariot Festival. Following tradition, each chariot is adorned with a specific color scheme: green and red for the chariot of Balabhadra, black and red for Subhadra's chariot, and yellow and red for the chariot bearing Lord Jagannath. These intricately designed covers serve as visual symbols of reverence and tradition, adding to the grandeur of the religious procession.

1. Chandua (canopy)

Initially, all the deities were sheltered with a cloth draped over their heads for protection. This adorned piece of fabric, known as a chandua, symbolizes reverence towards the deity. Furthermore, sizable chanduas are prominently displayed during significant events such as weddings and gatherings, adding a touch of cultural splendor to the occasion.

2. Chhati (Ritualumbrella)

As implied by its name, the ritual umbrella serves a purpose during ceremonial journeys and regal processions. However, it is noteworthy that these umbrellas are prohibited within the precincts of the Jagannath temple. While historically indispensable for any procession, be it religious or royal, their contemporary usage has primarily reverted to ceremonial contexts. Additionally, the chhati has adapted to modern times, finding new applications in commercial and secular realms, including as garden umbrellas and ornamental accessories for women.

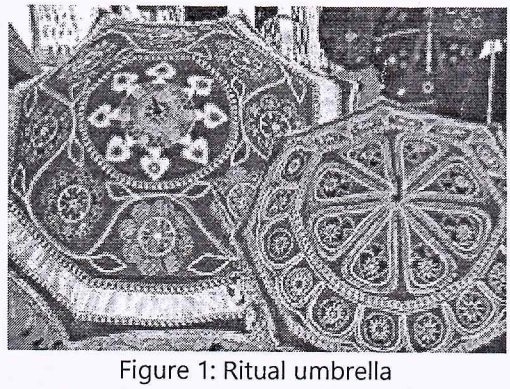


Figure 1: Ritual umbrella

3. Trasa (Banner)

In former times, this banner held significant religious and royal significance, being a common sight in religious ceremonies and regal processions. However, in contemporary times, its usage has primarily been confined to religious contexts, with appearances in royal processions becoming increasingly rare. Specific individuals belonging to designated categories would carry this item, and its absence from a procession was deemed incomplete, underscoring its historical importance and ceremonial significance.

Co-ordinator
IQAC, Shri Ram College
Muzaffarnagar

Chairman
IQAC, Shri Ram College,
Muzaffarnagar

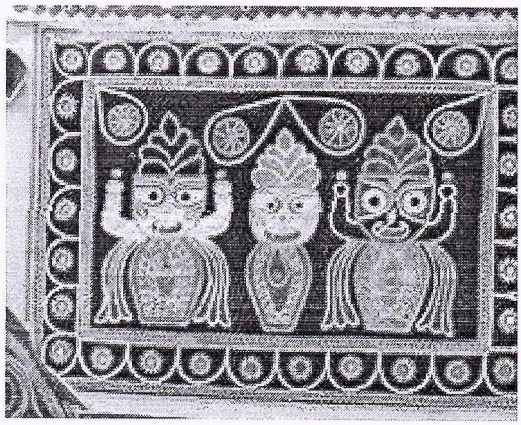


Figure 2: Trasa (Banner)

4. Alata (Hand-fan for Religious Use)
During processions of the deities, alatas play a crucial role in shielding them from the heat. Initially crafted from plain cloth, these alatas have evolved over time to feature intricate decorations, specifically tailored for this protective purpose.

5. Adheni (Banner)
"From traditional to modern times, this item has been extensively utilized in religious processions and, to a lesser extent, in royal ones.

6. Dola Mandani (Covering for Celestial Vehicle)
Initially designed for ceremonial purposes, this covering adorned the summits of divine wooden chariots or bimanos.

In its current adaptation, it has transformed into door embellishments or jhalars (literally 'frills'), serving as decorative elements in domestic settings.

Motifs
The motifs used consist of stylized representations of flora and fauna as well as a few mythical figures. Of the more common of these motifs are

- Tree: Belagaccha,
- Leaves: (patra)
- Flowers: (Malli – Mogra, Padma, Tarup, Guntha Surya Mukhi)

4. Birds
Sua – Parrot, Bataka – Duck, Hansa – Swan, Mayur – Peacock

5. Animals: Hat – Elephant, Singho – Lion, etc."
The fundamental design comprises a blend of narrow and wide stripes, embellished with appliquéd mythical motifs such as Rahu, Chandra, and various nature-inspired elements adorning the four sides above the openings. These captivating appliqué covers serve as distinguishing markers, facilitating the identification of the chariots carrying the three deities from afar, particularly amidst the bustling throngs of pilgrims lining the main road of Puri during the annual chariot festival.

- Phula patti (flower motif)
- Sadha patti (plain red strip)
- Nahara patti (cone pattern)
- Kalaso patti (pitcher strip)
- Beliri patti (strip from left to right)
- Mooda patti (strip from right to left)
- Gula patti (wavy strip)
- Hirana patti (mogra flower strip)

There are many more strip designs available in Puri. To maintain consistency, these strips also follow spacing, color, and guideline standards.

IV. CHALLENGES

At Pipli, when you travel to the main street, you see hand skills are completely shifting towards machine-made products. Local tailors are stitching appliqué by machine, and even repetitive motifs are being replaced by machine-made laces. Tourists who come to these shops need economic products, whether machine-made or handmade. The unique quality of Pipli appliqué lies in the skill of the artisan and unique aesthetics, but if they use readymade laces and machine-stitched elements, anyone can make such products. Artisans or sellers should focus on demonstration, traditional themes, and stories so that they can convince buyers about the legacy, as most visitors are actually tourists of Puri.The craft industry in India is facing a decline in demand, compounded by the influx of foreign brands. Additionally, the challenges intensified with the onset of the COVID-19 pandemic, as shops remained closed for months, further impacting the craft sector.Artisans used to buy cloth from the state-owned Orissa Textiles Mills (OTM). But after the shutting down of the mill, they have to depend

Co-ordinator
IQAC, Shri Ram College
Muzaffarnagar

Chairman
IQAC, Shri Ram College,
Muzaffarnagar

on private mills or manufacturing units of other states, which increases the price of raw materials.

V. CONCLUSION

In conclusion, Pipili stands as a renowned hub for the exquisite art of appliqué, deeply ingrained in its cultural and economic fabric. Originating as a practical solution, appliqué has evolved into a distinguished art form, with Pipili being a testament to its vibrancy and tradition. However, amidst modernization, the shift towards machine-made products poses challenges to traditional craftsmanship. The decline in demand, exacerbated by the impact of the COVID-19 pandemic, and the scarcity of raw materials further threaten the livelihoods of artisans. Despite these challenges, preserving the legacy of Pipili's unique appliqué craftsmanship requires a concerted effort to uphold traditional themes, storytelling, and artisanal skills. Reviving interest and sustaining the craft industry necessitate innovative strategies to adapt to changing market dynamics while safeguarding the cultural heritage embedded in Pipili's artisanal legacy.

REFERENCES

1. https://www.bing.com/ck/a?!&&p=18cd3d9a7a92a0a0JmltdHM9MTcxMTA2NTYwMC7625666d6ee2&psq=applique+craft+of+orissa+in+india+%3a+continuty%2c+changes+%26+commercialization&u=a1aHR0cHM6Ly93d3cuYW50aHJvLm94LmFjLnVrL3NpdGVzL2RlZmF1bHQvZmlsZXMvYW50aHJvL2RvY3VtZW50cy9tZWRpYS9qYXNvMjlfMV8xOTk4XzUzXzcwLnBkZg&ntb=1
2. www.utsavpedia.com/motifs-embroideries/the-adorable-art-of-applique-embroidery/
3. https://www.bing.com/ck/a?!&&p=897521624d3bb1beJ7625666d6ee2&psq=applique+craft+of+orissa+in+india+%3a+continuty%2c+changes+%26+commercialization&u=a1aHR0cHM6Ly9lbi53aWtpcGVkaWEub3JnL3dpa2kvUGlwaWxpX2FwcGxpcXUlQzMlQTlfd29yaw&ntb=1

Co-ordinator
IQAC, Shri Ram College
Muzaffarnagar

Chairman
IQAC, Shri Ram College,
Muzaffarnagar

article_pdf | QT AG-Modules whose h-Pure-S | Vol. 44, No 1, pp18-24, DOI: 10
Not secure | cnki.kmlib.yn.cn/kcms/detail/detail.aspx?filename=SXYJ202401003&dbcode=CJFQ&dbname=CJFD2024
中国知识基础设施工程 www.cnki.net
中国学术期刊网络出版总库

节点文献

QT AG-Modules whose h-Pure-S-High Submodules Have Closure

推荐 CAJ下载 PDF下载 下载得分数 下载 下载

【作者】Mohd Noman ALI; Vinit Kumar SHARMA; Ayazul HASAN;

【Author】Mohd Noman ALI;Vinit Kumar SHARMA;Ayazul HASAN;Department of Mathematics, Shri Venkateshwara University;College of Applied Industrial Technology, Jazan University;

【通讯作者】Ayazul HASAN;

【机构】Department of Mathematics, Shri Venkateshwara University; College of Applied Industrial Technology, Jazan University;

【摘要】A right module M over an associative ring R with unity is a QTAG-module if every finitely generated submodule of any homomorphic image of M is a direct sum of uniserial modules.This article considers the closure of h-pure-S-high submodules of QTAG-modules.Here,we determine all submodules S of a QTAG-module M such that each closure of h-pure-S-high submodule of M is h-pure-■-high in■.A few results of this theme give a comparison of some elementary properties of h-pure-S-high and S-high submodules. ..更多

【Abstract】A right module M over an associative ring R with unity is a QTAG-module if every finitely generated submodule of any homomorphic image of M is a direct sum of uniserial modules.This article considers the closure of h-pure-S-high submodules of QTAG-modules.Here,we determine all submodules S of a QTAG-module M such that each closure of h-pure-S-high submodule of M is h-pure-■-high in■.A few results of this theme give a comparison of some elementary properties of h-pure-S-high and S-high submodules. ..更多

【关键词】QT AG-modules; closures; h-pure-S-high submodules;
【Key words】QT AG-modules; closures; h-pure-S-high submodules;

【文献出处】Journal of Mathematical Research with Applications 数学研究及应用(英文版), 编辑部邮箱, 2024年01期

【分类号】O153.3 【下载频次】3

节点文献中 请输入检索词 全文快照搜索 知网节下载

本文链接的文献网络图示:

本文的引文网络

上级参考文献(0) → 参考文献(0) → 节点文献 → 引证文献(0) → 二级引证文献(0)

共引文献(0)

同被引文献(0)

0

2024

文献数

年度

Co-ordinator
IQAC, Shri Ram College
Muzaffarnagar

Chairman
IQAC, Shri Ram College,
Muzaffarnagar

Journal of Mathematical Research with Applications
Jan., 2024, Vol. 44, No. 1, pp. 18–24
DOI:10.3770/j.issn:2095-2651.2024.01.003
Http://jmre.dlut.edu.cn

$QTAG$-Modules whose h-Pure-S-High Submodules Have Closure

Mohd Noman ALI[1], Vinit Kumar SHARMA[1], Ayazul HASAN[2,*]

1. *Department of Mathematics, Shri Venkateshwara University, Gajraula, Amroha-U.P., India;*
2. *College of Applied Industrial Technology, Jazan University, Jazan, Kingdom of Saudi Arabia*

Abstract A right module M over an associative ring R with unity is a $QTAG$-module if every finitely generated submodule of any homomorphic image of M is a direct sum of uniserial modules. This article considers the closure of h-pure-S-high submodules of $QTAG$-modules. Here, we determine all submodules S of a $QTAG$-module M such that each closure of h-pure-S-high submodule of M is h-pure-$\overline{S}$-high in $\overline{M}$. A few results of this theme give a comparison of some elementary properties of h-pure-S-high and S-high submodules.

Keywords $QTAG$-modules; closures; h-pure-S-high submodules

MR(2020) Subject Classification 16K20; 06F25; 13C05

1. Introduction and backgrounds

Let R be any ring. A uniserial module M is a module over a ring R, whose submodules are totally ordered by inclusion. This means simply that for any two submodules N and L of M, either $N \subseteq L$ or $L \subseteq N$. An element $u \in M$ is uniform, if uR is a non-zero uniform (hence uniserial) module and for any module M with a unique decomposition series, the symbol $d(M)$ will denote its decomposition length.

The close association of abelian group theory and the theory of modules have been extensively studied in the literatures. For details on the abelian groups behaving like modules, we refer to [1,2]. In the 1970s, Singh [3] began his investigations into the torsion abelian groups or TAG-modules, defined by satisfying two properties relating to uniserial modules while the rings are associative with unity.

(i) Every finitely generated submodule of any homomorphic image of M is a direct sum of uniserial modules.

(ii) Given any two uniserial submodules U_1 and U_2 of a homomorphic image of M, for any submodule N of U_1, any non-zero homomorphism $\phi : N \to U_2$ can be extended to a homomorphism $\psi : U_1 \to U_2$, provided the composition length $d(U_1/N) \leq d(U_2/\phi(N))$.

He followed this up in his another work, "Abelian groups like modules" [4], and introduced the notion of $QTAG$-module in a natural way arising from his investigation in [3]; this notion

Received March 14, 2023; Accepted September 22, 2023
* Corresponding author
E-mail address: ayazulh@jazanu.edu.sa (Ayazul HASAN)

Co-ordinator
IQAC, Shri Ram College
Muzaffarnagar

Chairman
IQAC, Shri Ram College,
Muzaffarnagar

2. Chief results

We begin by reviewing some terminology from [13] and [14], respectively. We say that a submodule S of M is high, if it is maximal with respect to $\cap M^1 = 0$. Note that if S is high submodule of M, then S is h-pure in M and M/S is h-divisible.

Likewise, a submodule S_1 of M is S_2-high, if $S_1 \cap S_2 = 0$ and S_1 is maximal with respect to this intersection, that is, it is not properly contained in any different submodule of M having the same property. It is self-evident that all S_2-high submodules are bounded if and only if for every h-pure submodule S_1 of an h-reduced $QTAG$-modules M containing S_2. M/S_1 is a direct sum of bounded modules.

Next, we review the following concepts from [15]. A submodule T of a $QTAG$-module M is h-pure-S-high in M if it is maximal among the h-pure submodules disjoint from S for some submodules S of M. It was seen that all h-pure-S-high submodules of M are S-high in M.

The following elementary, but useful lemma, possess a central position.

Lemma 2.1 *Suppose S_1, S_2 and S_3 are submodules of a $QTAG$-module M such that*

(i) $S_1 \cap S_2 = S_1 \cap S_3 = 0$,

(ii) $S_2 \subseteq \overline{M}$,

(iii) *if* $\mathrm{Soc}(H_t(S_2)) \neq 0$, *then* $\mathrm{Soc}(H_t(S_3)) \subseteq \mathrm{Soc}(H_t(S_2))$ *for some* $t \geqslant 0$,

(iv) S_2 *and* S_3 *are h-pure submodules of M.*

Then $S_2 + S_3$ is h-pure submodule of M and $(S_2 + S_3) \cap S_1 = 0$.

Proof Suppose $x \in S_2$, $y \in S_3$ and $z \in M$; if $x + y = z'$ such that $d(zR/z'R) = t$, then $e(x)y = e(x)z'$ with $d(zR/z'R) = t$. Therefore, by using (iv), we can find a uniform element $u \in S_3$ such that $e(x)y = e(x)u'$, where $d(uR/u'R) = t$. It follows that $y - u' \in S_2$ by (iii), where $d(uR/u'R) = t$. Note that $x + y - u' = H_t((z-u)R) \in S_2$ where $d(uR/u'R) = t$ and by (iv), there exists a uniform element $v \in S_2$ such that $x + y - u' = v'$, where $d(uR/u'R) = d(vR/v'R) = t$. Therefore, we get that $x + y = w'$, where $w = u + v$ and $d(wR/w'R) = t$. Now set $x + y = w$, where $x \in S_2, y \in S_3$ and $w \in S_1$. Then we obtain that $e(x)y = e(x)w \in S_1 \cap S_3 = 0$ and hence $y \in S_2$ by (iii). This, in turn, implies that $x + y = w \in S_1 \cap S_2 = 0$, and so $(S_2 + S_3) \cap S_1 = 0$, as expected.

As an immediate consequence, we yield the following.

Corollary 2.2 *Let S be a submodule of a $QTAG$-module M, and let T be an h-pure-S-high submodule of M. Then the following hold:*

(i) $T \subseteq \oplus_{i \in I} \mathrm{Soc}(H_i(M))$.

(ii) *T is h-pure in M.*

Proof Let T be an h-pure-S-high submodule of M and $L = \oplus_{i \in I} \mathrm{Soc}(H_i(M))$ be any submodule of M. One sees readily in view of Lemma 2.1, $T+L$ is an h-pure submodule of M and $(T+L) \cap S = 0$. From the maximality of T, we have $L \subseteq T$. Note that if $x' \in T$, for some $x \in M$ and $d(xR/x'R) = 1$, then $x' = y'$ for some $y \in T$. It follows that $x - y \in \mathrm{Soc}(H_i(M)) \subseteq T$ and

Co-ordinator
IQAC, Shri Ram College
Muzaffarnagar

Chairman
Shri Ram College,
Muzaffarnagar

In virtue of Lemma 2.1, we have $(P_1 + T) \cap S_1 = 0$, and $P_1 + T$ is h-pure in M. From the maximality of T, we have $P_1 = \overline{T}$. Therefore, $\overline{T}$ is an h-pure-$(S_1 \cap S_3)$-high submodule of S_3 in conjunction with [15, Theorem 1].

(ii) Let P_2 be an h-pure-$(S_1 \cap S_3)$-high submodule of S_3. Since P_2 is closed, it easily follows that P_2 is h-pure in M. Henceforth, according to (i), for any h-pure-S_1-high submodule T of M containing P_2, we have $\overline{T} = T \cap S_3 = P_2$. We complete the proof. □

As a direct consequence of the preceding theorem we have the following.

Corollary 2.5 *Let S_1 and S_2 be submodules of a QTAG-module M with $\overline{(M/S_1)} = S_2/S_1$. If T is an h-pure-S_1-high submodule of M, then the following hold.*

(i) $\overline{T}$ is h-pure-$\overline{T}$-high in $\overline{M}$.

(ii) $\overline{T}$ is h-pure-S_1-high in S_2 (resp., $S_1 + \overline{M}$).

(iii) $\mathrm{Soc}(M) = \mathrm{Soc}(S_1) + \mathrm{Soc}(T)$.

(iv) If $u \in M$ such that $u' \in T$ where $d(uR/u'R) = 1$, then $u \in \mathrm{Soc}(S_1) \oplus T$.

(v) Closure of all h-pure-S_1-high submodules of M are exactly all h-pure-$\overline{S_1}$-high submodules of $\overline{M}$ and exactly all h-pure-S_1-high submodules of $S_1 + \overline{M}$ (resp., S_2).

Proof (i), (ii) and (v) follow directly on the same idea as in Theorem 2.4.

As for the third part, since $\overline{T}$ is $\overline{S_1}$-high submodule of $\overline{M}$, then $\mathrm{Soc}(M) = \mathrm{Soc}(S_1) \oplus \mathrm{Soc}(T)$.

Concerning the fourth part, suppose $u \in M$ such that $u' \in T$ where $d(uR/u'R) = 1$. Then there exists a uniform element $v \in T$ such that $d(uR/vR) = 1$. Henceforth, $u - v \in \mathrm{Soc}(M) = \mathrm{Soc}(S_1) \oplus \mathrm{Soc}(T)$ and consequently $u \in \mathrm{Soc}(S_1) \oplus T$. □

And so, we prepare to prove the following corollary.

Corollary 2.6 *Let S_1 be a submodule of the QTAG-module M. If T is an h-pure-S_1-high submodule of M. Then the following are equivalent:*

(i) T is S_1-high in M;

(ii) $S_1 \oplus T$ is essential in M;

(iii) $(S_1 \oplus T)/T$ is essential in M/T;

(iv) $(T + \overline{M})/\overline{M}$ is $(S_1 + \overline{M})/\overline{M}$-high in $M/\overline{M}$;

(v) $M/(S_1 \oplus T)$ is closed.

Proof The implication (i)⇒ (ii) is obvious.

(ii)⇒ (iii). Let $x \in M \setminus S_1 \oplus T$ and n be the least natural number such that $nx \in S_1 \oplus T$. By Corollary 2.5, there is a non-zero uniform element $nx + T$ of $(S_1 \oplus T)/T$ and we are done.

(iii)⇒(iv). Clearly, $(T + \overline{M})/\overline{M} \cap (S_1 + \overline{M})/\overline{M} = 0$, we assume a submodule S_2 of M such that $S_2/\overline{M}$ is a $(S_1 + \overline{M})/\overline{M}$-high submodule of $M/\overline{M}$ containing $(T + \overline{M})/\overline{M}$. Let y be any uniform element in S_2. Then there exists an integer t such that $ty = a + b$, where $a \in S_1$ and $b \in T$. Thus $a = ty - b \in S_1 \cap S_2 = \overline{S_1}$ and $e(a)ty = e(a)b = e(a)tc$ for some $c \in T$. Hence $y - c \in \overline{M}$ and consequently $y \in T + \overline{M}$, as required.

(iv)⇒ (v). For each non-zero uniform element $x \in M$ there is an integer t in a such a way that $t(x + \overline{M}) = (b + \overline{M}) + (a + \overline{M})$ holds for some $b \in T$ and $a \in S_1$. Hence $tx = a + b + z$

Co-ordinator
IQAC, Shri Ram College
Muzaffarnagar

Chairman
IQAC, Shri Ram College,
Muzaffarnagar

So if $(\overline{M} \oplus S_3)$ is h-pure in M, then $u \in (\overline{M} \oplus S_3)$. The rest result directly follows from Theorem 2.4.

Next we deal with the converse implication. Let L be an h-pure-$\overline{S_1}$-high submodule of M and $(S_2 \oplus \overline{M})/\overline{M}$ be a $(S_1 + \overline{M})/\overline{M}$-high submodule of $M/\overline{M}$. Since S_2 is h-pure in M, it easily follows from Lemma 2.1 that $L \oplus S_2$ is h-pure in M and $(L \oplus S_2) \cap S_1 = 0$. If T is an S_1-high submodule of M containing $L \oplus S_2$, we have $\overline{M} \oplus S_2 = \overline{M} + T$ and $(T + \overline{M})/\overline{M} \cap (S_1 + \overline{M})/\overline{M} = 0$. Therefore, $\overline{M} \oplus S_2 = \overline{M} + T$. Of course we claim that $w \in T$. Indeed $w = x + y$, where $x \in \overline{M}$ and $y \in S_2$. This shows that $y \in \overline{T} = L$ and $w \in L \oplus S_2$. Thus, by what we have just seen above, we obtain in view of Theorem 2.4, $T = L \oplus S_2$, as desired. The proof of the theorem is completed. □

3. Open problems

In closing, we pose the following questions of interest.

Problem 3.1 *Is it true that all h-pure-S-high submodules are closed under direct sums of uniserial modules?*

Problem 3.2 *Does there exist an S-high submodule which is not h-pure-S-high submodule?*

Problem 3.3 *Suppose M is a QTAG-module. What are the conditions under which any h-pure submodule between M and $\mathrm{Soc}(M)$ is h-pure-S-high submodule?*

Acknowledgements The authors would like to express their sincere thanks to the referees for their careful reading of the paper, and to the Editors for their valuable editorial work.

References

[1] K. BENABDALLAH, S. SINGH. *On Torsion Abelian Groups Like Modules*. Springer, Berlin, 1983.
[2] S. SINGH, M.Z. KHAN. *TAG-modules with complement submodules h-pure*. Internat. J. Math. Math. Sci., 1998, **21**(4): 801–814.
[3] S. SINGH. *Some Decomposition Theorems in Abelian Groups and Their Generalizations*. Dekker, New York-Basel, 1977.
[4] S. SINGH. *Abelian groups like modules*. Act. Math. Hungar., 1987, **50**(1-2): 85–95.
[5] A. HASAN, RAFIQUDDIN. *On completeness in QTAG-modules*. Palest. J. Math., 2022, **11**(2): 335–341.
[6] A. HASAN. *Structures of QTAG-modules determined by their submodules*. Uzbek Math. J., 2021, **65**(3): 38–45.
[7] M. Z. KHAN, G. VARSHNEY. *On h-purifiable submodule of QTAG-module*. Tamkang J. Math., 2014, **45**(3): 251–258.
[8] H. A. MEHRAN, S. SINGH. *On σ-pure submodules of QTAG-modules*. Arch. Math., 1986, **46**(6): 501–510.
[9] J. BECVAR. *N-pure-high subgroups of abelian groups*. Acta Univ. Carolin. Math. Phys., 1985, **26**(1): 21–33.
[10] L. FUCHS. *Infinite Abelian Groups (I)*. Academic Press, New York-London, 1970
[11] L. FUCHS. *Infinite Abelian Groups (II)*. Academic Press, New York-London, 1973.
[12] A. TUGANBAEV. *Distributive Modules and Related Topics*. Gordon and Breach Science Publishers, Amsterdam, 1999.
[13] M. Z. KHAN. *Modules behaving like torsion abelian groups (II)*. Math. Japon., 1979, **23**(5): 509–516.
[14] A. MEHDI, F. MEHDI. *N-high submodules and h-topology*. South East Asian J. Math. Math. Sci., 2002, **1**(1): 83–88.
[15] A. HASAN, J. C. MBA. *On QTAG-modules having all N-high submodules h-pure*. Mathematics, 2022, **10**(19): 3554.

Coordinator
IQAC, Shri Ram College
Muzaffarnagar

Chairman
IQAC, Shri Ram College,
Muzaffarnagar

ISSN - 2023

International Journal of Science, Engineering and Technology

An Open Access Journal

Anu Devi, 2023, 11:3
ISSN (Online): 2348-4098
ISSN (Print): 2395-4752

Exploring Prospects and Challenges in the Indian Textile Industry

Assistant Professor Anu Devi, Assistant Professor Minakshi Kakran, Assistant Professor Rajni Kant
Fine Arts Department
Shri Ram College, Muzaffarnagar

Abstract- The Indian textile sector stands as a cornerstone of the Indian economy, contributing approximately 7% of the total GDP and over 12% of the manufacturing sector, with export earnings exceeding 13%. It ranks as the second-largest employer in India, following the agriculture sector. Globally, India holds a significant position, representing 5.2% of textile exports and 3.7% of apparel exports. Directly, it employs around 45 million individuals, with another 60 million engaged indirectly through associated activities. Projections indicate promising growth, with the domestic home textile market expected to achieve a Compound Annual Growth Rate (CAGR) of 4%, reaching $13 billion, and the technical textile market poised to grow at a CAGR of 10%, reaching $42 billion within the same timeframe. India secures the second position in textile exports, commanding a 7% share, and the sixth position in apparel exports with a 3% share globally. Post-COVID, there's been a noticeable surge in demand, amplified by government support through attractive schemes like Production Linked Incentive (PLI) and Mega Investment Textile Parks (MITRA). These initiatives aim to propel the sector towards surpassing the ambitious $250 billion target by 2025-26, as outlined in recent reports. The impending release of the new textile policy is anticipated to be a game-changer, yet a strategic roadmap is imperative to realize the industry's full potential and meet the set targets within the stipulated timeline."

Keywords- Globally, Sector, GDP, Apparel Textile

I. INTRODUCTION

The Indian clothes making business has been really important for India's money for a long time. It has a lot of history and it's also really important in the whole world. Lots of different things are part of this business, like making clothes, spinning yarn, weaving fabric, and making garments. It gives jobs to millions of people and helps India make a lot of money.

The Indian clothes making business is super important for India's money. It helps make jobs, earn money from selling things to other countries, and helps make life better for everyone. But there are problems that need fixing so that the business can keep growing and stay competitive in the world.

"This research paper wants to talk about the good things and the problems the Indian clothes making business is dealing with. We looked at information from different places like books, reports about the business, and numbers to see what's going on. We checked how the business is doing now, what parts can grow more, what's stopping it from growing, and how we can fix those problems.

Our study helps us understand better what might happen to the Indian clothes making business in the future. Even though this business helps India a

© 2023 Anu Devi. This is an Open Access article distributed under the terms of the Creative Commons Attribution License (http://creativecommons.org/licenses/by/4.0), which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly credited.

Co-ordinator
IQAC, Shri Ram College
Muzaffarnagar

Chairman
IQAC, Shri Ram College
Muzaffarnagar

lot, it's facing many problems. It's having a hard time keeping up with other countries in using new technology, being productive, and taking care of the environment. The COVID-19 pandemic made things even harder by messing up how things are made and sold."

Back Ground

The Indian clothes making business has a long history and has been really important for India's money for a really long time. It includes lots of different jobs like making clothes, weaving fabric, spinning yarn, and making garments. This business gives jobs to many people, especially in the countryside, and helps India earn money by selling things to other countries.

Objectives

The AIM of this Research paper to achieve the following objectives:

- Analyze the current Position of the Indian textiles industry.
- Find out the prospects and growth opportunities for the industry in India.
- Highlight the major challenges faced by the Textile industry.
- Suggest ways to fix these problems and make the business grow more."

II. METHODOLOGY

We got information for this study from different places like smart people's articles, reports about the business; Research papers Websites from the government, and statistical databases. We looked at all this information to see what's going on with the Indian clothes making business, what's working well, and what's not.

Over Veiw of yhe Indian Textile Industry

1. Historical Development of Textile Industry

Let's talk a bit about how the Indian clothes making business has grown over time. India is one of the top countries that makes and sells clothes in the whole world. The Indian clothes making business has been around for a really long time, more than 5000 years! It started with people weaving cloth by hand in small villages, and now we have big factories making lots of clothes.

2. Role in India's Economy of Textile Sector

The clothes making business is really Critical for India's economy. It makes up over 7 % of all the GDP of Indian Textile and more than 12 percent of the GDP from manufacturing Sector. It's also the second biggest job provider in India, after Agriculture.

3. International Sales of Textile & Apparel Industry

A lot of products made by Indian trade industry have become really important for India's Gross Domestic product, exports, job creation, and getting money from other countries. In the last few years, the rate at which clothes and fabrics are export to other countries has been growing by about 10.06% every year on average. If we want to increase the value of these exports from $36 billion in 2017-18 to $300 billion by 2024-25, we'd need to grow by more than 22% every year.

III. PROSPECTS AND GROWTH OPPORTUNITIES OF TEXTILE INDUSTRY

1. Innovations in Technology

Just like in other industries, technology has been a big help in making the clothes making business better and more advanced. At every step, from making yarn to finished clothes, new technology has helped save money, use time better, and make more things. Things like automation, using computers, and better ways of making things have all helped make the Indian clothes making business grow and make India's economy stronger.

2. Emphasis on Environmentally Friendly Practices

Improving the value of locally made products, making materials last longer, promoting timeless clothing, reducing waste, and lessening the harm to the environment from making and using clothes are all part of focusing on sustainability. It's becoming more and more important for the clothes making business to be eco-friendly. We need to use processes that don't harm the environment, start

Co-ordinator
IQAC, Shri Ram College
Muzaffarnagar

Chairman
IQAC, Shri Ram College,
Muzaffarnagar

programs to recycle materials, and make clothes in ways that are better for the planet. This shift towards sustainability is really important for the Indian clothes making business to keep growing and stand out in the global market.

3. Developing Local Consumption

Experts in the industry believe that the current trend is temporary, and strong local buying will help keep demand high in the next few months, along with the increase in exports. Even with the rise in prices, people will keep buying clothes locally because the economy is growing and becoming more open.

4. Growing International Markets

India's trajectory towards becoming a global hub remains steadfast, promising to significantly amplify employment opportunities and foster substantial value creation domestically, in alignment with the Prime Minister's visionary 'Make in India' initiative. This transformative journey is poised to attract a substantial investment ranging from US$ 180 billion to US$ 200 billion, culminating in the creation of approximately 35 million new jobs. Furthermore, India's textile sector is poised to capitalize on burgeoning markets across Africa, Latin America, and Southeast Asia, presenting promising avenues for export expansion on a global scale.

5. Government Initiatives and Policy Frameworks

The initiatives taken by the government to address such problems -

- The government's decision to permit 100% Foreign Direct Investment (FDI) in the sector via the automatic route.
- Establishment of an India-Japan agreement aimed at fostering cooperation in textiles, facilitating Indian exporters to meet the technical requirements stipulated by Japanese importers.
- Proposal for the implementation of a National Technical Textiles Mission spanning from 2020-21 to 2023-24.
- Rollout of the New Textiles Policy 2020 by the Ministry of Textiles, aimed at the comprehensive development of the sector.
- Approval by the Cabinet Committee on Economic Affairs (CCEA) mandating the packaging of food grains and sugar in jute material for the Jute Year 2019-20.
- Amendment of the Technology Up gradation Fund Scheme (A-TUFS), anticipated generating employment for 35 million individuals and facilitating investments totaling Rs. 95,000 cores by 2022.
- Launch of the Integrated Wool Development Programme (IWDP) aimed at providing support to the wool sector from wool.

IV. KEY CHALLENGES CONFRONTING THE INDIAN TEXTILE INDUSTRY

1. International Rivalry

The textiles industry faces fierce global competition, exacerbated by the presence of low-cost manufacturing giants like China and Bangladesh. These competitors exert significant pressure on the Indian market. To navigate these challenges, innovative strategies for low-cost manufacturing must be developed.

2. Infrastructure Deficiency

The Indian textiles industry has trouble with its infrastructure, like not having enough good roads, electricity, and transport systems. This makes it hard for the industry to work efficiently.

3. Labour Related Problems

India has a lot of young people waiting to start working. The textile industry is a good option for them because it needs a lot of workers and can even have small businesses. But, like other industries, the textile industry in India has some problems with work, which we'll talk about next.

Firstly, the textile industry is split into many parts, like spinning and making clothes. It's really important to make sure the workers in this industry stay safe and healthy. Another problem is child labor. A report by the India Committee of the Netherlands found that in 2007, over 400,000 kids under 18 were working in cotton farms in Gujarat, Andhra Pradesh, Tamil Nadu, and Karnataka. More

Co-ordinator
IQAC, Shri Ram College
Muzaffarnagar

Chairman
IQAC, Shri Ram College,
Muzaffarnagar

than half of these kids were younger than fourteen years old.

4. Poor Working Environment

The place where employees work affects how well a business does. But, in many textile factories in India, there are big problems. Basic things like toilets, drinking water, fresh air, and fans are missing. The working areas are often dark and dirty with grease on the floor.

A study by Fibre2fashion found that workers in these factories face many problems like bad furniture, no fresh air or light, and not enough safety measures for emergencies. Because of these conditions, workers can get sick with problems like joint pain and knee arthritis.

5. Outdated Technology

Because there aren't many companies in India making textile machinery, cloth manufacturers struggle to replace old machines. It takes 2 to 3 years to import new machines, and by then, they're already outdated, which makes the quality and productivity worse.

Also, since there's not much investment or research in textile machinery, the industry has to buy machines from other countries, which makes costs higher and productivity lower. Even though there are schemes like the Soft Loan Scheme to help modernize textile equipment, the problem hasn't been fixed. Actually, the industry is slow at using new machines and technology.

6. Shattered Supply Chain

We often see that the textile industry's supply chain is all over the place. There are problems with different parts not working together well, no proper coordination, and missing information.

To make things better, we need to come up with plans to bring everything together, work together with others, and make the processes smoother and streamlining to enhance efficiency and competitiveness.

V. STRATEGIES TO OVERCOME CHALLENGES

1. Increasing Research and Development (R&D) Endeavors

The primary focus should underscore the significance of allocating resources towards research and development (R&D) to stimulate innovation, enhance product quality, and cultivate value-added textiles. This underscores the necessity for fostering collaboration among industry, academia, and research institutions to propel R&D endeavors and foster technological advancements.

2. Empowering Infrastructure Resources

In this section, we will delve into strategies aimed at enhancing infrastructure facilities within the textiles industry. It will address the imperative for investing in logistics, transportation, and power infrastructure to bolster operational efficiency, minimize costs, and facilitate industry expansion.

3. Advancing Skill Development and Training Initiatives

This section will underscore the critical role of skill development and training programs in mitigating the labor shortage prevalent in the textiles industry. It will elaborate on the importance of vocational training, fostering partnerships between industry and academia, and implementing apprenticeship programs to cultivate a proficient workforce adept at fulfilling industry demands.

4. Fostering Sustainable Manufacturing Practices

This section will underscore the significance of embracing sustainable manufacturing practices within the textiles industry. It will explore various strategies including resource optimization, waste reduction, and the adoption of renewable energy to mitigate the environmental footprint while simultaneously fortifying long-term sustainability.

5. Synergy and Integration across the Supply Chain

This section will center on elucidating the significance of synergy and integration across the supply chain in the textiles industry. It will delve

Co-ordinator
IQAC, Shri Ram College
Muzaffarnagar

Chairman
IQAC, Shri Ram College,
Muzaffarnagar

into strategies aimed at nurturing partnerships, facilitating information sharing, and orchestrating coordination among diverse stakeholders to streamline processes, diminish lead times, and elevate overall operational efficiency.

VI. CONCLUSION

The examination of the Indian textiles industry has unveiled numerous avenues for expansion, encompassing technological advancements, sustainable methodologies, burgeoning domestic demand, nascent global markets, and favorable governmental endeavors. Embracing cutting-edge technologies like automation and digitization holds the potential to augment productivity and bolster competitiveness. Furthermore, prioritizing sustainable manufacturing practices and meeting the escalating demand for eco-friendly textiles can unlock fresh pathways for development. Exploiting the burgeoning domestic market propelled by population expansion, urbanization, and evolving consumer inclinations is imperative. Venturing into emerging markets such as Africa, Latin America, and Southeast Asia can diversify export destinations and lessen reliance on conventional markets. The supportive government initiatives and policies are pivotal in nurturing the industry's growth and fortifying its competitive edge.

The insights gleaned from this research paper will enrich our comprehension of the trajectory of the Indian textiles industry, empowering policymakers, industry stakeholders, and researchers to make informed decisions and enact effective strategies. The recommendations derived from this research will delineate actionable steps to surmount challenges and capitalize on opportunities, thereby fostering sustainable development within the industry and ensuring its enduring contribution to India's economic growth. With its substantial potential for growth and development, the Indian textiles industry plays a pivotal role in bolstering the country's economy and facilitating employment generation. This research paper has furnished invaluable insights into both the prospects and challenges confronting the industry, while offering actionable recommendations for future endeavors.

In conclusion, the Indian textiles industry stands at the threshold of a promising future, contingent upon proactive efforts from both industry stakeholders and policymakers to address challenges and capitalize on growth opportunities. Through the adoption of innovative approaches, substantial investments in technology, infrastructure, and skill development, as well as a steadfast commitment to sustainability, the Indian textiles industry can fortify its position as a global leader. By doing so, it can not only contribute significantly to economic development but also create ample employment opportunities for millions of individuals.

REFERENCES

1. https://www.bing.com/ck/a?!&&p=86c3da4aab6a9586JmltdHM9MTcxMDg5MjgwMCZpZ3VpZD0wMGJjNjU5Yi02NzZiLTZmYjYtMWQxNy03NjI1NjY2ZDZlZTImaW5zaWQ9NTIxNQ&ptn=3&ver=2&hsh=3&fclid=00bc659b-676b-6fb6-1d17-
2. https://www.google.com/amp/s/baliyans.com/amp/daily-current-affairs/editorial/indian-textile-industry
3. https://www.iastoppers.com/articles/mains-article-indian-textile-industry-challenges-and-suggestion
4. Bajaj Parul & Sharma Anu. (2020). India's Textile and Clothing Trade with ASEAN: Emerging Trends and Structure. Jaipuria International Journal of Management Research (July-December 2019), 5(2), 23-34.
5. Bedi & Upadhayay. (2015). A Study of Automated Textile Industry; Opportunity and Challenges in Punjab. International Journal of Management & Business Studies (IJMBS Vol. 5, ISSue 3, July - Sept 2015)
6. Biz Vibe. (2020). Global Textile Industry Factsheet 2020: Top 10 Largest Textile Producing Countries and Top 10 Textile Exporters in the World. 'https://blog.bizvibe.com/blog/top-10-largest-textile-producingcountries'
7. Chakraborty Subhayan. (2020). India seeks stronger rules of origin as it urges ASEAN for FTA review. Business Standard

Co-ordinator
IQAC, Shri Ram College
Muzaffarnagar

Chairman
IQAC, Shri Ram College,
Muzaffarnagar

8. Economic Times. (2021). India to be among fastest-growing emerging markets in FY22: S&P. Economictimes.indiatimes.com www.ijcrt.org © 2021 IJCRT | Volume 9, Issue 6 J
9. Textile Magazine. (2021). 2020 and Beyond – Asia, the Global Hub for Textile Manufacturing.

Co-ordinator
IQAC, Shri Ram College
Muzaffarnagar

Chairman
IQAC, Shri Ram College
Muzaffarnagar

Reena Tyagi, 2023, 11:3
ISSN (Online): 2348-4098
ISSN (Print): 2395-4752

International Journal of Science, Engineering and Technology

An Open Access Journal

Reflecting on the Dominance of Indians Time Honored Embroidery Techniques

Assistant Professor Reena Tyagi
Department of Fine Arts
Shri Ram College Muzaffarnagar

Abstract- Traditional embroidery is a captivating art form passed down through generations, showcasing cultural heritage worldwide. Artisans use needle and thread to create intricate designs, each stitch crafted meticulously for stunning textures. From Indian kantha to Japanese sashiko, diverse styles reflect unique cultural identities. Motifs inspired by nature, mythology, and everyday life hold deep symbolic significance, preserving cultural narratives. Artisans infuse personal stories into their creations, making fabric come alive with beauty and meaning. Besides aesthetics, embroidery serves practical purposes, adorning clothing, accessories, and home furnishings with elegance and cultural pride.

Keywords- Traditional embroidery, motif chikankari, kashida, kantha, phulkari,

I. INTRODUCTION

Embroidery is a cherished art form and craft that involves decorating fabric or flexible materials using needle and thread. It's a creative process where artisans adorn surfaces with intricate designs and patterns, often incorporating materials like metal strips, glass, pearls, beads, feathers, and sequins for added embellishment. While machine embroidery emerged during the Industrial Revolution in the 19th century to replicate hand embroidery's appearance, it doesn't quite capture the same construction methods.

Indian embroidery is a testament to the country's rich cultural heritage, boasting a diverse array of regional styles and techniques. From the vibrant colors of Gujarat's mirror work to the intricate threadwork of Lucknow's Chikan embroidery, each region in India has its own distinctive embroidery tradition.

This tradition is deeply ingrained in the fabric of Indian society, serving as a means of cultural expression and storytelling. Embroidery in India is not merely about decorating fabric; it is a reflection of the community's identity and heritage.

Motifs and designs often draw inspiration from the natural environment, religious beliefs, economic status, and social customs of the region. For example, motifs depicting flowers, animals, and geometric patterns may symbolize the local flora and fauna or represent auspicious symbols in religious ceremonies.

Moreover, Indian embroidery is not limited to needlework alone. Artisans employ a variety of techniques and materials to embellish fabrics, including beadwork, sequins, appliqué, and patchwork. Each stitch and embellishment carries with it a piece of the community's history and traditions, making Indian embroidery a cherished and enduring tradition that continues to thrive in the modern era.

Types of Indian Embroidery- Indian embroidery encompass a rich tapestry of renowned and celebrated styles, each with its own unique charm

© 2023 Reena Tyagi. This is an Open Access article distributed under the terms of the Creative Commons Attribution License (http://creativecommons.org/licenses/by/4.0), which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly credited.

Co-ordinator
IQAC, Shri Ram College
Muzaffarnagar

Chairman
IQAC, Shri Ram College,
Muzaffarnagar

and heritage. Here are some acclaimed Indian embroideries:

II. CHIKANKARI OF LUKNOW

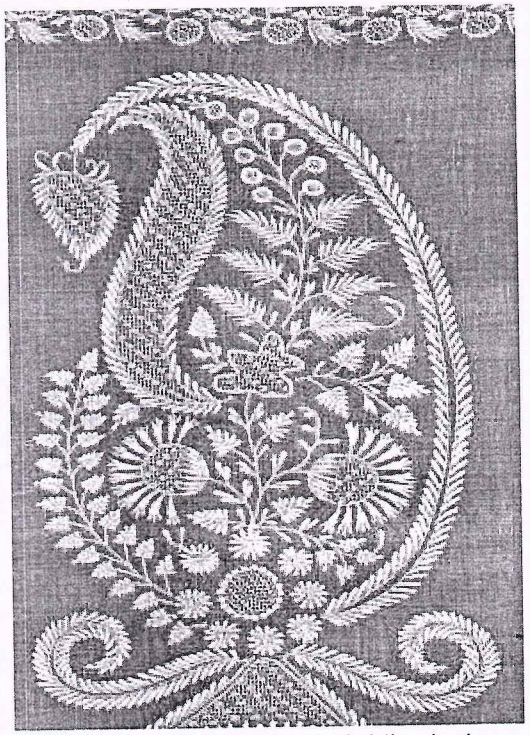


Figure 1: Paisley motif of chikankari

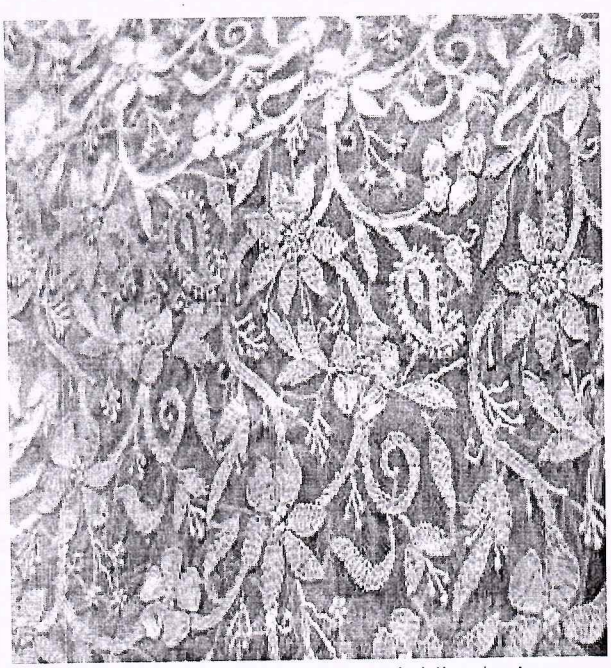


Figure 2: All over design of chikankari

Chikankari embroidery, originating from the historical city of Lucknow in Uttar Pradesh, India. Its name derives from the Persian word "Chakeen," signifying elegant patterns, which aptly encapsulates the beauty of this renowned craft. Chikan embroidery, widely regarded as a symbol of elegance and refinement, is believed to have been introduced to India by Nur Jahan, the influential wife of Emperor Jahangir. Nur Jahan's patronage and appreciation for the arts played a pivotal role in the development and popularization of this exquisite craft during the Mughal era. Under her guidance, Chikan embroidery flourished, captivating the royal court with its delicate beauty and intricate design

Also referred to as Shadow Work, Chikankari employs a distinctive technique wherein the herringbone stitch is meticulously worked from the fabric's reverse side, casting subtle shadows that outline delicate motifs on the front. Traditionally, this exquisite embroidery was exclusively executed on pristine white muslin fabric using matching white thread, embodying purity and sophistication. However, as Chikankari evolved over time, it embraced a diverse range of fabrics such as linen, georgette, chiffon, and even synthetic materials, expanding its versatility and appeal. While its roots lie in traditional white-on-white embroidery, contemporary Chikankari exhibits a spectrum of pastel-colored fabrics adorned with the timeless elegance of white thread. The motifs featured in Chikankari draw inspiration from the enchanting beauty of nature, including delicate floral like jasmine, majestic peacocks, and intricate lace patterns, infusing each piece with charm and grace. The creative process of Chikankari often commences with the transfer of intricate designs onto fabric using wooden block prints and washable colors. These stamped patterns serve as guides for skilled embroiderers, who employ a repertoire of stitches such as Satin Stitch, Stem Stitch, Back-Stitch, Herringbone Stitch, and Button-Hole Stitch to bring the designs to life with meticulous precision and artistry. Chikankari embroidery manifests in two distinct styles: flat and knotted embossed, each showcasing the artisan's skill and creativity. From adorning traditional

Co-ordinator
IQAC, Shri Ram College
Muzaffarnagar

Chairman
IQAC, Shri Ram College,
Muzaffarnagar

garments like saris, blouses, kurtas, and sari borders to embellishing household linens including curtains and pillow covers, Chikankari lends an aura of sophistication and refinement to every piece it graces.

In essence, Chikankari embroidery epitomizes the fusion of heritage and contemporary elegance, enchanting connoisseurs with its intricate craftsmanship and timeless allure

III. KANTHA OF BENGAL

Kantha embroidery comes from Bengal's villages and almost disappeared long ago. But in the 1940s, it came back to life, thanks to Rabindranath Tagore's daughter-in-law. However, it faced challenges again during India's Partition in 1947 and the conflicts that followed. But after Bangladesh's Liberation War in 1971, Kantha became popular again.

The word "kantha" might come from the Sanskrit word "kontha," meaning rags. Kantha embroidery, a traditional art from Bengal, translates to "Patched Cloth." Its origins are shrouded in mythologies, with one tale suggesting that women in ancient times stitched together layers of torn clothes. Another legend ties it to Lord Buddha and his disciples, who used discarded rags for clothing. The word "Kantha" itself means "throat" in Sanskrit, with Lord Shiva, known as Nilakanth or "blue throat," associated with the Throat Chakra.

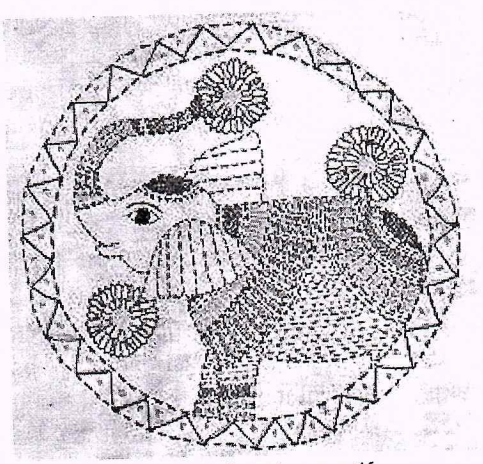


Figure 3: kantha motif

This embroidery involves stitching together layers of discarded fabric, such as dhotis or saris, using a simple running stitch with white thread. These stitched layers provide warmth and protection from the cold. Muslin saris in shades of grey, black, or white are particularly prized for their elegance and beauty, representing valuable handloom textiles cherished by women in Bengal

The process of making Kantha involves layering worn clothes and stitching them together using variations of the running stitch. Despite the simplicity of the stitch, the motifs can be intricate and varied. These motifs often depict gods and goddesses, flowers, animals, or geometric patterns, reflecting the personal connection of the artisan. There are seven types of Kantha, each serving different purposes:

1. Archilata Kantha
These are small covers adorned with wide, colorful borders, typically used for mirrors or toilet accessories.

2. Baiton Kantha
Square wraps used to cover books and other valuables, featuring elaborate borders.

3. Durjani/Thalia
Quilted wallets made from rectangular Kantha pieces.

4. Lep Kantha
Rectangular wraps heavily padded to create warm quilts, stitched in a wavy pattern with simple embroidery added afterward.

5. Oaar Kantha
Pillow covers with simple designs, often featuring a decorative border.

6. Sujani Kantha
Decorative quilted Kantha blankets.

7. Rumal Kantha
Used as absorbent wipes or plate coverings, often featuring a central design.

Co-ordinator
IQAC, Shri Ram College
Muzaffarnagar

Chairman
IQAC, Shri Ram College,
Muzaffarnagar

IV. PHULKARI OF PUNJAB

The term "Phulkari" originates from Punjabi, combining the words "Phul" meaning flower and "Kari" meaning work, translating to "flower work" or "floral work". This traditional embroidery style originated in Punjab during the 15th century, practiced predominantly by women in rural areas. Phulkari is often referred to as the folk embroidery of Punjab.

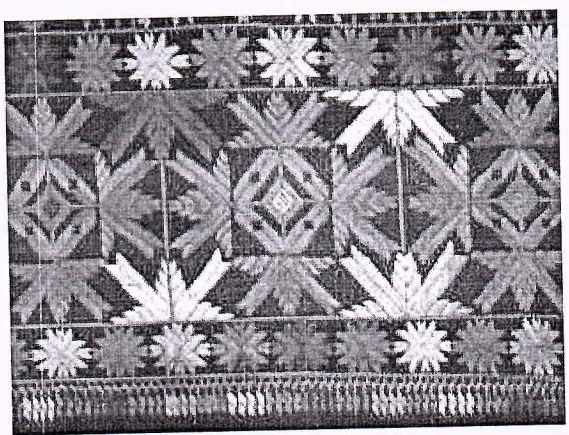


Figure 4: Boarder motif of Phulkari

Despite its name suggesting floral motifs, Phulkari designs encompass a variety of motifs, including geometric patterns and shapes alongside flowers. Known for its vibrant and colorful aesthetic, Phulkari embroidery adds brightness and cheerfulness to people's lives. This embroidery style has gained popularity worldwide for its unique and intricate designs.

In ancient Punjab, the birth of a girl was celebrated as a joyous occasion. Upon the birth of a daughter, mothers and grandmothers would immediately commence embroidering Phulkari. This tradition stemmed from the belief that the girl would be the progenitor of future generations, and the embroidered Phulkaris would be presented to her upon her marriage. It was customary for parents, according to their social status, to bestow a dowry comprising 11 to 101 Baghs and Phulkaris upon their daughter as part of her wedding trousseau. This practice symbolized the family's blessings and served as a cherished tradition honoring the bride's role in future generations.

Traditionally, Phulkaris were crafted using real flowers, with Silk and Mulmul fabrics favored for their purity and durability. The creation of Phulkaris was believed to be intertwined with the morality, righteousness, qualities, and character of women. Initially, these embroidered textiles were not intended for sale but were meticulously crafted by women for personal and familial use.

In Punjab, women adorned themselves with Phulkaris during weddings, festivals, and other celebrations. These vibrant textiles served as expressions of creativity and added color to daily life. Phulkari embroidery offered women a canvas for artistic freedom, allowing them to showcase their skills and imagination.

Even today, Phulkaris remain an integral part of Punjabi weddings, symbolizing tradition, heritage, and cultural identity. Their significance is immortalized in Punjabi folk songs that celebrate this cherished folk art form-

"Ih phulkari meri maan ne kadhi, iss noo ghut ghut japhiyan paawan"-My dear mother has embroidered this phulkari;I embrace it again and again with affection.

Phulkari Embroidery encompasses various captivating styles, each with its unique symbolism and aesthetic appeal:

Thirma
Signifying purity, this style is often worn by elder women and widows, reflecting a sense of reverence and tradition.

Darshan Dwar
Tailored for temple visits, Darshan Dwar designs carry religious connotations, featuring motifs appropriate for spiritual settings, thereby enhancing the wearer's connection to their faith.

Bawan Bagh
An exceptional type of Phulkari, Bawan Bagh showcases a mesmerizing array of fifty-two distinct patterns, exemplifying exquisite craftsmanship and intricate detailing.

Co-ordinator
IQAC, Shri Ram College
Muzaffarnagar

Chairman
IQAC, Shri Ram College,
Muzaffarnagar

Chope
Characterized by its use of a single color, Chope embroidery adds a touch of understated elegance, often employed for border decoration to achieve a refined aesthetic.

Surajmukhi
Drawing inspiration from sunflowers, Surajmukhi Phulkari embodies the vibrancy of nature and vitality, with sunflower motifs adorning the fabric, radiating warmth and energy.

Kaudi Bagh
Featuring chains of small white squares resembling stylized cowries, Kaudi Bagh embroidery introduces texture and dimension, enhancing the visual appeal of the design.

Panchranga
Vibrant and lively, Panchranga Phulkari incorporates chevrons adorned with five different colors, offering a captivating display of hues and patterns.

Satranga
Similar to Panchranga but with an added complexity, Satranga embroidery showcases chevrons embellished with seven distinct colors, elevating the diversity and richness of the design.

Meenakari
Reflecting opulence and sophistication, Meenakari Phulkari integrates gold and white threads with small multicolored lozenges, reminiscent of traditional enamel work, lending a touch of luxury to the embroidery.

V. KASHMIRI KASHIDA

Kashida, originating from Kashmir, is primarily practiced by the men of the region. This detailed embroidery is inspired by the stunning natural beauty of Kashmir's landscapes, known for its vibrant colors, intricate textures, captivating designs, and precise techniques. It is prominently showcased in shawls and plays a central role in the cottage industry of Srinagar, with every family member contributing to its production.

The technique of Kashida embroidery involves using a variety of base materials such as cotton, wool, or silk, available in an array of colors including white, blue, yellow, purple, red, green, and black. Threads used for Kashida embroidery range from wool to silk or cotton, depending on the desired effect. The embroidery employs main stitches like darning stitch, stem stitch, satin stitch, and chain stitch, with special stitches like Zalakdozi (chain stitch), Vata Chikn (buttonhole), Doria (openwork), and Talaibar (goldwork).

Motifs in Kashida embroidery often reflect the region's abundant flora and fauna, featuring birds like magpies and kingfishers, as well as flowers, butterflies, maple leaves, almonds, cherries, grapes, and plums. The tracing of designs onto the fabric is carried out by skilled professionals known as Naquashband (Nakshaband), following traditional techniques for precise outcomes.

Kashmiri embroidery encompasses various styles, including Sozni and Rezkari, Aari-work, and Kashmiri Couching. Sozni embroidery, renowned for its intricate patterns and reversible designs on shawls, utilizes stitches like fly stitch, stem stitch, and darning stitch. Aari-work involves filling motifs with chain stitch using a hook, while Kashmiri Couching intricately twists multiple strands of thread and couches them with a single thread.Kashmiri embroidery extends beyond textiles to crafts such as Gabha and Namda work. Gabha work creates unique floor coverings from recycled woolen blankets or shawls, featuring appliqué work and ornamental designs. Namda work embellishes felt carpets with chain stitch embroidery, often depicting floral and geometric patterns.

Various types of Kashmiri embroideries exist, including Kashida, Zalakdozi, Refoogari, and Tapestry work, each contributing to the rich textile heritage of the region. These embroideries adorn a wide range of products, from shawls and garments to household articles, showcasing the exceptional craftsmanship and cultural significance of Kashmiri embroidery.here are the brief description of each-

Co-ordinator
IQAC, Shri Ram College
Muzaffarnagar

Chairman
IQAC, Shri Ram College,
Muzaffarnagar

Kashida

A general term for Kashmir embroidery encompassing various stitches such as chain stitch (zalakdozi), buttonhole (vata chikn), openwork (dora), gold work (talaibar), and satin (sozni).

Zalakdozi

A form of Kashmir embroidery characterized by the use of tiny delicate chain stitches to depict stylized paisley motifs, a beloved element of this embroidery style.

Refoogari

Derived from the darning stitch, this Kashmiri embroidery technique involves weaving threads into the fabric material used as the base, resulting in a finely textured fabric with a design that looks uniform on both sides.

Tapestry work

Introduced by Major and Mrs. Handow around 1935, this embroidery technique involves using a blunt tapestry needle on canvas cloth known as Dasuta. It utilizes woolen thread called Ear and whip stitching by counting the threads to create household articles.

VI. CONCLUSION

In conclusion, embroidery stands as a cherished art form that transcends time and borders, weaving together stories of tradition, culture, and craftsmanship. From the intricate Chikankari of Lucknow to the rustic Kantha of Bengal and the vibrant Phulkari of Punjab, each embroidery style reflects the unique identity and heritage of its region. Indian embroidery, in particular, serves as a testament to the country's rich cultural tapestry, boasting a diverse array of techniques and motifs passed down through generations. As we marvel at the beauty and intricacy of these embroidered masterpieces, we are reminded of the enduring legacy of craftsmanship and creativity that continues to thrive in the modern era. Embroidery not only adorns fabric but also stitches together the fabric of communities, connecting us to our past and enriching our present with its timeless elegance and cultural significance.

REFERENCES

1. https://1.bp.blogspot.com/-82XL6vE3CSg/T4BZKlPm-SI/AAAAAAAAJz0/cU1xgQdytkA/s1600/Embroidery+Stitches.jpg
2. https://www.caleidoscope.in/art-culture/phulkari-embroidery-punjab
3. https://www.kashmirbox.com/
4. https://www.utsavfashion.com/blog/crafts/kashida-embroidery
5. https://en.wikipedia.org/wiki/Phulkari
6. https://www.memeraki.com/blogs/news/phulkari-the-embroidery-tradition-from-punjab
7. https://strandofsilk.com/journey-map/west-bengal/kantha-embroidery/introduction
8. www.indiantravelportal.com
9. http://hand-embroidery.com/history-of-chikankari.html
10. http://hand-embroidery.com/history-of-chikankari.html
11. https://phdessay.com/chikankari-of-lucknow/
12. http://www.nazranachikan.com/about-us-chikankari-embroidery/ http://www.indianmirror.com/culture/indian-specialties/Chikankari.htm
13. Gupta, S. (2017). The Role of Microfinance in Development of Craft and Cluster Activities in UP-A Case Study of Chikankari Industry of Lucknow
14. Kar, S. (2018). Next to a River: Mobility, Mapping, and Hand Embroidery.
15. Kumar, a. (2017). Connecting history and tourism: role of the history of chamba in tourism of himachal pradesh. Global Journal of Environmental Planning and Architectural Heritage [ISSN: 2581-4192 (online)], 1(1)
16. Sharma, k. R. (2017). Cultural tourism in chamba: re-discovery and innovativeness of lost traditions. International Journal of Current Research in Education, Culture and Society [ISSN: 2581-4028 (online)], 1(1).
17. Devi, Saroj, Parveen Punia, Neelam Pruthi, and Nidhi Sisodia. "Transformation of Kantha Traditional Embroidery: As fabric painting." (2017).
18. https://strandofsilk.com/journey-map/west-bengal/kantha-embroidery/history

Co-ordinator
IQAC, Shri Ram College
Muzaffarnagar

Chairman
IQAC, Shri Ram College,
Muzaffarnagar

19. Devi, S., Punia, P., Pruthi, N., & Sisodia, N. (2017). Development of Kantha Embroidery Motifs to Designs: Traditional to Contemporary. Int. J. Curr. Microbiol. App. Sci, 6(7) 4479-4488.

Chairman
IQAC, Shri Ram College,
Muzaffarnagar

Co-ordinator
IQAC, Shri Ram College
Muzaffarnagar

ISSN No:-2456-2165

Role of Various Color therapies on Alleviating Depression, Anxiety, and Stress

[1]Reena Tyagi (Assistant Prof.)
[2]Sharmistha P Samal (Assistant Prof.)
Department of Fine Arts
Shri Ram College Muzaffarnagar

Abstract:- Color therapy, also known as Chromotherapy, is an ancient practice that utilizes the therapeutic properties of colors to enhance physical and mental well-being. Rooted in historical civilizations like Egypt, China, and India, color therapy recognizes the unique influences of different hues on emotions, energy levels, and overall health. The practice involves various techniques such as exposure to colored lights, massages with color-infused oils, meditation, and the intentional selection of colored attire and foods. The fundamental properties of color—hue, value, and intensity—shape its impact on individuals, with warm colors like red and orange typically stimulating, and cool colors such as green and blue inducing a sense of calm. Color therapy draws from historical wisdom, incorporating practices like chakra balancing and Ayurveda, aligning specific colors with energy centers in the body. The article explores the effects of colors on mood and energy levels, detailing the associations of warm and cool colors with specific emotions and attributes. Additionally, it delves into the practical application of color psychology in various aspects of life, from boosting memory to enhancing creativity and controlling appetite. While color therapy may not serve as a standalone solution for complex health issues, it is seen as a valuable complementary approach. By strategically incorporating colors into different aspects of life, individuals can potentially alleviate issues such as depression, anxiety, lack of focus, and creativity blocks. Recognizing the profound impact of colors on overall well-being, color therapy aims to contribute to a holistic sense of wellness and vitality when integrated with traditional medical practices.

I. INTRODUCTION

Color therapy is an old way of using colors to help people feel better. In today's world, many people are interested in different kinds of medicine that are not traditional. Color therapy is one of these, and it's all about how colors can affect how people think and feel. People have been using color therapy for a very long time. Imagine that colors are like different tools in a toolbox. Each color is like a different tool that can help fix different problems in our bodies and minds. We use these colors in different ways, like looking at colored lights, using oils that have colors in them for massages, or even just thinking about certain colors. Some people even wear colorful clothes or eat foods with certain colors to feel better. Colors are important in our world. They make things look interesting and nice. But they can also make people feel better, especially if they have trouble seeing, are sick in the hospital, or just feel sad. This article is all about how different colors can help us stay mentally healthy and feel good."Color therapy has many advantages, and the people who practice it, called Chromo therapists, believe they can use different colors to help balance how people feel and think. They think each color has a special power that can make you feel better in your mind, body, or spirit. Colors come from light, and light has different vibrations that make colors look different. Imagine sunlight, for example; it has all the colors you can see, like red, orange, yellow, green, blue, purple, and more. It also has some colors you can't see, like infrared and ultraviolet. In simple words, Chromo therapists use the power of colors to make people feel better and more balanced in different parts of their lives. To address both physical and emotional issues, color therapy employs a diverse array of techniques. These may encompass exposure to colored lights, massages using color-infused oils, meditation and visualization exercises centered on specific hues, the intentional selection of colored attire, and even the inclusion of colorful foods in one's diet.

II. HOW COLOR THERAPY WORKS

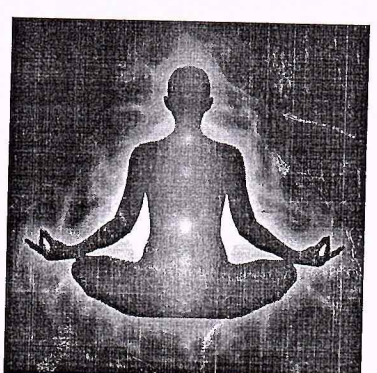


Fig 1 chakra colors

To really understand how color therapy works, we need to look back in history. Ancient Egyptians were known that colors could make people feel better. They believed that each color had a special power, and they used colors in their daily life. They decorated their temples with colors that represented different gods, and they wore colorful clothes to feel certain emotions.

Director
IQAC, Shri Ram College
Muzaffarnagar

Chairman
IQAC, Shri Ram College,
Muzaffarnagar

The sun was also super important to them, and they thought it could heal people. They even used colorful gemstones and crystals in their rituals to bring out specific energies. In China, they had their own way of using colors for healing. They believed in the five-element theory, which connects colors to different parts of the body and energies. This helped them treat people in a personalized way. They also used rainbow-colored silks in treatments like acupuncture to balance the body's energy.India has a long history of using colors for healing too. They created Ayurveda, a system of medicine that's been around for thousands of years. Ayurveda says that different colors are connected to energy centers in our bodies called chakras. Balancing these chakras with color therapy is believed to make us feel better, both physically and emotionally. Today, we still use color therapy, and science is helping us understand it better.

III. FUNDAMENTAL PROPERTIES OF COLOUR

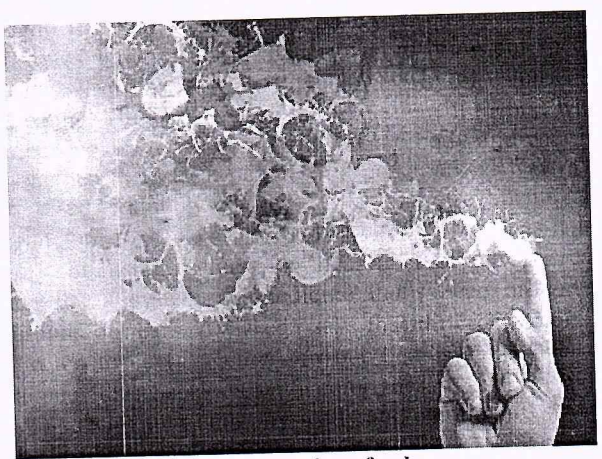


Fig 2 properties of colors

Color possesses three fundamental properties known as hue, value, and intensity.

- **Hue:** Hue is like the name of a color on the color wheel, such as red, green, or violet-blue. It tells us what makes each color different from the others.

- **Value:** Value describes the relative lightness or darkness of an object, determined by the amount of light it reflects. White is the lightest value, while black represents the darkest. Most colors encompass a range of values; for example, shades from pale pink to deep maroon fall within the "red" category. Each hue also has a typical or "normal" value. For instance, yellow is generally considered a light color, while violet is seen as a dark color, despite both having a range of values. When a color is lighter than its normal value, it's called a tint (e.g., pink is a tint of red), and when it's darker, it's termed a shade (e.g., maroon is a shade of red).

- **Intensity**: Also known as chroma or saturation, intensity pertains to the relative brightness or dullness of a color. Colors can be pure and highly saturated, as seen on the color wheel, or they can be muted and softened. Colors with high intensity are vivid and vibrant, while those with lower intensity appear more muted or grayed.

There are several methods for altering the intensity of colors:

- **Adding White**: Incorporating white into a color results in a lighter and less intense version. For example, adding white to pure red creates a lighter shade, such as pink.

- **Adding Black**: Introducing black darkens the color and reduces its intensity.

- **Adding Gray**: Adding gray of the same value as the original color reduces intensity while maintaining the same value.

- **Adding Complementary Hue**: Mixing a color with its complementary hue (opposite on the color wheel) can create a neutral or grayish result. For instance, when green (composed of yellow and blue, which are complementary to red) is combined with red, it can produce a grayish tone, with the dominance of either color affecting the final outcome. This process diminishes the intensity of the original color.

In summary, color can be understood through its hue (name), value (lightness/darkness), and intensity (brightness/dullness), with various methods available for adjusting these properties to achieve different visual effects.

IV. EFFECTS OF COLORS ON MOOD AND ENERGY LEVELS

A. ***Warm Colors:*** *Warm colors typically evoke stimulating emotions. These colors include shades like red, orange, and yellow. They are often associated with energy, enthusiasm, and positive emotions-*

- **Red:** Connected to the bottom chakra, the color red helps us feel stable and instinctive. It is believed to boost our energy, passion, and blood circulation. But, in some situations, it might also make us feel angry

- **Orange:** Connected to the pelvis chakra, the color orange means being hopeful, finding joy, feeling romantic, getting excited, being happy, and having lots of energy.

- **Yellow:** Tied to the naval chakra, yellow is associated with hope, willpower, laughter, warmth, optimism, and hunger, promoting a sense of happiness.

B. ***Cool Colors:*** *Cool colors are generally calming in nature. They include shades like green, blue, and indigo. These colors often bring about a sense of serenity and tranquility-*

- **Green:** Connected to the heart chakra, the color green symbolizes healing, balance, love, being grounded,

Co-ordinator
IQAC, Shri Ram College
Muzaffarnagar

Chairman
IQAC, Shri Ram College,
Muzaffarnagar

nature, growth, good health, sometimes feeling jealous, and a sense of calmness

- **Blue:** Connected to the throat chakra, the color blue is linked to talking, understanding things, feeling peaceful, being smart, staying loyal, and telling the truth.
- **Indigo:** This color is linked to the third eye chakra and is connected with seeing beyond, easing pain, bringing good fortune, having wisdom, feeling royal, keeping things mysterious, and earning respect, all while encouraging a sense of balance.
- **Violet:** Purple is linked to the crown chakra and means having a good imagination, waking up your spirit, feeling calm and peaceful, and being creative. It mixes both red and blue to find a balance between being excited and calm, which helps boost creativity.

C. Neutral Colors:

- **White:** White is often associated with pureness, innocence, cleanliness, and neutrality.
- **Black:** Black conveys authority, strength, power, as well as mourning and intelligence.
- **Brown:** Brown is primarily linked to reliability, stability, friendship, sadness, comfort, and security.

Color therapy and chakra balancing practices suggest that colors have the potential to influence emotions and energy levels. However, it's essential to remember that individual reactions to colors can vary, and these effects are not universally experienced in the same way by everyone.

V. USING COLOR PSYCHOLOGY TO ENHANCE VARIOUS ASPECTS OF YOUR LIFE:

- **Boosting Memory:** Incorporate yellow into your environment when you need to remember something. Research suggests that yellow may aid in memory retention.
- **Increasing Productivity:** Avoid white-walled workspaces as they can lead to side effects like headaches and nausea. Consider using red or blue in your workspace to boost productivity.
- **Relaxation:** To create a relaxing space, add green elements. Green is often linked to nature and comfort, making it an ideal choice for spaces designed for relaxation.
- **Controlling Appetite**: If you want to refrain from overeating, avoid the color yellow in your dining room. Studies have shown that people in yellow rooms tend to consume more food.
- **Boosting Confidence:** Combine red and black in your attire for a confidence boost. These colors exude authority and sophistication, making them suitable for presentations or public speaking.
- **Enhancing Creativity:** Incorporate blue into your creative spaces. Research has indicated that exposure to blue can stimulate creativity, making it an excellent choice for artistic environments.
- **Feeling Energetic and Happy:** Wear a combination of orange and yellow to feel more energetic and project positivity to others.
- **Promoting Calm:** For stressful situations, use pastel green and blue. These colors are calming and can be beneficial in health-oriented spaces or calming rooms.
- **Adding a Romantic Touch:** Incorporate pink into your decor, wardrobe, or bedroom to create a romantic atmosphere. Pink is associated with romance and tranquility.
- **Boosting Focus:** Include blue in your home office or workspace to encourage focus and limit distractions, aiding in productivity.
- **Lifting Spirits:** Introduce cheerful yellow into your living and working spaces to promote optimism and well-being.
- **Hosting Social Gatherings:** Decorate with orange when hosting a party to stimulate energy and encourage interaction among guests.
- **Enhancing Self-Expression:** Exposure to orange can help lift repressions and encourage self-expression, making it useful in personal relationships.
- **Stimulating Curiosity:** Incorporate yellow into your attire when taking a class to stimulate interest and curiosity, facilitating a more open mindset.
- **Reentering and Reducing Stress:** Spend time in nature surrounded by greenery to connect with your spiritual center and alleviate stress, allowing worries to dissipate.

Thus we can say that color psychology can play a significant role in influencing emotions, productivity, and overall well-being, making it a valuable tool for enhancing various aspects of anyone life.

VI. CONCLUSION

In conclusion, color therapy, rooted in ancient practices and embraced by Chromo therapists, harnesses the power of colors to positively impact mental and physical well-being. The historical significance in cultures like Egypt, China, and India, coupled with modern scientific understanding, highlights the enduring relevance of color therapy. The properties of colors, including hue, value, and intensity, provide a framework for its application. The effects of warm and cool colors on mood and energy levels,

Co-ordinator IQAC, Shri Ram College Muzaffarnagar

Chairman IQAC, Shri Ram College, Muzaffarnagar

as well as the role of neutral colors, underscore the versatility of color therapy. Integrating color psychology into daily life, from boosting memory to enhancing creativity, demonstrates its potential to influence various aspects of well-being. While individual reactions to colors may vary, color therapy serves as a valuable tool in promoting a balanced and harmonious life. Whether through exposure to colored lights, massages, or intentional color choices in attire and surroundings, the holistic approach of color therapy offers a complementary avenue for enhancing emotional, mental, and physical health.

REFERENCES

[1]. Toketemu Ohwovoriole (2023).Color Therapy : Types, Techniques, And Benefits https://draxe.com/
[2]. Jillian Levy (2021) Color TherapyBenefits For Mood & More https://www.verywellmind.com
[3]. White swan foundation (2015).Anxiety & Disorder https://www.whiteswanfoundation.org/
[4]. Narayana health.(2020). What is colour therapy
[5]. https://www.narayanahealth.org/
[6]. Dr.Karthik kumar & Dr Pallavi Suyog. Which Color Light Helps Anxiety.https://www.medicinenet.com/
[7]. What is colour therapy? Does it really work (June 2019)https://timesofindia.indiatimes.com/
[8]. Prof.GB Luthria (2023). Colour Therapy for managing hyperthyroidism and hypothyroidism.https://www.freepressjournal.in/
[9]. Dr. Rakesh Gupta (2021).Color Therapy in Mental Health and Well Being. International Journal of All Research Education and Scientific Methods (IJARESM), ISSN: 2455-6211
[10]. Dinshah, Darius (2012). Let There be Light. Dinshah Health Society. ISBN 978-0933917309
[11]. Babu, P. N., Shankar, M., & Babu, M. N. complementary and alternative medicine an overview
[12]. Birren, F. (2016). Color psychology and color therapy; a factual study of the influence of color on human life. Pickle Partners Publishing
[13]. Group Coloring Therapy as Trauma Healing For Child Community Affected By Mount Semeru Eruption: A Case Study. Journal Of Rural Community Nursing Practice ISSN: 2986-7401
[14]. Samina T, Azeemi Y, Raza SM. A critical analysis of chromo therapy and its scientific evolution. Evid Based Complement Alternat Med. 2005; 2(4):481-488.
[15]. Rothì, D. M., & Leavey, G. (2006). Mental health help-seeking and young people: A review. Pastoral Care in Education, 24(3), 4-13

Co-ordinator
IQAC, Shri Ram College
Muzaffarnagar

Chairman
IQAC, Shri Ram College,
Muzaffarnagar

INTERNATIONAL RESEARCH JOURNAL OF COMMERCE, ARTS AND SCIENCE



ISSN 2319 – 9202

An Internationally Indexed Peer Reviewed & Refereed Journal

WWW.CASIRJ.COM
www.isarasolutions.com

Published by iSaRa Solutions

Co-ordinator
IQAC, Shri Ram College
Muzaffarnagar

Chairman
IQAC, Shri Ram College,
Muzaffarnagar

Discussion On Various Properties of Linear Transformation

Vinay Kumar[1], Dr. Vinit Kumar Sharma[2], Anjali[3]

1. Asst Prof (Bhagwant Institute of Technology, Muzaffarnagar, UP)
vkpanchal453@gmail.com
2. Professor (Department of Mathematics, Shri Ram College, Muzaffarnagar, UP)
vksharmaraj@gmail.com
3. Maths faculty (Bookhive Academy in Naraina,Delhi)
Email: anjalichaudhary0210@gmail.com,

Abstract

Linear transformations play an important role within the sector of algebra. In this paper we will be covering different parts of the linear transformations starting from its definition to kernels and examples. Yet, when we want to proceed or change the image in any way like rotating it about a point on the screen, we require a function to evaluate its original position for each of the original vectors. While, a vector could be used to specify, a certain type of motion actual vectors themselves are essentially static, unchanging objects. These transformations can be defined on finite or infinite spaces so there have been different types of linear transformations. It's known by different names such as linear maps or mapping or vector space homomorphism. The functions satisfying the property under vector addition and scalar multiplications are termed as linear transformation. A writing review that directly connects to the content of this section is provided, along with headings for additional research and didactic proposals.

KeyWords:_ Linear transformation, kernel, image, range, vector space, Linear transformation characteristics, Theorem of Nullity for Rank and Matrix representation.

INTRODUCTION

The intent of this paper is to discuss about the linear transformations, its definition, algebraic classification, examples and features. In algebra, a linear transformation will be defined as a map from one to another vector space. These transformations can be defined only if it satisfies the two properties, (vector addition and scalar multiplication) The linear transformation sometimes also known as the vector space homomorphism, the linear map or the linear mapping. The initiation of the speculation of system of linear equations was done by Rene Descartes in 1637. He has described mappings in this that retain the linear structure of many vectors space's much as how the length of vector parametrizes the line. The function is called linear because it preserves the linear combinations, also the linear mappings give the result as a line. The range for any linear transformation can be seen as endomorphism if it comes to be same as the domain vector space. Also, it can be considered as automorphism if it is invertible. These transformations play a vital role not only within the branch of algebra of mathematics but also in the real life as well. These are important because they preserve the structure of every vector space in which these transformations are defined. If both vector spaces are specified over the same field, then these transformations can also be defined. The kernel and image, both are the subspaces of the range of the defined linear transformation.

Co-ordinator IQAC, Shri Ram College Muzaffarnagar
Chairman IQAC, Shri Ram College Muzaffarnagar

PRELIMINARIES

Definition: Allow A and B be the vector space above the identical field Q. Then the mapping Q: A → B is known as linear transformation if it for any two vectors a, b ∈ A and any scalar c ∈ Q, the below two axioms needs to be satisfied:

(1) Q (a + b) = Q(a) + Q(b) 1

(2) Q(c.a) = c Q(a) 2

Condition 1 and 2 are equivalent to sup. Q (αa + βb) = α Q(a) + β Q(b)

Note: a) condition (1) is called Additive property of T and condition (2) is called homogenous property of T.

For any vectors $a1 \ldots \ldots, an$ V and scalars $c_1, \ldots, cn$ K, the following equations hold due to the associativity of the addition operation indicated as +.

$c1(a1) + \ldots \ldots + cnf = c1f(a1) + \ldots \ldots + cnf = c1f(a1) + \ldots \ldots + cnf = c1f(a1) + \ldots \ldots + cnf\ (an)$ [4].

As a result, a linear map is one in which linear combinations are preserved[5].

It follows that f(0a) =0a by denoting the zero elements of the vector spaces A and B with the letters 0b and 0a, respectively. In the equation for degree 1 homogeneity, let c = 0 and an A be the variables:

F(0b) = f(0b) = 0f(b) = 0a F(0b) = f(0b) = 0f(b) = 0a F(0b)

Another definition:

A linear transformation S is a mapping from one vector space A to one more vector space B. [5].

S: A -- B, where m and n are vector spaces

X: the domain of S

Y: the co-domain of S

A mapping S is termed as a linear transformation if it satisfies the subsequent two axioms:

1) $S\ (m + n) = (m) + S(n)$, ∀ m, n ∈A

2) $(cm) = c\ T(m)$, ∀ c ∈ R

2.1 Algebraic classification of Linear transformation:

Let us consider A and B be the vector space above a field K, and X: A → B be a linear map [6].

Monomorphism:

If X meets the following conditions, it is said to be injective or monomorphism:

1. X is one-one.
2. Ker X = {0V}
3. dim (Ker X) = 0
4. X is left-invertible, which means that the identity map on V is described by a linear map T: W V.

a) Epimorphism: Epimorphism is a term that refers to a surjective

If X meets the following criteria, it is said to be surjective or epimorphism:

Co-ordinator
IQAC, Shri Ram College
Muzaffarnagar

Chairman
IQAC, Shri Ram College
Muzaffarnagar

1. X is onto
2. Co Ker X = {0w }
3. X is right-invertible, which means that the identity map on V is described by a linear map T: W V.

Isomorphism:

If X is both right-invertible and left-invertible, it is said to be an isomorphism.

A linear transformation's kernel S

The set of all the vectors in X whose image under the linear transformation S: XY is zero is known as the kernel of the linear transformation if X(F) and Y(F) are two vector spaces. Ker (S) or N are used to indicate it (S).

T(x) = 0Y; T(x) =N(T) = x X; T(x)=N(T) =x X

Example:1 Verify the accuracy of a linear transformation. S $(X1, X2) = (X1 + X2, X1 + 2X2)$.

Solution: Let x = $(a1, a2)$ and y = $(b1, b2)$

Then, vector addition property,

S (x+ y) = S $(m1 + n, m2 + n2)$

= $((m1 + n1) + (m2 + n2), (m1 + n1) + 2(m2 + n2))$

= $((m1 + m2) + (n1 + 2), (m1 + 2m2) + (n1 + 2n2))$

= $(m1 + m2, m1 + 2m2) + (n1 + 2, n1 + 2n2)$

= S(x) + T(y)

Scalar multiplication:

cx = c $(m1, m2) = (cm1, cm2)$

S (x) = S $(cm1, cm2)$

= $(cm1 + cm2, cm1, 2cm2)$

= $(m1 + m2, m1 + 2m2)$

= c S (x)

Since it satisfies both the properties, therefore, T is linear transformation.

Example:2 Demonstrate that the linear transformation S:$R^2 \rightarrow R^2$elucidate by S (x, y) = (y, x) is a linear transformation.

Proof: let u = $(u1, u2)$ and v =$(v1, v2)$ R^2 be any real numbers, and (x, y) be any real numbers

Therefore xu + yv = x$(u1, u2)$ + y$(v1, v2)$ = $(xu1 + yv1, xu2 + yv2)$ belongs to R^2

Now S(xu + yv) = $S(xu1 + yv1, xu2 + yv2)$

= $(xu2 + yv2, xu_1 + yv_1)$

= $(xu_2, xu_1) + (yv_2, yv_1)$ =

= $x(u1, u2) + yS(v1, v2)$

= $xS(u) + xS(v)$

Therefore, the given transformation is a linear transformation .

Example of Functions that are not linear transformations:

1. f(x) = cosx

cos $(x1 + x2) \neq \cos(x1) + \cos(x2)$

$\cos(\frac{\pi}{2}) + \cos(\frac{\pi}{3}) \neq \cos(\frac{5\pi}{6})$

Chairman IQAC, Shri Ram College, Muzaffarnagar
IQAC, Shri Ram College Muzaffarnagar

This implies that f(x) = cos(x) is not a linear transformation.

2. $f(x) = x^3$
$(x1 + x2)^3 \neq x_1^3 + x_2^3$

This convey that $f(x) = x^3$ is not a linear transformation.

3. $(x) = x + 2$

It is not a linear transformation because this function does not fulfil both vector addition and scalar multiplication

Zero Transformation [1]:

$S: A \rightarrow B$ S(v) = 0 ∀ a ∈ A

Identity Transformation [1]:

$S: A \rightarrow B$ S (a) = a, ∀ a ∈ A

The characteristics of linear transformations [3]:

If $T: V \rightarrow W$ is a linear transformation from V(F) to W(F). Then
$S: V \rightarrow X$ is a linear transformation from V(F) to W(X). then , and $a, b \in V$
1.S(0) = 0
2.S (-a) = - S (a)
3.S (b-a) = S (b) –S (a)
4.If a = c1a1 + c2a2 + ⋯ + cnan . Then ($(a) = S$(c1a1 + c2a2 + ⋯ + cnan))

Rank and Nullity of Linear Transformation

RANK : If V (F) and W (F) are vector spaces and T: V W be an L.T., then the dimension of the range space of T is known as the rank of T. (T)
Therefore, (T) = dim (Range T)
Nullity: If T: V →W is an L.T., and V (F) and W (F) are vector spaces, then T's nullity is its null spaces' dimension, and it is represented by the symbol v (T)
So, v (T) = dim (Null space of T)
Range: When T: V →W is a linear transformation and V (F) and W (F) are vector spaces, the image set of V under T is either R (T) or T (V), i.e., Range T = T (v) | v V.
Rang Space is another name for Range T. (A vector space is R (T)) [10]

RANK - NULLITY THEOREM OR SYLVESTER'S LAW OF NULLITY

If both V and W are vector spaces and T is a linear transformation, then V W. Consider the V to have n dimensions. If V is a finite - dimensional space, then Rank (T) + Nullity (T) = n, Rank (T) + Nullity (T) = dim
V. Furthermore, V R (T) and N (T) have finite dimensions.

Important points:

1.A linear transformation is known for its operation preserving property.
2.A linear transformation A linear operator is one that transforms a vector space into itself.

Co-ordinator IQAC, Shri Ram College Muzaffarnagar
Chairman IQAC, Shri Ram College, Muzaffarnagar

Example of Linear Transformation and bases:[11]

Q 1 Let (S: $R^3 \rightarrow R^3$) be a linear transformation such that S (1, 0, 0) = (2, -1, 4), S (0, 1, 0) = (1, 5, -2) , S (0, 0, 1) = (0, 3, 1), Find S(2, -2, -1).

Solution: (2, -2, -1) = 2(1, 0, 0) -2(0, 1, 0) - 1(0, 0, 1)

S (2, -2, -1) = 2S (1, 0, 0) -2S (0, 1, 0) – 1S (0, 0, 1)
[because given transformation is a linear transformation]

= 2(2, -1, 4) - 2(1, 5, -2) - 1(0, 3, 1)

=(4,-2,8) - (2,10,-10) - (0,3,1)
= (2,-15,17) .

Q 2 Let (S: $R^3 \rightarrow R^3$) be a linear transformation such that S(1,0,0)=(3,-2,1) ; S(0,1,0)= (2,1,-1) ; S(0,0,1) =(-2,-2,1) , find S(1,2,3).

Solution: (1,2,3) = 1(1,0,0,) +2(0,1,0) +3(0,0,1)

S(1,2,3) = 1S(1,0,0) +2S(0,1,0) + 3S(0,0,1) [because given transformation is a linear transformation]

=1 (3,-2,1) +2 (2,1,-1) +3 (-2,-2,1)

=(3,-2,1) +(4,2,-2) +(-6,-6,3)
= (1,-6,2)

The Matrix of a Linear Transformation

For a vector x in the domain of T, given matrix of a linear transformation is one where T(x)=Ax. This implies that multiplication by this matrix while applying the transformation T to a vector is equivalent Such a matrix, which is specific to the transformation, can be found for any linear transformation T from Rn to Rm for fixed values of n and m.

CONCLUSION

The property of a function that satisfies the vector addition and scalar multiplication of the vector spaces above a given field F is known as the linear transformation,also known as the linear map or vector space homomorphism [1]. In this study, we discuss numerous linear transformation properties, starting with the image and ending with the transformation kernel. These transformations have been divided into different categories according to their algebraic properties, these are monomorphism, epimorphism and isomorphism. These transformations are very important not only in the linear algebra branch of mathematics but also in the real life. One of the main uses of these transformations is in the machine learning application. These transformations are used in the rotation, 2D and 3D object translation and scaling the linear transformations can be used to change the shape of things. They're also employed as a mechanism for representing change, such as in calculus, where derivatives are used, or in

Co-ordinator IQAC, Shri Ram College Muzaffarnagar
Chairman IQAC, Shri Ram College, Muzaffarnagar

relativity, where they're used to keep track of the local reference frame alternations. Linear transformations play a fundamental role in the study of Linear Algebra, Calculus, Differential Equations, Differential Geometry, and various other mathematical disciplines.

REFERENCES

1. Anton, H., & Rorres, C. (2013). *Elementary linear algebra: applications version*. John Wiley & Sons.
2. Axler, S. (1997). *Linear algebra done right*. Springer Science & Business Media. Blinn, J. (2003). Jim Blinn's corner: notation, notation, notation. Morgan Kaufmann.
3. Rudin, W. (1991). Functional analysis, mcgrawhill. *Inc, New York*, *45*, 46.
4. Rudin, W. (1976). *Principles of mathematical analysis* (Vol. 3). New York: McGraw-hill.
5. Kim, T., & Adalı, T. (2003). Approximation by fully complex multilayer perceptrons. *Neural computation*, *15*(7), 1641-1666.
6. Margalit, D., Rabinoff, J., & Rolen, L. (2017). Interactive linear algebra. *Georgia Institute of Technology*.
7. Dagum, E. B. (2002). A linear transformation and its properties with special applications in time series filtering.
8. Ghante, P. B., & Yakkaldevi, A. (2014). *Library automation*. Laxmi Book Publications.
9. O'Rourke, M. F., Staessen, J. A., Vlachopoulos, C., & Duprez, D. (2002). Clinical applications of arterial stiffness; definitions and reference values. *American journal of hypertension*, *15*(5), 426-444.
10. Anjana (2021) The Study of linear transformations (Vol 23), Journal of university for science & technology.

Chairman
IQAC, Shri Ram College,
Muzaffarnagar

Co-ordinator
IQAC, Shri Ram College
Muzaffarnagar

IOSR Journal of Applied Physics (IOSR-JAP)
e-ISSN: 2278-4861.Volume 16, Issue 3 Ser. 2 (May. – June. 2024), PP 31-38
www.iosrjournals.org

"A Study on the Influence of Magnetohydrodynamic Pc4 Magnetic Micropulsations on Geomagnetic Activity as Correlated with Kp Values"

Dr. Manoj Mittal
Associate Professor,
Shri Ram College, Muzaffarnagar

Abstract
Magnetic Pulsations recorded on the ground are the signatures of the integrated signals from the earth's magnetosphere. Pc4 geomagnet-ic pulsations are quasi-sinusoidal variations in the earth's magnetic field in the period range 45-150 seconds. The magnitude of these pulsations ranges from fraction of a nano Tesla (nT) to several nT. Although these pulsations can be observed in a number of ways, yet the application of ground-based magnetometer arrays has proven to be the most successful methods of studying the spatial structure of hydromagnetic waves in the earth's magnetos-phere. The solar wind provides the energy for the earth's magnetospheric processes. The source of Pc4 magnetic pulsations can either be internal to the magnetosphere (endogenic) or external to it, transmitted through the magnetopause (exogenic). Most of the Pc4 studies undertaken in the past have been confined to middle and high latitudes.
The spatial and temporal variations observed in the Pc4 occurrence are of vital importance because these provide evidence that can be directly related to both endogenic and exogenic wave generation mechanisms. At low latitudes (L< 2), the wave energy predominates in the Pc4 band. However the spatial characteristics of these pulsations have received little attention in the past. The present study is undertaken for describing the dependence of low latitude Pc4 occurrence on the Kp values and the Interplanetary Magnetic Field (IMF) over the period range 01 January to 31 December, 2023 employing an array of three low latitude recording stations at Hanley, Nagpur and Pondicherry. Analysis of the data for the whole year 2023 provided similar patterns of Pc4 occurrence for Kp at all the three stations. Although Pc4 occurrence was reported for Kp values, yet the major Pc4 events occurred for rage 5+ Kp 8+. The IMF dependence of Pc4 occurrence for the year 2023 has shown that even though at all the three stations, it spread for IMF magnitude of up to 22 nT, yet the majority of Pc4 events occurred for a narrower range of 2-10 nT. However it is important to note that at all the three stations, the peak in the occurrence of Pc4 events was observed for IMF range of 3 to 5 nT. The results suggest that the solar wind controls Pc4 occurrence through a mechanism in which Pc4 wave energy is convected through the magnetosheath and coupled to the standing oscillations of the magnetospheric field lines.

I. Introduction

Examplesof exogenic sources of Pc4 are surface waves produced at the magnetopause by Kelvin Helmholtz in-stability, and waves produced at the bow shock or in the magnetosheath, all of which eventually propagate into the magnetosphere. The internal generation occurs by means of plasma instabilities within the magnetosphere. Free energy internal sources include pressure gradients, velocity shears and rapid changes in the magnetospheric geometry associated with sub-storms. Greenstadt et al have presented the first direct evidence for the propagation of external Pc3-4 wave energy into the magnetosphere. Using a few individual events from ISEE 1-2 spacecrafts, they have verified that the same frequencies in the 10 – 100 mHz band were observed in the magneto-sheath and also in the magnetosphere but lower power was seen there. Tomomura et al. have also observed similar results from six months of ISEE data in the 3-30 mHz band. These researchers further demonstrated that the compressional oscillations dominated in the magneto-sheath around local noon while transverse Alfven waves were observed within the magnetosphere.

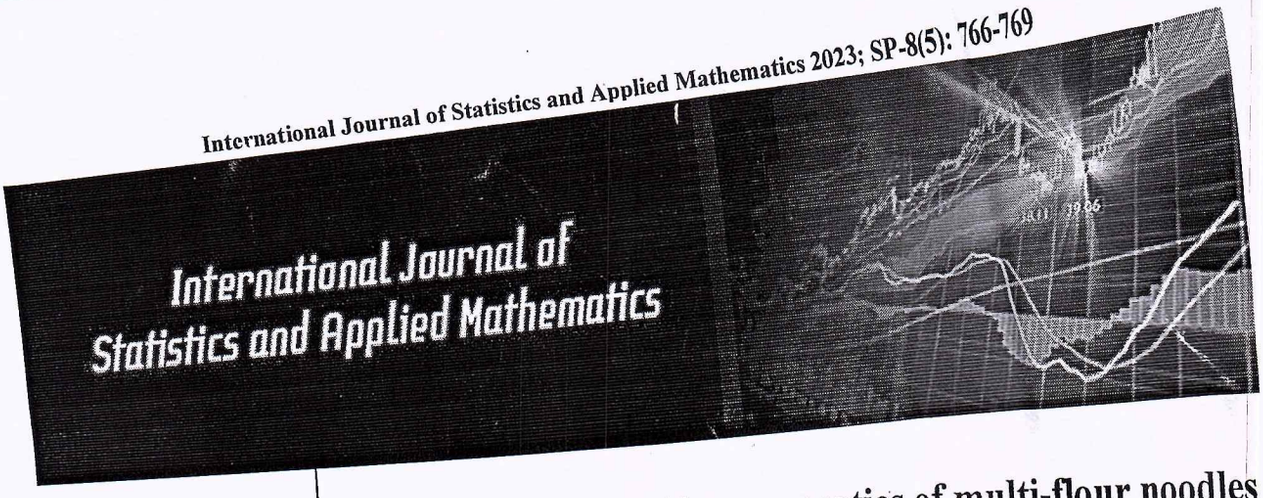
The diurnal variation of occurrence and frequency of Pc3-4 waves recorded at ground station and their dependence on latitude and geomagnetic indices Kp and also vital identification their source and propagation modes. The present study describes diurnal and seasonal dependence on Pc4 wave occurrence on Kp at very low latitude in india.

II. Data Analysis

Co-ordinator
IQAC, Shri Ram College
Muzaffarnagar

Chairman
IQAC, Shri Ram College,
Muzaffarnagar

International Journal of Statistics and Applied Mathematics 2023; SP-8(5): 766-769



ISSN: 2456-1452
Maths 2023; SP-8(5): 766-769
© 2023 Stats & Maths
https://www.mathsjournal.com
Received: 05-07-2023
Accepted: 11-08-2023

Sunil
School of Agricultural Sciences & Engineering, IFTM University, Moradabad, Uttar Pradesh, India

Neelesh Chauhan
Department of Agricultural Engineering, SVPUAT, Meerut, Uttar Pradesh, India

Ramesh Pal
School of Agricultural Sciences & Engineering, IFTM University, Moradabad, Uttar Pradesh, India

Vipul Chaudhary
Department of Processing and Food Engineering, MCAE&T, ANDUAT, Ayodhya, Uttar Pradesh, India

Vikrant Kumar
Shri Ram College, Muzaffarnagar, Uttar Pradesh, India

Ratnesh Kumar
Mangalayatan University, Jabalpur, Madhya Pradesh, India

Ram Kumar
Department of Irrigation and Drainage Engineering, College of Technology, Govind Ballabh Pant University of Agriculture and Technology, Pantnagar, Uttarakhand, India

Corresponding Author:
Ramesh Pal
School of Agricultural Sciences & Engineering, IFTM University, Moradabad, Uttar Pradesh, India

Evaluation of cooking properties of multi-flour noodles

Sunil, Neelesh Chauhan, Ramesh Pal, Vipul Chaudhary, Vikrant Kumar, Ratnesh Kumar and Ram Kumar

Abstract
The present research was carried out to study the cooking properties of multi-flours noodles. The noodles were developed by taking different proportion of multi-flours in the ratio of (T_{100}) 100:0:0:0:0, (T_{90}) 90:2.5:2.5:2.5:2.5, (T_{80}) 80:5.0:5.0:5.0:5.0, (T_{70}) 70:7.5:7.5:7.5:7.5, (T_{60}) 60:10:10:10:10 and (T_{50}) 50:12.5:12.5:12.5:12.5 respectively. The cooking properties like cooking yield (%), optimum cooking time (min), water absorption (g/g), swelling index (%) and cooking loss (%) of multi- flours noodles were evaluated. The cooking properties of multi-flours noodles were (T_{50}) 50:12.5:12.5:12.5:12.5 has highest cooking property.

Keywords: Cooking properties, multi-flour, noodles

1. Introduction
Noodles are widely consumed throughout the world and their global consumption is second only to bread. Instant noodles are widely consumed throughout the world and it is a fast growing sector of the noodle industry (Owen, 2001) [16]. This is because instant noodles are convenient, easy to cook, low cost and have a relatively long shelf-life. Wheat flour which is usually used to make instant noodles is not only low in fibre and protein contents but also poor in essential amino acid, lysine. Flour of hard wheat *(Triticum aestivum* L.) is the main primary ingredient (Fu, 2008) [5] and the addition of alkaline salts can help strengthen the structure and hence improve the firmness of the final product (Hou and Kruk, 1998; Kulkarni *et al.*, 2012) [6, 12]. The information on final product quality and the factors affecting quality are extremely limited in the scientific literature (Kruger *et al.*, 1998) [11]. The growth of bakery industry is about 10% per annum and the products are increasingly becoming popular among all sections of people (Indrani *et al.*, 1997) [10]. Noodles are very thin form mostly made of wheat flour and water, the dough then are sheeted, rolled, cutted, dried and boiled in water. Noodle manufacturing involves sheeting and cutting of dough, which allow slower water addition as compared with other bakery products (Miskelly, 1993; Corke and Bhattacharya, 1999; Gulia *et al.*, 2014) [14, 4, 7]. The good quality of noodle is characterized by firm and elastic texture due to wheat flour function as a binding agent during dough formation. People prefer noodles with hard texture, strong and elastic when it is served. Cooked noodles should be free from surface stickiness with a firm, chewy and elastic or resilient bite (Miskelly, 1996; Chang and Wu, 2008) [15, 2]. Among ready-to-eat snacks, biscuits possess several attractive features including wider consumption base, relatively long shelf-life, more convenience and good eating quality (Akubor, 2003; Hooda and Jood, 2005) [1, 8].

2. Materials and Methods
2.1 General discussion
The wheat flour, soybean flour, carrot powder, mushroom composite flours. The cooking properties of multi-flour noodles were analyzed that is, cooking yield (%), optimum cooking time (min), water absorption (g/g), swelling index (%) and cooking loss (%), ae expressed in Table 1.

2.2 Cooking Properties: Cooking yield, Optimum cooking time, Water adsorption, Swelling index and cooking loss.

Co-ordinator
IQAC, Shri Ram College
Muzaffarnagar

Chairman
IQAC, Shri Ram College,
Muzaffarnagar

Table 1: Treatments details

Experimental Parameters	Levels	Description				
Flour	5	Wheat flour (W), Soy bean flour (S), Carrot powder (C), Mushroom flour (M), Apple pomace powder (P)				
Ratio	6	W	S	C	M	P
	T_{100}	100	0	0	0	0
	T_{90}	90	2.5	2.5	2.5	2.5
	T_{80}	80	5	5	5	5
	T_{70}	70	7.5	7.5	7.5	7.5
	T_{60}	60	10	10	10	10
	T_{50}	50	12.5	12.5	12.5	12.5

2.3 Cooking yield (%): Cooking yield was calculated as a percentage of dry cooked noodle weight prior to cooking Li and Vasanthan, (2003) [13].

2.4 Optimum Cooking Time

To determine the cooking time, 5.0 g of noodles were boiled in 300 ml distilled water. Noodles were cooked until disappearance of white core as judged by squeezing between two glass slides. A volume basis and the results were reported as ml/g of dry flour. The experiments were conducted in triplicate.

2.5 Water Absorption (WA %)

The water uptake (%) was considered by Galvez and Resurreccion, (1992) [6].

$$\text{WA (\%)} = \frac{\text{Weight of cooked noodle - Weight of uncooked noodle}}{\text{Weight of uncooked noodles}} \times 100 \quad (1)$$

2.6 Swelling Index

Swelling index after cooking was calculated by the equation.

$$Swelling\ Index\ (SI, \%) = \frac{(W_1 - W_2)}{W_2} \times 100 \quad (2)$$

2.7 Cooking Loss: This is usually quantitatively described by the term ''cooking loss" (Chen *et al.*, 2002) [3]. Total cooking losses, which include solid losses and soluble losses, were calculated with the following equations (DM = dry matter ratio of crude samples):

$$Total\ Cooking\ Loss\ (TCL, \%) = \frac{(5 \times DM - W_2)}{5 \times DM} x100 \quad (3)$$

$$Solid\ Loss\ (SL, \%) = \frac{(W_3) \times 100}{5 \times DM} \quad (4)$$

$$Soluble\ Loss\ (SSL, \%) = \frac{(W_4)\, x\, 100}{5 \times DM} \quad (5)$$

3. Results and Discussion

3.1 Cooking properties of multi-flour noodles

Cooking properties of multi-flour noodles (T_{100}, T_{90}, T_{80}, T_{70}, T_{60}, and T_{50}) were evaluated value in fresh as well as during storage period presented in Table 2.

Table 2: Cooking properties of multi-flours noodles

Cooking properties/ Treatments	Treatments					
	T_{100}	T_{90}	T_{80}	T_{70}	T_{60}	T_{50}
Cooking yield (%)	269.33	273.84	284	289	294.80	297.50
Optimum Cooking Time (min)	5.60	6.40	7.60	8.30	9.60	9.70
Water absorption (g/g)	1.40	1.50	1.60	2.10	2.10	2.20
Swelling index (%)	210.3	213.3	215.26	218.3	222.6	225.30
Cooking Loss (%)	4.30	4.53	5.43	6.36	6.40	7.50

3.2 Cooking yield (%)

The data for variation in cooking yield (%) of multi-flours noodles is presented in Table 2. The cooking yield ranged from 269.33 to 297.50% depending upon the blending ratio. The highest cooking yield was observed for T_{50} (297.50%) and the lowest T_{100} (269.33%) noodles. The cooking yield of noodles was observed for T_{50} (297.50%) followed by T_{60} (294.80%), T_{70} (289.0%), T_{80} (284.0%), T_{90} (273.84%) and T_{100} (269.33%), respectively as shown in Fig.1. The cooking yield of noodles increased with increase in proportions of soy bean, carrot, mushroom and apple pomace powder with wheat flour.

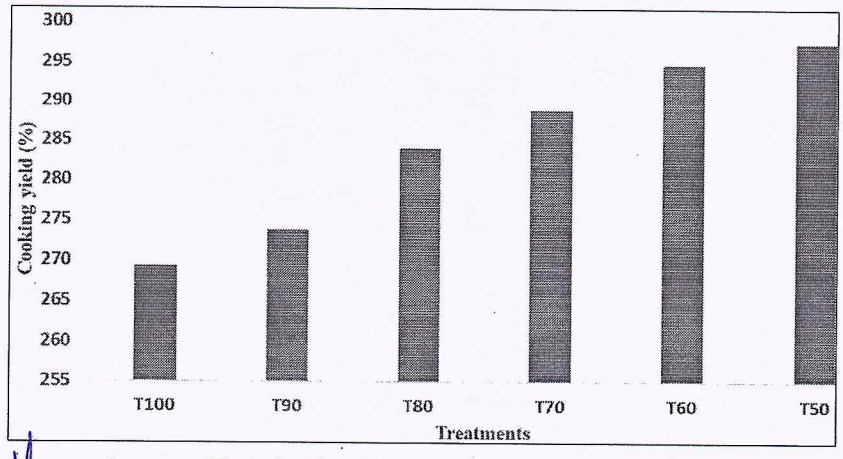


Fig 1: Cooking yield (%) of multi-flour noodles

Co-ordinator
IQAC, Shri Ram College
Muzaffarnagar

Chairman
IQAC, Shri Ram College.
Muzaffarnagar

3.3 Optimum cooking time (min.)

The data for variation in optimum cooking time (min.) of multi fours noodles is presented in Table 2. The optimum cooking time ranged from 5.60 to 9.70 min. depending upon the blending ratio. The highest time for cooking was observed for T_{50} (9.70 min.) and the lowest T_{100} (5.60 min.) noodles as shown in Fig.2. The optimum cooking time was found for noodles T_{50} (9.70 min.) followed by T_{60} noodle (9.60 min.), T_{70} (8.30 min.), T_{80} (7.60 min), T_{90} (6.40 min.) and T_{100} noodle (5.60 min.), respectively. The cooking time increased with increase in proportions of soy bean, carrot, mushroom and apple pomace powder with wheat flours.

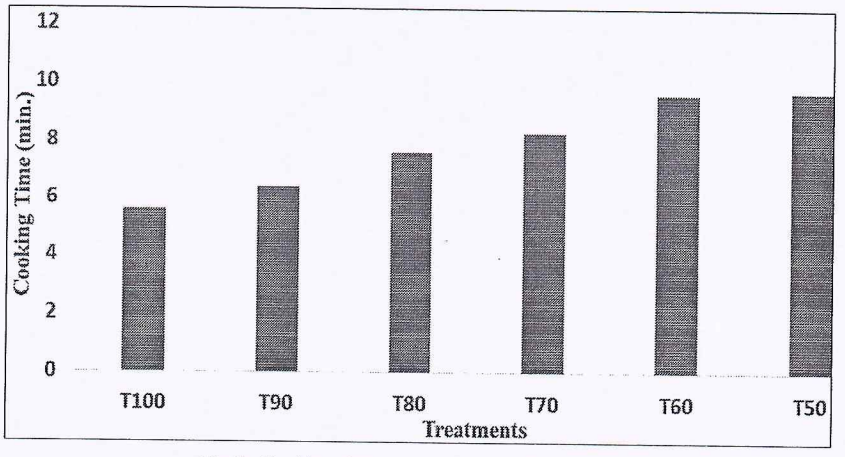


Fig 2: Cooking time (min.) of multi-flour noodles

3.4 Water absorption

The data for variation in water absorption (g/g) of multi flour noodles is presented in Table 2. The water absorption ranged from 1.40 to 2.20 g/g depending upon the blending ratio. The highest water absorption was observed for T_{50} (2.20 g/g) and lowest T_{100} (1.40 g/g) noodles. The water absorption was found for noodles T_{50} (2.20 g/g) followed by T_{60} (2.10 g/g), T_{70} (2.10 g/g), T_{80} (1.60 g/g). T_{90} (1.50 g/g) and T_{100} (1.40 g/g), respectively. as shown in Fig.3. The water absorption of noodles increased with increase in proportions soy bean, carrot, mushroom and apple pomace powder with wheat flour.

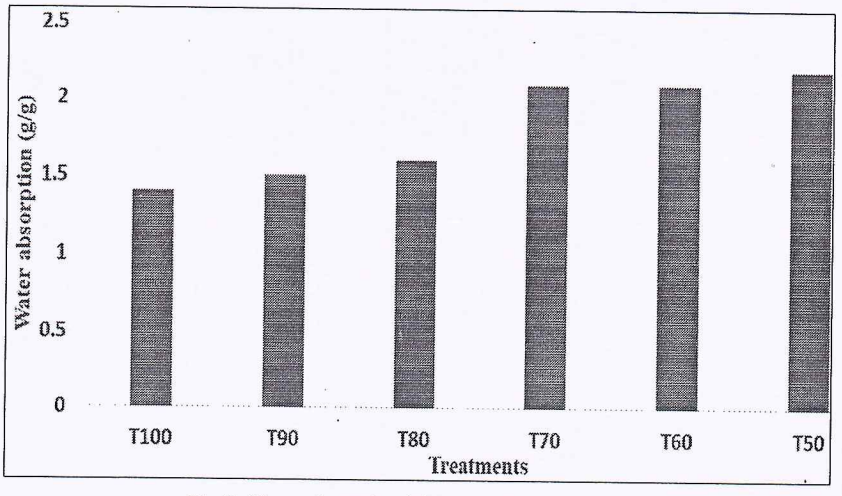


Fig 3: Water absorption (g/g) of multi-flour noodles

3.5 Swelling index (%)

The data for variation in swelling index (%) of multi flours noodles is presented in Table 2. The swelling index ranged from 210.30 to 225.30% depending upon the blending ratio. The highest swelling index was observed for T_{50} (227.12%) and lowest T_{100} (211.11%) noodles. The swelling index was found for noodles T_{50} (225.30%) followed by T_{60} (222.60%), T_{70} (218.30%), T_{80} (215.26%) T_{90} (213.30%) and T_{100} (210.30%), respectively as shown in Fig.4. The swelling index of noodles increased with increase in proportions of soy bean, carrot, mushroom and apple pomace powder with wheat flour.

3.6 Cooking loss (%)

The data for variation in cooking loss (%) of composite flours noodles is presented in Table 2. The cooking loss ranged from 4.30 to 7.50% depending upon the blending ratio. The highest cooking loss was observed for T_{50} (7.50%) and lowest T_{100} (4.30%) noodles. The cooking loss was found for noodles T_{100} (7.50%) followed by T_{60} (6.40%), T_{70} (6.36%), T_{80} (5.43%), T_{90} (4.53%) and T_{100} (4.30%) respectively, as shown in Fig.5. The cooking loss of noodles increased with increase in proportions of soy bean, carrot, mushroom and apple pomace powder within wheat flour.

Co-ordinator
IQAC, Shri Ram College
Muzaffarnagar

Chairman
IQAC, Shri Ram College,
Muzaffarnagar

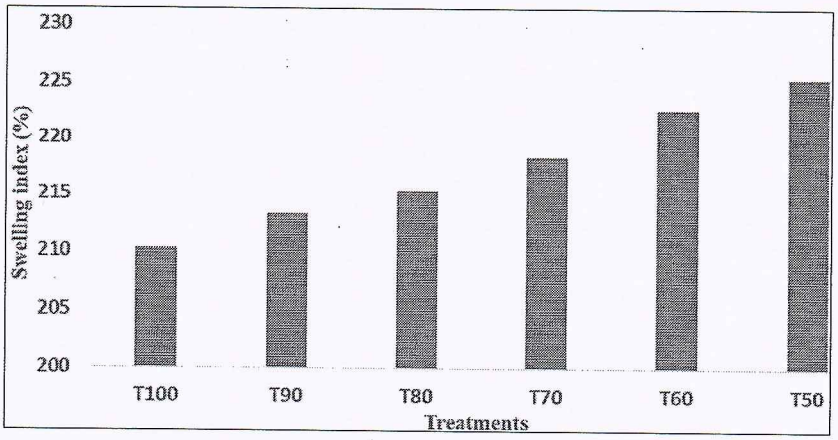


Fig 4: Swelling index (%) of multi-flour noodles

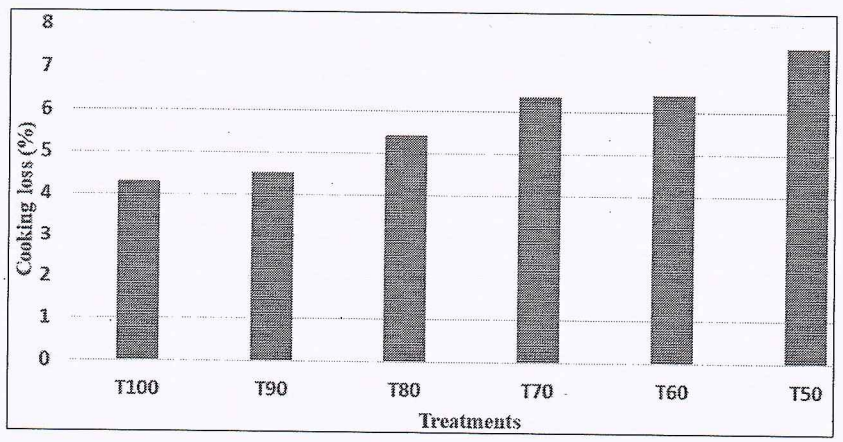


Fig 5: Cooking loss (%) of multi-flour noodles

4. Conclusion

In this research the cooking properties of multi-flour noodles were analyzed that is, cooking yield (%), optimum cooking time (min), water absorption (g/g), swelling index (%) and cooking loss (%) were increased with increase in the incorporation of other flours with wheat flour. The result showed that the T_{50} has highest cooking properties compared to others.

5. References

1. Akubor P. Functional properties and performance of cowpea/plantain/wheat flour blends in biscuits. Plant Food for Human Nutrition. 2003;58:1-8.
2. Chang HC, Wu LC. Texture and quality properties of Chinese fresh egg scientific & Technology Research. 2008;4:50-53.
3. Chen Z, Sagis L, Legger A, Linssen JPH, Schols HA, Voragen AGJ. Evaluation of starch noodles made from three typical Chinese sweet potato starches. J Food Sci. 2002;67(9):3342-3347.
4. Corke H, Bhattacharya M. Wheat products: Noodles. In: Asian Foods: Science and Technology; c1999. p. 43-70.
5. Fu BX. Asian noodles: History, classification, raw materials and processing. J Food Research International. 2008;41:888-890.
6. Galvez FCF, Resurreccion AVA. Reliability of the focus group technique in determining the quality characteristics of navy bean noodles. Journal of Sensory Study. 1992;7:315.
7. Gulia N, Dhaka V, Khatkar SB. Instant Noodles: Processing, Quality, and Nutritional Aspects. Critical Reviews in Food Science and Nutrition. 2014;54:1386-1399.
8. Hooda S, Jood S. Organoleptic and nutritional evaluation of wheat biscuits supplemented with untreated and treated fenugreek flour. J Food Chemistry. 2005;90:427-435.
9. Hou G, Kruk M. Asian Noodle Technology. Technical Bulletin. 1998;20(12):1-10.
10. Indrani S, Savithri GD, Venkateswara RG. Effect of defatted soy flour on the quality of buns. J Food Sci. Technol. 1997;34:440-442.
11. Kruger JE, Hatcher DW, Anderson MJ. The effect of incorporation of rye flour on the quality of oriental noodles. Food Res. Internat. 1998;31(1):27-35.
12. Kulkarni SS, Desai AD, Ranveer RC, Sahoo AK. Development of nutrient rich noodles by supplementation with malted ragi flour. International Food Research Journal. 2012;19(1):309-313.
13. Li JH, Vasanthan T. Hypochlorite oxidation of field pea starch and its suitability for noodle making using an extrusion cooker. Food Res. Internat. 2003;36:381-386.
14. Miskelly DM. Noodles- A new looks at an old food. Food Australia. 1993;45:496-500.
15. Miskelly DM. Modern noodle based foods–Raw material needs. In A. B. Blakeney and L. O'Brien (Eds.), Pacific People and Their Food St. Paul, MN: American Association of Cereal Chemists; c1996. p. 123-142.
16. Owen G. Cereal processing technology. Cambridge: Wood head publishing; c2001.

Co-ordinator
IQAC, Shri Ram College
Muzaffarnagar

Chairman
IQAC, Shri Ram College,
Muzaffarnagar



Journal of Global Agriculture and Ecology

Volume 16, Issue 3, Page 41-52, 2024; Article no.JOGAE.12057
ISSN: 2454-4205

Effect of Different Zinc Sources and Application Methods on Content and Uptake of Micronutrients of Basmati Rice

Suhal Sardar [a*], U.P. Shahi [b], Ashok Kumar Ahluvalia [a], Raj Kumar [a], Rahul Arya [c] and Suraj Singh [a]

[a] Department of Agriculture, Shiri Ram College Muzaffarnagar, India.
[b] Department of Soil Science, Sardar Vallabh Bhai Patel University of Agriculture and Tech, Modipuram, Meerut, India.
[c] Department of Basic Science Shiri Ram College Muzaffarnagar, India.

Authors' contributions

This work was carried out in collaboration among all authors. All authors read and approved the final manuscript.

Article Information

DOI: https://doi.org/10.56557/jogae/2024/v16i38795

Open Peer Review History:
This journal follows the Advanced Open Peer Review policy. Identity of the Reviewers, Editor(s) and additional Reviewers, peer review comments, different versions of the manuscript, comments of the editors, etc are available here: https://prh.ikprress.org/review-history/12057

Original Research Article

Received: 25/02/2024
Accepted: 28/04/2024
Published: 30/07/2024

ABSTRACT

Zinc (Zn) is an essential trace element for plants, animals and human's health. Zn deficiency is widely spread in paddy soils of India and has negative impact on national rice production. Field experiment on rice crop was conducted in sandy loam soil at crop research center Chirodi of SVBP University of Agriculture and Technology, Meerut., during *Kharif* season of 2011 and 2012 toevaluate the "Effect of different sources and application methods of zinc on content and uptake of micronutrients in basmati rice crop in sandy loam soil. The experiment was laid out in randomized block design with three replications. The experiment comprised of twelve treatments *viz.;* T_1 (control), T_2 (recommended NPK @120:60:60 kg ha^{-1}) T_3 (5 kg Zn through $ZnSO4.7H_2O$+RDF), T_4(5

**Corresponding author: Email: suhalsardar696@gmail.com;*

Cite as: *Sardar, Suhal, U.P. Shahi, Ashok Kumar Ahluvalia, Raj Kumar, Rahul Arya, and Suraj Singh. 2024. "Effect of Different Zinc Sources and Application Methods on Content and Uptake of Micronutrients of Basmati Rice". Journal of Global Agriculture and Ecology 16 (3):41-52. https://doi.org/10.56557/jogae/2024/v16i38795.*

Co-ordinator
IQAC, Shri Ram College
Muzaffarnagar

Chairman
IQAC, Shri Ram College,
Muzaffarnagar

kg Zn through mono $ZnSO4.7H_2O$),T_5 (0.1% Zn spray through $ZnSO4.7H_2O$+RDF),T_6 (0.1% Zn spray through $ZnSO4.7H_2O$ + RDF),T_7 (0.012% Zn spray through chelated Zn at tillering + RDF),T_8 (0.05% Zn spray through $ZnSO4.7H_2O$ at tillering +0.05% at panicle initiation+ RDF), T_9 (0.05% Zn spray through mono $ZnSO4.7H_2O$ at tillering + 0.05% at panicle initiation +RDF),T_{10} (0.006% Zn spray through chelated Zn at tillering + 0.006% at panicle initiation+ RDF), T_{11} (micronutrient mixture@ 25kg ha^{-1} + RDF), T_{12} (vermicompost @ 3tha^{-1}+ RDF).The experimental soil was low in organic carbon and available nitrogen and medium in phosphorus and higher in potassium with slightly alkaline in pH. The status of DTPA extractable Zn 1.23 mg Kg^{-1},Fe 14.85 mg Kg^{-1} Cu 2.43 mg Kg^{-1} Mn 10.91 mg Kg^{-1} in the surface soil. Nutrient assimilation at different stages by the rice crop varied significantly due to application of different treatments in the study. Maximum zinc content 85.78 and 93.57 ppm and uptake 288.60 and 341.85 g/ha at 30 DAT during 2011 and 2012 found in T12 which was significantly higher than the rest of the treatments while minimum zinc content recorded in T_1 was significantly lower than the rest of the treatments during both the years. Similar trends were also recorded at 60 DAT, grain and straw growth stages of rice plant. The zinc content of plant sample in T_{11} and T_3 was also higher and statistically at par to the level of zinc content recorded in T_{12}. The Cu, Fe, and Mn content and uptake at different growth stages of rice plant sample in T_{11} and T_3 was also higher and like the level in T_{12}. Among the method of Zn application, soil application resulted in higher biomass, micronutrient content and uptake in the grain and straw. Foliar application caused greater effect on zinc content and uptake and as well as content and uptake of Cu, Fe and Mn in rice plant at different growth stages during both the years. Among the sources of Zinc, $ZnSO_4.7H_2O$ proved to be the most efficient source of Zn for rice production.

Keywords: Content; micronutrients; rice; soil application; uptake; zinc sulphate.

1. INTRODUCTION

"Rice (*Oryza sativa* L.) is one of the most predominant cereal food crops in about 40 countries in the world. In India, it is grown in an area of 45.07 m ha with a total production of 122.27 m t and a productivity of 2713 kg ha^{-1}. Milled production in India in 2022-23 is 136.00 million tones and 2023-24 is 134.00 million tones" [1]. "As per the ministry of Agriculture, Vanakalam (kharif) paddy acreage as on 08th September 2023 has increased by 2.69 % to 403.40 lakh hectares (996.84 lakh acres) as compared to 392.81 lakh hectares (970.6 lakh acres) during the same period of last year. Higher acreage was covered in Uttar Pradesh 59.01 lakh ha (145.83 lakh acres)" [2]. "Green revolution, introduction the high yielding varieties, extension of irrigated areas and use of high analysis micro-nutrient free NPK fertilizers which increasingly catalyze the depletion of finite reserves of soil micronutrients leading to the occurrence of widespread multi-micronutrient deficiencies. Significance of these nutrients has been realized during past decades when their widespread deficiencies, especially Zn, Fe and B were observed in most of the soils in India" [3]. "Enhancing the availability of micronutrients along with macronutrients in rice cultivation could improve the quality and yield and thus micronutrients are more important for sustainable rice production" [4]. "Indian soils are becoming poorer in respect of organic matter content. The depletion of primary, secondary and micronutrients like Zn, Cu, Mn, B and Fe has also become more conspicuous in decreasing the productivity of crops which can be alleviated either by external application of organic matter or any other application of suitable sources to sustain productivity and quality of produce besides soil health and fertilizer use efficiency. High-yielding varieties and greater fertilizer application were the strategies to vigor the crop yield potential and feed increasing population. Increased application of fertilizers was not sufficient to compensate over-use of cultivated land. Highyielding varieties rapidly depleted soil micronutrients, therefore recent literature witnessed Zn deficiency, along with Iron (Fe), vitamin A, and Iodine (I) deficiency". Rana and Kashif, [5] Among the essential nutrients, zinc plays a vital role in various plant physiological processes, including nutrient metabolism, enzyme activation, and stress tolerance. Zinc is a cofactor for numerous enzymes involved in carbohydrate and protein metabolism, growth regulation, and defense mechanisms. Adequate zinc nutrition is crucial for maintaining optimal plant growth, development, and overall productivity [6]. "Zn influences the activity, structural integrity, and folding of numerous proteins as a fundamental or catalytic enzyme"

Co-ordinator
IQAC, Shri Ram College
Muzaffarnagar

Chairman
IQAC, Shri Ram College,
Muzaffarnagar

[7,8]. "In addition to its role as a key factor for the structural integrity of ribosomes, Zn plays a number of other important bio-physicochemical roles in plants, including gene regulation and activation, protein synthesis, involvement in carbohydrate metabolisms, and morphological and anatomical participation in bio-membranes" [9]. "Application of zinc salts e.g., zinc sulphate is a common practice to correct Zn deficiency. Moreover, Zn chelates, such as Zinc ethylene diamine tetra acetic acid (Zn-EDTA), which supply significant amount of Zn to the plant without interacting with soil components. In Zn-EDTA Zn ion (Zn^{2+}) is surrounded by chelated ligands. Efficient uptake and transport of micronutrients to the grains can be increased by foliar application of micronutrient containing fertilizers. Therefore, like other micronutrients, foliar application of Zn is considered as potential method to ameliorate Zn deficiency in cereal grains" [10,11]. This study was aimed to investigate the effects of different sources of zinc applied through soil or foliar method on rice yield dynamics and nutrients status in paddy grains and straw. Results of this study will help to mitigate zinc deficiency in rice and improve zinc, Copper, Iron and Manganese use efficiency in the rice crop. Nayan and Fouzi [12] to evaluate "the application of Zn and Fe in the form of sulfate salt showed a lower toxicity effect in terms of growth and dry matter of plants than Fe and Zn in the form of ethylene di amine tetra acetic acid (EDTA). In terms of Zn uptake, it was found that there was a significant difference observed compared to the control, especially when 3 kg/ha Zn was applied, regardless of whether it was in the form of sulfate or EDTA. Furthermore, there was an increase in Fe uptake observed with increased Zn application". Mrudhula et al. [13] exhibited that in brown rice significantly received highest zinc content (22.4) with soil application of $ZnSO_4$@ 50kg ha^{-1}+ foliar application of zinc at grain filling stage @ 1% over control and it was on par with all other treatments. At 60 days, 120 days and 180 days after harvest of the crop data revealed that soil application of ZnSO4 @ 50 kg ha^{-1} + foliar application of zinc at grain filling stage @ 0.5% recorded significantly the highest zinc content in single polished and double polished rice followed by soil application of ZnSO4 @ 50 kg ha-1 + foliar application of zinc at grain filling stage @ 1%. Sathiyamurthi et al. [14] The results of the study indicated that soil application of Zn significantly increased the seed index and lint index and micro- nutrient uptake of cotton. The maximum Zn uptake by straw and total Zn uptake by rice was observed with Zn EDTA followed by ZnO, $ZnSO_4.7H_2O$, $Zn(PO_4)_2$ and $ZnCl_2$ but these sources were found non significant. These findings are well corroborated with Verma et al. [15] and Islam et al. [16]. This study was aimed to investigate the effects of different sources of zinc applied through soil or foliar methods on micronutrient content and uptake at different growth stages of rice. Results of this study will help to mitigate micronutrient deficiency in rice and improve the nutrient use efficiency in the rice paddies.

2. MATERIALS AND METHODS

The experiment was conducted at the Crop Research Center, Chirodi of Sardar Vallabhbhai Patel University of Agriculture & Technology (SVPUAT), Meerut (U.P.) during *kharif*2011 and 2012. The area receives 862 mm of rain annually on an average, of which 90% is confined to rainy season (July - September). The soil of experimental site was sandy loam in texture having 53.54, 27.6, and 18.86 % sand, silt and clay, respectively; pH 8.35, Electrical conductivity (EC) 0.189 dSm^{-1}, Organic Carbon (4.2 g Kg^{-1}) low, alkaline $KMnO_4$ N 206.30 Kg ha^{-1}, Olson –P 18.60 Kg ha^{-1} ammonium acetate extractable K 278.70 Kg ha^{-1} and DTPA extractable Zn 1.23 mg Kg^{-1},Fe 14.85 mg Kg^{-1} Cu 2.43 mg Kg^{-1} Mn 10.91 mg Kg^{-1}. The treatments comprised of 4 sources of Zn (zinc sulphate heptahydrate), mono zinc sulphate, chelated zinc and micronutrient mixture) and vermicompost with the combination of RDF (NPK @ 120:60:60) in different mode of application (soil application and foliar spray). There were 12 treatments combinations replicated thrice in a randomized block design. The vermicompost @ 3 t ha^{-1} were applied before transplanting with the combination of RDF during 2011 and 2012. While the graded level of Zn was applied at the time of transplanting, tillering and panicle initiation. A uniform dose of Urea, Diammonium Phosphate (DAP), Muriate of Potash (MOP), Zinc Sulphate, Mono Zinc suphate, Chelated Zinc, micronutrient mixture and vermicompost were used to provide N, P, K, Zn, Cu, Fe, Mn as per treatments in T_2-T_{12} Whereas in T_1 no fertilizers were used. A basal dose of 60 Kg N, 30 Kg P and 30 Kg K ha^{-1} and 5 Kg Zn ha^{-1} and full dose of vermicompost was applied at the time of transplanting while remaining half dose of N were applied at the time of tillering and panicle initiation. Growth observations were recorded at 30 and 60 day after transplanting (DAT) and at harvesting of the crop. Yield attributes were recorded at harvest

Co-ordinator
IQAC, Shri Ram College
Muzaffarnagar

Chairman
IQAC, Shri Ram College,
Muzaffarnagar

and grain and straw yield was recorded plot wise after threshing of produce. After cleaning and drying the to 14 per cent moisture. The yield of net plot, thus converted to q ha^{-1}. Dry weight of straw collected from net plot was recorded after sun grains; the grain yield was recorded in kg per plot. Total uptake of N, P, K, Zn, Cu, Fe and Mn by rice was calculated from dry matter obtained at respective interval and after harvesting (grain and straw). Plant sample were analyzed for total N, P, K, Zn, Cu, Fe and Mn The total N content was estimated through Automatic N analyzer using 0.2 gm grounded samples. For P and K analysis, plant samples were wet digested in di-acid mixture. P was determined by Vanadomolybidos phosphoric yellow color method (Jackson, 1973), K by Flame Photometer (*Jackson*,1973), Zn, Cu, Fe and Mn by atomic absorption spectrophotometer.The entire data was analyzed statistically by using ANOVA. Chemical analysis for plant and soil was done by using standard methods in the Department of Soil Science, College of Agriculture, SVBPUAT, Meerut (U.P.), India.

3. RESULTS AND DISCUSSION

3.1 Zinc Content (mg kg^{-1}) and Uptake (gha^{-1}) of Rice at different Stages of Rice Plant

The two years data presented in Table 1. Indicates that the Zinc content of rice plant at 30 DAT ranges from 46.37 to 85.78 and 50.24 to 93.59 ppm and uptake ranges from 80.86 to 288.04 and 99.62 to 341.41gha^{-1} was recorded in different treatments during 2011 and 2012, respectively. Maximum zinc content 87.78 and 93.57 ppm and uptake 288.04 and 341.41 gha^{-1} during 2011 and 2012 recorded in T12 significantly higher than the rest of the treatments while minimum zinc content(0.75 and 0.89 ppm) and uptake (13.08 and 17.65g ha^{-1})was observed in T_1which was significantly lower than the rest of the treatments during both the years. Generally, the zinc content of plant sample at all the growth stage was higher in those treatments where zinc through either source was applied basal than foliar. The zinc content of plant sample in T_{11} and T_3 was also higher and statistically at par to the level of zinc content recorded in T_{12}. Among the treated plots minimum plant zinc content was recorded in T_2 having no zinc application followed by T_{10} and T_9 received lower concentration of zinc in foliar mode. Zinc content of rice plant at 60 DAT ranges from 26.19 to 74.35 and 31.93 to 79.35 ppm and uptake 87.55 to 459.03 and 126.03 to 523.86 g ha^{-1}during 2011 and 2012, respectively. Maximum zinc content 74.35 and 79.35 and uptake 459.03 and 523.86 g ha^{-1} during 2011 and 2012 found in T12 was significantly higher than the rest of the treatments while minimum zinc content (0.60 and 0.74ppm) and uptake (20.05 and 29.20 g ha^{-1}) recorded in T_1 was significantly lower than the rest of the treatments during both the years. In general the zinc content at 60DAT of plant sample was found superior in those treatments where zinc through either source was applied basal than foliar. The zinc content and uptake of plant sample in $T_{11}$and $T_3$was also higher because of Micronutrient mixture @25kg$ha^{-1}$and $ZnSO_4.7H_2O$ @25Kg ha^{-1} was applied with RDF respectively but not to the level of zinc was recorded in $T_{12}$where Vermicompost @3tons ha^{-1} + RDF was used. Among the zinc treated plots minimum zinc content and uptake at this growth stage was recorded in T_{10}followed by T_9 receiving lower concentration of zinc in foliar mode and significantly superior with T_2 where no zinc was applied.Zinc content of rice grain ranges from 41.46 to 81.54 and 47.63 to 88.46 ppm and uptake ranges from 100.87 to 301.69 and 127.64 to 384.80gha^{-1} was recorded during 2011 and 2012, respectively. Maximum zinc content 81.44 and 88.46 ppm and uptake 301.69 and 384.80 gha^{-1} during 2011 and 2012 found in T_{12} was significantly higher than the rest of the treatments while minimum zinc content and uptake recorded in T_1 was significantly lower than the rest of the treatments during both the years. In general, the zinc content of rice grain was found to be superior in those treatments where zinc through either source was applied basal than foliar. The zinc content of rice grain in T_3 and T_{11} was also higher but not to the level of zinc recorded in T_{12}. Among the zinc treated plots minimum zinc content was recorded in T_{10} followed by T_9 receiving lower concentration of zinc in foliar mode and significantly superior with T_2 where the zinc was not applied.Zinc content of rice straw ranges from 4.58 to 17.65 and 5.82 to 19.52 ppm and uptake18.68 to 100.65 and 23.85 to 117.68 gha^{-1}during 2011 and 2012, respectively. Maximum zinc content 17.65 and 19.52 ppm and uptake 100.65 and 117.68 gha^{-1} during 2011 and 2012 found in T_{12} was significantly higher than the rest of the treatments while minimum zinc content recorded in T_1control where any fertilizerwas not applied. The zinc content of rice straw was found superior in those treatments where zinc through either source was applied in basal and foliar. The zinc content of rice straw in T_{11} and T_3 was also higher and

Co-ordinator
IQAC, Shri Ram College
Muzaffarnagar

Chairman
IQAC, Shri Ram College,
Muzaffarnagar

statistically at par to the level of zinc content recorded in T_{12}. Among the zinc treated plots minimum zinc content was recorded in T_{10} followed by T9.Treatments where zinc is applied in foliar mode receiving lower zinc content and uptake but significantly superior to T_2 where zinc was not applied.Higher zinc uptake at 30 and 60 DAT and by rice grain and straw at harvesting in T_{12} may be described with higher biomass production at respectively growth stages and higher zinc content. Higher zinc content in plant sample under these treatments may be due to inclusion of vermicompost and organic matter had been reported to improve zinc availability in soil. Similar result were also recorded by Kumar et al. [17] The experimental results also showed that micronutrient (Zn, Fe and Mn) concentration and uptake significantly increased as compared to control with micronutrient application (Zn, Fe and Mn). Kumar and Kumar (2009) studied that there was a significant increase in the yield and yield attributes of rice up to 45 kg ZnSO4/ha. The content and uptake of Zn also increased significantly with increasing levels of zinc sulfate. Soil applied Zn was superior compared to its foliar application. Similarly, the maximum Zn uptake by straw and total Zn uptake by rice was observed with Zn EDTA followed by ZnO, ZnSO4.7H2O, Zn3(PO4)2 and $ZnCl_2$ but these sources were found nonsignificant. These findings are well corroborated with Verma et al. [15] and Islam et al. [16] Ghatak et al [18] reported that application of 30 kg ZnSO4/ha recorded the highest values of yield attributes, yield, uptake of Zn, N and K by plant. Similar result also observed by Kailiang Mi, [19] and Rana and Kashif, [5].

3.2 Copper Content (mg kg^{-1}) and Uptake (gha^{-1}) of Rice at different Stages

The two years data are presented in Table 2. indicated that the copper content and uptake of rice biomass at 30 and 60 DAT and rice grain and straw was significantly affected by different treatments during both the years. Copper content of rice plant at 30 DAT ranged from 16.69 to 34.68 and 20.35 to 38.83 ppm and uptake 29.11 to 116.56 and 40.38 to 141.72 gha^{-1}in different treatments during 2011 and 2012, respectively. Maximum Copper content 87.78 and 93.57 ppm and uptake 116.56 and 141.72 gha^{-1}during 2011 and 2012 found in T_{12} was significantly higher than the rest of the treatments while minimum copper content was recorded in $T_1$was significantly lower than the rest of the treatments during both the years. Generally, the Copper content of plant sample at this stage was higher in those treatments where zinc through either source was applied as basal than foliar. The copper content of plant sample in $T_{11}$where micronutrient mixture @25 $Kgha^{-1}$and $T_3$where $ZnSO_4.7H_2O$@ 25 $Kgha^{-1}$ was applied with RDF respectively was also higher but not to the level of copper was recorded in T_{12}. Among the zinc treated plots minimum plant Copper content was recorded in T_{10} and T_9 where lower concentration of zinc was applied in foliar mode and those treatments slightly higher with T_2 receiving no zinc. Similar trends in content and uptake was also recorded in rice plants at stage of 60 DAT. Copper content in rice grain ranged from 14.46 to 30.58 and 16.65 to 33.86 ppm and uptake 34.89 to 113.35 and 44.75 to 147.28 gha^{-1} during 2011 and 2012, respectively. Maximum Copper content 30.58 and 33.87 ppm and uptake 113.35 and 147.28 gha^{-1} during 2011 and 2012 found in T_{12} was significantly higher than the rest of the treatments while minimum Copper content and uptake was recorded in $T_1$was significantly lower than the rest of the treatments during both the years. Generally, the Copper content and uptake of plant sample at this stage was higher in those treatments where zinc through either source was applied basal than foliar. The Copper content of plant sample in T_{11} and T_3 was also higher and statistically at par with T_{12} during 2011 while during 2012.The treatments received micronutrient mixture and zinc sulphateheptahydrate with RDF respectivelyin T_{11} and T_3 was also higher but not to the level of copper recorded in T_{12}. The effect of foliar application with lower concentration of zinc was non-significant and it was found statistically at par with T_2 receiving no zinc during 2011 but during 2012 those treatments significantly varied to T_2.Copper content in rice straw ranged from 5.49 to 17.25 and 7.86 to 19.62 ppm and uptake 21.83 to 94.07 and 31.95 to 129.93 gha^{-1} during 2011 and 2012, respectively. Maximum Copper content 17.25 and 19.62 ppm and uptake 94.07 and 129.93 gha^{-1} during 2011 and 2012 found in $T_{12}$where vermicompost @3 ton $ha^{-1}$was applied with RDF significantly higher than the rest of the treatments while minimum Copper content and uptake was recorded in T_1which was significantly lower than the rest of the treatments during both the years. Generally, the Copper content and uptake of rice straw was higher in those treatments where zinc through either source was applied basal than foliar application. The Copper content of plant sample in T_{11} and T_3 was also higher and while T_{11} is statistically at par with T_{12} during 2011 while during 2012 those treatments were also higher but not to the level of copper

Co-ordinator
IQAC, Shri Ram College
Muzaffarnagar

Chairman
IQAC, Shri Ram College,
Muzaffarnagar

was recorded in T_{12}. Except for T_5 and T_6 the effect of foliar application with higher to lower concentration of zinc was non-significant and it was found statistically at par with T_2 receiving no zinc during both the years.The higher uptake of copper by rice plant, grain, and straw in T_{12} at 30, 60 DAT and harvesting is well expected since the biomass yield as well as copper content was higher in T_{12} at these stages. Gurmani et al. [20] observed that Application of NPK + Zn + Cu + Fe + Mn resulted in the highest Zn concentration, whereas application of NPK + Cu resulted in the highest Cu concentration in the leaves. Fe and Mn concentrations in the leaves were highest with the application of NPK Cu + Mn and NPK + Zn + Cu + Fe + Mn, respectively.

3.3 Iron Content (ppm) of Rice at different Stages

The two years data presented in Table 3. Indicated that the iron content of rice biomass at 30 and 60 DAT and rice grain and straw was significantly affected by different treatments during both the years. Iron content of rice plant at 30 DAT ranged from 312.65 to 366.93 and 320.46 to 374.59 ppm and uptake from 545.83 to 1233.14 and 6635.25 to 1366.11gha^{-1} during 2011 and 2012, respectively. Maximum iron content 366.93 and 374.59 ppm and uptake 1233.14 and 1366.11gha^{-1} during 2011 and 2012 found in T_{12} was significantly higher than the rest of the treatments while minimum iron content and uptake recorded in T_1 (control) was significantly lower than the rest of the treatments during both the years. In general, the iron content and uptake of plant sample at this stage was higher in those treatments where zinc through either source was applied basal than foliar. The content of iron in plant sample in T_{11} and T_3 was also higher and statistically at par to the level of iron content recorded in T_{12}. Similar trends in content and uptake were also observed at the 60 DAT stage of rice plant.The iron content of grain ranged from 56.58 to 92.85 and 62.25 to 98.78 ppm and uptake from 134.64 to 343.36 and 167.57 to 429.86 gha^{-1} during 2011 and 2012, respectively. Maximum iron content 92.85 and 98.78 ppm and uptake 343.36 and 429.86 gha^{-1} during 2011 and 2012 found in T_{12} was significantly higher than the rest of the treatments while minimum iron content and uptake recorded in T_1 which was significantly lower than the rest of the treatments during both the years. In general, the iron content of grain was lower in those treatments where zinc through either source was applied in foliar than basal. The iron content of grain in T_{11}, $T_3$and T_4 was also higher and statistically at par with the level of iron content recorded in T_{12}. But in the of uptake iron uptake of grain sample in T_{11} and T_3 was also higher and statistically at par to T_{12} during 2011 but during 2012 these treatments were found significantly inferior to T_{12} in respect of iron uptake. Iron content of rice straw ranged from 148.89 to 212.59 and 162.35 to 218.35 ppm and uptake from 610.03 to 1212.06 and 667.64 to 1445.22 gha^{-1} during 2011 and 2012, respectively. Maximum iron content 212.59 and 218.35 ppm and uptake 1212.06 and 1445.22 gha^{-1} during 2011 and 2012 found in T_{12} was superiorto the rest of the treatments while minimum iron content and uptake recorded in T_1 was significantly lower than the rest of the treatments during both the years. Generally, the iron content and uptake of rice straw was higher in those treatments where zinc is applied basal than foliar. The iron content and uptake of rice straw in T_{11} and T_3 was also higher and statistically at par to the level of iron content recorded in T_{12}. Among the treated plots receiving lower concentration of zinc in foliar mode did not show any effect and straw iron content and uptake was minimum and statistically at par to T_2 during both the years. The maximum iron uptake during 2011and 2012 found in T_{12} at different stages may be supposed due to higher dry matter accumulation and iron content. Higher iron content in plant in T_{12} may be supposed due to the application of vermicompost, which is a rich source of nutrients and enhances the availability of micronutrients in the soil, is responsible for the rise in micronutrient concentrations. The more iron availability in soil owing to more reductive condition than the rest of the treatments. Decomposition of vermicompost will utilize the soil oxygen and therefore more reduction will take place which is very conductive for iron availability. Similar result was also recorded by Gurmani *et al.* [20] that Application of NPK + Zn + Cu + Fe + Mn resulted in the highest Zn concentration, whereas application of NPK + Cu resulted in the highest Cu concentration in the leaves. Fe and Mn concentrations in the leaves were highest with the application of NPK Cu + Mn and NPK + Zn + Cu + Fe + Mn, respectively. Kumar et al. [17] The application of 125% RDF + Vermicompost at 6 t ha-1 + 2% Zinc Solubilizing bacteria (T8) produced the highest values for Fe, Mn, Zn, and Cu content in grain and straw among the various treatments. Dhaliwal and Walia [21] reported that incorporation of manures increased the availability of micronutrients like Zn, Cu, Fe and Mn.

Co-ordinator
IQAC, Shri Ram College
Muzaffarnagar

Chairman
IQAC, Shri Ram College,
Muzaffarnagar

Table 1. Effect of zinc sources and application methods on content (ppm) and uptake (g ha^{-1})of zinc in rice at different stages

Treatments	Content (ppm)								Uptake (g ha^{-1})							
	30DAT		60DAT		Grain		Straw		30DAT		60DAT		Grain		Straw	
	2011	2012	2011	2012	2011	2012	2011	2012	2011	2012	2011	2012	2011	2012	2011	2012
T_1	46.37	50.24	26.19	31.93	41.46	47.63	4.58	5.82	80.86	99.62	87.57	125.94	100.87	128.12	18.68	23.85
T_2	51.48	54.83	30.45	36.52	47.39	53.22	6.53	7.79	100.45	121.17	116.75	161.33	151.65	176.85	33.71	41.93
T_3	78.73	83.38	52.48	57.86	72.59	78.89	14.91	16.19	223.98	261.72	277.59	339.59	262.55	311.76	81.66	93.59
T_4	72.75	76.58	48.53	54.54	67.25	73.52	12.25	14.42	182.92	221.38	252.30	315.49	237.50	274.22	67.04	82.82
T_5	68.92	72.35	44.38	49.82	64.68	68.84	11.69	13.56	168.44	194.54	220.87	276.94	224.24	254.22	63.59	77.86
T_6	64.93	69.38	41.87	47.92	59.49	65.45	10.60	11.83	154.96	183.58	199.15	255.86	204.22	236.73	57.10	67.38
T_7	61.95	65.59	38.54	44.46	57.36	63.75	9.85	11.19	140.63	164.01	193.68	231.56	195.02	228.55	52.35	63.53
T_8	58.39	62.34	35.69	41.95	54.65	60.45	8.35	10.23	129.62	151.81	159.75	211.83	180.34	213.98	44.22	57.81
T_9	55.83	59.37	34.73	40.36	53.83	58.53	7.45	9.94	119.65	139.59	148.15	197.63	177.64	204.86	39.41	54.03
T_{10}	54.38	57.86	33.85	38.59	51.75	57.60	7.21	9.24	111.60	129.83	148.22	172.67	170.77	200.06	37.34	49.94
T_{11}	80.43	87.48	59.85	65.54	77.24	83.45	15.56	17.74	247.29	295.74	132.15	411.63	282.97	335.22	87.18	102.89
T_{12}	85.78	93.59	74.35	79.35	81.54	88.46	17.65	19.52	288.60	341.85	338.45	523.71	301.69	385.11	100.65	117.68
SE (m)	3.53	2.99	.68	.67	1.69	2.81	1.31	.17	11.35	8.53	4.93	4.49	12.81	15.02	2.01	6.55
CD(p=0.05)	10.43	8.83	2.00	1.98	4.98	8.29	3.85	.49	33.51	25.19	3.99	13.26	37.83	44.33	5.95	19.33

Table 2. Effect of zinc sources and application methods on content (ppm) and uptake (g ha^{-1}) of copper in rice at different stages

Treatments	Content (ppm)								Uptake (g ha^{-1})							
	30DAT		60DAT		Grain		Straw		30DAT		60DAT		Grain		Straw	
	2011	2012	2011	2012	2011	2012	2011	2012	2011	2012	2011	2012	2011	2012	2011	2012
T_1	16.69	20.35	10.26	13.96	14.46	16.65	5.49	7.86	29.11	40.38	34.23	54.98	34.89	44.75	21.83	31.95
T_2	20.38	24.38	12.56	15.68	17.39	19.95	7.95	9.68	40.02	53.95	48.05	69.31	57.25	70.02	43.35	55.21
T_3	31.78	35.84	20.75	24.59	26.56	28.63	13.49	16.06	90.53	112.45	109.76	144.47	96.12	113.48	71.64	92.59
T_4	29.45	33.69	18.73	22.48	24.64	26.43	11.83	13.37	73.76	97.62	97.28	129.99	87.25	98.64	66.04	77.22
T_5	28.69	32.45	17.85	20.54	23.39	25.87	10.49	12.95	70.01	87.35	88.95	114.26	78.97	91.65	59.92	75.75
T_6	28.25	30.79	16.38	19.82	22.56	24.64	9.48	12.84	67.30	85.15	78.02	105.80	78.46	91.09	50.24	72.52
T_7	26.25	28.53	15.85	19.55	22.24	24.43	9.30	11.35	59.06	77.17	73.24	101.96	74.93	88.02	48.16	61.57
T_8	24.46	26.65	15.36	18.65	21.75	23.58	8.74	11.35	56.15	69.61	68.58	94.29	71.16	85.38	47.41	64.61
T_9	23.36	26.65	13.95	17.45	20.39	22.95	8.45	10.78	50.15	62.60	59.57	85.47	69.22	82.14	43.40	58.69
T_{10}	22.63	25.49	13.45	17.32	19.85	21.59	8.32	10.65	61.88	56.95	52.48	77.56	65.44	74.59	45.66	60.97
T_{11}	32.59	36.79	23.83	27.49	28.79	30.85	16.05	17.98	100.16	124.37	134.73	172.54	105.47	123.93	84.96	103.33
T_{12}	34.68	38.83	26.58	30.65	30.58	33.87	17.25	19.62	116.56	141.72	164.03	202.25	113.35	147.28	94.07	129.93
SE (m).	3.89	0.45	0.70	0.48	1.77	0.40	0.62	0.56	5.36	1.76	3.34	2.981	4.72	3.95	4.11	4.68
CD (p=0.05)	N.S.	1.33	2.06	1.43	5.22	1.18	1.83	1.65	15.83	5.20	9.88	8.79	13.95	11.66	12.14	13.82

Chairman
IQAC, Shri Ram College,
Muzaffarnagar

Co-ordinator
IQAC, Shri Ram College
Muzaffarnagar

Chairman
IQAC, Shri Ram College,
Muzaffarnagar

Table 3. Effect of zinc sources and application methods on content (ppm) and uptake (g ha^{-1}) of iron in rice at different stages

Treatments	Content (ppm)								Uptake (g ha^{-1})							
	30DAT		60DAT		Grain		Straw		30DAT		60DAT		Grain		Straw	
	2011	2012	2011	2012	2011	2012	2011	2012	2011	2012	2011	2012	2011	2012	2011	2012
T_1	312.65	320.46	170.21	176.61	56.58	62.25	148.89	162.35	545.83	635.25	569.81	696.42	134.64	167.57	610.03	667.64
T_2	326.85	334.58	174.43	180.71	61.45	66.53	162.86	169.59	640.99	739.38	667.96	797.36	196.33	221.97	840.67	914.82
T_3	357.26	365.64	203.96	208.94	85.76	90.24	198.75	206.85	1017.14	1146.31	1078.07	1225.80	308.60	358.59	1088.36	1196.50
T_4	353.37	361.37	199.08	204.66	82.67	87.85	193.95	200.69	885.58	1079.41	1032.75	1184.64	293.33	327.04	1061.43	1152.86
T_5	350.45	358.46	195.71	201.36	77.65	83.46	186.87	193.38	857.37	964.84	974.01	1119.52	270.95	310.44	1016.34	1107.57
T_6	346.76	354.44	191.83	196.94	75.88	81.48	183.55	190.47	828.85	935.54	912.18	1052.14	261.41	295.15	988.27	1092.70
T_7	340.74	348.68	188.58	194.44	72.64	78.56	180.86	187.68	766.31	874.18	872.89	1013.61	246.10	293.33	961.41	1068.56
T_8	335.84	343.38	184.91	191.73	70.63	75.18	176.87	183.48	746.10	836.89	828.32	968.34	239.72	266.36	937.04	1043.23
T_9	33.970	341.49	182.13	188.83	67.85	73.78	172.66	179.36	716.63	801.14	777.36	923.47	224.96	258.15	913.54	1013.96
T_{10}	329.56	337.65	179.73	186.67	65.97	71.96	169.44	176.88	678.71	755.05	701.68	835.35	217.28	248.70	877.65	960.51
T_{11}	364.85	372.89	208.18	214.76	87.59	92.37	206.96	214.82	1122.18	1260.06	1176.60	1349.65	320.97	371.10	1159.61	1255.15
T_{12}	366.93	374.59	212.22	218.46	92.85	98.78	212.59	218.35	1233.14	1366.11	1310.06	1442.76	343.36	429.86	1212.06	1445.22
SE (m).	4.79	3.81	3.49	3.82	4.24	3.91	2.17	4.65	29.28	18.30	22.71	27.84	19.44	19.00	47.99	46.50
CD (p=0.05)	14.14	11.25	10.32	11.28	12.53	11.53	6.39	13.74	86.43	54.03	67.06	82.18	57.37	56.09	141.65	137.26

Table 4. Effect of zinc sources and application methods on content (ppm) and uptake (g ha^{-1}) of manganese in rice at different stages

Treatments	Content (ppm)								Uptake (g ha^{-1})							
	30DAT		60DAT		Grain		Straw		30DAT		60DAT		Grain		Straw	
	2011	2012	2011	2012	2011	2012	2011	2012	2011	2012	2011	2012	2011	2012	2011	2012
T_1	125.76	133.75	82.09	86.12	25.65	32.53	45.560	49.76	218.58	265.25	274.85	339.44	62.09	87.36	186.15	201.59
T_2	137.95	145.79	86.68	90.71	31.49	36.86	54.39	58.38	270.74	321.77	331.61	400.61	104.03	122.90	295.72	327.51
T_3	170.85	179.38	111.26	116.12	51.76	55.45	94.25	98.55	484.96	562.42	588.81	683.06	187.16	219.58	516.31	569.70
T_4	165.45	173.64	108.48	111.48	47.68	51.86	87.48	92.73	414.66	502.74	565.34	645.10	168.57	193.36	487.35	532.53
T_5	161.85	169.78	104.58	108.66	44.70	48.65	81.85	85.78	396.32	456.70	520.86	604.35	152.19	172.49	445.04	493.74
T_6	157.56	165.85	101.88	105.43	42.89	45.95	79.51	83.45	377.18	437.92	485.38	562.83	148.90	169.72	442.05	479.66
T_7	153.97	161.39	100.47	103.94	40.68	43.75	75.65	79.36	345.77	437.87	465.05	542.10	130.21	156.62	412.75	451.54
T_8	150.65	158.76	96.63	100.35	37.85	40.55	68.95	73.69	334.34	386.95	431.76	508.53	130.12	146.87	371.80	416.04
T_9	147.36	154.39	96.42	97.46	35.69	37.86	65.85	69.38	297.06	362.41	411.95	476.43	121.47	135.47	348.39	395.03
T_{10}	144.57	151.85	91.26	94.94	33.65	35.65	62.54	65.25	283.15	339.62	356.77	424.96	110.98	123.26	324.04	355.53
T_{11}	179.56	187.65	116.82	120.42	58.78	61.94	100.68	104.85	552.18	600.61	660.19	757.03	215.59	248.78	564.14	613.00
T_{12}	187.85	195.78	120.41	124.39	64.58	68.85	107.86	112.73	630.67	664.92	743.70	795.36	238.94	299.64	615.19	745.81
SE (m).	4.91	4.58	3.46	3.71	0.73	0.68	0.94	4.92	15.11	15.64	20.64	25.96	8.56	7.76	23.16	31.02
CD (p=0.05)	14.49	13.52	10.23	10.95	2.15	2.01	2.79	14.52	44.59	46.16	60.94	76.65	25.27	22.90	68.39	91.57

Co-ordinator
IQAC, Shri Ram College
Muzaffarnagar

Chairman
IQAC, Shri Ram College,
Muzaffarnagar

Table 5. Effect of zinc sources and application methods on dry matter accumulation (q ha^{-1}) at different stages and yield (q ha^{-1}) of rice

Treatment	30 DAT		60DAT		Grain Yield		Straw Yield	
	2011	2012	2011	2012	2011	2012	2011	2012
T_1	17.44	19.83	33.43	39.47	24.33	26.80	40.80	40.99
T_2	19.59	22.10	38.32	44.16	32.00	33.23	51.63	53.83
T_3	28.45	31.35	52.88	58.71	36.17	39.60	54.77	57.81
T_4	25.08	28.95	52.02	57.85	35.33	37.30	54.73	57.44
T_5	24.44	26.90	49.73	55.60	34.67	36.93	54.40	57.42
T_6	23.87	26.40	47.57	53.41	34.33	36.17	53.87	56.96
T_7	22.53	25.06	46.27	52.10	34.00	35.77	53.15	56.78
T_8	22.23	24.37	44.78	50.55	33.83	35.47	52.97	56.51
T_9	21.45	23.47	42.68	48.94	33.00	35.10	52.90	54.36
T_{10}	20.58	22.36	39.04	44.72	33.00	34.60	51.80	54.10
T_{11}	30.75	33.78	56.55	62.81	36.67	40.17	56.03	58.52
T_{12}	33.58	36.48	61.74	66.02	37.00	43.50	57.03	66.29
SE (m)	2.01	2.41	2.23	2.34	1.73	1.37	2.67	2.33
CD(p=0.05)	5.93	7.11	6.60	6.93	5.12	4.05	7.90	6.89

3.4 Manganese Content (ppm) and Uptake (gmha^{-1}) of Rice at different Stages

The data regarding application effect of various sources of zinc in different mode and vermicompost along with RDF on manganese content during 2011 and 2012, respectively are shown in Table 4. The Mn content of rice biomass at 30, 60 DAT and rice grain and straw was significantly affected by different treatments during both the years. The Mn content of rice plant at 30 DAT ranged from 125.76 to 187.87and 133.75 to 195.78 ppm and uptake from 218.58 to 630.67 and 265.25 to 664.92 gha^{-1} during 2011and 2012, respectively. Maximum Mn content 187.85 and 195.78 ppm and uptake 630.67 and 664.92 gha^{-1} during 2011 and 2012 found in T_{12} was significantly higher than the rest of the treatments while minimum Mn content recorded in T_1 was significantly lower than the rest of the treatments during both the years. The Mn contentand uptake of plant sample in T_{11} was higher and statistically at par to the T_{12} and the treatment T_3 was also higher but not to the level of Mn content and uptake recorded in T_{12}. Among the treated plots minimum Mn content was recorded in T_2 where no zinc is used followed by T_{10} and T_9 receiving lower concentration of zinc in foliar mode. Similar trends in Mn content and uptake was also observed at 60 DAT stage of rice plant.Mn content of rice grain ranged from 25.65 to64.58 and 32.53 to 68.85 ppm and uptake from 62.09 to 238.94 and 87.36 to 299.64 gha^{-1}during 2011and 2012, respectively. Maximum Mn content 160.55 and 165.86 ppm and uptake 238.94 and 299.64 gha^{-1} during 2011 and 2012 respectively found in T_{12} was significantly higher than the rest of the treatments while minimum Mn content recorded in T_1 was significantly lower than the rest of the treatments during both the years. In general Mn content and uptake of plant sample at this stage was higher in those treatments where zinc through either source was applied as basal than foliar. The Mn content of grain in T_{11} and T_3 was also higher but not to the level of Mn content recorded in T_{12}. Among the zinc treated plots minimum Mn content and uptake was recorded in T_{10} and it was found statistically at par with T_2 and followed by T_9 during both the years. Mn content of rice straw ranges from 45.56 to 107.86 and 49.76 to m112.73 ppm and uptake 186.15 to 615.19 and 201.59 to 745.81 gha^{-1}during 2011and 2012, respectively. Maximum Mn content 107.86 and 112.73 ppm and uptake 615.19 and 745.81gha^{-1}during 2011 and 2012 found in T_{12} was significantly higher than the rest of the treatments while minimum Mn content recorded in T_1 was significantly lower than the rest of the treatments during both the years. In general Mn content of rice straw was higher in those treatments where zinc through either source was applied basal than foliar. The Mn contentof rice straw in T_{11} and T_3 during 2011was also higher but not to the level of Mn content recorded in T_{12} but during 2012 were found statistically at par to the T_{12}. Among the zinc treated plots minimum Mn content in straw during 2011 was recorded in T_{10} and T_9 and these treatments were significantly higher to the T_2 where no zinc is used but during 2012 these treatments were found statistically at par to T_2.But in the case of manganese uptake of rice straw in T_{11} was also higher and statistically

Co-ordinator
IQAC, Shri Ram College
Muzaffarnagar

Chairman
IQAC, Shri Ram College,
Muzaffarnagar

at par with T_{12} while T_3 was significantly varied to T_{12} but during 2012 these treatments were significantly inferior to T_{12}. The effect of foliar application of zinc in lower concentration on manganese uptake was non-significant and it was also found statistically at par with T_2 during both the years.The maximum manganese uptake during 2011and 2012 found in T_{12} at different stages may be supposed due to higher dry matter accumulation and manganese content. Higher manganese content in plant in T_{12} may be supposed due to the more Mn availability in soil owing to the more reductive condition than the rest of the treatments. Decomposition of vermicompost will utilize the soil oxygen and therefore more reduction will took place which is very conductive for Mn availability. Similar result was also recorded by Gurmani *et al.* [20] that Application of NPK + Zn + Cu + Fe + Mn resulted in the highest Zn concentration, whereas application of NPK + Cu resulted in the highest Cu concentration in the leaves. Fe and Mn concentrations in the leaves were highest with the application of NPK Cu + Mn and NPK + Zn + Cu + Fe + Mn, respectively. Walia et al. (2008) reported similar results pertaining to uptake of Zn, Cu, Fe and Mn in rice-wheat system. This result is supported by Saddika [22] who observed that application of Zn markedly increased their respective concentration and uptake by the rice crops.(Doreet.al., 2018). Observed that the increase in Zn uptake might be due to theapplication of zinc sulphate that might have increasedthe availability and uptake of other essential nutrients [23-27].

4. CONCLUSION

The present study has shown that application of zinc improved the biomass, grain and straw yield and uptake of micronutrients in basmati rice crop. The application of vermicompost @ 3 t ha^{-1}+RDF in the treatment T_{12} recorded higher values of micronutrients content and uptake over the other treatments. But the content and uptake of micronutrients in treatments (T_{11}) T_3 where micronutrient mixture@ 25 kg ha^{-1} and$ZnSO_4$ @ 25kg ha^{-1}were applied respectively with RDF was also higher and equally good like the treatment T_{12}.

DISCLAIMER (ARTIFICIAL INTELLIGENCE)

Author(s) hereby declare that NO generative AI technologies such as Large Language Models (ChatGPT, COPILOT, etc) and text-to-image generators have been used during writing or editing of manuscripts.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

REFERENCES

1. Surya Krishna GK, 1, Ch. Sujani Rao, Venkata Subbaiah P, Sree Rekha M.4, Srinivasa Rao V.; 2022.
2. Paddy Outlook, September. 2023;1-5.
3. Katyal JC. Micronutrients in Indian Agriculture.Indian Journal of Fertilizers. 2018;14(4):12-26.17:22-43.
4. Chauhan SVS, Raghav BS, Singh D. Zinc requirement of rice (Oryza sativa) crop in alluvial soil. Annals of Plant and Soil Research. 2017;19(3):315-318.
5. Rana and Kashif. Effect of different Zinc sources and methods of application on rice yield and nutrients concentration in rice grain and straw. Journal of Environmental and Agricultural Sciences; 2014.

   ISSN: 2313-8629
6. Yadav R, Singh A, Yadav RS, Singh B, Dahiya JS. Response of barley (*Hordeum vulgare* L.) to zinc nutrition in acid alfisol of northern India. Journal of Crop Improvement. 2020;34(5):680-693
7. Castillo-González J, Ojeda-Barrios D, Hernández-Rodríguez A, González-Franco AC, Robles-Hernández L, López-Ochoa GR. Zinc metalloenzymes in plants. Interciencia. 2018;43: 242–248.

   DOI: 10.378-1844/14/07/468-08.
8. Zaheer IE, Ali S, Saleem MH, Ali M, Riaz M, Javed S, et al. Interactive role of zinc and iron lysine on spinacia oleracea l. growth, photosynthesis and antioxidant capacity irrigated with tannery wastewater. Physiol. Mol. Biol. Plants. 2020; 26(12):2435–2452.

   DOI: 10.1007/s12298-020-00912-0.
9. Hafeez B, Khanif Y, Saleem M. Role of zinc in plant nutrition: A review. Am. J. Exp. Agric. 2013;3(2):374.

   DOI: 10.9734/AJEA/2013/2746

Co-ordinator
IQAC, Shri Ram College
Muzaffarnagar

Chairman
IQAC, Shri Ram College,
Muzaffarnagar

10. Cakmak I. Enrichment of cereal grains with zinc: Agronomic or genetic biofortification. Plant Soil. 2008;302:1–17.
11. Fang Y, Wang L, Xin Z, Zhao L, An X. Effect of foliar application of zinc, selenium, and iron fertilizers onnutrients concentration and yield of rice grain in China. J Agric Food Chem. 2008; 56:2079-2084.
12. Dayang Safinah Nayan and Suhaila Fouzi. The Effect of Zinc and Iron Applications from Different Sources to Growth, Dry Matter, and Its Uptake by Lettuce (*Lactuca sativa*) Pertanika.Journal of Tropical Agricultural Science. 2023;46(4).
    DOI: 10.47836 /pjtas.46.4.03.
13. Improvement of rice grain zinc concentration through biofortification of zinc Anny Mrudhula, K.1 Krishna Veni, B.2, Suneetha, Y.2 and Sunil Kumar, M.3 and Naik, B.S.S.S4 Eco. Env. & Cons. 29 (October Suppl. Issue): 2023; (S187-S194).
14. Sathiyamurthi S, Elayaraja D, Kamalakannan P. Studies on the effect of different zinc sources and levels on the quality and micro- nutrient uptake of cotton. Journal of Pharmacognosy and Phytochemistry. 2019;SP2:397-400
15. Verma VK, Meena RN, Maurya SP, Bahadur S, Gautam A, Maniram. Effect of sources of zinc and various crop establishment methods on growth, yield and yield attributes of rice (*Oryza sativa* l.) in eastern U.P. Ecology, Environment and Conservation. 2015;(21):283- 287.
16. Md. Rafiqul Islam1 *, Nilufar Yesmin1, Meher Malika1, Azmul Huda2 and M. Mazibur Rahman1.Effect of zinc supplied from two different sources on the growth, yield and zinc uptake of rice (cv. BRRI dhan49).Asian Australas. J. Biosci. Biotechnol. 2016;1(2):230-234
17. S. Arun Kumar1*, Kamini Kumari2, K. Arivazhagan3 Nutrient Content and Nutrient Uptake of Rice by The Impact of Inorganic, Organic, and Biological Sources of Nutrients in An Inceptisol Soil of Tamil Nadu.Journal of Advanced Zoology. 2023;44(03):834:840.
    ISSN: 0253-7214
18. Ghatak R, Jana PK, Sounda G, Ghosh RK, Bandyopadhyay P. Response of transplanted rice to zinc fertilization at farmer's field on red and laterite soils of West Bengal. Journal of Inter academician. 2005.9(2):231-234.
19. Kailiang Mi, Xijun Yuan, Qianyue Wang, Canping Dun, Rui Wang, Shuo Yang, Yanju Yang, Hongcheng Zhang and Haipeng Zhang* Zinc oxide nanoparticles enhanced rice yield, quality, and zinc content of edible grain fraction synergistically.Frontier in Plant Science. 2023;14.
    Available:https://doi.org/10.3389/fpls.2023.1196201.
20. Gurmani AR, Khan MQ, Bakhsh A, Gurmani AH. Effect of micronutrients (Zn, Cu, Fe, Mn) on the rice yield and soil/plant concentration. Sarhad Journal of Agriculture. 2003;19(3):383-390.
21. Dhaliwal SS, Walia SS. Integrated nutrient management for sustaining maximum productivity of rice-wheat system under Punjab conditions, Journal of Research Punjab Agricultural University. 2008;45:12-16.
22. Saddika MA, Effects of micronutrients on the growth and yield of rice (BRRI dhan29). M.S. Thesis. Dept. of Soil Science, BAU, Mymensingh. 2013; 31-40.
23. Coffin MD. The Evaluation of Low-Use-Rate Zinc Fertilization Strategies on Seedling Canopy Coverage, Zn Concentration, Biomass, and Grain Yield. Graduate Theses and Dissertations; 2019.
    Available:https://scholarworks.uark.edu/etd/3227
24. Direct and Residual Effect of Integrated Use of Organics and Inorganics on Micronutrient Content under Rice-Sorghum Cropping System
25. Dore V, Koti RV, Math KK. Response of zinc application on growth, zinc content and grain yield of rice genotypes and correlation between zinc content and yield attributes of rice genotypes. Indian Journal of gricultural Research. 2018;52(6):625-630.
26. Sekhar Kumar , Rohtas Kumar , Sawan Kumar and Jyoti Sharma. International Journal of Plant & Soil Science. 2023; 35(6):177-188.
    DOI: 10.9734/ijpss/2023/v35i62853

Co-ordinator
IQAC, Shri Ram College
Muzaffarnagar

Chairman
IQAC, Shri Ram College,
Muzaffarnagar

27. Waleed Khaliq Rana. Saifur Rehman Kashif Effect of different Zinc sources and methods of application on rice yield and nutrients concentration in rice grain and straw.Journal of Environmental and Agricultural Sciences; 2014.
ISSN: 2313-8629

Disclaimer/Publisher's Note: The statements, opinions and data contained in all publications are solely those of the individual author(s) and contributor(s) and not of the publisher and/or the editor(s). This publisher and/or the editor(s) disclaim responsibility for any injury to people or property resulting from any ideas, methods, instructions or products referred to in the content.

© Copyright (2024): Author(s). The licensee is the journal publisher. This is an Open Access article distributed under the terms of the Creative Commons Attribution License (http://creativecommons.org/licenses/by/4.0), which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited.

Peer-review history:
The peer review history for this paper can be accessed here:
https://prh.ikprress.org/review-history/12057

Coordinator
IQAC, Shri Ram College
Muzaffarnagar

Chairman
IQAC, Shri Ram College,
Muzaffarnagar

Prog. Agric. 24 (2) : 100-106 (2024)
DOI : 10.5958/0976-4615.2024.00016.5

Society for Recent Development in Agriculture
Website : www.progressiveagriculture.in

IMPACT OF YEAST ON PHYSIC-CHEMICAL PROPERTIES OF MIXED FRUIT WINE DURING STORAGE

Vikrant Kumar, Jaivir Singh, Mohd Nayeem Ali and Anjali Jakhar

Assistant Professor Department of Agriculture, Shri Ram College, Muzaffarnagar (UP) 251001
Professor Department of Agriculture Engineering SVPUAT, Modipuram, Meerut
***Corresponding Author Email** - vkvk6096@gmail.com

Abstract

The mixture of fruits pulp containing low sugar and thus sugar level will adjust from 25 °Brix by using sugar solution. The pH level of mixture will adjusted at 4. The juice will yeast by *saccharomyces cerevisiae* with 0.5 %. The TSS largely affects the various physic-chemical parameters of fermented wine. Sugar is the main substrate for fermentation of fruits juice into alcohol. The specific gravity of the wine was found to be decreased with increase in sugar percent. Wine is a cocktail produced using aged grapes or different organic products. Yeast devours the sugar in the grapes and converts it to ethanol and carbon dioxide.

Introduction

Wine is an alcoholic beverage produced from juices of variety of fruits by fermentative action of microorganisms either spontaneously or seeding with a particular strain mainly of yeast species to adopt a particular quality of wine. Wine is one of the most recognizable high value added products from fruits (Okeke *et al.*, 2015). Wines are regular utilization characterized as a result of the typical alcoholic aging of the juice of sound ready grapes. Grape wines are maybe the most monetarily significant organic product juice liquor (Kelebek and Canbas 2013). Non-accessibility and generally significant expense of getting successful financially alcoholic fermentative *Saccharomycese cerevisiae* strains are a significant compel being developed and supporting neighborhood modern maturation measure (Yabaya, *et al.*, 2016). The maturation might be started utilizing a starter culture of *Saccharomycese cerevsiae*, in which case the juice is vaccinated with populace of yeast of 10^6 - 10^7 cfu/ml juice. This methodology produces wine of commonly anticipated taste and quality. On the off chance that the maturation interaction is permitted to continue normally, the yeast present on the outside of the natural products. The characteristic aging cycle is polished generally around the globe, particularly for home creation of wine. In normal maturation measure, there is a reformist example of yeast development. *Saccharomycese cerevsiae* can endure a lot more elevated levels of ethanol up to 15% v/v or more than different species who just endure up to 5% or 8% liquor. (Adams, 1990; Guleria, 2014 and Aidoo, 1994). Strains of *Saccharomyces cerevisiae* yeast which are known to deliver diverse unpredictable profiles have been regularly utilized for alcoholic maturation.

Materials and Methods

Alcohol Content

Alcohol determination by specific gravity method provides an approximation of the alcohol content only. The method assume that the difference in specific gravity. Before and after fermentation is due solely to the conversion of sugars before fermentation. The alcohol content calculates by the following relation:

$$\text{Alcohol (\%v/v)} = (SG_2 - SG_1) / 0.0074$$

Where,

Co-ordinator
IQAC, Shri Ram College
Muzaffarnagar

Chairman
IQAC, Shri Ram College,
Muzaffarnagar

Scanned with OKEN Scanner

SG_1 = Initial specific gravity measurement

SG_2 = Final specific gravity measurement

pH Content

The pH was determined directly during fermentation using a digital pH meter as described by Ochai and Kolhatkar (2008).

Total soluble solids (TSS)

The total soluble solid content was determined in terms of °Brix by using hand refractometer at 20 °C. It measures TSS in terms of refractive index. Brix is a measure of solids only in case of pure sucrose solutions. Generally, fruit juices contain more sugar than any other soluble constituents and hence brix provides a useful guide of soluble solid or sugar content (Maziar, 2010).

Specific gravity Content

The specific gravity was determined using specific gravity bottle. The empty bottle was weighed, filled with distilled water and reweighed. It was then filled with sample and weighed (Ranganna, 1986).

The specific gravity, of the sample will be calculated, as follows:

$$\text{Specific gravity} = \frac{W_s}{W_w}$$

Where, W_s = Weight of known volume of sample in gm

W_w = Weight of an equal volume of water in gm

Density Density

The density, ñ in kg/m^3, will be calculated as:

$$\rho = 1000 \times \text{Specific gravity}$$

Experimental Plan

The juice will be extract by homogenizing the pulp mixer after washing the fruits. The mixture of fruits pulp containing low sugar and thus sugar level will adjust from 25 °Brix by using sugar solution. The pH level of mixture will adjusted at 4. The juice will yeast by *Saccharomyces cerevisiae* with 0.5%. The complete mixture will be hold 30 days for fermentation at room temperature. The wine will racking pasteurization (60 °C, 3 min.) and bottling after fermentation process.

Fermentation Process

The good quality fruits were procured from the local market of Meerut. The procured fruits were washed with water and unwanted material like dust; dirt and surface adhering were removed. The fruits were peeled with the help of a stainless steel knife and boot the ends of the fruits were weighted according to the treatments ratio. After setup the treatments of sample the sugar level in juices were adjusted at 25 °Brix and yeast *Sacharomyces cerevisiae* was added to the clarified juice to initiate fermentation for 30 days. The yeast percentages were used in the treatment 0.5 % than the samples were fermented at room temperature. In red wine making the pulp, skins and seeds of grapes and other fruits are kept together after crushing and during all parts of the fermentation. This is done to extract color and flavor. The post fermentation process was necessary to ensure good conservation and presentation of produced mixed fruit wine.

Effect on physico-chemical characteristics of mixed fruits wine with 0.5% yeasting on storage period.

Effect on Specific Gravity

The experimental data are presented in Table 1 the data were analyzed to observe the effect of 0.5% yeasting concentration of mixed fruit wine during storage period as show in bar diagrams Figure 1. The Specific Gravity of mixed fruit wine showed an increasing trend for all the treatments with storage period start from 0, 30, 60 and 90 days. The study revealed that specific gravity of the samples having yeast concentration of 0.5%. Estimation of specific gravity of treatments T_1, T_2, T_3, T_4, T_5 and T_6 has been conducted. It has been studied that as the number of day's increases, the specific gravity also increases gradually. The specific gravity ranges from 1.065 to 1.075 for T_1 on 1st day to last day of storage period. 1.078 was the starting specific gravity of T_2 which increased to 1.089 on 90th day. The initial specific gravity of T_3 was 1.097 which increased to 1.104 on the 90th day. For T_4, the specific gravity starts from 1.099 and increased to 1.106 on 90th day. On the 1st day the specific gravity was 1.099 for T_5 and then it increased to 1.108 on 90th day. In case of T_6, specific gravity was 1.101 on 1st day which increased to 1.111 on 90th day. The ANOVA of steady revealed that the specific gravity of mixed fruit wine was found to be significant at $p = 0.05$ level of significance.

Table 1 Effect on Specific gravity of 0.5%

Co-ordinator
IQAC, Shri Ram College
Muzaffarnagar

Chairman
IQAC, Shri Ram College,
Muzaffarnagar

Scanned with OKEN Scanner

yeasting during storage period

Treatments/Days	0 Day	30 Day	60 Day	90 Day
T_1	1.065	1.067	1.071	1.075
T_2	1.078	1.081	1.085	1.089
T_3	1.097	1.099	1.102	1.104
T_4	1.099	1.102	1.104	1.106
T_5	1.099	1.102	1.106	1.108
T_6	1.101	1.104	1.109	1.111

Effect on Total Soluble Solids (TSS)

The TSS content of mixed fruit wine showed a decreasing trend for all the treatments with storage period up to 30 days. The study revealed that TSS of the samples having 0.5% yeast was observed as 25 °Brix in fresh samples. From Table 2 and Figure 2 it was observed that TSS of all the samples decreased with storage period (0, 30, 60, and 90 days). The TSS largely affects the various physic-chemical parameters of fermented wine. Sugar is the main substrate for fermentation of fruits juice into alcohol. The specific gravity of the wine was found to be decreased with increase in sugar percent. This might be due to increase in alcohol percent with increase in sugar percent. Estimation of TSS of T_1, T_2, T_3, T_4, T_5 and T_6 has been conducted. It has been studied that as the number of day's increases, the TSS (°Brix) also decreases gradually. The TSS (°Brix) ranges from 17.50 to 14.17 for T_1 on 1st day to last day of storage period. 16.83 was the starting TSS (°Brix) of T_2 which decreased to 13.50 on 90th day. The initial TSS (°Brix) of T_3 was 16.50 which decreased to 13.50 on the 90th day. For T_4, the TSS (°Brix) starts from 16.50 and decreased to 13.50 on 90th day. On the 1st day the TSS (°Brix) was 15.67 for T_5 and then it decreased to 12.50 on 90th day. In case of T_6, TSS (°Brix) was 15.50 on 1st day which decreased to 12.50 on 90th day. The ANOVA of steady revealed that the TSS of mixed fruit wine was found to be significant at $p = 0.05$ level of significance.

Table 2 Effect on TSS of 0.5% yeasting during storage period

Treatments/Days	0 Day	30 Day	60 Day	90 Day
T_1	17.5	16.5	15.83	14.17
T_2	16.83	15.83	14.94	13.50
T_3	16.5	15.5	14.83	13.50
T_4	16.5	15.5	14.83	13.50
T_5	15.67	14.83	13.94	12.50
T_6	15.5	14.8	13.93	12.50

Effect on Density

The Density of mixed fruit wine showed an increasing trend for all the treatments with storage period up to 0, 30, 60 and 60 days. The study revealed that density of the samples having yeast concentration of 0.5%. The experimental data are presented in Table 3 The data were analyzed to observe the effect of 0.5% yeasting concentration of mixed fruit wine during storage period as show in bar diagrams Figure 3 Estimation of density of T_1, T_2, T_3, T_4, T_5 and T_6 has been conducted. It has been studied that as the number of day's increases, the density also increases gradually. The density ranges from 1065 kg/m^3 to 1075 kg/m^3 for T_1 on 1st day to last day of storage period. 1078.33 kg/m^3 was the starting density of T_2 which increased to 1089 kg/m^3 on 90th day. The initial density of T_3 was 1097 kg/m^3 which increased to 1104 kg/m^3 on the 90th day. For T_4, the density starts from 1099 kg/m^3 and increased to 1106 kg/m^3 on 90th day. On the 1st day the density was 1099.33 kg/m^3 for T_5 and then it increased to 1108 kg/m^3 on 90th day. In case of T_6, density was 1101 kg/m^3 on 1st day which increased to 1111 kg/m^3 on 90th day.. The ANOVA of steady revealed that the density of mixed fruit wine was found to be significant at $p = 0.05$ level of significance.

Effect on Density of 0.5% yeasting during storage period

Treatments/Days	0 Day	30 Day	60 Day	90 Day
T_1	1065	1067	1070.67	1075
T_2	1078.33	1081	1085.00	1089
T_3	1097	1099.33	1101.67	1104
T_4	1099	1101.67	1104.00	1106
T_5	1099.33	1102.33	1106.00	1108
T_6	1101	1103.67	1109.33	1111

Effect on pH content

According to Fleet, pH directly affects wine stability. This may be as a result of the fact that at a pH close to neutral (7.0), most microorganisms such as bacterial and molds including some yeasts become more active for fermentation and subsequent spoilage of wine, while pH below 3.5

Co-ordinator
IQAC, Shri Ram College
Muzaffarnagar

Chairman
IQAC, Shri Ram College,
Muzaffarnagar

Scanned with OKEN Scanner

eliminates most of the microbes and favors only a few of the microorganisms for fermentation. Molds and yeasts are usually low pH tolerant and are therefore associated with the spoilage of food with low pH. Yeasts can grow in a pH range of 4 – 4.5 and molds can grow from 2 – 8.5 but favor low pH. The pH plays an important role in aging, clarifying or fining. As the strength of the relative charge of suspended particles decreases in the wine, the pH of the wine increases.

At high pH, organic protein fining agents may possess a positive charge insufficient to bind to the negatively charged particulates, thus potentially increasing the turbidity of the wine **(Nuengchamnog and Ingkaninan 2017)**. Estimation of pH content of treatments T_1, T_2, T_3, T_4, T_5 and T_6 has been conducted. It has been studied that as the number of day's increases, the pH content also decreases gradually. The pH content ranges from 3.70 to 3.63 for T_1 on 1st day to last day of storage period. 3.72 was the starting pH content of T_2 which decreased to 3.65 on 90th day. The pH content of T_3 was 3.69 which decreased to 3.62 on the 90th day. For T_4, the pH content starts from 3.68 and decreased to 3.60 on 90th day. On the 1st day the pH content was 3.59 for T_5 and then it decreased to 3.50 on 90th day. In case of T_6, pH content was 3.52 on 1st day which decreased to 3.48 on 90th day. The experimental data are presented in Table 4 The data were analyzed to observe the effect of 1% yeasting concentration of mixed fruit wine during storage period as show in bar diagrams Figure 4. The ANOVA of steady revealed that the pH content of mixed fruit wine was found to be significant at p = 0.05 level of

Effect on pH content of 0.5% yea storage period

Treatments/Days	0 Day	30 Day	60 I
T_1	3.70	3.68	3.6
T_2	3.72	3.69	3.6
T_3	3.69	3.66	3.6
T_4	3.68	3.65	3.6
T_5	3.59	3.56	3.5
T_6	3.52	3.51	3.5

Effect on Alcohol Content

The alcohol content production of mixed fruit wine showed an increasing trend for all the treatments with storage period up to 90 days. The experimental data are presented in Table 5 The data were analyzed to observe the effect of 1% yeasting concentration of mixed fruit wine during storage period as show in bar diagrams Figure 5 Estimation of alcohol content of treatments T_1, T_2, T_3, T_4, T_5 and T_6 has been conducted. It has been studied that as the number of day's increases, the alcohol content also increases gradually. The alcohol content ranges from 6.80 to 8.78 for T_1 on 1st day to last day of storage period. 8.96 was the starting alcohol content of T_2 which increased to 10.36 on 90th day. The initial alcohol content of T_3 was 10.14 which increased to 11.31 on the 90th day. For T_4, the alcohol content starts from 10.36 and increased to 11.58 on 90th day. On the 1st day the alcohol content was 10.95 for T_5 and then it increased to 11.89 on 90th day. In case of T_6, alcohol content was 12.30 on 1st day which increased to 13.47 on 90th day. The ANOVA of steady revealed that the alcohol content of mixed fruit wine was found to be significant at p = 0.05 level of significance.

Table 5 Effect on Alcohol Content of 0.5% yeasting during storage period

Treatments/Days	0 Day	30 Day	60 Day	90 Day
T_1	6.80	7.42	8.20	8.78
T_2	8.96	9.32	9.86	10.36
T_3	10.14	10.59	11.04	11.31
T_4	10.36	10.72	11.35	11.58
T_5	10.95	11.26	11.58	11.89
T_6	12.30	12.70	13.20	13.47

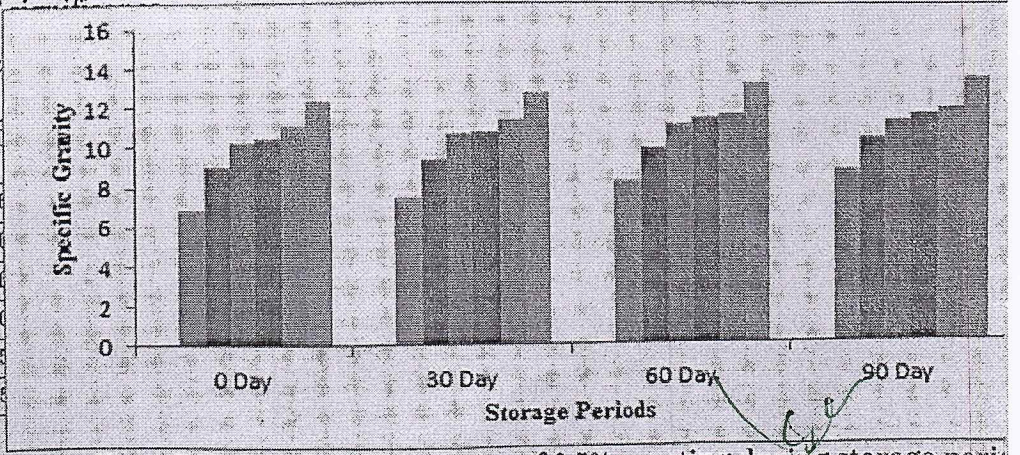


Fig. 1 Effect on Specific gravity of 0.5% yeasting during storage perio

Co-ordinator
IQAC, Shri Ram College
Muzaffarnagar

Chairman
IQAC, Shri Ram College
Muzaffarnagar

Scanned with OKEN Scanner

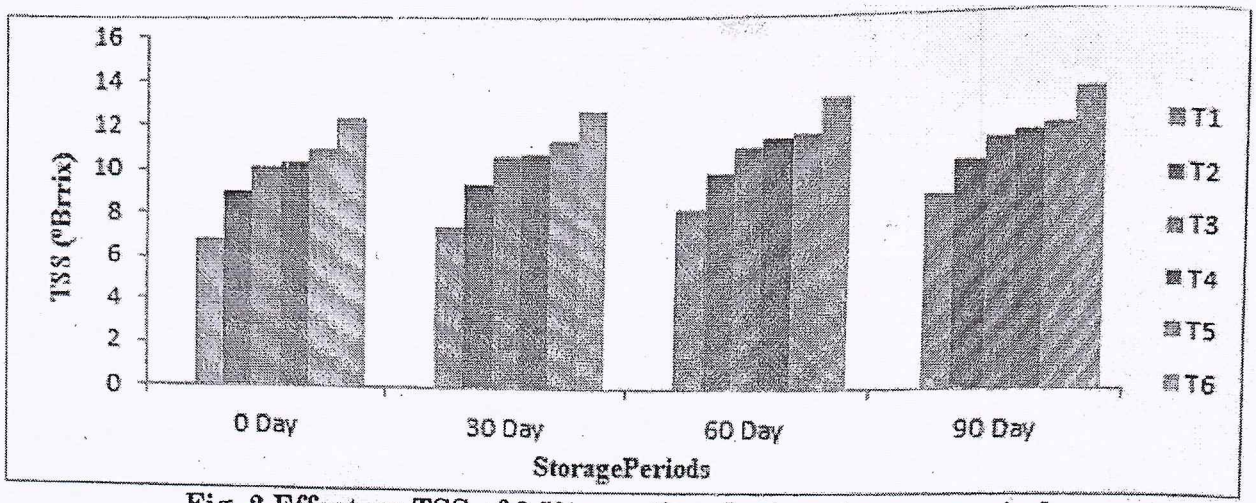


Fig. 2 Effect on TSS of 0.5% yeasting during storage period

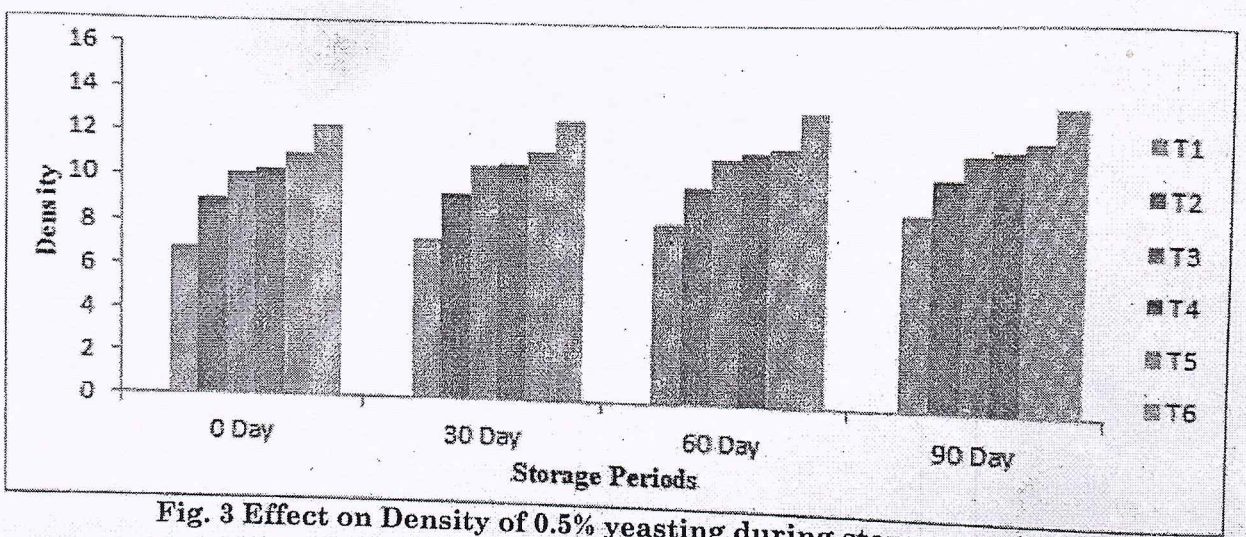


Fig. 3 Effect on Density of 0.5% yeasting during storage period

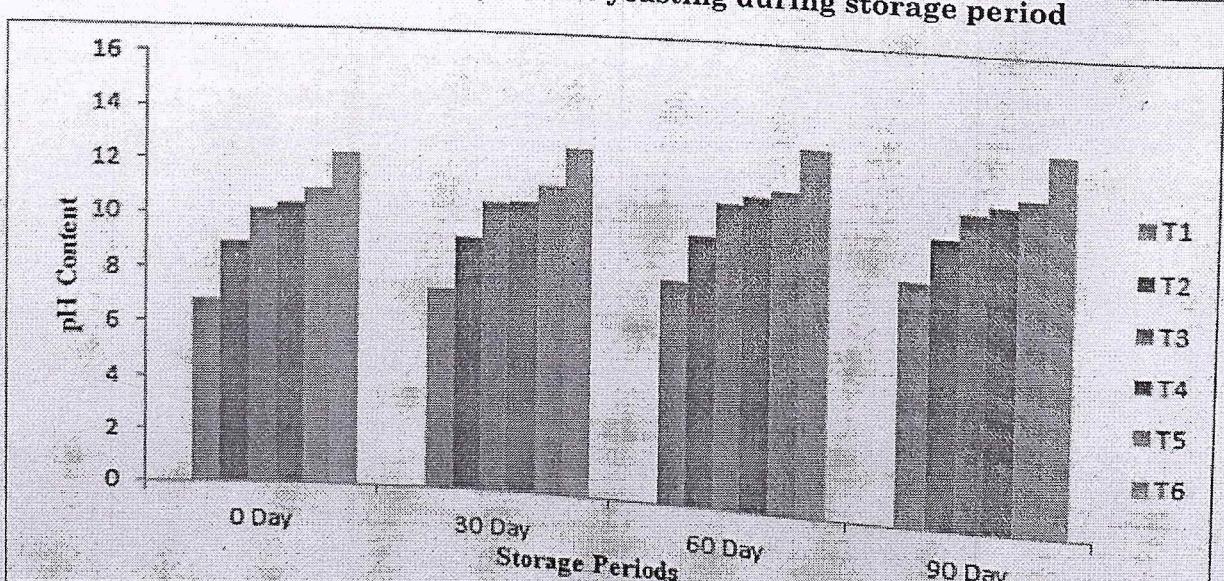


Fig. 4 Effect on pH content of 0.5% yeasting during storage period

Co-ordinator
IQAC, Shri Ram College
Muzaffarnagar

Chairman
IQAC, Shri Ram College,
Muzaffarnagar

Scanned with OKEN Scanner

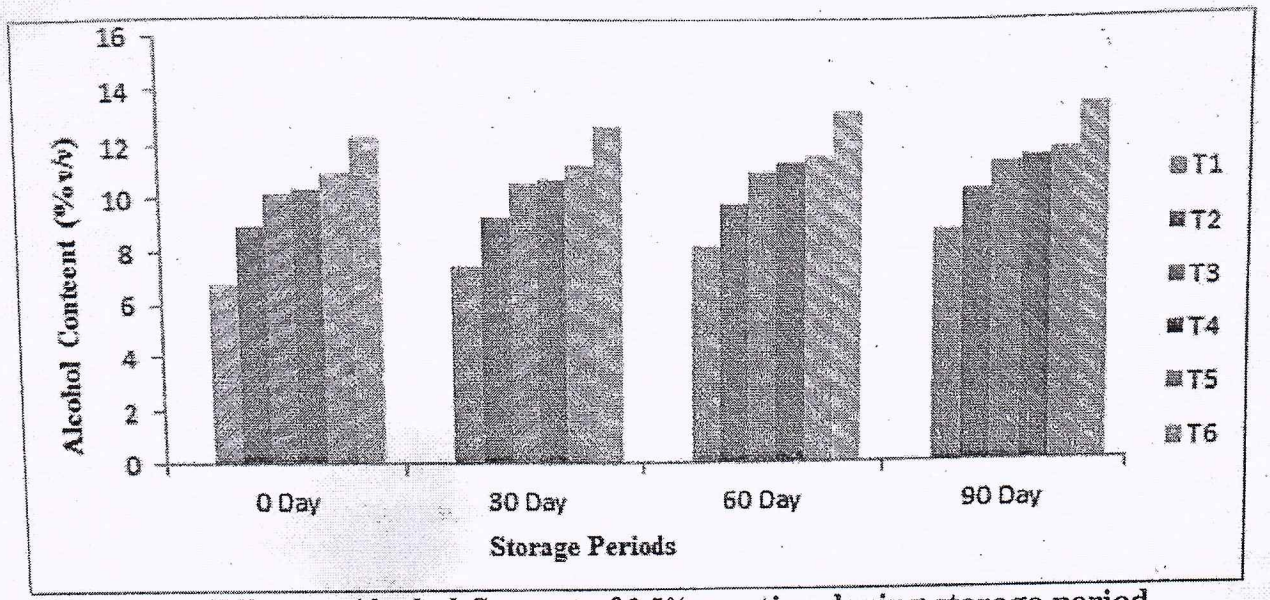


Fig. 5 Effect on Alcohol Content of 0.5% yeasting during storage period

Conclusion

Wine is any alcoholic beverage produced from juices of variety of fruits by fermentative action of microorganisms either spontaneously or seeding with a particular strain mainly of yeast species to adopt a particular quality of wine. Wine is one of the most recognizable high value added products from fruits. Most commercially produced wines are usually made from fermented grapes; this fermentation process is not done by introducing any chemicals or sugar but by adding different species of yeast to the crushed grapes. Yeast has the capability of converting grapes into an alcoholic compound and removing the sugar content in it for the production of different types of wines. The nutritive value of wine is increased due to release of amino acids and other nutrients from yeast during fermentation. We noted high fermentation activity of the yeast which to complete the fermentation after 30 days. Increase in sugar concentration also increases the acidity of wine. Inoculum % has very less effect on physicochemical parameters of fermented juice. The wine has been produced by a technology similar to that of traditional wine production. As the demand for wine there is also a requirement for experts who can create the good quality wine. Little work has been reported on development and quality assessment of mixed fruits wine developed from mixed fruits incorporating grapes, orange, pineapple and banana fruits. Thus, there is a need to develop the mixed fruits red wine which would serve as nutritious products. In this sequence, this study was conducted to developed mixed fruits wine (Kumar, *et al.*, 2021).

Acknowledgement:

We would like to acknowledge the Department of Agricultural Engineering (S.V.P. University of Agricultual and Technology, Modipuram, Meerut) for providing facilities to conduct the experiment.

References:

- Okeke, B.C., Agu, K.C., Uba, P.O., Awah, N.S., Anaukwu, C.G., Archibong, E.J., Uwanta, L.I., Ezeneche, J.N., Ezenwa, C.U. and Orji, M.U. (2015) wine production from mixed fruits (Pineapple and watermelon) using high alcohol tolerant yeast isolated from palm wine, *Universal journal of microbiology research* vol. 3(4): 41 – 45.
- Kelebek, H., Selli, S. and Canbas, A. (2013) HPLC determination of organic acids, sugars, phenolic compositions and antioxidant capacity of organic juice and orange wine. *Microchemical journal* 91, 20 – 24.
- Yabaya, A., Bobai, M. and Adebayo, L.R. (2016) production of wine from fermentation of vitis

Co-ordinator IQAC, Shri Ram College Muzaffarnagar
Chairman IQAC, Shri Ram College, Muzaffarnagar
Scanned with OKEN Scanner

vinfera (grape) juice using *Sacchromyces cerevisiae* strain isolated from palm wine, *International journal of information research and revie*, Vol. 3(10): 2834 – 2840.

- Adams, M .R. (1990) tropical aspects of fermented foods, *Trends in food science and technology*, vol. 1: 141 – 144.
- Aidoo, K.E. (1994) applications of biotechnology to indigenous fermented foods, *Proctechno*, vol. 12: 83 – 94.
- Guleria, A. (2014) production of grapes wine by the use of yeast, *Saccharomycese cerevisiae*, global journal of research analysis, Vol. 3(6): 1 – 5.
- Ochai, J. O. and Kolhatkar, A. (2008). Medical Laboratory Science and Practice. Tata McGrewHill Publishing Limited New Delhi, New York. Pp 50-53, 803.
- Ranganna, S. (1986). *Hand Book of Analysis and Quality Control for Fruit and Vegetable Products. 2nd ed. McGraw Hill Pub. New Delhi*
- Maziar, S.A. (2010). A study on some efficient parameters in batch fermentation of ethanol using *Saccharomyces cerevesiae* SC1 extracted from fermented siahe sardasht pomace. *African Journal of Biotechnology*, Vol. 9 (20): 2906- 2912.
- Kumar, V., Singh, J., Singh, B.R., Chauhan, N., Chanda, S., Yadav, M.K., Kumar, V. and Kumar, P. (2021) Effect of Physico-Chemical Characteristics of Developed Mixed Fruits Wine during Fermentation Process, *Journal of Exerimental Agriclture International*, 43(6): 53-60.

Received : May 2024; Revised : June 2024; Accepted : July 2024

Co-ordinator
IQAC, Shri Ram College
Muzaffarnagar

Chairman
IQAC, Shri Ram College,
Muzaffarnagar

Scanned with OKEN Scanner

Prog. Agric. 24 (1) : 128-136 (2024)
DOI : 10.5958/0976-4615.2024.00019.4

Society for Recent Development in Agriculture
Website : www.progressiveagriculture.in

EFFECT OF DIFFERENT NITROGEN LEVELS AND FYM ON GROWTH AND YIELD OF WHEAT (TRITICUM AESTIVUM L.).

Sarika1, Suhal Sardar2, Raj Kumar2, Ashok Kumar2, Suraj Singh

1 Department of agriculture Himgiri Zee University Dehradun.
2 Department of agriculture Shi Ram College Muzaffarnagar

***Corresponding Author Email -**

Abstract

The experiment was carried to determine the Effect of different Nitrogen levels and FYM on Growth, and Yield of wheat (*Triticum aestivum L.*) during rabi (winter) season 2021-22 at the Agronomy Research Farm, Agriculture Department, Himgiri Zee University, Selaqui, Dehradun Uttarakhand. Experiment was conducted on wheat variety of W-75.The soil of experimental site was sandy loam in texture pH 7.27, Electrical conductivity (EC) 0.18 dSm^{-1}, Organic Carbon (4.9 g Kg^{-1}) low, alkaline $KMnO_4$ N 265.30 Kg ha^{-1}, Olson –P 24.88 Kg ha^{-1} ammonium acetate extractable K 108.70 Kg ha^{-1}.The treatments comprised of 4 level of nitrogen N_1 (60 kg N/ha), N_2 (90 kg N/ha), N_3 (120 kg N/ha), N_4 (150 kg N/ha) and one level of farm yard manure at which FYM was applied@ 6 tonnes ha^{-1} with the three levels of nitrogen (60, 90 and 120 kg ha^{-1}) in the mode of soil application. There were 8 treatments combinations T_1 Control (without fertilizer), T_2 (60 kg N + 60 kg P^2O^5 + 60 kg K^2O ha^{-1}), T_3 (90 kg N + 60 kg P^2O^5 + 60 kg K^2O ha^{-1}), T_4 (120 kg N + 60 kg P^2O^5 + 60 kg K^2O ha^{-1}), T_5 (60 kg N + 60 kg P^2O^5 + 60 kg K^2O + FYM 6 tones ha^{-1} a) T_6 (90 kg N + 60 kg P^2O^5 + 60 kg K^2O + FYM 6 tones ha^{-1}) ,T_7 (120 kg N + 60 kg P^2O^5 + 60 kg K^2O + FYM 6 tones ha^{-1}), and T_8 (150 Kg N + 60 kg P^2O^5 + 60 kg K^2O ha^{-1}) replicated thrice in a randomized block design with in 24 plots. The results revealed that the application of 120Kg Nitrogen with Farm yard manure @ 6tones ha^{-1} gave the maximum plant height, number of tillers m^{-2}, dry matter accumulation, and yield attributing characters, grain yield, straw yield, and biological yield. The maximum plant height **86.75 cm,** number of tillers 93.68 m^{-1}row length, and dry matter accumulation 751.75 g m^{-1} row length respectively was recorded in T_7 where 6 t ha^{-1} FYM was applied with 120 Kg nitrogen in the experimental year followed by T_8 where 150 kg nitrogen was applied with recommended P and K. The similar trends were also recorded in the grain, straw and biological yield. Maximum grain yield (37.63 q ha^{-1}),straw yield (50.36 q ha^{-1}) and biological yield (87.99 q ha^{-1}) in the treatment T7 where 6 t ha^{-1} FYM was applied with the combination of 120 Kg N ha^{-1} which were statistically at par with the treatment T8 (36.20, 48.66 q/ha and 85.19 q ha^{-1} respectively) where 150 kg N ha^{-1} was applied.

Introduction

Wheat (*Triticum aestivum* L.) is the world's most outstanding crop that excels all other cereals both in area and production, known as the king of cereals. It is the single most important cereal crop that has been considered an integral component of the food security system of the several nations of Europe, West Asia, and North Africa. It ranks first in the world, among the cereals in respect of an area (219 m ha) and production (715.9 m tones) **(Anonymous 2016-17).** It is primarily grown in temperate regions and also at higher altitude under tropical climate areas in winter season. In India, it is grown an area of 30.79 million hectares with the production of 98.51 million tonnes and average productivity of 3.20 t ha^{-1}**(Anonymous, 2017-18).** India is concerned, about 91% of the

Co-ordinator
IQAC, Shri Ram College
Muzaffarnagar

Chairman
IQAC, Shri Ram College,
Muzaffarnagar

total wheat production is contributed by northern states like Uttar Pradesh, Haryana, and Punjab, where Uttar Pradesh ranks first with respect to area (9.65 m ha) and production (26.87 m tones) but the productivity is much lower (2784 kg ha^{-1}) as compared to Punjab and Haryana (4511 kg ha^{-1}) **(Anonymous, 2016-17)**. In Uttarakhand, agro-climate conditions vary from sub-tropical to temperate. During 2011-12, in hilly region, wheat yield from 1.96 lakh hectare was recorded to be 2.64 lakh tones showing average productivity of 13.4 q ha^{-1}. Whereas, in the plain areas, production was noted as 35.7 q ha^{-1} followed by productivity of 23.8 q ha^{-1}. In Uttarakhand, wheat is grown on 0.3 m ha area with production and productivity of 0.84 mt and 2.33 t ha^{-1} respectively **(Anonymous, 2014)**. In an experiment conducted Rudraprayag district of Uttarakhand under the front line demonstration (FLD), wheat yield obtained was 2.15 t ha^{-1} which is 28.83% more that the yield from field with only traditional practices used by farmer (1.67 t ha^{-1}) **(Singh 2017)**. Among the major nutrients, nitrogen is most essential nutrient among essential plant nutrients, plays key role in plant growth, development and production. Nitrogen is one of the major factors that plays important role in plant metabolism and determines the crop vigor and yield **(Korres and Froud, 2000)**. Nitrogen is essential for protein production in plants, which is the direct or indirect source of protein for animal and human nutrition **Prasad, 2003)**. Plant need adequate dose of chemical fertilizer to meet its nitrogen requirements which increases the number of tillers, spikelets, grains, spike length and weight of the grain **(Ali et al, 2000)**. Although increased levels of production can be achieved by increased use of fertilizers, but continuous use of chemical fertilizers alone may lead to decline in productivity, loss of secondary micronutrients and some detrimental effect on physico-chemical properties of soil **(Joy et al., 2018, Bhatt, 2017)**. and may not be so remunerated unless the fertility of the soil is maintained at sustainable levels by application of organic manure. Therefore, to maintain soil fertility and productivity at a sustainable level for long duration, use of organic manure is quite essential. Use of organic and inorganic nutrient resources together not only maintain soil fertility and provide proper nutrition to the crop, it is environment friendly and cost effective approach for cultivation. **(Hassan et al., 2018)**. Integrating the organic and inorganic sources of Nitrogen is a beneficial practice which increases the efficiency of utilization of Nitrogen **(Zahoor et al. 2015)**. Integrating use of inorganic fertilizers with FYM improves the yield in wheat crop more than inorganic fertilizers or FYM used separately. It shows impressive results and is thus recommended for optimum wheat production **(Rathi et al, 2019)**.

Material and Methods

The experiment was performed at the Agronomy Research Farm, Agriculture Department, Himgiri Zee University, Selaqui, Chakrata Road, Dehradun, and Uttarakhand during Rabi season 2021-2022. The experimental site is located in Dehradun in the foothill of the lower Himalayas in the Shivalik range at 650 m MSL. The site is situated at 31° 21′ 50" N latitude and 78° 18′ 27" E longitude. The soil of experimental site was sandy loam in texture pH 7.27, Electrical conductivity (EC) 0.18 dSm^{-1}, Organic Carbon (4.9 g Kg^{-1}) low, alkaline $KMnO_4$ N 265.30 Kg ha^{-1}, Olson –P 24.88 Kg ha^{-1} ammonium acetate extractable K 108.70 Kg ha^{-1}.The treatments comprised of 4 level of nitrogen N_1 (60 kg N/ha), N_2 (90 kg N/ha), N_3 (120 kg N/ha), N_4 (150 kg N/ha) and one level of farm yard manure at which FYM was applied@ 6 tonnes ha^{-1} with the three levels of nitrogen (60, 90 and 120 kg ha^{-1}) in the mode of soil application. There were 8 treatments combinations T_1 Control (without fertilizer), T_2 (60 kg N + 60 kg P^2O^5 + 60 kg K^2O ha^{-1}), T_3 (90 kg N + 60 kg P^2O^5 + 60 kg K^2O ha^{-1}), T_4 (120 kg N + 60 kg P^2O^5 + 60 kg K^2O ha^{-1}), T_5 (60 kg N + 60 kg P^2O^5 + 60 kg K^2O + FYM 6 tones ha^{-1}) T_6 (90 kg N + 60 kg P^2O^5 + 60 kg K^2O + FYM 6 tones ha^{-1}) ,T_7 (120 kg N + 60 kg P^2O^5 + 60 kg K^2O + FYM 6 tones ha^{-1}), and T_8 (150 Kg N + 60 kg P^2O^5 + 60 kg K^2O ha^{-1}) replicated thrice in a randomized block design. The farm yard manure @ 6 t ha^{-1} were applied at time of sowing with the combination of different nitrogen level. While the calculated dose of Urea, Di ammonium Phosphate (DAP) , Muriate of Potash (MOP), were used to provide N, P, K, and micronutrients as per treatments in T_2-T_8 Whereas in T_1 control no fertilizers were used. A

Co-Ordinator IQAC, Shri Ram College Muzaffarnagar
Chairman IQAC, Shri Ram College Muzaffarnagar

half dose of N, full dose of P, K, and farm yard manure were applied at the time of sowing while remaining half dose of N were applied in three equal splits at the Crown root initiation, Tillering and Late jointing stages of wheat. Growth observations were recorded at 30 and 60 day after sowing (DAS) and at the harvesting of the wheat crop. Yield attributes were recorded at harvest and grain and straw yield was recorded plot wise after threshing of produce. After cleaning and drying the to 14 per cent moisture. The yield of net plot, thus converted to q ha^{-1}. Dry weight of straw collected from net plot was recorded after sun grains; the grain yield was recorded in kg per plot. The entire data was analyzed statistically by using ANOVA. Chemical analysis of soil sample was done by using standard methods in the Department of agriculture Himgiri Zee University, Selaqui, Chakrata Road Dehradun Uttarakhand.

Results and Discussion

Plant height

The data regarding the application effect of different Nitrogen levels and FYM (Farm Yard Manure) on plant height of wheat at 30, 60 DAS and harvesting during 2022 are shown in Table.1 It is clear from the table that measured plant height was affected significantly by different treatments at the entire observation interval during the experimental year. Plant height increased at faster rate till 60 DAS while after that the increment in plant height was slower. The plant height measured at 30 DAS ranged from 18.85 to 29.76 cm during the experimental year respectively ,under different treatments and affected significantly with the application of different treatments. Maximum plant height was recorded with T_7 where 120 kg was applied with the combination of FYM 10 toes ha^{-1}.Which was significantly at par with the treatments T_8, T_6, T_5, T_4 and T_3 and significantly superior than the reatment T1 control which was no fertilizer was sed. Regarding nitrogen nutrition practices, lant height as increased significantly with ıcreasing levels of nitrogen from 60, 90, 120 and 50 kg ha^{-1} alone and combination with FYM (6 nes ha^{-1}). The combination of nitrogen 120 kg $^{-1}$ with FYM (6 tones ha^{-1}) was found gnificantly superior followed by treatment T8 where 150 kg N ha^{-1} was applied with recommended P and K with respect to the plant height over the rest of nitrogen applied treatments. The minimum plant height was observed in the treatment T1 control (Without fertilizer).Plant height increases by 31.93 to 57.82 per cent with increase the levels of nitrogen alone and in combination with FYM than T1 control.

At 60 DAS stage plant height ranged from **58.42** to **72.52** cm during the experimental year respectively under different treatments and varied significantly than the rest of treatments. Plant height increased by 8.57 to 24.14 per cent. At this stage the maximum plant height **72.52 cm** was recorded in T_7 where 6 t ha^{-1}FYM was applied with 120 Kg nitrogen in the experimental year followed by T_8 (**71.63 cm**) where 150 kg nitrogen was applied with recommended P and K. With exception of T_1, T_2, T_3, and T_4, rest of the treatments having nitrogen application alone and combination with FYM were found statistically at par in respect of plant height at 60 DAS during the experimental years. At this stage also comparatively lower plant height was recorded in the treatments where nitrogen was applied alone than the combination with FYM. At 90 DAS stage increment of 4.79 to 15.09 per cent in plant height was found during experimental year. At this stage maximum plant height (**88.00** cm) was recorded in T_7 (6 t ha^{-1}FYM with 120 kg N ha^{-1}) followed by T_8 (**85.67 cm**) where 150 kg nitrogen with recommended P and K was applied. The highest plant height at 90 DAS was observed in the treatment T_7 which was significantly at par with the treatments T_8, T_6 and significantly superior than the rest of the treatments during the experimental year. At harvest stage plant height ranged from **74.34** to **86.75** cm during the experimental year respectively under different treatments and varied significantly than the rest of treatments. Plant height increased by 5.25 to 16.69 per cent. At this stage the maximum plant height **86.75 cm** was recorded in T_7 where 6 t ha^{-1} FYM was applied with 120 Kg nitrogen in the experimental year followed by T_8 (**84.79 cm**) where 150 kg nitrogen was applied with recommended P and K. With exception of T_1, T_2, and T_3 rest of the treatments having nitrogen application with recommended P and K and the combination with FYM were found statistically at par in respect o

Co-ordinator IQAC, Shri Ram College Muzaffarnagar
Chairman IQAC, Shri Ram College Muzaffarnagar

plant height at harvest during the experimental years. At this stage also comparatively lower plant height was recorded in the treatments where nitrogen was applied alone than the combination with FYM. At all growth stages highest plant height was recorded in T_7 where 6 t ha^{-1} FYM with 120 kg nitrogen was applied and equally good with the treatment T_5 where 150 kg nitrogen was applied with recommended P and K. Plant height of wheat at different stage was affected significantly by different treatments. The plant height recorded in T_7 (120 kg N + 60 kg P^2O^5 + 60 kg K^2O + 6 t ha^{-1} FYM) was significantly higher than the rest of the treatments during the experimental year. Plant height was slightly lower in the treatments receiving nitrogen nutrition with the combination of recommended P and K than the treatments receiving nitrogen with the combination of recommended P, K and FYM. This effect may be supposed due to adequate availability of NPK and micronutrients with the application of recommended NPK and FYM. On the decomposition of FYM many essential plant nutrient become available to plant and many chelating agents are produced which increased the availability of micronutrients and dissolution of minerals which naturally found in the soil. The balanced supply of nutrients plays an important role for rapid growth and development of a crop. Cells protein content increase as the application of nitrogen increase and size of plant cell increases, as a result of that leaf area and photosynthesis rate rises which ultimately make the plant taller **(Wysocki et al., 2007)**. The increase in plant height was because nitrogen increases leaf area which results in high rate of photosynthesis, more production of assimilates and plant dry matter. These results are similar to **Liaqat et al.,(2003)** who also reported that plant height was significantly increased by different doses of nitrogen. Application of nitrogen significantly increased the growth parameters. Application of 120 kg N/ha produced significantly taller plants, more number of tillers and dry matter than all other levels of nitrogen. Similar result also found by **(Ullah et al., 2018)**.

Number of tillers (m^{-1} row length)

The data regarding the application effect of different Nitrogen levels and FYM (Farm Yard Manure) on number of tillers m^{-1} row length of wheat at 60 DAS and at harvest during 2021 are shown in Table.2. It is clear from the table that measured number of tillers m^{-1} row length was affected significantly by different treatments at the entire observation interval during the experimental year. Number of tillers increased at faster rate till 60 DAS while after this no further increment in number tillers. The number of tillers measured at 60 DAS ranged from 53.97 to 93.68 m^{-1} row length during the experimental year respectively under different treatments. The highest number of tillers was observed in the treatment T_7 (93.68 m^{-1}) which was significantly higher than the rest of treatment and at par with the treatment T_5 (91.25 m^{-1}). The minimum number of tillers was observed in the treatment T_1 (53.97) control where no fertilizer was used. The number of tillers increases with increases the level of N alone and combination with FYM. The number of tillers m^{-1} increases from 19.32 to 73.57 per cent in the different treatments than the control. The number of tillers measured at Harvest ranges from 47.76 to 90.78 per m^{-1} row length during the experimental year under the different treatments. The higher number of tillers per m^{-1} row length was observed in the treatment T_7 (90.78 m^{-1}) which was significantly higher than the rest of treatment and at par with the treatment T_5 (88.45 m^{-1}). The minimum number of tillers was observed in the treatment T_1 (47.76) control where no fertilizer was used. The number of tillers increases in the treatment where increases the level of N alone and combination with FYM. The number of tillers per m^{-1} row length increases from 28.24 to 90.07 per cent in the different treatments than the control. This effect may be supposed due to nitrogen has a vital role in cell division and elongation. Thus nitrogen favored greater assimilation of protein and carbohydrates. These two compound present in meristematic region of the plant induce rapid cell elongation which ultimately result in better plant growth. Tillering ability is genetically controlled but it also much dependent on other organic input and increasing nitrogen supply further increasing the tiller number. The interaction effect of nitrogen and FYM treatments on number of tillers/m2 was found to be significant. The balanced supply of nutrients plays an important role for rapid growth

Chairman
IOAC, Shri Ram College
Muzaffarnagar

and development of a crop. Organic manures supply both macro and micro-nutrients and also improve the availability of native nutrients. Application of 120 kg N/ha significantly increased growth parameters, yield and yield attributes as compared to control. Application of 15 t/ha FYM along with 120 kg N/ha significantly improved the growth and yield of wheat. Similar results were reported by **Kavinder (2019) and Kumar et al. (2001)** also reported that increasing dose of nitrogen significantly increased the number of spike bearing tiller. These results are confirmatory to those revealed by **Ullah et al. (2018),**

Dry matter accumulation (g m^{-1} row length)

The data regarding the application effect of different Nitrogen levels and FYM (Farm Yard Manure) on Dry matter accumulation (g m^{-1} row length) of wheat at 30, 60 DAS and at harvest during 2021 are shown in Table.2. It is clear from the table that measured dry matter accumulation (g m^{-1} row length) was affected significantly by different treatments at the entire observation interval during the experimental year. The number dry matter accumulation (g m^{-1} row length) measured at 30 DAS ranged from 47.12 to 62.43 (g m^{-1} row length) during the experimental year respectively under different treatments. The maximum dry matter accumulation (g m^{-1} row length) was observed in the treatment T_7 (62.43 g m^{-1} row length) which were significantly higher than the rest of treatments and at par with the treatment T_8 (57.35 g m^{-1} row length) and T_6 (56.36 g m^{-1} row length). The minimum dry matter accumulation (g m^{-1} row length) was observed in the treatment T_1 (47.12 g m^{-1} row length) Control where no fertilizer was applied. The dry matter accumulation (g m^{-1} row length) increases with increases the level of N alone and combination with FYM. The dry matter accumulation (g m^{-1} row length) increases from 4.39 to 32.49 per cent in the different treatments than the control. The number dry matter accumulation (g m^{-1} row length) measured at 60 DAS ranged from 283.96 to 373.99 (g m^{-1} row length) during the experimental year respectively under different treatments. The maximum dry matter accumulation (g m^{-1} row length) was observed in the treatment T_7 (373.99 g m^{-1} row length) which were significantly higher than the rest of treatments. The minimum dry matter accumulation (g m^{-1} row length) was observed in the treatment T_1 (283.96 g m^{-1} row length) Control where no fertilizer was applied. The dry matter accumulation (g m^{-1} row length) increases with increases the level of N alone and combination with FYM. The dry matter accumulation (g m^{-1} row length) increases from 3.91 to 31.70 per cent in the different treatments than the control. The number dry matter accumulation (g m^{-1} row length) measured at harvest ranged from 589.92to 751.75 (g m^{-1} row length) during the experimental year respectively under different treatments. The maximum dry matter accumulation (g m^{-1} row length) was observed in the treatment T_7 (751.75 g m^{-1} row length) which were significantly higher than the rest of treatments. The minimum dry matter accumulation (g m^{-1} row length) was observed in the treatment T_1 (589.92g m^{-1} row length) Control where no fertilizer was applied. The dry matter accumulation (g m^{-1} row length) increases with increases the level of N alone and combination with FYM. The dry matter accumulation (g m^{-1} row length) increases from 3.14 to 27.43 per cent in the different treatments than the control. This result might be recorded due to increasing the N level increased plant height, tillers m^{-1} row length, no. of leaves leaf area index indicating higher chlorophilic area improving photosynthetic efficiency of plant under 150 Kg N ha^{-1} and 120 kg N ha^{-1} with FYM @6t ha^{-1}. Application of nitrogen significantly increased the growth parameters. Application of 120 kg N ha^{-1} produced significantly taller plants, more number of tillers and dry matter accumulation than all other levels of nitrogen. Similar results were reported by **Singh and Agrawal (2005).** Such improvement in dry matter accumulation due to N application has also been reported by **Ali et al. (2011) and Shirazi et al. (2014).** The higher dose of N led to higher accumulation of dry matter, thus the effect is reflected in the form of crop growth rate between different sub stages **Satyanarayana et al. (2017)** also reported similar results.

Grain yield (q ha^{-1})

It is clear from the table.3 that grain yield of wheat ranged from 17.800 to 37.633 qha^{-1} during the experimental year respectively under different

IQAC, Shri Ram College Muzaffarnagar
Chairman IQAC, Shri Ram College Muzaffarnagar

treatments. The maximum grain yield was observed in the treatment T_7 (37.633) which were significantly higher than the rest of treatment and at par with the treatment T8 (36.200). The minimum grain yield was recorded in the treatment T_1 (17.80) control where nitrogen was not applied and which was significantly differ then the other treatments. The grain yield increases with increases the level of N alone and combination with FYM. The grain yield increases from 18.53 to 111.42 per cent in the different treatments than the control. Similar result also recorded by **Ullah et. Al.,(2018)** Wheat grain yield was also significantly increased by different levels of nitrogen. Maximum grain yield (5576 kg ha-1) was obtained from T6 while minimum grain yield (1881.3 kg ha -1) was recorded from the treatment where no application of nitrogen was done. Among all the essential nutrients applied to the plants nitrogen is the major one which has a key role in the process of photosynthesis. Increased rate of photosynthesis by the high dose of nitrogen gave more yield because large amount of dry matter, more assimilates were produced and transported to fill the seeds as a result of more applied nitrogen.

Straw yield (q ha^{-1}) The data are shown in Table.3 the straw yield ranged from 27.36 to 50.36 ha^{-1} during the experimental year respectively under different treatments. The maximum straw yield was observed in the treatment T_7 (50.36) which were significantly higher than the rest of treatments and at par with the treatment T_8 (48.66) and T_6 (46.16). The minimum straw yield was observed in the treatment T_1 (27.36) control where no fertilizer was applied. The straw yield increases with increases the level of N alone and combination with FYM. The straw yield increases from 17.90 to 84.06 per cent in the different treatments than the control. **Singh and Singh. (2017)** also recorded the similar result the wheat yield was significantly affected by nitrogen fertilizer, FYM and their interaction. Stover yield increased under different N levels was significantly higher over control. Straw production followed trend similar to grain yield with higher values recorded with 12.0 kg N ha-1.Grain and straw yield of wheat increased significantly with the application of FYM. The increase in wheat grain yield was 24.2% with application of 7.5 t FYM ha-1 over the control. It is might be due to steady decomposition of FYM and release of nutrients throughout the crop growth period coupled with better assimilation of nutrients **(Kumar et al. 2015, Singh et al. 2016).**

Biological yield (q ha^{-1})

The data are shown in Table.3 the biological yield ranged from 45.16 to 87.993 during the experimental year respectively under different treatments. The highest biological yield was found in the treatment T_7 (87.993) which were significantly higher than the rest of treatments and statistically at par with the treatment T8 (84.86). The minimum biological yield was observed in the treatment T_1 (45.16) control where no fertilizer was applied. The biological yield significantly increases with increases the level of N alone and combination with FYM. The biological yield increases from 18.15 to 94.84 per cent in the different treatments than the control. Maximum grain yield (37.63 q ha^{-1}) ,straw yield (50.36 q ha^{-1}) and biological yield (87.99 q ha^{-1}) were recorded under application of FYM 6 t ha-1with the combination of 120 Kg N ha^{-1} in rabi season which were statistically at par with the treatment T8 (36.20, 48.66 q/ha and 85.19 q/ha respectively) where 150 kg N ha^{-1} was applied in rabi season while significantly higher among the treatments receiving FYM and N application. The beneficial effect of organic manures on grain, straw and biological yields might be assigned to the fact that after proper decomposition and mineralization, these manures supplied available plant nutrients directly to the plants and also had solubilizing effect on fixed forms of nutrients in soil. **Singh and Agarwal (2004)** also reported higher yield of wheat with increasing dose of FYM. Grain, straw and biological yield was increased due to with nitrogen's effect may be linked mostly to its role in the stimulation of numerous physiologica processes such as cell division and cell elongation which resulted in more photosynthetic area, whic boosted photosynthetic production and, as a resul spike and grain numbers. The promoting effects nitrogen on spikes number m^{-2} and grains numb spike-1. Similar result was reported by **El.Say and Hammad (2007), and Kaur and Sin (2015).**

Co-ordinator
IQAC, Shri Ram College
Muzaffarnagar
Chairman
IQAC, Shri Ram College,
Muzaffarnagar

Conclusion

On the basis of results it may be concluded that for obtaining optimum growth and yield attributes as well as yield from wheat crop 120 kg nitrogen should be applied with the combination of 6 tones ha^{-1} FYM. The cost of cultivation with the use of organic manure may be comparatively higher but to some extent it will also replenish the deficit nutrients and therefore the soil health will be maintained. The study shows that the application of nitrogen @ 150 kg ha^{-1} is also increase the yield of wheat and equally good with treatment receiving120 kg nitrogen with the combination of 6 tones ha^{-1} FYM.

References

- Ali A., M.A. Choudhry, M.A. Malik. R. Ahmad and Saifullah. (2000). Effect of various doses of nitrogen on the growth and yield of two wheat cultivar. Pak. J. Biol. Sci., 3(6): 1004-1005.
- Anonymous (2016-17). The 2nd Advance Estimates of production of major crops for 2016-17 have been released by the Department of Agriculture, Cooperation and Farmers Welfare on 15th February, 2017.
- Anonymous, (2017-18). http://www.agricoop.nic.in
- Anonymous,2014. http://www.krishijagran.com-area, production and yield of wheat during 2011-12 and 2012-14 in major producing state.
- Bhatt, M.K., Labanya, R., Joshi, H.C., Pareek, N., Chandra, R., & Raverkar, K.P. (2017). long-term effects of inorganic fertilizers and fym on soil chemical properties and yield of wheat under rice-wheat cropping system. ENVIS Bulletin Himalayan Ecology, Vol 25.
- Dinesh Pratap Singh and Dashrath Singh (2017) Effect of nitrogen and FYM on yield, quality and uptake of nutrients in wheat (Triticum aestivum) Annals of Plant and Soil Research 19(2): 232 – 236.
- El-Sayed Soad, A. and S.M. Hammad (2007), Effect of nitrogen and potassium levels on agronomic and quality traits in three bread wheat cultivars. J.Agric Sci. Mansoura Univ., 32 (7): 5139- 5153.
- Gomaa, M.A., F.I. Radwan, E.E. Kandil and Seham M.A. El-Zweek Effect of Some Macro and Micronutrients Application Methods on Productivity and Quality of Wheat *(Triticum aestivum, L.)* Middle East Journal of Agriculture Research ISSN 2077-4605 Volume : 04 | Issue : 01 | Jan-Mar. | 2015 Pages: 01-11
- Hassan, A., Malik, A., Ahmad, S., Malik, A., Mir, S.A., Bashir, O., &Safal, R. (2018). Yield and Nitrogen Content of Wheat *(Triticum aestivum)* as Affected by FYM and Urea in Cold Arid Region of India. Int. J. Curr. Microbiol. App. Sci 7(2), 328-332. doi: https://doi.org/10.20546/ijcmas.2018.702.043
- Imdad Ullah, Nasir Ali , Saba Durrani, Muhammad Adeel Shabaz , Abdul Hafeez, Hafeez Ameer1, Muhammad Ishfaq1, Muhammad Rashid Fayyaz3, Abdur Rehman1 , Abdul Waheed (2018) Effect of Different Nitrogen Levels on Growth, Yield and Yield Contributing Attributes of Wheat. International Journal of Scientific & Engineering Research Volume 9, Issue 9, September- ISSN 2229-5518.
- Jince Mary M. Joy, Ravinder, J., Rakesh, S., & Somashekar, G. (2018). A review article on integrated nutrient management in wheat crop. International Journal of Chemical Studies; 6(4), 697-700.
- kaur Gurpreet, asthir Bavita and Bains Navtej Singh.(2015) Nitrogen levels effect on wheat nitrogen use efficiency and yield under field conditions June 2015 African Journal of Agricultural Research 10(23):2372-2377 DOI: 10.5897/AJAR2015.9668.
- Kavinder , Hooda V. S. , Yash Pal Malik , Devraj , Harender and Kavita (2019) Effect of Farm Yard Manure and Nitrogen Application on Growth and Productivity of Wheat under Long Term Experimental Conditions. 35(4): 1-7, 2019; Article no.CJAST.49137 ISSN: 2457-1024.
- Korres NE, Froud WRJ (2000). Effect of winter wheat cultivars and seed rate on the biological characteristics of naturally occurring weed flora. Weed Research. 42:417-428.

IQAC, Shri Ram College, Muzaffarnagar
Chairman IQAC, Shri Ram College, Muzaffarnagar

- Kumar A., Singh B. and Singh J. 2001. Response of macaroni wheat *(Triticum durum)* to nitrogen, phosphorus and sodic water on loamy-sand soils of southwest Haryana Indian Journal of Agronomy 46(1):118-121.
- Kumar, Y., Singh, S.P. and Singh, V.P. (2015) Effect of FYM and potassium on yield, nutrient uptake and economics of wheat in alluvial soil. Annals of Plant and Soil Research 17 (1): 100-103.
- Liaqat, A., Q. M. U. Din and M. ALI. 2003. Effect of Different Doses of Nitrogen Fertilizer on the Yield of Wheat. Int. J. Agri. & Bio. 5 (4):438–439.
- Prasad, R. 2003. Protein -energy malnutrition and fertilizer use in India. Fertiliser News 49(5): 65–67
- Rahman, M. Z.; Islam, M. T. and Karim, M. A. (2014). Dry matter accumulation, leaf area index and yield responses of wheat under different levels of nitrogen. *Bangladesh Journal of Agriculturist.***7** (1): 27-32.
- Rathi Deepika, Sharma Manoj, Ahlawat Isha, DahiyaGarima (2019). Yield and Yield Attributes of Wheat Crop Response to FYM and Fertilizers Application: A Review.)
- Satyanarayana M. , Pratap Kumar Reddy A. , Spandana Bhatt P. , Narender Reddy S. and Padmaja J. (2017) Effect of Different Varieties and Levels of Nitrogen on Growth Functions of Wheat *(Triticum aestivum L.)* Int.J.Curr.Microbiol.App.Sci 6(8): 3435-3442.
- Shirazi S. M., Zulkifli Yusop, Zardari N. H., and Ismail Z. (2014) Effect of Irrigation Regimes and Nitrogen Levels on the Growth and Yield of Wheat *Hindawi Publishing Corporation Advances in Agriculture* Volume 2014, Article ID 250874, 6 pages http://dx.doi.org/10.1155/2014/250874.
- Singh, A.P., Lal, A.K. and Singh, A.P. (2016) Effect of FYM, potassium and zinc on yield, quality and uptake of nutrients in forage oat in alluvial soil. Annals of Plant and Soil Research 18 (4): 338-341.
- Singh, R, Hemant, K., Shweta., and Kumar, A. (2015) a. Growth and yield of late sown wheat as influenced by irrigation schedules and integrated nutrient management. Research Environmental Life Science 8(2): 275-277.
- Singh, R. &Agrawal, S.K. (2005).Effect of levels of farm yard manure and nitrogen fertilizer on grain yield and use efficiency of nutrients on wheat *(Triticum aestivum).* Indian J. Agric. Sci., 75(7), 408-413.
- Singh, R. and Yadav, D.S. (2006). Effect of rice *(Oryza sativa)* residue and nitrogen on performance of wheat *(Triticum aestivum L.)* under rice-wheat cropping system. Ind. J. Agron., 51(4): 247-250.
- Singh, S. B. (2017). Impact of frontline demonstrations on yield of wheat *(Triticum aestivum L.)* under rain fed condition in Uttarakhand. International Journal of Science, Environment and Technology, 6(1), 779-786.
- Wysocki, D. J., M. Corp, D. A. Horneck and L. K. Lutcher. 2007. Nutrient Management Guide: Irrigated and Dryland Canola. Oregon State University EM-8943-E. Available from: http://www.extension.oregonstate.edu/catalog/pdf/em/em8943-e.pdf
- Zahoor, W. Ahmad, K, Hira, A. Khan, M.T. Jan, K. Akhter, Bashir- ullah (2015). Integrated use of farm yard manure and urea fertilizer enhanced tissue nitrogen of wheat at different growth stages. Journal of Biology, Agriculture and Healthcare. 5:98-105.

Table.1 Effect of different Nitrogen levels and Farm Yard Manure (FYM) on plant height (cm.) at different growth stages.

Treatments	Plant height (cm.)			
	30 DAT	60 DAS	90 DAS	At harvest
T1	18.85	58.42	76.46	74.34
T2	24.87	63.43	80.13	78.25
T3	25.39	64.88	81.20	80.67
T4	27.23	67.27	83.13	82.45
T5	27.60	68.94	83.87	82.86
T6	27.90	69.88	84.67	83.38
T7	29.76	72.52	88.00	86.75

Co-ordinator IQAC, Shri Ram College Muzaffarnagar

Chairman IQAC, Shri Ram College Muzaffarnagar

T8	28.34	71.63	85.67	84.79
SE (m)	1.55	1.41	1.10	1.44
CD(p=0.05)	4.76	4.32	3.37	4.41

Table.2 Effect of different Nitrogen level and Farm Yard Manure (FYM) on number of tillers m^{-1} row length) and dry matter accumulation gm m^{-1} row length) at different stages.

reatments	No. of tillers	Dry matter accumulation(gm.)			
	60 DAS	At harvest	30 DAS	60 DAS	At Harvest
T1	53.97	47.76	47.12	283.96	589.92
T2	64.40	61.25	49.19	295.09	608.45
T3	69.78	67.28	50.26	302.43	643.38
T4	76.33	73.59	51.71	319.33	663.13
T5	79.34	77.47	53.14	338.00	707.67
T6	86.09	83.85	56.36	344.38	722.07
T7	93.68	90.78	62.43	373.99	751.75
T8	91.25	88.45	57.35	348.94	743.65
SE (m)	1.76	1.67	47.12	283.96	589
CD(p=0.05)	5.40	5.12	49.19	295.09	608

Table 3. Effect of different Nitrogen levels Farm Yard Manure (FYM) on yields (q ha- wheat.

Treatments	Yields (q ha^{-1})		
	Grain yield	Straw yield	Biologi yield
T1	17.80	27.36	45.16
T2	21.10	32.26	53.36
T3	23.83	35.36	59.19
T4	26.30	38.26	64.56
T5	30.60	42.36	72.96
T6	32.13	46.16	78.29
T7	37.63	50.36	87.99
T8	36.20	48.66	84.86
SE (m)	1.55	2.27	2.227
CD(p=0.05)	4.75	6.95	6.821

Received : May 2024; Revised : June 2024; Accepted : July 2024

Co-ordinator
IQAC, Shri Ram College
Muzaffarnagar

Chairman
IQAC, Shri Ram College,
Muzaffarnagar

The Pharma Innovation Journal 2023; SP-12(10): 1499-1504

www.ThePharmaJournal.com

The Pharma Innovation

ISSN (E): 2277-7695
ISSN (P): 2349-8242
NAAS Rating: 5.23
TPI 2023; SP-12(10): 1499-1504
© 2023 TPI
www.thepharmajournal.com
Received: 10-07-2023
Accepted: 14-08-2023

Anjali Jakhar
Assistant Professor,
Department of Agriculture,
Shri Ram Group College,
Muzaffarnagar, Uttar Pradesh,
India

Anil Kumar Gupta
Associate Professor,
Department of Dairy Science &
Technology, R.K. (PG) College,
Shamli, Uttar Pradesh, India

Vikrant Kumar
Assistant Professor,
Department of Agriculture,
Shri Ram Group College,
Muzaffarnagar, Uttar Pradesh,
India

Mohd. Nayeem Ali
Assistant Professor,
Department of Agriculture,
Shri Ram Group College,
Muzaffarnagar, Uttar Pradesh,
India

Mukul
Assistant Professor,
Department of Agriculture,
Shri Ram Group College,
Muzaffarnagar, Uttar Pradesh,
India

Corresponding Author:
Anjali Jakhar
Assistant Professor,
Department of Agriculture,
Shri Ram Group College,
Muzaffarnagar, Uttar Pradesh,
India

Climate change and food security in India

Anjali Jakhar, Anil Kumar Gupta, Vikrant Kumar, Mohd. Nayeem Ali and Mukul

Abstract
Accessibility of food implies food creation inside the nation, imports of food and earlier year stock in govt. storehouses. Admittance to food implies having adequate assets both financial and physical to acquired fitting eating regimen. Usage of food implies proper utilize in view of the information on fundamental nourishment which is essential for our wellbeing. Environmental change is any adjustment of environment after some time because of normal fluctuation or as a human movement. The Unified Country's Intergovernmental Board on Environmental change (UNIPCC) has expressed that regular peculiarities with the end goal that sun oriented variety and volcanoes created a large portion of the warming from pre-modern opportunity to 1950 and had a little cooling impact subsequently. As per IPCC (2007) assessments anticipate that the region under food grain, for example tumbled from 126.18 million hectare to 122.23 million hectare during the period from 1975-76 to 2008-09. The concentrate likewise demonstrates that there is an enormous scope variance nearby under the development in the Kharif season. To comprehend its effect on food creation, understanding its key dimensions is significant. Exceptional report on discharge situation (SRES) of the IPCC (2007) notices an alternate improvement way for worldwide harvest yield diminishes. To project the future food grain creation by utilizing relapse procedure, in the wake of ascertaining esteem by utilizing relapse method we find that India's food grains creation will be increment closest 308 million tons. So we presume that nation faces significant difficulties to build its food creation to the tune of 308 million tons by 2020-21, to take care of it's steadily developing populace.

Keywords: Food security, climate change, cultivation, economic & nutritional etc.

Introduction
A country might gain independence in food at a place of time yet the idea of food security necessities that convenient, dependable and healthfully satisfactory stockpile of food ought to be accessible on a drawn out premise. This suggests that a country needs to guarantee the development rate in food supply so that at exceeds the expansion in populace and furthermore the expansion popular coming about because of expansion in the pay of individuals.
The idea of food security has been developed in last quarter of twentieth hundred years, and has been a significant issue of conversation in number of world meetings assembled by the Unified Country Association in the 10 years of 1990's. A significant early move toward further developing world food culmination was the foundation of the worldwide data and early admonition framework on food and farming in Food and Agribusiness Association in 1975 which assists the local area with getting ready ahead of time to meet food crises. "Food security implies all individuals at all-time have physical and monetary admittance to adequate, protected and nutritious food to meet their dietary necessities and food inclinations for a functioning and sound life" (World food culmination 1996). The idea of food security characterized by FAO (1983) [19] planned idea of food security as" access by all individuals , consistently to enough nourishment for a functioning and sound life, it's fundamental components are the accessibility of food, admittance to food and the usage of food"
Environment is one of the principal determinants of agrarian creation and it could cause fluctuation in horticultural creation. Analysts and chairmen are worried about the possible harms and advantages that might emerge in future from environmental change and advantages and its effect on farming, since these will influence home grown and global strategies, exchanging design, asset use, and food security. Straightforwardly or by implication 55% of the nation populace relies upon the environment delicate area horticulture. The rural area is a main impetus in the gas outflow and land use impacts that cause environment. Decline in yield of harvests as temperature expansions in various pieces of India - For instance a 2 °C expansion in temperature, rice yields could diminish by around 0.75 ton/hectare in the high

Co-ordinator
IQAC, Shri Ram College
Muzaffarnagar

Chairman
IQAC, Shri Ram College,
Muzaffarnagar

return regions and by around 0.06 ton/hectare in the low yield waterfront districts, and 2 °C expansion in temperature Wheat Yield decreased by around 0.35 ton/hectare (in the event that northern India). Significant effects of environmental change will be on downpour taken care of yields (other than rice and wheat), which represent almost 60% of cropland region.

In emerging nation like India, the idea of food security goes through a change with the progressive phase arrived at by the general public, and at the current stage the food security in India might be envisioned to make accessible least amount of food grains to the whole populace. Food grains are significant in Indian setting, as our most memorable issue is to decrease hunger as opposed to go for other exorbitant things like vegetables, natural products, meats and so on, thusly drifts in per capita supply of food grain is constantly viewed as a mark of progress in the food security. In this manner to put it plainly, expanded accessibility of food is an important condition in food shortfall nations to accomplish food security which ought to be matched by decrease in destitution to guarantee financial access (for poor people), as well as the actual admittance to food by all individuals consistently both in amount and quality to meet their dietary prerequisite enough for a functioning life.

The Mission was gone on during the twelfth Arrangement with new focuses of extra creation of 25 million tons of food grains containing 10 million tons of rice, 8 million tons of wheat, 4 million tons of heartbeats and 3 million tons of coarse grains toward the twelfth Arrangement's end. Past the twelfth Arrangement (2017-18 to 2019-20), it was chosen to proceed with the program with new focuses to accomplish 13 million tons of extra food grains creation containing rice-5 million tons, wheat-3 million tons, beats 3 million tons and nutricum-coarse grains 2 million tons by 2019-20 with an extra unbiased to upgrade post-collect worth expansion at ranch entryway for better value acknowledgment to ranchers through proficient market linkages. The objective for the year 2020-21 is rice-1.7 million tons, wheat-1 million tons, beats 1 million tons and nutricum-coarse cereals 0.7 million tons.

Data and Methodology

This portion deals with the analytical procedure employed for analysing data to attain the objective of the article and to arrive at relevant conclusion. The estimating in the review utilizes the time series information of food grain creation from 2010-11 to 2019-20, in which year 2010-11 uncovers the base time frames. A period series information, takes just time requested grouping of perceptions of a variable and its investigation foster a model for anticipating future worth using past perception of the variable to be estimated. As in relapse examination during the assessment of boundaries, the equivalent weight is relegated to every one of the years taken in study.

The review is solely founded on Auxiliary information. Optional data got from different government workplaces and factual notices viz., Monetary Review, Service of Money, Horticulture Circumstance in short, Directorate of Financial aspects and Measurement Service of Farming, Govt of India. Different sources viz., Different month to month or quarterly diaries distributed by government and different important site and so on. The quick consequences of the projections of food grains creation in India. As finished up in strategic segment that the relapse approaches is sufficient for anticipating in light of the fact that variable don't connected with it. Hence it was utilized Pattern esteem ('b' coefficient) was found. To project the future food grain creation by utilizing Common Least Square strategy to track down the worth of 'b' coefficient as follows:

$$Y = a + bT$$

Where,
Y = Dependent Variable (production)
a & b = Constraint
T = Time Period (0, 1, 2, 3, ... n)

Make two normal equation (a) and (b) are given below:

$$\sum Y = Na + b\sum T \quad (a)$$

$$\sum YT = a\sum T + b\sum T^2 \quad (b)$$

By using these equations calculate value of constraint (a and b). After calculated the value of these constraint find out the projected requirement for rice, wheat, core cereals and pulses separately.

Result and Discussion

Global climate change is one of the important challenges humanity is facing today. Agriculture will continue to face twin challenges of growing population and sustainable use of natural resources inspite of significant advance made in the past. Thus, keeping the objective of the article in mind, to project future food grain production for the year 2020-21 in India using Regression Analysis in time series data. By using Regression analysis find the value of Trend coefficient ('b') for rice, for wheat, for core cereals and for pulses separately. After calculating the value of Trend coefficient ('b') calculated projected value of food grains for rice, for wheat, for core cereals and for pulses separately. Trend value ('coefficient) for rice 1.36, for wheat 1.40, for core cereals 0.79 and for pulses 0.34 respectively. Calculated projected value for rice, wheat, core cereals and pulses on the basis of these trend values for rice, wheat, core cereals, and pulses respectively. Previous value of food grains and projected value of rice, wheat, core cereals and pulses respectively (Table 1 and 2). After calculating value by using this technique we find that India's food grains production will be increase nearest 308 million tons. So we conclude that nation faces significant difficulties to expand its food creation to the tune of 308 million tons by 2020-21, to take care of its consistently developing populace, which is probably going to arrive at multiple billion by the 2020-21.

Status of food availability and its production

At the outset, it would be useful to understand the growth of food production in India in the recent past. Table -3 provides growth rates in area, production and yield of major food crops for the period 1990-91 to 2010-11. The production of rice & wheat grew at the rate of 0.58 percent & 1.72 percent between 1990-91 to 1999-2000. The growth rate was found 1.59 and 1.61 percent respectively for the period between 2000-01 and 2001-11. The country has imported a significant quantity of wheat when a poor crop forced the country plunder world markets for the first time in six years. (Table-3)

In view of changing dietary habits of the population. The production of 244.46 million tonnes seems sufficient to fulfill the domestic demand. According to Chand, "Per capita production of food grains increased from 18 kg. During early 1970s to 207 kg. By mid 1990s, even when country's population increased by more than 50 percent. After mid-

Co-ordinator
IQAC, Shri Ram College
Muzaffarnagar

Chairman
IQAC, Shri Ram College,
Muzaffarnagar

1990s, food grains production has failed to keep pace with the population growth. Per capita production of cereals has declined by 17 kg. Per year and pulses production by 3 kg. Per year during the last decade. This could create a serious threat to food security". The production of total pulses has indicated a growth of 0.59 and 2.61 per cent per annum between 1990-91 and 1999-2000 and 2000-01 to 2009-10 while sugarcane production decline at the rate of 2.73 and 0.93 per cent per year in same period.

Evidently, production of some essential food item has increased during the recent period but, there is acute shortage of basic food items like's pulses and edible oil in the market despite huge imports and prices are skyrocketing. The country has been importing these items for others countries. Given the uncertainty of availability and high prices in the world market, it is essential to increase domestic production. Area under food grains for instance fell down from 125 million hectares to 123.2 million hectares during the periods from 2013-14 to 2015-16, and then fluctuated during 2016-17 to 2019-20 whereas the production registered also decline during same period. (Table- 4)

Food is the essential necessity of people yet per capita accessibility of heartbeats, the significant wellspring of protein for Indians, has become close to half since freedom. This is notwithstanding India's outcome in food creation. The typical per capita accessibility of wheat and rice together has expanded apparently during this period. The per capita accessibility of absolute food grain which was 334.3 gms per capita each day in 1951 has ascended to 417.3, 468.5, 386.2,444, and 484.3 gms. per capita each day in 1981, 1991,2001,2011 and 2020 separately. If there should arise an occurrence of heartbeats, it has definitely tumbled from 43 gms per capita each day in 2012-13 to 41.7 gms in 2013-14 and in 2015-16 46.4 gms to 43 gms in 2017-18. But in 2019-20 it was 54.5 gms it's high as compare to 2011-12 but. Availability of pulses gms per capita per day was fluctuated since 2010-11 to 2019-20. (Table –5).

The long attracted stagnation creation of heartbeats is probably going to decrease per capita accessibility of this protein rich food in future with rising salaries and populace pressure. Subsequently, step ought to be taken to improve creation of heartbeats in India. The issue accepts extraordinary importance considering declining accessibility of heartbeats and expanding accessibility of oats. However, for a reasonable eating routine heartbeat protein are fundamental because of other rich parts. The entire situation of net accessibility of heartbeats causes serious worry in the country. This ought to be seen intensely from the mark of safety and nature of food particularly for poor people and the rustic populace. India assumes a vital part by offering in excess of 10% on the planet's food creation. Per capita each day accessibility of food grain in India gradually declined from 468.8 gm each day in 1971 to 443 gm each day in 2007 (Joined Country Improvement Program 2009). The Assembled Country Populace Projection Report (UNPP) demonstrates that total populace will increment to 8.3 billion out of 2025 and 10 billion of every 2050 from the current degree of 6.7 billion.

Status of climate change

Furthermore, environmental change is representing an incredible test to future development potential. Notwithstanding mechanical advances, weather conditions are as yet a critical figure horticultural efficiency. The worldwide mean surface temperature will bit by bit increment. Consequences of environmental change models demonstrate that the world in a century will become hotter than whenever during the most recent 100,000 years or more. Warming will be more prominent in districts in contrast with others. Environmental shift will differ in course and size starting with one country then onto the next. Specialist have completed investigations (Warrick, 1988; Doorman and Semenov, 2005; Repel *et al.* 2004, 2005; Lobell *et al.*, 2005) on potential impacts of environmental change on possible changes in grain crop yields, on oat creation, food costs and the ramifications for changes in the quantity of hungry individuals. Environmental change would unfavourably influence worldwide creation between 0 to 5 percent, as an outcomes world cereal costs are assessed to increment by 10 to 100% at relying upon the harvest viable and the quantity of individuals in danger from hunger by 5 to 50 percent (Repel *et al.*, 2004). As per Joined Country Intergovernmental Board on Environmental Change (UNIPCC), 2001 the three primary drivers of the expansion in greenhouse gases saw throughout the course of recent years have been petroleum products, land use and horticulture.

In 2009 province of Climate Report by the Service of Climate and Ranger service (MOEF) clubs the issues fewer than five key difficulties looked by India, which are environmental change, food security, water security, energy security, and overseeing urbanization. Worldwide environmental change is one of the significant difficulties mankind is confronting today. To comprehend its effect on food creation, understanding its key dimensions is significant. Yield of harvests diminishes in agricultural nations because of expansion in temperature whereas yield of harvests expansion in created nations because of expansion in temperature. The primary driver of an unnatural weather change has been human movement connected with petroleum product consuming and deforestation. These human exercises expanding ozone depleting substances fixation, which brought about catching the sun radiation in the world's air prompting warming of the earth. The vitally ozone harming substances are carbon dioxcide, nitrous oxcide and methane, out of which carbon dioxide discharge contributed the majority of the absolute greenhouse gases source in 2004, for example to tune of 77%.

India rank among top five nations as far as greenhouse gases outflow. In the year 2007 all out greenhouse gases emanations from India was 1727.71 million tons of carbon dioxcide same, out of which carbon dioxcide discharge was 1221.76 million tons, Methane 20.56 million tons and Nitrous oxide 0.24 million tons Indian Public Environmental Change Activity Plan (INCCAP) in May 2010. In 1994, the all-out greenhouse gases discharge for India was 1228.54 million tons of carbon dioxcide same; it shows a Build Yearly Development Rate (CAGR) of 2.9 percent during that period (Monetary Review 2012). The Unified Country Intergovernmental Board on Environmental Change (UNIPCC), World Bank and the Assembled Country Global Advancement Program cautioned India against the serious and antagonistic outcomes of environmental change. The expanded carbon dioxide level alongside environmental change would influence crop yield from one side of the planet to the other. On-going review lead by Worldwide Food Strategy Exploration Foundation featured that; A) 25 million additional youngsters will be malnourished in 2050 because of environmental change, B) Flooded wheat yield will be marked down around 30%, and watered rice

Co-ordinator
IQAC, Shri Ram College
Muzaffarnagar

Chairman
IQAC, Shri Ram College,
Muzaffarnagar

yield around 15% in 2050, C) Environmental change will expand costs of wheat, rice and maize by 90%, 12% and 35 percent separately in 2050. India's GHG discharge are vigorously impacted by the construction of its enormous and exhausting economy, the restriction on its energy assets, as likewise its on-going status as far as energy access. In 2007, India GHG outflow by sources and evacuation by sinks were 37% of carbon dioxcide the biggest offers from power age (37%), horticulture (21%), ventures (5%), and other assembling Enterprises (17%), and similarly, concrete, transport, iron steel, squander shows in pie graph.

India, as an emerging nation has motivation to be worried about the unfavourable effect of environmental change on its economy. An enormous piece of its populace relies upon environment delicate areas for occupation which makes it exceptionally helpless against environmental change. Country faces significant difficulties to build its food creation to the tune of 300 million tons by 2020; to take care of its steadily developing populace, which is probably going to arrive at more than 1.35 billion by the 2020. GHGs Discharge by Various Area in India portrayed in (Table-6).

The Assembled Country Intergovernmental Board on Environmental Change (UNIPCC), the World Bank and the Unified Countries Modern Advancement Association (UNDP) cautioned India against the serious and unfavourable results of a dangerous atmospheric devotion and environmental change. Researcher accepts that tropical nations, for example, India are more defenceless against environmental change than those in the mild zone. A review distributed in science proposes that, because of environmental change, "Southern Africa could lose in excess of 30% of its principal crop maize, by 2030. In South Asia misfortunes of numerous territorial staples, for example, rice, millet and maize could top 10%". The 2001, IPCC, Third Appraisal Report reasoned that the least fortunate nations would be hardest hit, with decrease in crop yields in most tropical and subtropical locales because of diminished water accessibility and new or changed bug bother occurrence. Clearly, populace would increment in the less evolved nations of the world china, India and Brazil would likewise experience this issue. The expectation of CO2 outflows in 2025 show that for every capita emanation on the planet will practically twofold. This present circumstance is supposed to happen in creating and created countries with the exception of the US (Table 7).

Climate change and food security

As per Food and Horticulture Association gauge 852 million individuals overall were under supported in 2002 because of decline accessibility of land for cultivating and progressively terrify water for agribusiness and different purposes. These two and different powers will challenge the limit of the world's food creation framework. As per above peculiarities the food security in India might be in danger in future because of the danger of environmental change. Indian horticulture previously dealing with issue of slow development will confront new difficulties as outrageous climate, eccentric precipitation example and irritation and illness assaults, which are all certain to hurt crop yield and result over the medium to long haul period. Environmental change prompting enormous harvest misfortune and leaving huge patches of arable land unsuitable for development, and consequently compromising for food security later on. The serious issues defying Indian farming are those of populace pressure, little property, exhausted soils, absence of current innovation and unfortunate offices for capacity. The most concerning issue Indian horticulture faces today and the main source of rancher's self-destruction is obligation. Compelling rancher into an obligation trap are taking off input costs, the diving cost of produce and an absence of legitimate credit offices, which makes ranchers go to private cash moneylenders who charge extravagant paces of revenue. To reimburse these obligations, ranchers get once more and get found out in an obligation trap.

The reason for this article to summed up the consequence of examination on project the future food grain creation for the year 2030 in India, net accessibility of food grain and potential impacts of environmental change on crop yields and oat creation in India.

Policy implication and government programme on food security and climate change

Some policy & programme planed and adopted by Indian Government to secure against increasing food grains requirement in coming years as well as climate change. Name and Nodal agency of the National Mission adopted by Indian government for Securing Climate Change:

1. National Mission on Sustainable Habitat plan implemented by Ministry of Urban Development, and aim to attempts to promote energy efficiency in buildings, management of soil waste and modal shift to public transport including transport options based on biodiesel and hydrogen.
2. National Water Mission prepared by Ministry of Water, and aim to the conservation of Water, minimising wastage and ensuring more equitable distribution both across and within states. The key focus of the mission document is:
   a) Intensive rain water harvesting and ground water charging to meet the demand of 1120 critical blocks during 11th plan and remaining blocks in 12th plan (march 2017) Besides 30 percent of the total urban areas would be covered by March, 2012.
   b) Increasing water use efficiency at least by 20 percent by 2012.
3. National Mission for Sustaining the Himalayan Ecosystem implemented by Ministry of Science and Technology, and aims to evolving management measures for sustaining and safeguarding the Himalayan glacier and mountain eco-system. The mission attempts to address following key issues:
   a) Himalayan Glaciers and the associated hydrological consequences.
   b) Biodiversity conservation and protection.
   c) Wild life conservation and protection.
   d) Planning for sustaining for the Himalayan ecosystem.
4. National Mission for Green India implemented by Ministry of Environment and Forest, and aim to enhancing eco-system services and Carbon sinks through afforestation on degraded forest land in line with the national policy of expending the forest and tree cover to 33 percent of the total land area of the country.
5. National Mission for sustainable Agriculture prepared by Ministry of Agricultural and cooperation, and aim to develop strategies to make Indian agriculture more resilient to Climate change new varieties of thermal resistant crops, new credit and insurance. The main focus of the Mission would be food security and protecting

Co-ordinator
IQAC, Shri Ram College
Muzaffarnagar

Chairman
IQAC, Shri Ram College,
Muzaffarnagar

land, water, biodiversity and genetic resources for sustainable production of food.

6. National Mission on Strategic Knowledge on Climate Change prepared by Ministry of Science and Technology, and aim to identify the challenges of, and the responses to, climate change through research and technology development and ensure funding of high quality and focused research into various aspects of climate change.
7. Indian Network for Climate Change Assessment implemented by Ministry of Environment. The INCCA has been conceptualised as a Network – based Scientific Programme.

Table 1: Food Grains Scenario in India 2010-11 to 20119-20 (million tonnes)

Year	Rice	Wheat	C. Cereals	Pulses	Total
2010-11	95.98	86.87	43.40	18.24	244.49
2011-12	105.30	94.88	42.01	17.09	259.29
2012-13	105.23	93.51	40.04	18.34	257.12
2013-14	106.65	95.85	43.30	19.26	265.05
2014-15	105.48	86.53	42.86	17.15	252.02
2015-16	104.41	92.29	38.52	16.32	251.54
2016-17	109.70	98.51	43.77	23.13	275.11
2017-18	112.76	99.87	46.97	25.42	285.01
2018-19	116.48	103.60	43.06	22.08	285.21
2019-20	118.87	107.86	47.75	23.03	297.50
2020-21*	121.46	108.75	49.66	25.58	305.44

Source: (*) indicate 4th Advance Estimation, Directorate of Economics and Statistics Fourth Advance Estimates of Production of Food Grain Production for 2020-21

Table 2: Projected Food Grains Production Scenario in India (million tonnes)

Year	Rice	Wheat	C. Cereals	Pulses	Total
2011-12	93.99	90.01	38.00	20.31	242.30
2012-13	92.54	78.20	34.64	22.09	227.46
2016-17	109.70	98.51	43.77	23.13	275.11
2020-21*	122.00	108.75	49.66	25.58	305.44
2021-22*	109.28	97.12	466.92	26.72	280.03
2028-29*	116.49	107.08	58.98	31.83	314.37
2029-30*	117.56	108.62	60.99	32.64	319.81

(*) indicate future projection, (c.) indicate core cereals

Source: Working group report on food projection towards 2033, Niti Aayog

Table 3: Growth Rates of Area, Production and Yield of Major Food Crops in India during 1990-91 to 1999-2000 and 2000-01 to 2009-10 (Base TE 1981-82 = 100)

Crop	1990-91 to 2000-01			2000-01 to 2009-10		
	Area	Production	Yield	Area	Production	Yield
Rice	0.68	2.02	1.34	-0.03	1.59	1.61
Wheat	1.72	3.57	1.83	1.21	1.89	0.68
Jowar	-3.53	-3.07	0.48	-3.19	-0.07	3.23
Bajara	-1.46	0.95	2.44	-0.42	1.68	2.11
Maize	0.94	3.28	2.32	2.98	5.27	2.23
Gram	1.26	2.96	1.68	4.34	5.89	1.48
Tur	-0.66	0.89	1.55	0.26	1.82	1.56
Total Pulses	-0.60	0.59	0.93	1.17	2.61	1.64
Other pulses	-1.61	-1.58	0.04	-0.34	-0.32	0.02
Total food grains	-0.07	2.02	1.52	0.29	1.96	2.92

Sources: Agricultural Statistical at a Glance 2020-21

Table 4: Total Yield and Area Production of Food grains in India

Year	Area (M. ha)	Production (M. Tones)	Yield (Q/ha.)
2011-12	124.8	259.3	20.78
2012-13	120.8	257.1	20.79
2013-14	125.0	265.0	21.20
2014-15	124.3	252.0	20.28
2015-16	123.2	251.6	20.42
2016-17	129.2	275.1	21.29
2017-18	127.5	28.0	22.35
2018-19	124.8	285.2	22.86
2019-20	127.0	297.5	23.43
2020-21	129.3	308.6	23.86

Source: Directorate of Economics and Statistics, Department of Agriculture and Cooperation.

Table 5: Net Availability of Food Grains in India (2011-18) (gm/capita/day)

Year	Rice	Wheat	Total Cereals	Gram	Pulses	Total
2010	188.4	154.7	63.97	12.9	37	456.97
2011	182.0	168.2	51.47	13.5	35.4	450.57
2012	181.6	163.6	65.5	14.5	43	468.2
2013	190.2	158.4	60.0	13.5	41.7	463.8
2014	197.4	183.1	52.7	15.3	43.3	491.8
2015	198.0	183.0	61.8	16.3	46.4	505.5
2016	186.0	168.0	77.7	14.0	43.8	489.5
2017	184.2	199.7	71.6	13.3	43.0	511.8
2018	183.0	182.7	80.6	17.3	54.7	516.3
2019	189.0	176.4	85.5	N.A	54.5	505.4

Source: Agricultural Statistic at a Glance 2020-21

Table 6: GHGs Emission by Different Sector in India

S. No.	Sectors	Percentage
1	Electricity	37%
2	Agriculture	21%
3	Other Energy Industries	5%
4	Other Manufacturing Industries	17%
5	Cement	5%
6	Transport	9%
7	Iron and Steel	4%
8	Waste	2%
Total		100%

Source: International Energy Agency 2019

Table 7: Status of Carbon dioxide Emission in the world

Population (Billion)			Per capita emission (actual ton)	Per capita emission (ton)
Region	2007	2025*	2007	2025*
World	6.7	8	4.2	7.9
Developed	1.3	1.3	11.2	15.2
Less Developed	5.4	6.6	2.5	6.4

Source: Peterson Institute for International Economics, Washington DC.2007

Acknowledgement

We would like to acknowledge the department of Agriculture Shri Ram College, Muzaffarnagar for providing facilities to conduct the experiment.

Conclusion

We conclude on the basis of above text Climate change drives down yields and nutrition of Indian crops rising temperatures and weather fluctuations may drive hunger and malnutrition in India, unless the country acts urgently. India, home to 1.4 billion people, is ranked 101 out of 116 countries in the Global Hunger Index, indicating a serious problem. It is

Co-ordinator IQAC, Shri Ram College Muzaffarnagar

Chairman IQAC, Shri Ram College, Muzaffarnagar

true that agricultural productivity in India is very low. if we can improve our productivity, we can ensure that issues related to food security can be fixed and we can fight climate change while ensuring no stomach in the country goes hungry.

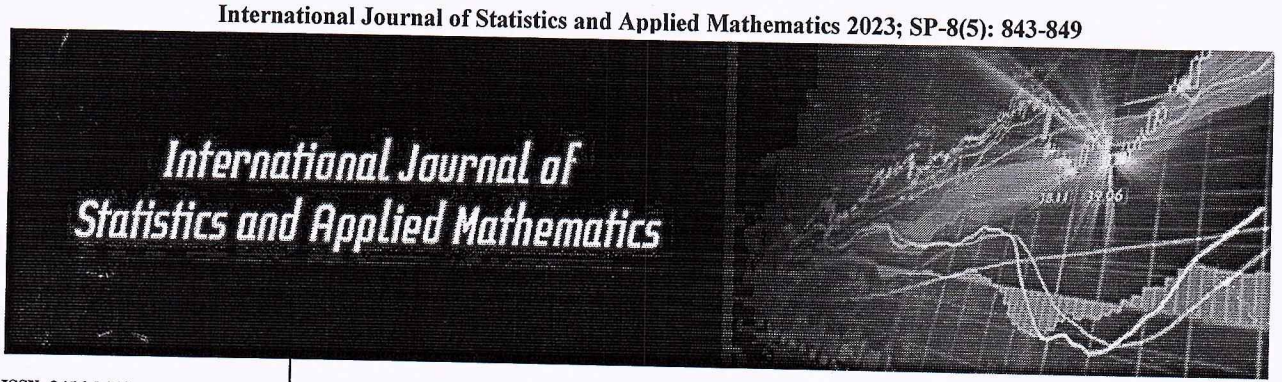
References

1. Agriculture Statistic at a Glance. Directorate of Economics and Statistic, Department of Agriculture and Cooperation in India; c2020-21.
2. Ahmad J, Alam D, Hassen S. Impact of Climate Change on agriculture and food security in India. Indian Journal of Agriculture, Environmental and Biotech. 2011;4(2):129-137 .
3. Dwivedi J. Global warming impact of climate change in Uttar Pradesh. Agriculture Today; c2012. p. 56-57.
4. Economic Survey. Ministry of Finance, Government of India; c2020-21.
5. George PS. Some reflections on food security in India. In: Annual conference of Indian Society of Agriculture Economics, 59th, Jabalpur, 1-3; c1999. p. 4-12.
6. Intergovernmental Panel on Climate Change, Report, Cambridge: Cambridge University Press; c2001.
7. International Food Policy Research Institute, Global Hunger Index; c2010.
8. Kalamkar SS. Food Security in India in global perspective. Agriculture Situation in Indian; c2008. p. 291-302.
9. Kumar A, Bantilan MCS, Kumar P, Kumar S, Jee S. Food Security in India: Trends, Patterns and Determinants. Indian Journal of Agricultural Economics. 2011;66(2):445-463.
10. Kaul S, Ram G. An assessment of impact of climate change on rice production in India. Agriculture Situation in India; c2008. p. 413-415.
11. Kumar U, Banerjee D. Challenges towards food security in India: A study in the context of agricultural productivity and financial capability. Indian Journal of Agricultural Economics. 2012;67(3):517.
12. Martolia R. Present and Future Challenges of Agricultural in meeting the Food Availability in India. Indian Journal of Agricultural Economics. 2012;67(3):530 .
13. Parry ML, Rosenzweig A, Livermore M, Fischer G. Effect of climate change on global food production under Emission and Socio Economic Scenario. Journal of Environmental Science. 2004;10(14):53-67.
14. Pathak H. Green house gas mitigation in Indian Agriculture. Annals of Agriculture Research new series. 2013;34(2):99-105.
15. Singh SR, Datta KK. Food security in India: Problems and Solution from farming perspectives. Indian Journal of Agricultural Economics. 2012;67(3):525.
16. Srivastava SC. Food Security in India: Challenges and Opportunities. Indian Journal of Agricultural Economics. 2012;67(3):527.
17. Tuteja U, Tuteja D. Food Security and Climate Change in India. Agriculture Situation in India; c2009. p. 275-281.
18. Working group report on food projection towards, Niti Aayog; c2033.
19. FAO. World Food Security: a Reappraisal of the Concepts and Approaches. Director Generals Report, Rome; c1983.

Co-ordinator
IQAC, Shri Ram College
Muzaffarnagar

Chairman
IQAC, Shri Ram College,
Muzaffarnagar

International Journal of Statistics and Applied Mathematics 2023; SP-8(5): 843-849



ISSN: 2456-1452
Maths 2023; SP-8(5): 843-849
© 2023 Stats & Maths
https://www.mathsjournal.com
Received: 01-08-2023
Accepted: 10-09-2023

Anjali Jakhar
Assistant Professor,
Department of Agriculture,
Shri Ram College,
Muzaffarnagar, Uttar Pradesh,
India

SK Sriwastava
Professor Department of
Agriculture Economics,
GBPUAT, Uttarakhand, India

Vikrant Kumar
Assistant Professor,
Department of Agriculture,
Shri Ram College,
Muzaffarnagar, Uttar Pradesh,
India

Mohd Nayeem Ali
Assistant Professor,
Department of Agriculture,
Shri Ram College,
Muzaffarnagar, Uttar Pradesh,
India

Mukul
Research Scholar, BAUT,
Banda, Uttar Pradesh, India

Corresponding Author:
Anjali Jakhar
Assistant Professor,
Department of Agriculture,
Shri Ram College,
Muzaffarnagar, Uttar Pradesh,
India

Technical efficiency of bajra crop on different size of farms in western region of Uttar Pradesh

Anjali Jakhar, SK Sriwastava, Vikrant Kumar, Mohd Nayeem Ali and Mukul

Abstract
Uttar Pradesh is the 2nd largest state in India. The economics of Uttar Pradesh is mainly based on agriculture and about 65% of the total population is dependent on agriculture the main crop of Uttar Pradesh is Wheat. Wheat is the state's principal food crop and sugarcane is the main commercial crop. It is produced in the largest part of the state in about 24% of agricultural Land. Taking into account the significance of the aforementioned facts to measures the technical efficiency of Bajra crops on different size of farms in western region of Uttar Pradesh year 2014-15. The results of investigating technical efficiency of the sample farm households under bajra crops indicated that output produced was less than the potential output to the extent of about 19 per cent in bajra, respectively. On overall basis, however, much variation observed across farm size groups.

Keywords: Agriculture, technical efficiency, Cobb-Douglas production function

Introduction
Agriculture plays a vital role in India's economy, as 54.6 per cent of the population is engaged in agriculture and allied activities (Census 2011) and it contributed 17.4 per cent to the country gross value added for the year 2016-17 (at current prices). As per the land use statistics (2014-15), the total geographical area of the country is 328.7 million hectares of which reported net sown area is 140.1 million hectares and gross cropped area is 198.4 million hectares with a cropping intensity of 142 per cent. The net area sown shared 43 per cent of the total geographical area. There has been a continuous decline in the share of agriculture and allied sector in the gross value added from 18.6 per cent in 2013-14, 18.0 per cent in 2014-15, 17.5 per cent in 2015-16 and 17.4 per cent in 2016-17 at current prices (Agriculture Annual Report, 2017-18) [3]. The 2017 global hunger index had rated India under 'serious' category with respect to under nutrition child stunting and child birth weight India was ranked 100 among 119 countries for which global hunger index was constructed. The population of India is projected to be 1.65 billion by 2050. Various studies indicate that the demand for food grains will grow by about 50 percent in 2050. (IFPRI, 2018). Climate change is also posing serious threat to food security in India. The intensity and extent of extreme climate events, such as drought, high rise and fall in temperature, floods, untimely and unevenly rainfall are adversely affecting agricultural production, farm incomes and food security. The available estimates reveal a loss of 10-40 per cent in food production due to rise in temperature (Joshi, 2016). Various estimates suggest that India will experience an increase of 2.2 to 2.9 degree Celsius in average temperature by 2050 affecting overall production of crops. In addition, increasing demand for industrialization, urbanization, housing and infrastructure is forcing conversion of agricultural land to non- agricultural use; therefore, the scope for expansion of the area available for cultivation is limited (Saxena, 2017) [13]. The state of Uttar Pradesh has seen regular fluctuation in the growth rate in area, production and yield. The fluctuation shows the vulnerability of the sector to seasonal conditions. (Koshal, 2012) [14]. Category wise variation in resources across the farm size groups lead to varying efficiency in production of crops. Majority of the land holdings are very small in the region. The adoption of well proven technology is constrained due to small size of holdings and poor farm resources.

Co-ordinator
IQAC, Shri Ram College
Muzaffarnagar

Chairman
IQAC, Shri Ram College,
Muzaffarnagar

The Cobb-Douglas production function was used to compute the technical efficiency. It was found that the Cobb- Douglas approximation gave a fair fit with the range of observations. The study also computed the technical efficiencies of different states. The researcher found that for each state there was a different estimate of efficiency, according to the factors of production included in the analysis Farrell (1957) [6]. Examined the technical efficiency, Allocative efficiency and economic efficiency for a sample of sixty farmers in the Dajabon region by using maximum likelihood techniques were used to estimate a Cobb-Douglas production frontier, which was then used to derive its corresponding dual cost frontier. These two frontiers were the basis for deriving farm-level efficiency measures Boris (1997) [5]. Technical inefficiency in the production of rice was negatively related with farm size, education of the farmer, experience, extension contacts and percentage of good land and positively related with age and fragmentation of the land Reddy and Sen (2004) [11]. Examined the technical efficiency and environmental impact of Bt cotton & Non Bt cotton in North India for the period from 2007-08, using stochastic frontier production function and the environmental impact quotient (EIQ). The results revealed that average technical efficiency was higher in Bt cotton farming. Roughly 80 per cent of Bt cotton farms fall in the efficiency range of 80 to 95 per cent; this figure reduced to 60 per cent on Non Bt cotton farms Manjunatha *et al.* (2011) [9]. Examined the technical efficiency of cocoa production in south west Nigeria for the period 2012. The result showed that cocoa enterprise was profitable, and in terms of technical efficiency, cocoa farmers in the region were relatively production efficient Ekiti state had the highest mean efficiency relative to Ondo state and Osun state. They also reported that the years of schooling had a positive influence on the technical efficiency of farmers while area of land cultivated and age of cocoa trees had a negative influence. Examined the efficiency in foodgrains production in India for the period from 1960-61 to 2013-14, using DEA and SFA frontier approach. High average efficiency in farming operations for both the frontier methods was observed. The period after 1990 had witnessed improved agricultural performance as inferred from the frequency distribution of the efficiency scores which indicated that during this period the overall efficiency scores had been higher and there was not a single year in which the efficiency levels had been less than 90 per cent Mathur (2018) [10]. Taking into account the significance of the aforementioned facts a study of technical efficiency in major crops was planned for western region of Uttar Pradesh. So in this case "Examine the technical efficiency of major crops on different size of farms in western region of Uttar Pradesh".

Methodology

The study is based on primary study and it is conducted in the western region of Uttar Pradesh. The technical efficiency of major crops of region is examined using primary data. Stratified random sampling and Cluster sampling technique has been adopted for the selection of respondent households of the western region for the agriculture year 2014-15.

Sampling Technique

At the first stage out of total six divisions in the western region of Uttar Pradesh two divisions *viz*., Meerut Division and Aligarh Division were selected randomly. From each selected division two districts had been selected purposively, each one with highest and lowest productivity of major crops. In Meerut Division, Meerut District was selected on the basis of high productivity and Ghaziabad District was selected on the basis of low productivity District, purposively. In Aligarh Division, Aligarh district was selected on the basis of high productivity, whereas, Kashganj District was selected on the basis of low productivity district, purposively. At next stage one development block was selected randomly from each selected district. From Meerut District, Mawana development block and from Ghaziabad district, Muradnagar Development block were selected randomly. Similarly from Aligarh district, Koil development block and from Kashganj district, Kashganj development block were selected randomly. Thereafter, one village was selected randomly from each selected development block and three adjoint villages were also included to form a cluster to select respondent farmers. At last stage sixty farmers (15 each from marginal, small, medium and large farm size groups) were selected randomly from each cluster. Hence, total sample size comprised of 240 farm households to collect primary data for the study. Under Mawana development block Tigri village was selected randomly and Khalidpur, Niloha and Kareempur adjacent villages were included to form cluster. In case of Muradnagar development block Didholi village was selected randomly and Sultanpur, MohammadPur and Jalalabad adjacent villages included to form cluster. Similarly under Koil development block Joraver Nagar village was selected randomly and Gadiyawali, Boner, Balrampur and Girdharpur adjacent villages were included to form cluster. In case of Kashganj development block Janhageerpur village was selected randomly to form a cluster with adjacent Mahawar, MohammadPur and dolna villages.

Different crops are grown in various seasons in the region, however, major crops of the region are those crops which together accounted for nearest 75 per cent of the gross cropped area arranged in descending order. Major crops were selected on the basis of cropping pattern of western region of the Uttar Pradesh state in 2014-15 shown in table No. 1.

Table 1: Major Crops grown in western region of Uttar Pradesh (2014-15)

Crop	Per cent of gross cropped Area	Cumulative Total
Wheat	39.00	39.00
Paddy	18.33	57.33
Sugarcane	14.33	71.33
Bajra	8.56	79.89
Potato	4.25	84.14
Maize	3.56	87.7
Urd	0.86	88.56

So, according to cumulative total of the per cent area in term of major crops wheat, sugarcane paddy and bajra are found as major crops of the western region of Uttar Pradesh on the basis of cropping pattern 2014-15, which is shown in the above table but bajra crop selected at random for measuring technical efficiency in western region of Uttar Pradesh.

Analytical framework

The estimation of technical efficiency in the production of bajra crops are indicated as difference in the rates of adoption of technical change. It also help to determine the effectiveness of growth promoting institutions such as education, extension services, and credit institution of production practices available to the farmers. Technical efficiency is examined to identifying the possibilities for further increase in output of any crop while conserving the resource use. The technical

Co-ordinator
IQAC, Shri Ram College
Muzaffarnagar

Chairman
IQAC, Shri Ram College,
Muzaffarnagar

efficiency refers to the proper choice of production function among all those activity in use by various farmers in the agriculture. Estimation of technical efficiency involved two stage procedures. Initially, estimates are obtained of frontier function a model which is neutrally upwardly scaled version of the ordinary least squares or average model. In the second stage, individual farms deviation from the frontier is used to estimate the technical efficiency. This also indicate that how much extra output could be obtained if a particularly farm was to reach on the frontier. For the measurement of technical efficiency the uniform weighted average prices of input and output are used for all the sampled farmers. Quantities of output and input on per hectare basis are used as the weights. The index of technical efficiency is constructed using the following formula:

$$T.E.j = Yj / Y^*j$$

OR

$$\ln T.E.j = \ln Yj - \ln Yj^* \quad (1)$$

Where,
T.E.j = Technical Efficiency of jth farmer
Yj = Actual gross return in Rs./ha of jth farmer
Yj * = Potential (maximum possible) gross return of jth farmer at present input use
Ln = Natural logarithm
Three methods are generally used for developing frontier production function as well as for calculating potential (maximum possible) gross return i.e. Y*j. These are Linear Programming, Corrected Ordinary Least Square (COLS) Technique and Maximum Likelihood Method.
Out of these, Corrected Ordinary Least Square technique is used in the present study to develop frontier function for each farmer, because COLS technique is simple and very widely used method for developing frontier production function (Russell and Young, 1983). Due to presence of multicollinearity, per farm crop cultivation data were transformed in per hectare input use and output of for different farm size groups, calculate zero order correlation matrices.

Corrected ordinary least squares (COLS) method
The Cobb- Douglas production function, as hypothesized in equation (1) stated as followed in log form:

$$Y = a X1^{b1} X2^{b2} X3^{b3} X4^{b4} X5^{b5} X6^{b6} X7^{b7} + Vi$$

or

$$\log Yj = a_0 + biXi + Vi. \quad (2)$$

Where,
Yj = Gross income from jth crop of the ith farm (Rs. per ha.)
Xi = Level of tth variables used in jth crop (quantity /value per hectare)
a = Constant term
bi = Regression Coefficients of the respective resource
Vi = Error term

After the estimation of above production function, the estimated value of lnYj * has been estimated for each farmer, using the original data set. Then residual, μj is calculated as follows:

$$\mu j = \ln Yj - \ln Yj \hat{} \quad (3)$$

where,
lnYj = Actual gross return in Rs./ha of jth farmer
lnYj^ = gross return of jth farmer, calculated by using original input data set in above estimated production function (2).

By the equation (3) a series is found. Among all the μj, the larger positive (+) is selected and denoted as μj max. Then, the correction is made in production function (2) by sifting the constant term upwardly by an amount equal to the value of μj max.
Thus the new form of production function has beecom as follows:

$$\ln Y = (\ln a + \mu j \max) + bi \ln Xi. \quad (4)$$

By combining the term (ln a) and (μj max), a new term is found and called as "ln a0". this (ln a0) has been assumed as the constant term for the frontier production function of estimated production function.
The form of frontier production function is as follows:

$$\ln Y = \ln a0 + bi \ln Xi. \quad (5)$$

By the use of frontier production function and the farmer's original input data set, Yj* estimated for each farmer. Therefore, technical efficiency of the farm households, across farm size group, has been worked out.

Result & Discussion on technical efficiency
As explained in the above section, the technical efficiency has been measured through an index of actual output of a farmer and the maximum possible output at his given level of resource use. At the first step, Cobb-Douglas production function has been estimated at the average resource use level of the sample farmers. Then the frontier production function has been obtained by finding the largest error amount (i.e., μj = ln Yj – ln yj ^) and shifting the intercept of estimated Cobb-Douglas production function to find out the largest possible output level at the average resource use of the sample farmers.

Cropping pattern followed by sample farm households in the western region of Uttar Pradesh
In the western region the technical efficiency indices have been constructed for each farm in different size group as well as for overall farm size group by estimated COLS frontier. Based on cropping pattern followed by farm households, bajra, wheat and sugarcane appeared as major crops which together contributed 70 per cent of gross cropped area in the western region of the state, during 2014-15. On the basis of cumulative total of the selected crops, total three crops; *viz.*, wheat, sugarcane and bajra emerged as the major crops of the western region of Uttar Pradesh based on primary survey, out of these crops bajra crop selected for estimating the technical efficiency on different size of farms which is shown in table 2 & 3.

Co-ordinator
IQAC, Shri Ram College
Muzaffarnagar

Chairman
IQAC, Shri Ram College,
Muzaffarnagar

Table 2: Cropping pattern followed on sample farm household in western region of Uttar pradesh during 2014-15 (Hectare per farm)

Crop	Farm Size Group				
	Marginal	Small	Medium	Large	Overall
Maize	0.03(3.17)	0.12(5.23)	0.32(7.35)	0.58(8.45)	0.2(5.62)
Jowar	0.28(27.91)	0.36(15.65)	0.46(10.66)	0.59(8.48)	0.65(18.26)
Urd	0(0.00)	0.03(1.3)	0.04(0.99)	0.1(1.4)	0.03(0.84)
Bajra	0.04(4.37)	0.34(14.78)	0.71(16.45)	1.15(16.62)	0.41 (11.52)
Wheat	0.32(31.88)	0.75(32.61)	1.35(31.20)	2.11(30.45)	1.15(32.3)
R&M	0(0.00)	0.01(0.44)	0.01(0.35)	0.06(0.88)	0.01(0.28)
Potato	0.003(0.33)	0.05(2.17)	0.09(2.14)	0.14(2.08)	0.04(1.12)
Pea	0.03(3.24)	0.05(2.17)	0.08(1.76)	0.11(1.57)	0.08(2.25)
Sugarcane	0.29(29.10)	0.59(25.65)	1.26(29.10)	2.08(30.07)	0.99(27.81)
Gross Cropped Area	1.008	2.3	4.32	6.93	3.56
Net Cultivated Area	0.65	1.45	2.79	4.15	2.29
Cropping intensity in per cent	155.08	158.44	154.79	166.97	155.46

Table 3: Major Crops Grown in Western Region

Major crops in Western Region		
Crop	Area (per cent to GCA)	Cumulative Total
Wheat	32.30	32.30
Sugarcane	27.81	60.11
Bajra	11.52	71.63
Maize	5.62	77.25
Potato	1.12	78.37
Pea	2.25	80.62
Urd	0.84	81.46
R & M	0.28	81.74

Figures in parentheses indicate per cent to gross cropped area

Technical Efficiency of Bajra Crops

On the basis of primary survey three major crops; i.e., sugarcane, wheat and bajra, out of these bajra crop was selected for measuring the technical efficiency of the selected farm household in the western region of Uttar Pradesh. The efficiency index for each farm household category wise as well as for overall farm size is presented in appendix. The descriptive statistics as well as the distributions of farmers (category wise) according to their technical efficiency status (in per cent term) are given in tables 3,4 & 5 for bajra crop.

Status of technical efficiency in bajra cultivation

The technical efficiency index across farm category and overall farm households are presented in appendix. The descriptive statistics as well as the distributions of farmers (category wise) according to their technical efficiency class (in per cent term) are given in tables 6,7 & 8.

Bajra production function estimates: The table 10 reveals that on marginal farms, the quantity of fertilizer has significantly contributed to the value of gross returns. In case of small farmers, bajra production responded significantly and positively to the quantity of fertilizer and machine cost. It indicates that there was room for improving gross return from bajra production by increasing the level of these inputs.

In case of medium and large farmers, value of seed has significantly contributed to the value of gross returns. For overall bajra growers, seed, human labour, and plant protection chemicals have been found positive and contributed significantly. The coefficient of fertilizer has been found to be negative and significant, which indicates that there is further scope of increasing the returns by enhancing levels of these inputs. The coefficient of seed and fertilizer are significant.

Table 4: OLS estimates of the production function in bajra crop in western region during 2014-15

Particulars	Marginal	Small	Medium	Large
Intercept	8.213* (2.338)	2.712(2.389)	6.243**(2.597)	10.620*(3.007)
Seed	0.061(0.102)	0.240(0.148)	0.519*(0.157)	0.319*(0.075)
Human labour	-0.059 (0.080)	-0.117 (0.14)	0.028 (0.043)	0.086 (0.090)
Irrigation	0.187 (0.191)	-0.016 (0.098)	-0.019 (0.087)	0.038 (0.034)
Fertilizer	-0.245* (0.177)	0.466*** (0.191)	0.172 (0.194)	-0.243 (0.277)
Insecticide	0.131 (0.103)	-0.101 (0.146)	0.067 (0.216)	0.040 (0.090)
Machine power	0.240 (0.236)	0.372**** (0.189)	-0.222 (0.170)	-0.039 (0.133)
R square	0.75	0.74	0.82	0.86

Note: *,**,***,****indicate significance at 1, 2, 5, and 10 per cent levels, respectively. Figures in parentheses indicate standard errors.

Table 5: Descriptive statistics of Technical Efficiency of bajra crop in Western region of Uttar Pradesh based on COLS frontier model

Technical efficiency	COLS frontier in sugarcane production			
	Marginal farmers	Small farmers	Medium farmers	Large farmer
Minimum efficiency level	0.60	0.65	0.64	0.64
Maximum efficiency level	0.99	0.99	0.99	0.99
Mean efficiency level	0.81	0.82	0.80	0.81
Variance	0.004	0.004	0.004	0.005
Standard deviation	0.06	0.07	0.06	0.07
Coefficient of variation	8.07	8.31	8.05	8.44

Co-ordinator
IQAC, Shri Ram College
Muzaffarnagar

Chairman
IQAC, Shri Ram College,
Muzaffarnagar

On the above table 10 &11, reveal that in bajra production, lowest per cent medium and large farm size groups, whereas, at overall level 58 per cent has been recorded. Highest efficiency level has been found more than 99 per cent across the farm size groups.

Among marginal farm households only 3.33 per cent of the farmers have been found efficient as low as between 51 to 60 per cent. About 13 per cent of the farmers are found in the 61 to 70 per cent efficiency level. Most of the farmers, 43.34 per cent, are found between 81 to 90 per cent efficiency. The per cent of the small farms in the range of 90-100 per cent has been about 13.33. The mean efficiency level of the marginal farmers in the bajra production observed at 82 per cent indicating that, on an average, about 18 per cent less output is being produced as compared to the frontier (potential) level of output.

Among small farm households about 13.33 per cent of the farmers have been found efficient between 61-70 per cent; whereas, 33.33 per cent of farmers are found between 71 to 80 per cent efficiency levels. Most of the farmers, 36.67 per cent, are found between 81 to 90 per cent efficient. Only 16.67 per cent of the farmers managed to be in the 91-100 per cent efficiency level. The mean efficiency level of the small farmers in the bajra production is observed as 83 per cent indicating that, on an average, about 17 per cent less output is being produced as compared to the frontier (potential) level of output.

Table 6: Descriptive statistics of technical efficiency of bajra crop based on COLS frontier model in Western region of Uttar Pradesh (Number)

T.E. Rating (%) intervals	Farm size group			
	Marginal	Small	Medium	Large
51-60	1(3.33)	0(0.00)	0(0.00)	0(0.005)
61-70	4 (13.33)	4 (13.33)	5 (16.67)	1 (3.33)
71-80	8 (26.67)	10 (33.33)	13 (43.33)	12 (40.00)
81-90	13 (43.34)	11 (36.67)	8 (26.67)	14 (46.67)
91-100	4 (13.33)	5 (16.67)	4 (13.33)	3 (10.00)

Note: Figure in parentheses show per cent to total number of sample farm households

In medium farm households about 16.67 per cent of the farmers have been found efficient as low as between 61 to 70 per cent levels. Majority of the farmers, 43.33 per cent are found up to 71-80 per cent efficient. Only 26.67 per cent of the farmers are found in the 81-90 per cent efficiency level; whereas, 13.33 per cent of the farmers were in the 91-100 per cent efficiency level. The mean efficiency level of the medium farmers in the bajra production observed 81 per cent, indicating that, on an average, about 19 per cent less output is being produced as compared to the frontier (potential) level of output.

In large farm households, only 3.33 per cent of the farmers have been found efficient between 61-70 per cent levels; whereas, 40.00 per cent of the farmers were in the 71 to 80 per cent efficiency level. Majority of the farmers; i.e., 46.67 per cent are found 81 to 90 per cent efficient. Only 10.00 per cent of the farmers registered in the class of 91 to 100 per cent efficiency level. The mean efficiency level of the large farmers in the bajra production observed 82 per cent indicating that, on an average, about 18 per cent less output is being produced as compared to the frontier (potential) level of output.

Conclusion

On the basis of above findings, it is concluded that there is a need to introduce suitable innovation in the region to increase the productivity of bajra. The result of investigation of technical efficiency of the sample farms under bajra crop indicates that 20 per cent less than the potential output is being obtained on the medium farm households. According to technical efficiency rating, up to 50 per cent farmers belong to inefficiency levels. Inefficiency is quite high as compared to sugarcane and wheat. Hence, more emphasis is required on bajra crop. So, it is a matter of concern for the policy makers.

Acknowledgement

We would like to acknowledge the department Agriculture Economics, GBPAUT, Pantnagar for providing facilities to conduct the experiment.

References

1. Agricultural Statistic at Glance Directorate of Economics and Statistic, Department of Agriculture & Cooperation in Uttar Pradesh; c2017-18.
2. Ali A, Jan AU. Analysis of sugarcane crop in Khyber Pakhtunkhwa: A stochastic frontier Approach. Sarhad Journal of Agriculture Research Article. 2017;33(1):69-79.
3. Anonymous, Agriculture Annual report; c2017-18.
4. Azhar RA. Education and technical efficiency in Pakistan's Agriculture. Pakistan Development Review. 1988;27(4):687-695.
5. Boris E. Technical, allocative and economic efficiency of peasant farming in the Dajabon region of the Dominican Republic. American Journal of Agricultural. Economics. 1997;14(2):51.
6. Farrell MJ. The measurement of production efficiency. Journal of Royal Statistical Society. 1957;120(3):253-290.
7. Goyal SK, Suhag KS, Pandey UK. An estimation of technical efficiency of paddy farmers in Haryana State of India. Indian journal of Agricultural Economics. 2006;61(1):108-122.
8. International Food Policy Research Institute, Global Hunger Index; c2018.
9. Manjunatha P, Bauer S, Ahmad MN. Technical efficiency and environmental impact of BT cotton and non-BT cotton in North India; c2011.
10. Mathur R. Efficiency food grains production in India using DEA and SFA. Central European Review of Economics Management. 2018;2(1):79-101.
11. Reddy AR, Sen C. Technical efficiency in Rice production and it's relationship to farm specific socio economic characteristics. Indian Journal of Agricultural economics. 2004;59(2):259-267.
12. Russell NP, Young T. Frontier Production function and measurement of technical efficiency. Indian Journal of Agricultural Economics. 1983;34(2):139-150.
13. Saxena A, Prasad M, Gupta A, Bharill N, Patel OP, Tiwari A, Er MJ, Ding W, Lin CT. A review of clustering techniques and developments. Neurocomputing. 2017 Dec 6;267:664-81.
14. Koshal J, Nedic A, Shanbhag UV. Regularized iterative stochastic approximation methods for stochastic variational inequality problems. IEEE Transactions on Automatic Control. 2012 Aug 24;58(3):594-609.

Co-ordinator
IQAC, Shri Ram College
Muzaffarnagar

Chairman
IQAC, Shri Ram College,
Muzaffarnagar

Appendix I: Technical efficiency indices of Bajra producer obtained by COLS method in Western region of Uttar Pradesh during 2014-15

Sl. No.	Farm size group				
	Marginal	Small	Medium	Large	Overall
	T.E.	T.E.	T.E.	T.E.	T.E.
1	0.8639	0.9619	0.8800	0.7897	0.7227
2	0.8700	0.6826	0.7960	0.8576	0.7493
3	0.8198	0.8402	0.9928	0.7787	0.7238
4	0.7827	0.6720	0.8321	0.7597	0.6800
5	0.8129	0.7022	0.7912	0.8207	0.6245
6	0.9545	0.8973	0.9248	0.7306	0.6914
7	0.9231	0.8632	0.6422	0.8151	0.7217
8	0.8664	0.8660	0.9817	0.8310	0.6917
9	0.8081	0.9897	0.8005	0.8161	0.7473
10	0.8190	0.8844	0.8291	0.7708	0.6088
11	0.7923	0.7817	0.7625	0.8701	0.5830
12	0.9275	0.8447	0.7993	0.7871	0.7440
13	0.8965	0.9933	0.6805	0.9106	0.7641
14	0.6839	0.9060	0.7573	0.8526	0.6550
15	0.6042	0.7494	0.7517	0.6424	0.6791
16	0.8062	0.8756	0.7424	0.8572	0.6285
17	0.9037	0.7912	0.7552	0.8188	0.7444
18	0.9937	0.7964	0.6804	0.8716	0.8590
19	0.8818	0.6533	0.7568	0.7405	0.6877
20	0.6852	0.8820	0.8086	0.8344	0.7319
21	0.8094	0.7201	0.9484	0.9312	0.8028
22	0.7972	0.7545	0.8322	0.7700	0.6539
23	0.8559	0.8155	0.8759	0.8170	0.9411
24	0.8162	0.7897	0.6692	0.8863	0.6557
25	0.7369	0.7700	0.8834	0.9924	0.6984
26	0.8334	0.8164	0.8916	0.8072	0.7072
27	0.8016	0.9917	0.7855	0.7196	0.6425
28	0.6157	0.7435	0.7018	0.8766	0.6795
29	0.6599	0.7696	0.8509	0.7801	0.6691
30	0.8781	0.9901	0.8043	0.7889	0.7330
31					0.7466
32					0.6666
33					0.7443
34					0.7741
35					0.8635
36					0.6545
37					0.7262
38					0.6485
39					0.5946
40					0.7453
41					0.7472
42					0.6892
43					0.7146
44					0.8209
Average T.E.	0.8167	0.8265	0.8070	0.8175	0.8169

Appendix II: Zero Order correlation matrix between independent variable and dependent variable for Marginal farmers of Bajra crop in Western region

	X1	X2	X3	X4	X5	X6	Y
X1	1						
X2	0.431831	1					
X3	-0.09962	0.54307	1				
X4	-0.1756	-0.34608	-0.13013	1			
X5	0.199832	0.070209	0.459142	-0.2042	1		
X6	0.001729	-0.01536	-0.16319	-0.1085	0.264319	1	
Y	0.178532	0.241423	0.217072	-0.2075	0.389843	0.196116	1

Co-ordinator
IQAC, Shri Ram College
Muzaffarnagar

Chairman
IQAC, Shri Ram College,
Muzaffarnagar

Appendix III: Zero Order correlation matrix between independent variable and dependent variable for Small farmers of Bajra crop in Western region

	X1	X2	X3	X4	X5	X6	Y
X1	1						
X2	0.267701	1					
X3	-0.09614	0.189369	1				
X4	-0.03323	0.199031	0.344767	1			
X5	0.192428	0.160255	0.010108	0.271108	1		
X6	-0.11243	-0.07134	0.051374	0.445222	0.137126	1	
Y	0.21549	-0.12319	-0.14434	-0.20072	-0.11008	-0.0242	1

Appendix IV: Zero Order correlation matrix between independent variable and dependent variable for Medium farmers of Bajra crop in Western region

	X1	X2	X3	X4	X5	X6	Y
X1	1						
X2	0.184982	1					
X3	-0.06583	-0.22256	1				
X4	-0.30058	-0.29547	0.22817	1			
X5	0.164693	0.061485	-0.01951	-0.44574	1		
X6	0.111489	0.017747	0.527689	-0.42008	0.19314	1	
Y	-0.3135	-0.25969	0.233446	0.045895	-0.1575	0.280789	1

Appendix V: Zero Order correlation matrix between independent variable and dependent variable for large farmers of Bajra crop in Western region

	X1	X2	X3	X4	X5	X6	Y
X1	1						
X2	0.065143	1					
X3	0.15228	0.073644	1				
X4	0.029418	-0.17151	-0.05341	1			
X5	0.065797	0.179039	0.052119	0.071792	1		
X6	-0.04908	-0.14169	0.057759	0.059949	-0.1678	1	
Y	0.054786	0.181032	-0.21246	0.051543	-0.1770	0.285326	1

Note: X1 = Expenditure on seed per ha.
X2 = Expenditure on human labour per ha.
X3 = Expenditure on irrigation charges per ha.
X4 = Expenditure on fertilizer per ha.
X5 = Expenditure on ppc per ha.
X6 = Expenditure on tractor power per ha.
Y = Gross return in Rs. Per ha.

Co-ordinator
IQAC, Shri Ram College
Muzaffarnagar

Chairman
IQAC, Shri Ram College,
Muzaffarnagar

Share More

International Journal of Agricultural Sciences
Volume 19 | Issue 2 | June, 2023 | 420-423 ■ ISSN : 0973-130X
DOI:10.15740/HAS/IJAS/19.2/420-423
Visit us : www.researchjournal.co.in

RESEARCH PAPER

Formulation of mixed fruits wine and its quality assessment during storage

Vikrant Kumar*, Mohd Nayeem Ali and Anjali Jakhar
Department of Agriculture, Shri Ram College, Muzaffarnagar (U.P.) India
(Email: vkvk6096@gmail.com)

Abstract : The mixture of fruits pulp containing low sugar and thus sugar level will adjust from 25 °Brix by using sugar solution. The juice will yeast by *saccharomyces cerevisiae* with 1%. The Specific Gravity of mixed fruit wine showed an increasing trend for all the treatments with fermentation period upto 0, 30, 60 and 90 days. The TSS largely affects the various physic-chemical parameters of fermented wine. Sugar is the main substrate for fermentation of fruits juice into alcohol. The specific gravity of the wine was found to be decreased with increase in sugar per cent. The highest value of alcohol content was found 18.65v/v in T_6 sample after last day of fermentation period with 1% of yeast concentration. It has been observed that the sample show the high alcoholic wine.

Key Words : Fruits, Fermentation, TSS, Specific Gravity, Alcoholic Wine

View Point Article : Kumar, Vikrant, Ali, Mohd Nayeem and Jakhar, Anjali (2023). Formulation of mixed fruits wine and its quality assessment during storage. *Internat. J. agric. Sci.*, **19** (2) : 420-423, **DOI:10.15740/HAS/IJAS/19.2/420-423.** Copyright@2023: Hind Agri-Horticultural Society.

Article History : Received : 09.02.2023; Revised : 09.03.2023; Accepted : 06.04.2023

***Author for correspondence:**

Co-ordinator
IQAC, Shri Ram College
Muzaffarnagar

Chairman
IQAC, Shri Ram College
Muzaffarnagar

Share More

TSS largely affects the various physic-chemical parameters of fermented wine. Sugar is the main substrate for fermentation of fruits juice into alcohol (Kumar *et al.*, 2021).

Material and Methods

Specific gravity :

The specific gravity was determined using specific gravity bottle. The empty bottle was weighed, filled with distilled water and reweighed. It was then filled with sample and weighed (Ranganna, 1986). The specific gravity, of the sample will be calculated, as follows:

$$\text{Specific gravity} = \frac{Ws}{Ww}$$

where,

Ws = Weight of known volume of sample in g

Ww = Weight of an equal volume of water in g.

Total soluble solids (TSS) :

The total soluble solid content was determined in terms of °Brix by using hand refractometer at 20 °C (68 °F). It measures TSS in terms of refractive index. Brix is a measure of solids only in case of pure sucrose solutions. Generally, fruit juices contain more sugar than any other soluble constituents and hence brix provides a useful guide of soluble solid or sugar content (Maziar, 2010).

Density :

The density, ñ in kg/m^3, will be calculated as:

ρ=1000 x Specific gravity

pH :

The pH was determined directly during fermentation using a digital pH meter as described by Ochai and Kolhatkar (2008).

Alcohol content :

Alcohol determination by specific gravity method provides an approximation of the alcohol content only. The method assume that the difference in specific gravity. Before and after fermentation is due solely to the conversion of sugars before fermentation. The alcohol content calculates by the following relation:

$$\text{Alcohol (\%v/v)} = (SG_2 - SG_1) / 0.0074$$

where,

SG_1= Initial specific gravity measurement

SG_2= Final specific gravity measurement

Results and Discussion

The experimental findings obtained from the present study have been discussed in following heads :

Effect on specific gravity :

Estimation of specific gravity of treatments T_1, T_2, T_3, T_4, T_5 and T_6 has been conducted. It has been studied that as the number of day's increases, the specific gravity also increases gradually. The specific gravity ranges from 1.211 to 1.218 for T_1 on 1st day to last day of storage period. 1.215 was the starting specific gravity of T_2 which increased to 1.222 on 90th day. The initial specific gravity of T_3 was 1.218 which increased to 1.223 on the 90th day. For T_4, the specific gravity starts from 1.218 and increased to 1.225 on 90th day. On the 1st day the specific gravity was 1.223 for T_5 and then it increased to 1.227 on 90th day. In case of T_6, specific gravity was 1.224 on 1st day which increased to 1.232 on 90th day. The ANOVA of steady revealed that the specific gravity of mixed fruit wine was found to be significant at $p \leq 0.05$ level of significance.

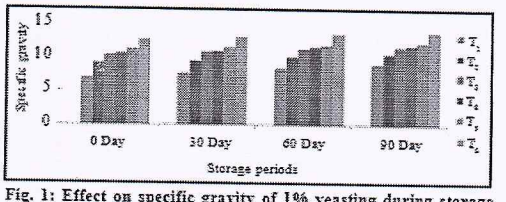


Fig. 1: Effect on specific gravity of 1% yeasting during storage period

Effect on total soluble solids (TSS) :

The TSS content of mixed fruit wine showed a decreasing trend for all the treatments with storage period upto 30 days. The study revealed that TSS of the samples having 1% yeast was observed as 25 °Brix in fresh samples. From Fig. 2 it was observed that TSS of all the samples decreased with storage period start from 0, 30, 60, and 90 days. The TSS largely affects the various physic-chemical parameters of fermented wine. Sugar is the main substrate for fermentation of fruits juice into alcohol. The specific gravity of the wine was found to be decreased with increase in sugar per cent. This might be due to increase in alcohol per cent with increase in sugar per cent. Estimation of TSS of T_1, T_2, T_3, T_4, T_5 and T_6 has been conducted. It has been studied that as the number of day's increases, the TSS (°Brix) also

Co-ordinator
IQAC, Shri Ram College
Muzaffarnagar

Chairman
IQAC, Shri Ram College,
Muzaffarnagar

Share More

to 10.50 for T_1 on 1st day to last day of storage period. 11.33 was the starting TSS (°Brix) of T_2 which decreased to 9.50 on 90th day. The initial TSS (°Brix) of T_3 was 12.33 which decreased to 9.50 on the 90th day. For T_4, the TSS (°Brix) starts from 11.33 and decreased to 9.17 on 90th day. On the 1st day the TSS (°Brix) was 10.67 for T_5 and then it decreased to 8.83 on 90th day. In case of T_6, TSS (°Brix) was 10.67 on 1st day which decreased to 8.5 on 90th day. The ANOVA of steady revealed that the TSS of mixed fruit wine was found to be significant at $p \leq 0.05$ level of significance.

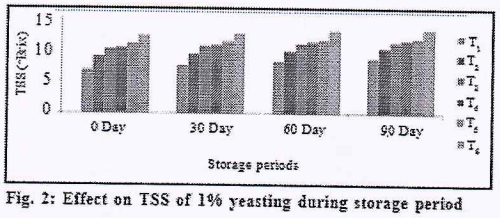


Fig. 2: Effect on TSS of 1% yeasting during storage period

Effect on density :

The density of mixed fruit wine showed an increasing trend for all the treatments with storage period upto 0, 30, 60 and 90 days. The study revealed that density of the samples having yeast concentration of 1%. The experimental data are presented in Fig. 3. Estimation of density of treatments T_1, T_2, T_3, T_4, T_5 and T_6 has been conducted. It has been studied that as the number of day's increases, the density also increases gradually. The density ranges from 1210.67 kg/m³ to 1218 kg/m³ for T_1 on 1st day to last day of storage period. 1215 kg/m³ was the starting density of T_2 which increased to 1222 kg/m³ on 90th day. The initial density of T_3 was 1218 kg/m³ which increased to 1223.33 kg/m³ on the 90th day. For T_4, the density starts from 1218.33 kg/m³ and increased to 1224.67 kg/m³ on 90th day. On the 1st day the density was 1223.33 kg/m³ for T_5 and then it increased to 1226.67 kg/m³ on 90th day. In case of T_6,

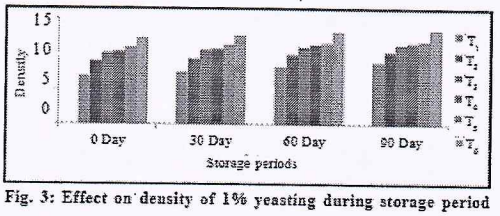


Fig. 3: Effect on density of 1% yeasting during storage period

1232.33 kg/m³ on 90th day. The ANOVA of steady revealed that the density of mixed fruit wine was found to be significant at $p \leq 0.05$ level of significance.

Effect on pH content :

Estimation of pH content of treatments T_1, T_2, T_3, T_4, T_5 and T_6 has been conducted. It has been studied that as the number of day's increases, the pH content also decreases gradually. The pH content ranges from 3.69 to 3.58 for T_1 on 1st day to last day of storage period. 3.67 was the starting pH content of T_2 which decreased to 3.56 on 90th day. The pH content of T_3 was 3.65 which decreased to 3.54 on the 90th day. For T_4, the pH content starts from 3.63 and decreased to 3.52 on 90th day. On the 1st day the pH content was 3.59 for T_5 and then it decreased to 3.51 on 90th day. In case of T_6, pH content was 3.56 on 1st day which decreased to 3.50 on 90th day. The data were analyzed to observe the effect of 1% yeasting concentration of mixed fruit wine during storage period as show in bar diagrams Figure 4.3.4. The ANOVA of steady revealed that the pH content of mixed fruit wine was found to be significant at p d" 0.05 level of significance.

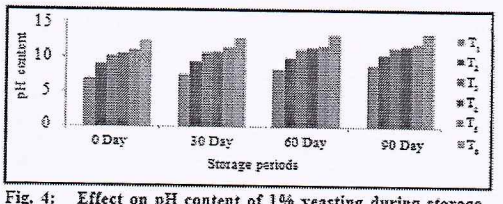


Fig. 4: Effect on pH content of 1% yeasting during storage period

Effect on alcohol content :

The alcohol content production of mixed fruit wine showed an increasing trend for all the treatments with storage period upto 90 days. The data were analyzed to observe the effect of 1% yeasting concentration of mixed fruit wine during storage period as show in bar diagrams Fig. 5. The alcohol content of mixed fruit wine showed an increasing trend for all the treatments with storage period upto 0, 30, 60 and 90 days. Estimation of alcohol content of T_1, T_2, T_3, T_4, T_5 and T_6 has been conducted. It has been studied that as the number of day's increases, the alcohol content also increases gradually. The alcohol content ranges from 10.32 to 11.44 for T_1 on 1st day to last day of storage period. 14.19 was the starting alcohol

Co-
IQAC, Shri Ram College
Muzaffarnagar

Chairman
IQAC, Shri Ram College,
Muzaffarnagar

Share More

content of T_2 which increased to 19.10 on 90 day. The initial alcohol content of T_3 was 14.42 which increased to 15.32 on the 90th day. For T_4, the alcohol content starts from 16.40 and increased to 17.57 on 90th day. On the 1st day the alcohol content was 17.30 for T_5 and then it increased to 18.29 on 90th day. In case of T_6, alcohol content was 17.75 on 1st day which increased to 18.65 on 90th day. The ANOVA of steady revealed that the alcohol content of mixed fruit wine was found to be significant at $p \leq 0.05$ level of significance.

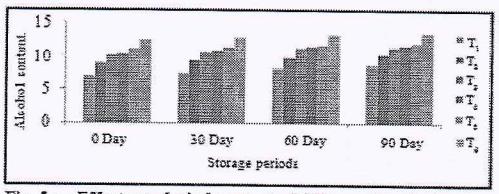


Fig. 5 : Effect on alcohol content of 1% yeasting during storage period

Conclusion:

Estimation of specific gravity of treatments T_1, T_2, T_3, T_4, T_5 and T_6 has been conducted. It has been studied that as the number of day's increases, the specific gravity also increases gradually. The TSS largely affects the various physic-chemical parameters of fermented wine. Sugar is the main substrate for fermentation of fruits juice into alcohol. The specific gravity of the wine was found to be decreased with increase in sugar per cent. The density of mixed fruit wine showed an increasing trend for all the treatments with storage period. It has been studied that as the number of day's increases, the pH content also decreases gradually. The alcohol content production of mixed fruit wine showed an increasing trend for all the treatments with storage period up to 90 1% yeasting concentration.

Acknowledgement:

We would like to acknowledge the Department of Agricultural Engineering (S.V.P. University of Agriculture and Technology, Modipuram, Meerut) for providing facilities to conduct the experiment.

References

Catania, P., Vallone, M. and Pipitone, F. (2009). Analysis of the main factors influencing the quality of wine from mechanically harvested grapes, *J.Agric. Engg.*, **4** : 27 – 30.

Kumar, V., Singh, J., Singh, B.R., Chauhan, N., Chandra, S., Yadav, M.K., Kumar, V. and Kumar, V. (2021). Effect of physico-chemical characteristics of developed mixed fruits wine during fermentation process, *J.Experimental Agriculture International*, **43**(6): 53-60.

Maziar, S.A. (2010). A study on some efficient parameters in batch fermentation of ethanol using *Saccharomyces cerevesiae* SC1 extracted from fermented siahe sardasht pomace. *African J. Biotechnology*, **9** (20) : 2906- 2912.

Ochai, J. O. and Kolhatkar, A. (2008). *Medical laboratory science and practice.* Tata McGrewHill Publishing Limited New Delhi, New York. pp. 50-53, 803.

Patharkar, S.R., Kawadkar, D.K. and Khapre, A.P. (2017). Development of orange (*Citrus reticulate* Blanco) wine from mixed culture fermentation, *International J. Current Microbiology & Applied Sciences*, **6** (8) : 3375 – 3383.

Ranganna, S. (1986). *Hand book of analysis and quality control for fruit and vegetable products.* 2nd Ed. McGraw Hill Pub. New Delhi, India.

Satav, D.P. and Pethe, A. (2017) Production and optimization of wine from banana fruits, *International J. Pharma and Bio Sciences*, **8** (2) : 790 – 794.

19th Year
★★★★★ of Excellence ★★★★★

ResearchGate

Company
About us
Blog

Co-ordinator
IQAC, Shri Ram College
Muzaffarnagar

Chairman
IQAC, Shri Ram College,
Muzaffarnagar

Plant Archives Vol. 24, No. 1, 2024 pp. 47-54 e-ISSN:2581-6063 (online), ISSN:0972-5210

Plant Archives

Journal homepage: http://www.plantarchives.org

DOI Url : https://doi.org/10.51470/PLANTARCHIVES.2024.v24.no.1.007

IMPACT OF DIFFERENT SOURCES AND APPLICATION MODES OF ZINC AND VERMICOMPOST ON N, P, K CONTENT AND UPTAKE IN SCENTED RICE CROP VARIETY PUSA 1121 IN SANDY LOAM SOIL

Suhal Sardar[1]*, U.P. Shahi[2], Ashok Kumar[1] and B.P. Dhyani[2]

[1]Department of Agriculture Shiri Ram College Muzaffarnagar, U.P., India

[2]Department of Soil Science, Sardar Vallabh Bhai Patel University of Agri. & Tech, Modipram, Meerut, U.P., India

*Corresponding author E-mail; suhalsardar696@gmail.com

(Date of Receiving-09-11-2023; Date of Acceptance-16-01-2024)

ABSTRACT

A field investigation was conducted during *Kharif* season 2011 and 2012 in sandy loam soil to study the potential of vermicompost and different sources and methods of zinc application on yield, content and uptake of N, P and K in rice crop. The experiment was laid out in Randomized Block Design with 12 treatments and 3 replications. The recommended dose of NPK at the rate of 120:60:60kg ha^{-1} respectively, was applied alone and with the combination of four sources of zinc in the mode of soil and foliar application and vermicompost @ 3t ha^{-1}. The experimental soil was low in organic carbon and available nitrogen and medium in phosphorus and higher in potassium with slightly alkaline in pH. Result reveal that application of $ZnSO_4$ @ 25kg ha^{-1} with RDF was equally good to the application of micronutrient mixture and vermicompost with RDF. Nutrient assimilation at different stages by the rice crop varied significantly due to application of different treatments in the study. Maximum nitrogen content 1.43 and 1.58% at growing stage (30 DAT) and in grain (1.29 and 1.62%) during 2011 and 2012 found in T_3, where 5 Kg zinc was applied with NPK @ 120: 60: 60 were significantly higher than the rest of the treatments, while minimum N content recorded in T_1 control (without fertilizers). N content at 60 DAT (1.36 and 1.48) and in straw (0.73 and 0.87%) was found significantly higher in the treatment T_{12}, where RDF was applied with the combination of VC @ 3 t h a^{-1} and significantly higher than the rest of treatments during both the years respectively. Maximum P and K content were recorded in the treatment T_{12} at all the growing stages as well as grain and straw during both the years. Maximum N uptake at 30, 60 DAT, Grain and straw during 2011 and 2012 found in T_3 where zinc sulphate was applied with combination of RDF and which was significantly higher than the rest of the treatments while minimum uptake recorded in T_1 but the maximum P and K uptake was recorded in the treatment T12. which was due to the application of vemicompost decreases the fixation of p and k in soil and increases the soluble p and k content in soil this lends support to higher uptake of p and k. The phosphorus content in grain and straw was found to decrease with the application of zinc. It might be due to the antagonistic effect of zinc on P absorption during both the years.

Key words : Zinc, Vermicompost, Content, uptake, Nitrogen, Phosphorus, Potassium, Soil application, Foliar application.

Introduction

Rice is the stable food of more than 60 percent of the world population. About 90 percent of all rice grow in the world is produced and consumed in Asian region. In India, rice is the most important and extensively grown food crop, occupying about 44.8 million hectares of land. Rice occupies a pivotal place in Indian agriculture and is the stable food for more than 70 per cent of population and source of livelihood for about 120- 150 million rural households. It accounts for about 43 per cent of total food grain production and 55 percent of cereals production in the country. India is one of the world's largest producers of white rice and brown rice, for 20% of all world rice production. Almost all parts of India are suitable for raising

IQAC, Shri Ram College Muzaffarnagar

Chairman
IQAC, Shri Ram College,
Muzaffarnagar

rice during the summer season provided that the water is available. Thus, rice is also raised even in those parts of western Uttar Pradesh, Punjab and Haryana where low level areas are waterlogged during the summer monsoon rainy season. Shukla and Behera (2011), reported that in India, zinc (Zn) is considered as most yield limiting essential element in agricultural crops, which likely to increase from 49 to 63% by 2025. Zinc is involved in physiological functions and its inadequate supply reduces the yield of crop. Its deficiencies can affect quality of produces. It is a constituent of many enzymes and role in carbohydrate and protein synthesis, maintaining the integrity of membranes, regulating auxin synthesis and in pollen formation. Its deficiency is a common problem in food crops, causing reduction in yield and quality of produces. In India analysis of 14,863 soil samples showed that 49% of soils are deficient and in Madhya Pradesh 60.3% of 6713 soil samples analyzed indicated deficiency of Zn (Shukla and Tiwari *et al.*, 2014). In this situation, the crops cultivated have low yield and produce seeds without Zn content. Zinc plays significant role in rice production but its deficiency is widespread and continues to be a limiting factor (Yilmaz *et al.*, 2010). Zinc sulphate is used in the amelioration of Zn deficiency and in the enrichments of grains (Alloway, 2009). Zn influences growth, yield and quality of paddy (Patnaik *et al.*, 2011). Keeping in view the important role of cereal in the economy of the tribals but limited information about this nutrient in soil, there is an urgent need for an accurate estimation of Zn in soils of central and north India. Since, it is a natural organic product which is eco-friendly, it does not leave any adverse effects either in the soil or in the environment. The C/N ratio of vermicompost is much lower (16:1) than that of FYM (30:1). 4 ton vermicompost was applied in rice at flowering and 100% NPK to wheat. Residual effect of 4 ton vermicompost application on available soil K was significant. Organic carbon (%), pH and electrical conductivity (dS m^{-1}) were not significant (Kumar *et al.*, 2017). Fertilizers are the major source of nutrients for rice under intensive cultivation. The use of chemical fertilizers in rice cultivation potentially reduces soil fertility (Biswas *et al.*, 2020). To improve physical, chemical and biological properties of soil, organic fertilizer can be applied (Olivares *et al.*, 2020 and Montenegro *et al.*, 2021). Micronutrients deficiency in crops and livestock's may cause a serious crop production or animal health problems. Micronutrients serve as constituents of prosthetic groups in metalloprotein and as activator of enzyme reactions. Iron is a structural component of porphyyrin molecules like cytochromes, hematin, ferrichrome and legheamoglobin. Manganese helps in chlorophyll formation and influence auxin levels in plants and high concentration of Mn favour the breakdown of indole acetic acid (IAA). Copper form various compound with amino acid and proteins in the plant. Copper has some indirect effect on nodule formation. It also act as electron carrier in enzyme which bring about oxidation- reduction reaction in plant. Zinc influences the formation of some growth hormones in the plant. Zinc is helpful in reproduction of certain plant and is associated with water uptake and water relation in plant. The major nutrient, deficiencies of zinc, copper, iron and manganese are frequent occurrence with major losses of crop productivity. Soil properties such as soil pH, redox potential, organic matter and moisture content exert large impact on adsorption-desorption and dissolution-precipitation reactions. Thus, soil properties regulate the amount of Zn dissolved in soil solution. Soil pH is the stronger variable affecting nutrient availability and the zinc nutrition is not far behind in this process. Increasing soil pH, especially above 6.5, results in decreased extractability and plant availability of soil Zn. Soil Zn is usually more available in soils with greater organic matter content and a relatively higher proportion of clay. Exchange positions are important in maintaining the Zn level sufficient for wet land rice and in this regard the cation exchange capacity of soils seems to play dominant role. Studied that among the different doses of NPK, application of NPK @ 125% RDF recorded significantly higher N, P and K content in plants, available in soil and uptake by plants over rest of treatments (Bairwa and Yadav, 2017). Prakash *et al.* (2019) recorded that the nutrient uptake was significantly -1 influenced by application of 100% RDF + GLM @ 6.25 t ha + -1 $ZnSO_4$ @ 12.5 kg ha as basal + 1.0% foliar spray (T). Soil plus foliar application of zinc with green leaf manure results in greater nutrient availability. The conjunctive use of green leaf manures and zinc which might have helped in gradual mineralization processes and the balanced supply of nutrients are the reason for the higher uptake of nutrients (N, P, K and Zn) by the crop. Kumar and Verma (2018) concluded that conventional till-wet direct seeded rice and 6 kg Zn ha^{-1} (basal application) was found better for N, P and K content and their uptake. Keram *et al.* (2012) revealed that yield, harvest index, nutrient (N, K and Zn) uptake and quality increased significantly with the application of recommended NPK+ Zn @ 20 kg ha^{-1} by wheat as compare to NPK alone. In general, yield, harvest index, total nutrient uptake and quality increased up to highest level of Zn, except total P uptake. Similar result also found by Bora *et al.* (2018) exhibited that FYM application along with NPK and NPK +Zn enhanced concentration of nutrients as well as their uptake

Co-ordinator
IQAC, Shri Ram College
Muzaffarnagar

Chairman
IQAC, Shri Ram College,
Muzaffarnagar

and that increased significantly with the application of N, P, K Zn and FYM applied in balanced combination. The highest values of nitrogen, phosphorus and potassium content uptake in rice were obtained under N120P40K40 + Znf + FYMr and N120P40K40 + FYMr treatments.

Materials and Methods

The experiment was conducted at the Crop Research Center, Chirodi of Sardar Vallabhbhai Patel University of Agriculture & Technology (SVPUAT), Meerut (U.P.) during *kharif* 2011 and 2012.

The area receives 862 mm of rain annually on an average, of which 90% is confined to rainy season (July - September). The soil of experimental site was sandy loam in texture having 53.54, 27.6, and 18.86 % sand , silt and clay, respectively; pH 8.35, Electrical conductivity (EC) 0.189 dSm^{-1}, Organic Carbon 0.42% (4.2 g Kg^{-1}) low, alkaline $KMnO_4$- N 206.30 Kg ha^{-1}, Olson –P 18.60 Kg ha^{-1} ammonium acetate extractable K 278.70 Kg ha^{-1} and DTPA extractable Zn 1.23 mg Kg^{-1}, Fe 14.85 mg Kg^{-1} Cu 2.43 mg Kg^{-1} Mn 10.91 mg Kg^{-1}. The treatments comprised of 4 sources of Zn (zinc sulphate heptahydrate), mono zinc sulphate, cheated zinc and micronutrient mixture) and vermicompost with the combination of RDF (NPK @ 120:60:60) in different mode of application (soil application and foliar spray). There were 12 treatments combinations replicated thrice in a factorial randomized block design. The vermicompost @ 3 t ha^{-1} were applied before transplanting with the combination of RDF during 2011 and 2012. While the graded level of Zn were applied at the time of transplanting, tillering and panicle initiation. A uniform dose of urea, Diammonium Phosphate (DAP), Muriate of Potash (MOP), Zinc sulphate, Mono zinc suphate, Chelated zinc, micronutrient mixture and vermicompost were used to provide N, P, K, Zn, Cu, Fe, Mn as per treatments in T_2-T_{12}. Whereas, in T_1 no fertilizers were used. A basal dose of 60 Kg N, 30 Kg P and 30 Kg K ha^{-1} and 5 Kg Zn ha^{-1} and full dose of vermicompost was applied at the time of transplanting while remaining half dose of N were applied at the time of tillering and panicle initiation. Growth observations were recorded at 30 and 60 day after transplanting (DAT) and at harvesting of the crop. Yield attributes were recorded at harvest and grain and straw yield was recorded plot wise after threshing of produce. After cleaning and drying the to 14 per cent moisture. The yield of net plot, thus converted to q ha^{-1}.Dry weight of straw collected from net plot was recorded after sun grains; the grain yield was recorded in kg per plot. Plant sample were analyzed for total N, P, K, Zn, Cu, Fe and Mn. The total N content was estimated through Automatic N analyzer using 0.2 gm grounded samples. For P and K analysis, plant samples were wet digested in di-acid mixture. P was determined by Vanadomolybidosphosphoric yellow color method (Jackson, 1973), K by Flame Photometer (Jackson, 1973), Zn, Cu, Fe and Mn by atomic absorption spectrophotometer. The entire data was analyzed statistically by using ANOVA. Chemical analysis for plant and soil was done by using standard methods in the Department of Soil Science, College of Agriculture, SVPUAT, Meerut (U.P.), India.

Results and Discussion

To study the effect of zinc sources and application mode on major nutrient content and uptake of rice

The plant as well as grain samples of rice were analyzed for different elements to work out their removal from the soil and data regarding the content of different nutrients in plant samples at different stages as affected by different treatments are shown in different Tables 1-3.

Effect on nitrogen content (%) and uptake of rice at different stages

Data presented in Table 1 that N content and uptake by rice biomass at 30 and 60 DAT and rice grain and straw at harvesting was significantly affected by different treatments during both the years. Nitrogen content of rice plant at 30 DAT ranges from 0.75 to 1.43 and 0.89 to 1.58% and uptake ranges from 13.08 to 44.32 and 17.65 to 66.10 kg ha^{-1} during 2011 and 2012. Maximum nitrogen content 1.43 and 1.58% during 2011 and 2012 found in T_3 with application of recommended NPK + soil application of zinc @ 5 kg ha^{-1} maximum nitrogen uptake 44.32 $kgha^{-1}$ during 2011 recorded in T_{12} and 60.10 kg ha^{-1} during 2012 in T_3. Nitrogen content of rice plant at 60 DAT ranges from 0.60 to 1.36 and 0.74 to 1.48% during 2011 and 2012, respectively. Maximum N content 1.36 and 1.48 and uptake 96.35 and 108.27 $kgha^{-1}$ during 2011 and 2012 respectively found in T_{12}, where recommended NPK was applied with vermicompost @ 3 t ha^{-1}, while minimum N content and uptake was observed in T_1 control during both the years. The nitrogen content and uptake of plant sample in T_{11} and T_3 where RDF was used with micronutrient mixture and zinc sulphate respectively was also higher but not to the level of nitrogen content and uptake recorded in T_{12}. The highest N content 1.29 and 1.62% and uptake 46.65 and 64.15 $kgha^{-1}$ in rice grain during 2011 and 2012 found in T_3 was significantly higher than the rest of the treatments while minimum N content and uptake recorded in T_1

Co-ordinator
IQAC, Shri Ram College
Muzaffarnagar

Chairman
IQAC, Shri Ram College,
Muzaffarnagar

Table 1 : Effect of zinc sources and application mode on nitrogen content (%) and uptake (kg ha^{-1}) in rice at different stages.

Treatments	30 DAT		60DAT		Grain		Straw		30 DAT		60DAT		Grain		Straw	
	2011	2012	2011	2012	2011	2012	2011	2012	2011	2012	2011	2012	2011	2012	2011	2012
T_1	0.75	0.89	0.60	0.74	0.77	1.11	0.27	0.38	13.08	17.65	20.05	29.20	18.73	29.74	11.01	15.57
T_2	1.40	1.42	1.20	1.14	0.94	1.28	0.39	0.46	27.42	31.38	45.98	50.34	30.08	42.53	20.13	24.76
T_3	1.43	1.58	1.25	1.37	1.29	1.62	0.63	0.69	40.68	66.10	66.12	80.44	46.65	64.15	34.50	39.88
T_4	1.37	1.52	1.20	1.28	1.24	1.58	0.55	0.62	34.34	44.57	62.45	74.05	43.80	58.93	30.10	35.61
T_5	1.34	1.51	1.17	1.20	1.23	1.57	0.50	0.57	32.71	40.61	58.24	66.71	42.64	57.98	27.20	32.72
T_6	1.30	1.47	1.09	1.14	1.20	1.54	0.46	0.53	31.03	38.83	51.89	61.22	41.19	55.70	24.78	30.18
T_7	1.17	1.34	0.98	1.05	1.11	1.44	0.45	0.52	26.34	33.54	45.32	54.74	37.74	51.51	23.92	29.52
T_8	1.15	1.32	0.87	0.96	1.09	1.43	0.43	0.50	25.59	32.16	38.94	48.51	36.92	50.72	22.77	28.25
T_9	1.15	1.20	0.96	0.95	1.00	1.34	.042	0.48	24.66	28.17	40.97	46.49	33.00	47.09	22.22	26.09
T_{10}	1.13	1.17	0.83	0.92	0.98	1.32	0.41	0.47	23.25	26.18	32.40	41.14	32.34	45.67	21.23	25.42
T_{11}	1.38	1.15	1.38	1.42	1.26	1.33	0.68	0.80	42.23	38.84	78.02	89.19	46.20	53.42	38.10	46.81
T_{12}	1.37	1.52	1.36	1.48	1.21	1.18	0.73	0.87	46.00	55.44	83.96	97.70	44.77	51.33	41.63	57.67
SE (m).	***.018***	***.016***	***.017***	***.017***	***0.01***	***0.02***	***0.01***	***0.02***	***1.09***	***.45***	***1.24***	***1.44***	***2.57***	***2.76***	***1.74***	***2.49***
CD(p=0.05)	***0.05***	***0.04***	***0.05***	***0.05***	***0.04***	***0.06***	***0.04***	***0.05***	***3.22***	***1.33***	***3.66***	***4.26***	***5.71***	***6.13***	***3.86***	***5.52***

where any sources of element was not applied. The N content and uptake of grain sample was higher in these treatments, where zinc in either source was applied as basal as foliar. The N content of grain in T_{11} and T_{12} was also higher but not to the level of N content recorded in T_3. Among the treated plots minimum plant N content was recorded in T_{10} followed by T_9. With exception of T_{11} during 2012 generally the nitrogen uptake of grain was higher in those treatments where zinc through either source was applied basal than foliar during both the years. Maximum N content 0.73 and 0.87% and uptake 41.63 and 57.67 kgha^{-1} by rice straw during 2011 and 2012 found in the treatment T_{12} was superior but significantly at with the treatments T_{11} and T_3, where RDF was applied with micronutrients mixture and zinc sulphate @ 20 Kg ha^{-1}, while minimum N content recorded in T_1 was significantly lower than the rest of the treatments during both the years. In general the N content and uptake of straw was higher in those treatments where zinc in either source was applied as basal as foliar. Nitrogen, phosphorus and potassium content of rice plant decline with the advancement in crop growth in different treatments which is obvious due to dilution effect. Maximum nitrogen content during 2011 and 2012 found in T_3 was significantly higher than the rest of the treatments while minimum N content recorded in T_1 was significantly lower than the rest of the treatments during both the years. The application of recommended NPK with zinc sulphate @25 kg ha^{-1} recorded higher nitrogen content in T_3 followed by T_2, T_{11} and T_{12} higher N content in T_3, T_{11} and T_{12} may be supposed due to better plant growth with the supplementation of zinc. Better plant growth as evidenced by dry matter production will extract more nitrogen from soil therefore plant N content may be higher. In case of T_2 plant growth was poor in absence of zinc and since recommended dose of N was applied therefore absorbed N was not diluted and plant N content was higher. Plant N content estimated at 60 DAT, grain and straw N content was also affected significantly by different treatments. At 60 DAT, plant N content was higher in T_{12}, T_{11} and T_3. More N content in T_{12} than T_3 may be explained due to more N availability with the addition application of VC over RDF. Similar results were also recorded by Jana *et al.* (2009) that the application of 30 to 40 kg ZnSO4/ha gave significantly higher values of plant height, number of effective tillers, panicle length, grain number per panicle, grain and straw yields and higher uptake of N, P, K and Zn in grain and straw of rice. Dixit *et al.* (2012) reported that nitrogen, phosphorus and potassium uptake in crop increased significantly with sulphur and zinc application. Ranjitha *et al.* (2013) also

Co-ordinator
IQAC, Shri Ram College
Muzaffarnagar

Chairman
IQAC, Shri Ram College.
Muzaffarnagar

Table 2 : Effect of zinc sources and application mode on phosphorus content (%) and uptake (kg ha^{-1}) of rice at different stages.

Treatments	Content (%)						Uptake (kg ha^{-1})					
	30DAT		60DAT		Grain	Straw	30DAT		60DAT		Grain	Straw
	2011	2012	2011	2012	2011	2011	2012	2011	2012	2011	2012	2011	2012	2011	2012	2011	2012
T_1	0.086	0.090	0.066	0.070	0.081	0.049	0.058	1.50	1.79	2.21	2.77	1.95	2.25	1.98	2.38
T_2	0.127	0.130	0.085	0.090	0.121	0.061	0.065	2.48	2.87	3.26	3.95	3.87	4.12	3.31	3.70
T_3	0.227	0.230	0.167	0.190	0.221	0.122	0.126	6.46	7.20	8.83	11.20	7.99	8.87	6.48	7.24
T_4	0.208	0.210	0.148	0.170	0.204	0.114	0.117	5.22	6.12	7.70	9.81	7.21	7.76	6.39	6.77
T_5	0.196	0.200	0.136	0.150	0.191	0.094	0.098	4.79	5.37	6.77	8.35	6.62	7.17	5.36	5.73
T_6	0.189	0.190	0.125	0.140	0.182	0.091	0.094	4.52	4.99	5.95	7.48	6.27	6.62	4.83	5.31
T_7	0.178	0.180	0.107	0.130	0.172	0.085	0.089	4.01	4.50	4.95	6.79	5.84	6.29	4.40	4.79
T_8	0.165	0.160	0.098	0.120	0.155	0.078	0.082	3.66	3.92	4.38	6.11	5.24	5.60	4.21	4.65
T_9	0.146	0.150	0.094	0.110	0.139	0.072	0.074	3.13	3.54	4.01	5.36	4.59	4.98	3.72	4.02
T_{10}	0.138	0.140	0.091	0.100	0.132	0.065	0.068	2.84	3.13	3.55	4.49	4.35	4.60	3.55	3.90
T_{11}	0.237	0.240	0.198	0.207	0.223	0.124	0.128	7.30	8.09	11.19	12.95	8.17	9.27	6.56	7.35
T_{12}	0.256	0.270	0.216	0.240	0.246	0.141	0.149	8.60	9.84	13.34	15.84	9.10	11.44	7.71	9.88
SE (m).	*0.0020*	*0.016*	*0.002*	*0.014*	*0.002*	*0.002*	*0.002*	*0.14*	*0.42*	*0.16*	*.81*	*.32*	*0.30*	*0.25*	*0.27*
CD(p=0.05)	*0.006*	*0.046*	*.006*	*0.042*	*.006*	*.005*	*.005*	*.44*	*1.24*	*0.48*	*2.40*	*0.97*	*0.89*	*0.76*	*0.80*

disclosed that significantly maximum NPK uptake by rice @ 157.9-30.7- 166.0 kg ha^{-1} was obtained in treatments receiving 50% inorganic nitrogen source (root dipping) and 50% organic nitrogen source through vermicompost (root dipping) as compared to 100% inorganic N source alone (136.5-23.2- 125.6 kg ha^{-1}) and control (58.7-6.9-61.6 kg ha^{-1}).

Phosphorus content (%) and uptake of rice at different stages

It is clear from the Table 2 that measured phosphorus content was affected significantly by different treatments during both the years. P content of rice at 30 DAT, 60 DAT and rice grain and straw at harvesting was significantly affected by different treatments during both the years. P content of rice plant at 30 DAT ranges from 0.086 to 0.256 and 0.090 to 0.270 percent and uptake 1.50 to 8.60 and 1.79 to 9.84 kgha^{-1} during 2011 and 2012, respectively. The maximum P content 0.256 and 0.270% and uptake 8.60 and 9.84 kgha^{-1} both during 2011 and 2012 found in T_{12}, while minimum P content and uptake was recorded in T_1 during both the years. In general the P content of plant sample at this stage was higher in those treatments where zinc in either source was applied as basal as foliar in optimum level. The P content and uptake of plant sample in T_{11} and T_3 was also higher but not to the level of P content recorded in T_{12}. The similar trend in P content and uptake was recorded at 60 DAT. The maximum P content 0.246 and 0.263% and uptake 9.10 and 11.44 kg ha^{-1} in grain during 2011 and 2012 found in T_{12} was significantly higher than the rest of the treatments while minimum P content and uptake of rice grain was recorded in T_1 significantly lower than the rest of the treatments during both the years. P content and uptake of rice grain was higher in those treatments where zinc by either source was applied basal than foliar. The response of T_{11} and T_3 in respect of grain P content and uptake was also higher but not to the level of P content recorded in T_{12}. The highest P content 0.141 and 0.149% and uptake 7.71 and 9.98 kgha^{-1} in straw during 2011 and 2012 found in T_{12} was significantly higher than the rest of the treatments, while minimum P content of rice straw recorded in T_1 was significantly lower than the rest of the treatments. The P content of straw sample was higher in those treatment where zinc in either source was applied in basal than foliar. The straw zinc content in treatments (T_{11}) receiving micronutrient mixture +RDF and T_3, where $ZnSO_4$ @ 25kg ha^{-1} + RDF was also higher, but not reach to the level of P content recorded in T_{12} where

Co-ordinator
IQAC, Shri Ram College
Muzaffarnagar

Chairman
IQAC, Shri Ram College,
Muzaffarnagar

vermicompost @ 3tone ha^{-1} was used with RDF. Among the treated plots minimum P content and uptake in rice straw was recorded in T_2 followed by T_{10} and T_9. Phosphorus content of the rice at 30, 60, grain and straw stage was significantly affected by different treatments during both the years. During all the stages the highest P content found in T_{12} was significantly higher than the rest of the treatments while minimum P content recorded in T_1 was significantly lower than the rest of the treatments during both the years. The P content was higher in those treatment where zinc in either source was applied in basal than foliar. The crop growth was better with balanced and adequate nutrition. Rooting system will also be better with adequate and balanced plant nutrition. Since roots are directly related to P absorption higher P content in those treatments is well expected. Addition of vermicompost will increase P well benefit the standing crops. Rana and Kashif (2014) reported that lowest P concentrations for paddy and straw were recoded under absolute control (T_1). When compared with Z-control (T_2) different sources of Zn application resulted in decreased P content in paddy and straw (except Zn-EDTA application, both soil and foliar). Maximum value of P content in paddy (2.11%) and straw (1.09%) were obtained in T_5 (Zn-EDTA applied @ 10.00 kg ha^{-1} in soil) followed by T_2. Among the Zn treatments, T_6 (ZnO applied @ 5.00 kg ha^{-1} in soil) recorded lower P contents in paddy (1.72 %) and straw (0.77 %). Ram *et al.* (2020) also reported thatthe content of nitrogen (N) of grain and straw of summer rice was maximum in the treatments with 75% RDN+25% N through Vermicompost (T_2) and it was closely followed by the treatment 75% RDN+25% RDN through FYM (T_3) and 100% RDN (T_1). The N content in straw of the treatment T_3 (75% RDN+25% RDN through FYM) was further significantly superior to 50% RDN+50% N through Vermicompost (T_4). Kumar *et al.* (2023) the content of phosphorus (P) in grain and straw of rice was at par with all nutrient management treatments except control (T_8) was significantly inferior to others. When compared to control and other treatments, the application of 125% RDF + Vermicompost @ 6 t ha^{-1} + 2% Zinc Solubilizing bacteria (T_8) resulted in significantly higher values for NPK uptake in grain and straw. This is because the concentration of nutrients in the soil was raised by using vermicompost in conjunction with chemical fertilizers. Similar result also found by Biswas *et al.* (2020) the highest nitrogen and potassium content by rice grain and straw were recorded with the application of 75% RDF + 25% N through vermicompost. The phosphorus content in grain was highest with 100% RDF + S40 Zn5 B 1.5 kg ha^{-1} while in straw it was maximum with customized fertilizer. The higher K content in grain and straw were noticed in 75% RDF + 25% N through sewage sludge.

Potassium content (%) and uptake (Kg/ha) of rice at different stages

It is clear from Table 3 that measured potassium content and uptake was affected significantly by different treatments during both the years. Potassium content and rice biomass at 30 and 60 DAT and rice grain and straw at harvesting were significantly affected by different treatments during both the years. Maximum K content 1.81 and 1.85% and uptake 60.81 and 67.47 kg ha^{-1} during 2011 and 2012 found in T_{12} was significantly higher than the rest of the treatments, while minimum K content recorded in T_1 was significantly lower than the rest of the treatments during both the years. In general, the K content of rice plant at this stage was higher in those treatments where zinc in either source was applied basal than foliar. The K content and uptake of rice plant sample in T_{11} and T_3 was also higher but not to the level of K content recorded in T_{12}. Among the treated plots minimum plant K content and uptake was recorded in T_2 followed by T_{10}. A similar trend in Potassium content and uptake was observed in rice plants at 60 DAT. The maximum range of Potassium content from 0.250 to 0.523 and 0.280 to 0.550% and uptake from 6.13 to 19.34 and 7.54 to 23.93 $kgha^{-1}$ of grain during 2011 and 2012, respectively. The highest K content 0.523 and 0.550% and uptake 19.34 and 23.93 $kgha^{-1}$ during 2011 and 2012 found in T_{12} was significantly higher than the rest of the treatments while minimum K content and uptake recorded in T_1 was significantly lower than the rest of the treatments. The K content and uptake of grain sample was higher in those treatments, where zinc in either source was applied as basal as foliar. The K content of grain in T_{11} and T_3 was also higher but not to the level of K content recorded in T_{12} among the treated plots minimum plant K content was recorded in T_2 followed by T_{10}. The potassium content of straw ranges from 1.21 to 1.55 and 1.24 to 1.58 % and uptake ranges from 49.25 to 84.82 and 50.76 to 104.67 kg ha^{-1} during 2011 and 2012, respectively. The highest K content 1.55 and 1.58% and uptake 84.82 and 104.67 kg ha^{-1} during 2011 and 2012 found in T_{12} was significantly higher than the rest of the treatments while minimum K content and uptake recorded in T_1 was significantly lower than the rest of the treatments. The K content and uptake of straw was higher in those treatments, where zinc in either source was applied basal than foliar. The K content and uptake of plant sample in T_{11} and T_3 was also higher but not to the level of K content recorded in T_{12}. Among the treated plots minimum

Co-ordinator
IQAC, Shri Ram College
Muzaffarnagar

Chairman
IQAC, Shri Ram College
Muzaffarnagar

Table 3 : Effect of zinc sources and application mode on potassium content (%) and uptake (kg ha^{-1}) of rice at different stages.

Treatments	Content (%)						Uptake (kg ha^{-1})					
	30DAT		60DAT		Grain	Straw	30DAT		60DAT		Grain	Straw
	2011	2012	2011	2012	2011 2012	2011 2012	2011	2012	2011	2012	2011 2012	2011 2012
T_1	1.33	1.38	.98	1.04	.25 .28	1.21 1.24	23.19	27.77	32.81	41.07	6.13 7.54	49.25 50.76
T_2	1.40	1.44	1.04	1.08	.29 .32	1.25 1.28	27.44	31.82	39.87	47.70	9.28 10.62	68.04 68.86
T_3	1.65	1.68	1.32	1.35	.45 .48	1.48 1.51	46.92	52.68	69.82	79.29	16.29 19.04	79.35 87.33
T_4	1.58	1.63	1.28	1.31	.43 .46	1.42 1.46	39.64	47.17	66.56	75.80	15.18 17.16	77.50 83.86
T_5	1.54	1.59	1.21	1.25	.40 .43	1.39 1.43	37.61	42.79	60.23	69.51	13.93 15.95	75.92 82.12
T_6	1.52	1.56	1.18	1.21	.38 .41	1.36 1.41	36.30	41.20	56.16	64.60	13.09 14.84	72.01 81.01
T_7	1.50	1.53	1.15	1.18	.35 .38	1.34 1.39	33.80	38.32	53.22	61.46	11.94 13.54	71.71 79.19
T_8	1.45	1.50	1.14	1.16	.33 .36	1.33 1.36	32.25	36.57	51.07	58.66	11.17 12.74	70.64 77.19
T_9	1.44	1.48	1.10	1.14	.32 .35	1.31 1.33	30.87	34.74	46.97	55.77	10.59 12.28	69.41 75.28
T_{10}	1.42	1.46	1.08	1.11	.30 .33	1.29 1.31	29.25	32.66	42.15	49.66	9.88 11.40	67.60 71.18
T_{11}	1.73	1.78	1.38	1.42	.48 .51	1.51 1.54	53.19	60.10	78.05	89.19	17.58 20.47	80.58 90.11
T_{12}	1.81	1.85	1.45	1.49	.52 .55	1.55 1.58	60.81	67.47	89.51	98.34	19.34 23.93	84.82 104.67
SE (m).	*0.015*	*0.018*	*0.017*	*0.014*	*0.014 0.014*	*0.013 0.017*	*1.251*	*.617*	*1.50*	*1.47*	*.937 .88*	*3.53 3.44*
CD (p=0.05)	*0.044*	*0.052*	*0.049*	*0.042*	*.041 .042*	*0.038 0.051*	*3.693*	*1.82*	*4.43*	*4.33*	*2.76 2.61*	*10.42 10.17*

plant K content was recorded in T_2 followed by T_{10}. Potassium content of the rice at 30, 60, grain and straw stage was affected significantly by different treatments during both the years. During all the stages the highest K content found T_{12} was significantly higher than the rest of the treatments while minimum K content of rice in T_1 was significantly lower than the rest of the treatments during both the years. The K content was higher in those treatments where zinc through either source was applied in basal than foliar. Grain and straw K content is affected significantly by the application of 3 tha^{-1} vermicompost + NPK (T_{12}), it may be due to more availability of K with the release of K from minerals owing to acidulation (Kumar *et al.*, 2023). When compared to control and other treatments, the application of 125% RDF + Vermicompost at 6 tha^{-1} + 2% Zinc Solubilizing bacteria (T8) resulted in higher values for NPK content in grain and straw. Grain and straw nitrogen and phosphorus concentration was recorded significantly higher in T_8. Potassium concentration in grain is significantly higher in T8 while straw potassium concentration is comparable to T7. The application of vermicompost, which is a rich source of nutrients and enhances the availability of macronutrients in soil, is responsible for the increase in nutritional content. Similar outcomes were discovered by Taheri Rahimabadi *et al.* (2017) and Papia Biswas *et al.* (2020). The control plots were found to have the lowest NPK concentration in grain and straw. Similar result was also recorded by Khan *et al.* (2003) recorded that a significant increase in Zn content of rice leaf before and after flowering and a significant decrease in P content of straw and paddy and starch content of paddy was recorded for all the methods. Nitrogen, K and Zn of paddy and straw and Zn contents of roots increased significantly with the application of zinc irrespective of the methods over control. The soil application of Zn was rated superior because it gave significantly higher content of N in rice paddy. Apoorva *et al.* (2017) reported that the K content was found to increase with the application of zinc. This might be due to the synergistic interaction between zinc and potassium. The highest uptake of potassium in grain (26.0 kg ha^{-1}) and straw (109.7 kg ha^{-1}) was seen in the treatment receiving RDF + soil application of bio zinc @30 kg ha^{-1}. The lowest uptake was recorded in control grain (6.5 kg ha^{-1}), straw (59.2 kg ha^{-1}).

Conclusion

Based on the experimental findings, it could be

Co-ordinator
IQAC, Shri Ram College
Muzaffarnagar

Chairman
IQAC, Shri Ram College
Muzaffarnagar

concluded that vermicompost is a best organic source of carbon and mineral nutrients which is a product of decomposition process using various species of earthworms and increase the availability of macro and micronutrients in soil. The application of 100% RDF + Vermicompost at 3 t ha^{-1} in T_{12} recorded higher values in NPK content and uptake over the other treatments. But the content and uptake of NPK in treatments (T_{11}) receiving micronutrient mixture +RDF and T_3 where $ZnSO_4$ @ 25kg ha^{-1} + RDF was also higher and equally good like treatment T_{12}.

References

Alloway, B.J. (2011). Soil factors associated with zinc deficiency in crops and humans. *Envi Geochem and Health*, May 12, 2011, 2009.

Apoorva, M.R., Chandrasekhar Rao P. and Padmaja G. (2017). Effect of zinc with Special Reference to Nano Zinc Carrier on Yield, Nutrient Content and Uptake by Rice (*Oryza sativa* L.). *Int. J. Curr. Microbiol. App. Sci.*, **6(8)**, 1057-1063

Arun, Kumar S., Kamini Kumari and Arivazhagan K. (2023). Nutrient Content and Nutrient Uptake of Rice by the Impact of Inorganic, Organic and Biological Sources of Nutrients in an Inceptisol Soil of Tamil Nadu. **44(03)**, 834-840. ISSN: 0253-7214.

Bairwa1, S. and Yadav P.K. (2017). Influence of FYM, Inorganic Fertilizers and Micronutrients on Soil Nutrient Status and Plant Nutrient Contents and their Uptake by African Marigold (*Tagetes erecta* Linn.). *Int. J. Curr. Microbiol. App. Sci.*, **6(6)**, 1362-1370.

Jana, P.K., Ghatak R., Sounda G., Ghosh R.K. and Bandyopadhyay P. (2009). Effect of zinc fertilization on yield, N,P, K and Zn uptake by transplanted rice at farmer's field of red and laterite soils of West Bengal. *Indian Agriculturist*, **53(3-4)**, 129-132.

Keram, K.S. Sharma B.L. and Sawarkar S.D. (2012). Impact of zinc application on yield, quality, nutrient uptake and soil fertility in a medium deep black soil (vertisol). *Int. J. Sci., Environ. Tech.*, **1(5)**, 563 – 571

Kumar, Amit, Dhyani B.P., Ashish Rai and Vipin Kumar (2017). Residual effect of Applied Vermicompost and NPK to Rice on Growth and Yield of Succeeding Wheat and Chemical Properties of Soil. *Int. J. Curr. Microbiol. App. Sci*, **6(11)**, 1087-1098.

Kumar, Sushil and Verma S.K. (2018). Crop Establishment Methods and Zinc Fertilization affects Nutrients Content and their Uptake of Direct-Seeded Rice. *Int. J. Curr. Microbiol. App. Sci.*, **7(12)**, 655-661.

Montenegro, E., Pitti J. and Olivares B. (2021). Identification of the main subsistence crops of the Tribe: a case study based on multivariate techniques. *Idesia*, **39(3)**, 83-94.

Olivares, B.O., Araya-Alman M. and Acevedo-Opazo C. (2020). Relationship Between Soil Properties and Banana Productivity in the two Main Cultivation Areas in Venezuela. *J. Soil Sci. Plant Nutr.*, **20(3)**, 2512-2524.

Papia, Biswas, Jitendra Singh Bohra and Nitesh Kumar (2020). Effect of nutrient management on quality, NPK content and uptake in rice (*Oryza sativa* L.) under rice-wheat cropping system. *J. Pharmacog. Phytochem.*, **9(2)**, 1254-1258.

Patnaik, M.C., Raju A.C. and Bhupal R.G. (2011). Zinc requirement of hybrid rice–Bhendi and its influence on zinc fractions in an Alfisol of Hyderabad. *J. Indian Soc. Soil Sci.*, **9**, 368-375.

Prakash, P., Hemalatha M. and Joseph M. (2019). Influence of Zinc Nutrition and Green Leaf Manuring on Dry Matter Yield, Nutrient Uptake and Economics of Rice Cultivation. *Indian J. Ecol.*, **46(1)**, 65-69.

Ram, M.S., Shankar T., Maitra S. and Duvvada S.K. (2020). Effect of Integrated Nutrient Management on Growth, Yield, Nutrient Content and Economics of Summer Rice (*Oryza sativa* L.). *Int. J. Pure Appl. Biosci.*, **8(3)**, 421-427.

Ranjitha, P. Sri, Kumar R.M. and Jayasree G. (2013). Evaluation of Rice (*Oryza sativa* L.) Varieties and Hybrids in Relation to Different Nutrient Management Practices for Yield, Nutrient Uptake and Economics in SRI. *Annals Biol. Res.*, **4 (10)**, 25-28.

Reshma, Bora, Aaradhana Chilwal, Pandey P.C. and Reetika Bhaskar (2018). Nutrient Content and Uptake in Rice (*Oryza sativa* L.) under the Influence of Long Term Balance Fertilizer Application. *Int. J. Curr. Microbiol. App. Sci.*, **7(9)**, 2011-2017.

Shukla, A.K. and Behera S.K. (2011). *Indian J. Fert.*, **7(10)**, 14-33.

Shukla, A.K. and Tiwari P.K. (2014). Annual Report of All India Coordinated Res. Project on Micro and Secondary Nutrients and Pollutant Elements in Soils and Plant. IISS, Bhopal (M.P.),

Shukla, A.K. and Tiwari P.K. (2016). Micro and Secondary Nutrients and Pollutant Elements Research in India. Coordinators Report- AICRP on Micro- and Secondary Nutrients and Pollutant Elements in Soils and Plants, ICAR-IISS, Bhopal. pp. 1-196.

Taheri Rahimabadi, E., Ansari M. H. and Razavi Nematollahi A. (2017). Influence of cow manure and it's vermicomposting on the improvement of grain yield and quality of rice (*Oryza sativa* L.) in field conditions. *Appl. Ecol. Environ. Res.*, **16(1)**, 97-110.

Umar Khan, M., Qasim M., Subhan M., Riazud Din Ahmad and Liaquat Ali (2003). Effect of Zinc Application by Different Methods on the Chemical Composition and Grain Quality of Rice. *J. Appl. Sci.*, **3**, 530-536.

Yilmaz, A., Torun B., Gultekin L. and Cakmak L. (2010). Effect of different zinc application methods on grain yield and zinc concentration in rice grown on zinc deficient calcareous soils. *J. Plant Nutr.*, **20**, 461-471.

Co-Ordinator
IQAC, Shri Ram College
Muzaffarnagar

Chairman
IQAC, Shri Ram College,
Muzaffarnagar

IJCRT.ORG ISSN : 2320-2882

INTERNATIONAL JOURNAL OF CREATIVE RESEARCH THOUGHTS (IJCRT)

An International Open Access, Peer-reviewed, Refereed Journal

आधुनिक भारतीय चित्रकला की विविध प्रवृत्तियाँ एवं प्रभाववाद

अनु देवी, शोध छात्रा, चौ0चरण सिंह विश्वविद्यालय, मेरठ व प्रवक्ता, ललित कला विभाग, श्रीराम कॉलेज, मुजफ्फरनगर।

डॉ0 वन्दना वर्मा, शोध निर्देशक व एसोसिएट प्रोफेसर, चित्रकला विभाग, जैन कन्या (पी0जी0) कॉलेज, मुजफ्फरनगर

संक्षेप

आधुनिक भारतीय चित्रकला पर साम्राज्यवादी एवं विस्तारवादी नीतियों का विशेष प्रभाव देखने को मिलता है। ब्रिटिश राज्य की स्थापना के साथ ही, प्रचलित परम्परागत कला–शैलियों के अवसान के साथ आधुनिक भारतीय चित्रकला का इतिहास जुड़ा हुआ है। जैसे–जैसे भारतवर्ष में ईस्ट इण्डिया कम्पनी का प्रभाव बढ़ता गया और हिन्दू तथा मुस्लिम शासकों को पदच्युत करके अनेक राज्यों का शासन सीधे ब्रिटिश सत्ता के अधीन होता गया, वैसे–वैसे राजाश्रय में पलने वाले चित्रकार भी अपने आश्रयदाताओं के दरबारों से पलायन करते गये। भारत में कुछ पश्चिमी चित्रकार मुख्यतः ईस्ट इण्डिया कम्पनी अथवा ब्रिटिश शासन के अधिकारियों के साथ आये कुछ अन्य चित्रकार भारत की समृद्धि की ख्याति सुनकर विदेशी व्यापारियों की भाँति भारत में अपना भाग्य आजमाने आ गये। भारतीय संरक्षकों ने अपनी परम्परागत कला–शैलियों का तिरस्कार करते हुए इन पश्चिमी चित्रकारों को अप्रत्याशित प्रोत्साहन दिया। किन्तु राजाश्रय से भिन्न यहाँ के लोक–जीवन में कलाओं का जो अनिवार्य प्रयोग होता रहा है, उसकी धारा इस युग में भी अविच्छिन्न बहती रही और उसके सौन्दर्य को कलाकारों की नई पीढ़ियों ने केवल तभी पहचाना जब यूरोप के कला–मर्मज्ञों ने आदिम कला तथा लोक कला की शक्ति की भूरि–भूरि प्रशन्सा की। भारतीय लोक–कलाओं का प्रभाव आज हम देश के मूर्धन्य कलाकारों पर देखते हैं।

मुख्य शब्दः भारतीय चित्रकला, विस्तारवाद, प्रभाववाद, प्रवृत्तियाँ।

आधुनिक भारतीय चित्रकला की पृष्ठभूमि

आधुनिक भारतीय चित्रकला की प्रवृत्तियाँ वर्तमान समय की चित्रकला में एक महत्वपूर्ण स्थान रखती है जबकि इसका इतिहास एक उलझनपूर्ण किन्तु विकासशील कला का इतिहास है। साम्राज्यवादी एवं विस्तारवादी नीतियों का विशेष प्रभाव इस कला पर देखने का मिलता है। बर्बर ओर लालची विदेशी शक्तियों ने इसे बार–बार आक्रान्त किया; अतः एक स्वतन्त्र–चेता राष्ट्र के रूप में इस देश की विचारधारा, कला एवं संस्कृति का विकास अपेक्षित दिशा में नहीं हो सका।

ब्रिटिश सत्ता के भारत से चले जाने के उपरान्त भी देश की कला का विकास उचित रीति से नहीं हो पा रहा है एवं न हम अपनी परम्पराओं और अतीत को ही सहीं ढंग से समझते हैं और न पश्चिमी आन्दोलनों के भारत देश पर पड़ने वाले आवश्यक अथवा अनावश्यक प्रभावों को ही गम्भीरता से सोच पा रहे हैं। ऐसी परिस्थितियों में आधुनिक भारतीय चित्रकला की कोई राष्ट्रीय व्याख्या कर पाना सम्भव नहीं रहा। अतः यह शोधपत्र आधुनिक भारतीय चित्रकला के प्रभाव को दर्शाने का एक प्रयास है।

ब्रिटिश राज्य की स्थापना के साथ ही, प्रचलित परम्परागत कला–शैलियों के अवसान के साथ आधुनिक भारतीय चित्रकला का इतिहास जुड़ा हुआ है। जैसे–जैसे भारतवर्ष में ईस्ट इण्डिया कम्पनी का प्रभाव बढ़ता गया और हिन्दू तथा मुस्लिम शासकों को पदच्युत करके अनेक राज्यों का शासन सीधे ब्रिटिश सत्ता के अधीन होता गया, वैसे–वैसे राजाश्रय में पलने वाले चित्रकार भी अपने आश्रयदाताओं के दरबारों से पलायन करते गये। भारत में कुछ पश्चिमी चित्रकार मुख्यतः ईस्ट इण्डिया कम्पनी अथवा ब्रिटिश शासन के अधिकारियों के साथ आये कुछ अन्य चित्रकार भारत की समृद्धि की ख्याति सुनकर विदेशी व्यापारियों की भाँति भारत में अपना भाग्य आजमाने आ गये। भारतीय संरक्षकों ने अपनी परम्परागत कला–शैलियों का तिरस्कार करते हुए इन पश्चिमी चित्रकारों को अप्रत्याशित प्रोत्साहन दिया। किन्तु राजाश्रय से भिन्न यहाँ के लोक–जीवन में कलाओं का जो अनिवार्य प्रयोग होता रहा है, उसकी धारा इस युग में भी अविच्छिन्न बहती रही और उसके सौन्दर्य को कलाकारों की नई पीढ़ियों ने केवल तभी पहचाना जब यूरोप के कला–मर्मज्ञों ने आदिम कला तथा लोक कला की शक्ति की भूरि–भूरि प्रशन्सा की। भारतीय लोक–कलाओं का प्रभाव आज हम देश के मूर्धन्य कलाकारों पर देखते हैं।

Co-ordinator
IQAC, Shri Ram College
Muzaffarnagar

Chairman
IQAC, Shri Ram College,
Muzaffarnagar

अंग्रेजी शासन के फलस्वरूप कला के क्षेत्र में दो प्रभाव पड़े, पहला– स्थानीय चित्रकारों ने अपने अनुसार पश्चिमी कला के मिश्रण से एक संकर कला–शैली का निर्माण किया जिसे कम्पनी शैली कहा गया है। दूसरा– यह कि समाज के सभी वर्गों में, जो कलाओं के संरक्षक समझे जाते हैं में पश्चिमी कला के प्रति आदरभाव बढ़ा और अपनी कला के प्रति भावना कम हुई। स्वयं अंग्रेजों ने इस भावना को बढाने तथा पश्चिमी चित्रकारों को भारत में प्रोत्साहित करने का भरपूर प्रयत्न किया। जो भारतीय चित्रकार पश्चिमी शैली में कार्य करते थे, अंग्रेजों ने उन्हें भी अत्यधिक प्रोत्साहन दिया।

चित्रकला की दुर्बलता

उन्नीसवीं शताब्दी के मध्य तक आते–आते राजस्थानी, पहाड़ी तथा मुगल शैलियों में पर्याप्त ह्रास हो गया था। राजस्थान कला की पहले जैसी स्थिति नहीं रही थी। जयपुर शैली के चित्रों की मांग बढ़ जाने के कारण घटिया स्तर की असंख्य कृतियों का निर्माण होने लगा जिनमें चरबों के आधार पर प्राचीन चित्रों की अनुकृतियों की संख्या बहुत अधिक थी। 1880 तक आते–आते इस शैली पर पर्याप्त यूरोपीय प्रभाव पड़ चुका था।

- पहाड़ी शैली की अन्तिम परिणति सिख चित्रकला में हुई जिसमें पर्याप्त दुर्बलता, आलंकारिकता तथा रेखांकन की कठोरता है। रंगों में भी पहले जैसा सौन्दर्य नहीं रहा। इसके साथ ही इस पर भी पश्चिमी कला का प्रभाव बढ़ता गया।
- मुगल कला में भी पहले जैसी उत्कृष्टता नही रही। आकृतियों में छाया–प्रकाश दिखाने हेतु काले रंग का प्रयोग किया जाने लगा। यूरोपीय कला के प्रभाव से अन्धकारपूर्ण वातावरण में तेज प्रकाश से चमकती आकृतियाँ भी अंकित की जाने लगी। घटिया रंगों का प्रयोग होने लगा और अनेक नकलें तैयार की जाने लगी। आलोचकों ने मुगल शैली के तीन रूप माने हैं दरबारी, लोकप्रिय तथा बाजारू। शक्तिशाली शासकों के अनत के साथ ही दरबारी मुगल कला भी समाप्त हो गयी।
- मुगल कलाकारों की परम्परा की अनुकृति करने वाले अन्य चित्रकारों की कला 'लोकप्रिय मुगल' अथवा प्रान्तीय मुगल–कहलाई और जो दरबारी मुगल कलाकार कही भी आश्रय न मिलने पर बाजार में आ बैठे उनकी कला 'बाजार मुगल' कहलाई। इस प्रकार मुगल कला का स्तर भी बहुत गिर गया था।
- दक्षिण की कला में उन्नीसवी सदी में मुगल तत्वों के साथ–साथ यूरोपीय तत्वों का बहुत अधिक सम्मिश्रण होने से इसमें भी पहले के समान सौन्दर्य नहीं रहा। इस समय तक अनेक विदेशी चित्रकार भी विभिन्न शासकों के दरबारों में आने लगे थे। उनके कारण भारत की परम्परागत शैलियों को बड़ा आघात लगा। उन्नीसवी सदी में भारतवर्ष के कई स्थानों पर कुछ स्थानीय शैलियाँ भी चल रही थीं। इनमें निम्न शैलियाँ प्रमुख थी।

भारतीय चित्रकला की विविध प्रवृत्तियाँ

बंगाल की पटुआ कला तथा कालीघाट की पट चित्रकला– लोककला के दो रूप हैं, एक प्रतिदिन के प्रयोग से सम्बन्धित और दूसरा उत्सवों से सम्बन्धित। पहले रूप में सरलता है: दूसरे में आलंकारिकता, दिखावा तथा शास्त्रीय नियमों के अनुकरण की प्रवृति दर्शाई जाती है। पटुआ कला प्रथम प्रकार की है और पटुआ कला और कालीघाट की पट चित्रकला भी एक नहीं है, एक जैसी है। जब कलकत्ता शहर बना तो कुछ ग्रामीण शिल्पी कालीघाट में आकर उनकी पद्धति में परिवर्तन होने लगा। उन्हें शहरी लोगों के लिए चित्रांकन करना पड़ा अतः इस नयी विधि में पटुआ कला की मूल भावना लुप्त हो गयी। रूप तो पुराने ढंग पर ही बनाये गये पर विषयवस्तु में परिवर्तन हो गया। इस प्रकार रूप और प्रतिपाद्य की एकसूत्रता समाप्त हो गयी और कला अपने आदर्श से विमुख हो गयी।

विशुद्ध पटुआ कला अत्यन्त प्राचीन है। इस कला के कुछ मूल आधार खोज लिये गये थे, परन्तु धीरे–धीरे ग्रामीण जीवन में इसके चित्रों की माँग बढ़ जाने के कारण इस कला में यान्त्रिक पुनरावृत्ति तथा व्यावसायिकता का समावेश हो गया। आज के बंगाली पटुआ कलाकार इस कला का अर्थ थी नहीं समझते। किन्तु इसके रूपों का आधार इतना दृढ़ है कि अत्यधिक यान्त्रिक होने पर भी इसके मूल रूप पूर्णतः विलुप्त नहीं हुए हैं।

पटुआ कला में पिछले युग के मानव द्वारा समझे गये प्रकृति के सारभूत तत्व प्रकट हुए हैं अतः यह प्रकृति की यथार्थ प्रतिकृति नहीं है। यह चारों ओर के वातावरण से मनुष्य के मन में उठे संवेगों की सीधी अभिव्यक्ति है अतः इसमें वस्तुओं के केवल आवश्यक तत्वों को लेकर ही रूप रचना कर दी जाती है। संसार भर की आदिम कलाओं में यही प्रवृत्ति मिलती है पर यह उनसे इस रूप में भिन्न है कि एक तो पटुआ कला के स्त्रोत स्थानीय मिथक हैं, दूसरे पटुआ कलाकार परिष्कृत कला को भी देखता है जो शहरों में चलती रहती है। पटुआ कला मिथकों तथा विश्वासों पर जीवित रहीं है। आदिम कला में अलग–अलग आकृतियों में तो लयात्मकता है पर सम्पूर्ण संयोजनों में नहीं है। पटुआ कला के सभी रूप एक काल्पनिक अन्तर्जगत की वस्तु हैं, एक रहस्य–सूत्र से वे आपस में सम्बन्धित है। उनका वास्तविक जीवन से कोई सम्बन्ध नहीं होता, ब्रह्माण्ड के सारभूत रूपों से होता है।

पटुआ कला ने अपने मिथक–विश्वासों को सरल रूपों में प्रस्तुत किया, उन्हें कोमल अथवा जटिल नहीं होने दिया। उसके सामने परिष्कृत कला भी थी किन्तु उसने उसकी अनुकृति नहीं की।

Co-ordinator
IQAC, Shri Ram College
Muzaffarnagar

Chairman
IQAC, Shri Ram College,
Muzaffarnagar

कालीघाट के पटचित्र– कालीघाट के पटचित्रों में व्यावसायिकता के साथ–साथ शहरीपन भी आ गया है। उनके विषय तो नये हो ही गये हैं, सामग्री में भी परिवर्तन हुआ है। कालीघाट में बिकने वाले इन पट चित्रों को प्रायः दर्शनार्थी भक्तजन खरीद ले जाते हैं। ये प्रायः टाट, कपड़ा, कागज अथवा कपड़े पर चिपके कागज तथा केनवास पर बनाये जाते हैं। इनमें प्रायः धार्मिक कथाओं, देवी–देवताओं की छवियों अथवा सामाजिक विषयों का अंकन रहता है। हास्य तथा व्यंग्य के चित्र भी अंकित किये जाते हैं। खनिज रंगों से टेम्परा विधि में चित्रण करके तूलिका द्वारा बाह्य रेखांकन कर दिया जाता है। पट–चित्रण की परम्परागत विधि में टाट पर गोबर–मिट्टी का छना हुआ गाढ़ा लेप करके सुखा लिया जाता हे। फिर उसे घोट कर चिकना कर लेते हैं। तत्पश्चात उस पर खनिज रंगों से तूलिका द्वारा आकृति–रचना करते हैं। उन्नीसवीं तथा बीसवी शताब्दियों में कालीघाट में पट–चित्रों तथा कागज पर बने चित्रों का बहुत प्रचार रहा है। इनमें लोक शैली के साथ–साथ कहीं–कहीं यूरोपियन टेकनीक का भी सम्मिश्रण किया गया है। कालीघाट के अतिरिक्त इस प्रकार के चित्र मिदनापुर, हुगली, चन्द्रनगर, बर्दवान तथा मुर्शिदाबाद में भी अंकित किये जाते रहे हैं। जया अप्पासामी के अनुसार इसके प्राचीन उदाहरण 1850 ई0 से पूर्व के नहीं मिलते।

उड़ीसा के पटचित्र– सत्रहवी सदी की उड़ीसा की स्थानीय चित्रकला में मुगल, दक्षिणी तथा विजय नगर की कला–शैलियों का सम्मिश्रण हुआ। इनके प्रभाव से लोक कला का वेग, अपभ्रंश शैली की अन्तराल व्यवस्था, विजय नगर शैली का आकृति विधान, दक्षिणी शैली की आलंकारिकता तथा मुगल शैली की रेखांकन की बारीकी का सम्मिश्रण हुआ। यही शैली अठारहवीं तथा उन्नीसवीं सदी की उड़ीसा की पट–चित्रकला में आगे विकसित हुई जिस पर कालीघाट की शैली का प्रभाव भी पड़ा। वृक्षों का लताओं के समान अंकन भी इस शैली की एक मुख्य विशेषता है। उन्नीसवीं सदी में इस पर कम्पनी शैली का प्रभाव भी पड़ने लगा। इस शैली के चित्रकार मुख्य रूप से कपड़े पर ही चित्रांकन करते रहे हैं। इस शैली के चित्र प्रायः जगन्नाथपुरी में आने वाले तीर्थयात्री एवं पर्यटक खरीद कर ले जाते हैं अतः विशाल पैमाने पर साधारण कोटि के चित्रों की लोक–शैली के समान ही रचना होती रही है। धार्मिक कथानकों के पुस्तक चित्र भी बनाये गये हैं। प्रायः राधा–कृष्ण के कथानक सम्बन्धी चित्रों की अधिकता है।

नाथद्वारा के पटचित्र– नाथद्वारा यूँ तो मेवाड़ शैली का प्रसिद्ध केन्द्र रहा है तथापि श्रीनाथ जी के दर्शनों को आने वाले तीर्थयात्रियों में प्रसाद के साथ–साथ धार्मिक दृष्टि से चित्रों की भी बड़ी माँग रहती है। इस माँग को पूरा करने के लिए सामान्य स्तर की शैली में पट–चित्र यहाँ बहुत बड़ी संख्या में बनते हैं। प्रायः भगवान श्रीकृष्ण के बाल एवं ग्वाल स्वरूप तथा गोपिकाओं और रास से सम्बन्धित घटनाओं एवं श्रीनाथजी की छवियों को ही चित्रित किया जाता हे। यहाँ बने पट–चित्र पिछवाइयों के रूप में भी प्रचलित हैं और सामान्य रूप से लटकाये जाने वाले चित्रों के रूप में भी। प्रायः टेम्परा विधि से राजस्थानी कला की परम्परा में ही चित्रण किया जाता है पर सरलीकरण इतना अधिक है कि यदि इन्हें चाहें तो लोक कला के समकक्ष रख सकते हैं। यहाँ की वर्तमान परम्परागत शैली में मेवाड़ के अतिरिक्त किशनगढ़, जयपुर तथा मुगल शैलियों का भी सम्मिश्रण हुआ है। खूबीराम, घासीराम, हीरालाल, नरोत्तम नारायण, लक्ष्मीलाल, नन्दलाल, गिरधारी लाल, भँवरलाल, नैनसुख, राजेन्द्र शर्मा, गुलाब जी मिस्त्री, घनश्याम, शंकर लाल आदि यहाँ के प्रसिद्ध चित्रकार हैं और इनमें से अनेक चित्रकारों की कृतियाँ मुद्रित तथा लोकप्रिय हुई हैं। इनका कार्य प्रायः व्यावसायिक स्तर का है। इनमें से अनेक चित्रकारों की कृतियाँ कलैण्डरों के माध्यम से घर–घर में पहुँच चुकी हैं। नाथद्वारा की शैली से मिलते–जुलते अनेक चित्र मथुरा तथा वृन्दावन के बाजारों में भी बनते और बिकते हैं। इनमें मुख्यतः जयपुर, किशनगढ़ तथा मेवाड़ की कला का प्रभाव रहता है।

तंजौर शैली के चित्र– तंजौर प्राचीन काल से ही कलाओं का समृद्ध केन्द्र रहा है। चोल राजाओं के समय यहाँ पर्याप्त उन्नति हुई थी। अठारहवीं तथा उन्नीसवीं सदी में भी यहाँ मुगल शैली के सम्मिश्रण से चली आ रही दक्षिणी शैली का ही प्रचलन था किन्तु धार्मिक तथा परम्परागत विषयों के चित्र परम्परागत शैली का ही प्रचलन था किन्तु धार्मिक तथा परम्परागत विषयों के चित्र परम्परागत शैली का आधार लेकर निर्मित किये जाते रहे। मराठाकाल में यहाँ पुस्तक–चित्रण की विधि भी विकसित हुई थी। इसमें किंचित गाढ़े लेप से आकृतियाँ बनाकर रिलीफ का हल्का प्रभाव दिया जाने लगा। रामायण, कृष्णलीला आदि विषयों का अंकन इस प्रकार के चित्रों में बहुत हुआ हे और रंगों के अतिरिक्त मूल्यवान पत्थरों तथा सुवर्ण के पत्रों को भी चिपकाया गया है। यह कला हैदराबाद, कुड्डप्पा, कुरनूल, अर्काट, मैसूर तथा तंजौर, सभी स्थानों पर किंचित स्थानीय विशेषताएँ लेकर विकसित हुई।

केदारनाथ, बद्रीनाथ, द्वारका आदि में बिकने वाले धार्मिक चित्रों तथा बंगाल, मधुबनी राजस्थान, उत्तर प्रदेश, गुजरात, मालवा आदि की लोक शैलियाँ भी अत्यन्त जीवन्त रूप में अपने–अपने क्षेत्रों को निरन्तर प्राणान्वित करती रही है।

काँच पर चित्रण– अठारहवीं सदी उत्तरार्द्ध में पूर्वी देशों की कला में अनेक पश्चिमी प्रभाव आये। यूरोपवासी समुद्री मार्गों से खूब व्यापार कर रहे थे। डचों, पुर्तगालियों, फ्रांसीसियों तथा अंग्रेज व्यापारियों ने भारतीय सागर–तटों पर अपनी बस्तियाँ

स्थापित कर ली थी। इनके लिए अनेक चित्रकार यूरोपीय काँच–चित्रण के अनुकरण पर चित्राँकन कर रहे थे। यह कार्य मुख्यतः चीनी चित्रकार कर रहे थे। भारतीय राजाओं ने भी विदेशी चित्रकारों को अपने दरबारों में स्थान दिया। टीपू सुल्तान ने भी इनसे अनेक चित्र बनवाये। सतारा, कच्छ तथा मुम्बई में भी अनेक चित्रकार थे जिनकी शैली में चीनी–यूरोपीय पद्धतियों का सम्मिश्रण था।

काँच पर चित्रण आरम्भ में दक्षिण भारत में प्रचलित हुआ था। तमिलनाडु, कर्नाटक, आन्ध्र प्रदेश तथा महाराष्ट्र में यह माध्यम भारत के अन्य क्षेत्रों की तुलना में पहले आरम्भ हुआ था। सभी क्षेत्रों में स्थानीय शैलियों के प्रभाव से

Co-ordinator
IQAC, Shri Ram College
Muzaffarnagar

Chairperson
IQAC, Shri Ram College
Muzaffarnagar

परिवर्तन भी हुए। तंजौर में यह काष्ठ–चित्रण से प्रभावित हुआ। भीड़ युक्त सपाट संयोजन, कृत्रिम अलंकरणें की प्रचूर सजावट और प्रदर्शन, सुवर्ण का अत्यधिक प्रयोग, रंगों में छाया देने के उपरान्त भी प्रायः सपाट तथा आलंकारिक प्रभाव, रेखांकन में भारीपन आदि इन चित्रों की प्रमुख विशेषताऐंह है। मैसूर के चित्रों का रेखांकन अधिक स्पन्दनयुक्त है, अलंकरण कम है और आकृतियों में गति तथा सजीवता है। कालीघाट की काँच–चित्रण कला में मोटी सीमा रेखा, ओजपूर्ण आकृतियाँ तथा भारीपन है। पृष्ठभूमि रिक्त रहती है। सभी स्थानों पर प्रायः देवी–देवताओं, राज–दरबारों तथा गणिकाओं का अंकन इस कला में अधिक हुआ है।

आधुनिक भारतीय चित्रकला का प्रभाववाद

यूरोप की आधुनिक चित्रकला का प्रथम महत्वपूर्ण आन्दोलन प्रभाववाद है। इसका मुख्य रूप से प्रचलन 1874 से 1886 तक पेरिस में रहा है और इसके प्रधान कलाकार मोने, पिस्सारो, रेनोआ, सिसले, देगा आदि रहे हैं। प्रभाववाद में प्रधानतः प्रकाश की क्रीडा को ही प्रस्तुत किया गया है अतः इन कलाकारों ने अमिश्रित रंगों का प्रयोग किया है जिससे रंगों में अधिक से अधिक प्रकाश प्रतिविम्बित हो सके। श्वेत तथा काले रंग के साथ ही इन कलाकारों ने कत्थई और भूरे रंगों का भी प्रयोग छोड़ दिया था। विषयों की दृष्टि से भी इन कलाकारों ने प्राचीन विषयों को पूर्णतः तिलाजलि दे दी थी और समकालीन जीवन की वास्तविकताओं को समझने के अभिप्राय से प्रायः प्राकृतिक दृश्यों का समय और वातावरण के अनुसार घटना स्थल पर जाकर ही चित्रण करने के अतिरिक्त स्थिर जीवन, कॉफी हाउस, वैश्याओं, आवारा व्यक्तियों, शराबियों, मध्य एवं निम्न वर्गीय व्यवसायियों एवं कारीगर कलाकारों को ही चित्रित किया।

फोटोग्राफी की प्रेरणा से प्रभाववादी चित्रकारों ने जीवन के व्यस्त क्षणों को भी चित्रित करने का प्रयत्न किया। आगे चलकर यह आन्दोलन नव प्रभाववाद में परिणत हो गया जिसमें रंगों के मिश्रण पूरी तरह छोड़ दिये गये और अमिश्रित रंगों को बिन्दुओं के रूप में हीं चित्रों में लगाया जाने लगा। दिन के अलग–अलग समयों में धूप की तेजी के अनुसार एक ही वस्तु के प्रकाश तथा छाया वाले भागों के रंगों में होने वाले परिवर्तनों का सावधानीपूर्वक अध्ययन किया गया। विदेशी पद्धतियों का अध्ययन करने वाले भारतीय चित्रकारों ने प्रभाववादी शैली में भी चित्रांकन किया है। बंगाल के आरम्भिक कलाकारों में यामिनीराय ने अनेक दृश्य–चित्र प्रभाववादी शैली में बनाये थे।

आधुनिक भारतीय दृश्य

चित्रकारों में अधिकांश ने प्रभाववादी पद्धति से चित्रण आरम्भ किया था। भारत के सुप्रसिद्ध चित्रकार हुसैन ने भी अपने आरम्भिक काल में प्रभाववाद से मिलती–जुलती विधि से अनेक दृश्य अंकित किये थे। बम्बई के ढोंद तथा लखनऊ के रणवीर सिंह बिष्ट के प्रभाववादी पद्धति से बने जल रंग दृश्य–चित्र अद्वितीय है। अभिव्यंजनावाद यूरोप में बीसवीं शती का एक प्रमुख कला आन्दोलन "अभिव्यजनावाद" के रूप में 1905–06 के लगभग उदय हुआ। इसका प्रधान प्रयोक्ता जर्मन कलाकार एडवर्ड मुक था। लगभग उसी समय अभिव्यंजनावादी प्रवृत्ति फ्रांस में भी 'फविवाद' के नाम से प्रचलित हुई जिसका प्रमुख कलाकार हेनरी मातिस था। जर्मनी कलाकार विषय वस्तु पर अधिक बल देते थे जबकि फ्रेंथ कलाकार चित्र के सम्पूर्ण स्थात्मक तत्व महत्वपूर्ण मानते थे। माति ने कहा था कि अभिव्यंजना मुखाकृति से प्रकट होने पालेभाव अथवा उगपूर्ण मुद्राओं में न होकर सम्पूर्ण चित्र के पूर्ण योजन में होती है। जर्मन अभिव्यजनवादी मनोवैज्ञानिक चरित्र चित्रण एवं परिवेश के द्वारा अभिव्यंजना करने के पक्षपाती थे। उन्होंने प्रकृति को पूर्णतः व्यक्तिगत ढंग से चित्रित किया और अत्यन्त सहजता तथा तात्कालिकता पर बल दिया। विरोधी रंगो राशक्त से मुक्त रेखाओं आदि का उन्होंने प्रकृति की व्यवस्था, समाज में बुराइयों तथा केविरफोटक स्वभाव इन तीनों में परस्पर संघर्ष दिखाने के उद्देश्य से पूर्ण उन्मुक्त विधि से प्रयोग किया। वे अपनी बात को तीव्रतम रूप में कहना चाहते थे अतः उन्होंने प्रकृति के आदिम रूपों को माध्यम बनाया।

भारत में रवीन्द्रनाथ ठाकुर द्वारा देशवासियों को सभी स्रोतों से प्रेरणा लेने तथा विश्व में अर्जित ज्ञान और अनुभवों द्वारा स्वय को समृद्ध बनाने का परामर्श देने के फलस्वरूप इण्डियन सोसाइटी आफ ओरियण्टल आर्ट द्वारा सन् 1922 में कलकत्ता में कलाकारों की एक चित्र प्रदर्शनी लगायी गयी। इसका भारतीय कलाकारों पर व्यापक प्रभाव पड़ा। प्रगतिशील विचारों वाले जो कलाकार 'केवल स्वदेशी' अथवा केवल परम्परागत भारतीय के विरोधी थे उन्होंने भी इस विदेशी कला प्रवृत्ति का स्वागत किया।

भारत में फॉय कला की प्रेरणा सर्वाधिक प्रबल रूप में शैलोज मुखर्जी की कृतियों में मिलती है। जब वे पेरिस गये थे तो हेनरी मातिस से मिले थे और उसके प्रभाव से उनक चित्रों में सपाट धरातल, लम्बी आकृतियाँ, व्यंजनापूर्ण रेखाओं तथा रगों का ताजगीपूर्ण प्रयोग हुआ। अमृता शेरगिल की कला में पर्याप्त अभिव्यंजना है किन्तु उनकी शैली पर अजन्ता का भी प्रभाव है। पश्चिम भारत के अन्य कलाकारों को जर्मन अभिव्यंजनाबाद का परिचय बम्बई के माध्यम से मिला। बम्बई में कुछ विदेशी अभियानावादी कलाकार सक्रिय थे जिनमें श्लेसिंगर, लीडन बन्धु (रुडीवान लीडन तथा लौलीदान लीडन) तथा वाल्टर लॅगहेमर प्रमुख थे। श्लेसिंगर कला–संरक्षक के समान आदरणीय समझे जाते थे। उनके द्वारा लिखी गयी कला सम्बन्धी पुस्तकों ने उस समय यूरोप की अनेक नई बातों से भारत के कला जगत को परिचित कराया था। लीडन टाइमा आफ इण्डिया में थे और समय–समय पर कला विषयक लेख भी लिखते रहते थे। लगहेमर इलस्ट्रेटेड वीकली में कला–निर्देशक थे और उनके घर कलाकारों का जमघट लगा रहता था। अनेक कलाकरों ने उनसे कला का मर्म सीखा था और उन्हें गुरु मानते थे। इन विदेशी कलाकारों ने भारत में अभिव्यंजनावाद के प्रचार का प्रयत्न किया। भारतीय कलाकारों ने अभिव्यंजना की दृष्टि से रंगों के प्रयोग को महत्वपूर्ण माना और तूलिकाघातों

Co-ordinator
IQAC, Shri Ram College
Muzaffarnagar
Chairman
IQAC, Shri Ram College
Muzaffarnagar

द्वारा भी चित्र में एक प्रकार की धरातलीय संगति उत्पन्न की जाने लगी। इसकी भी अभिव्यंजनात्मक दृष्टि से रचना की जान लगी। चालीस और पचास के दशकों (1941–1960) में यह प्रभाव विशेष रहा। 1940 के लगभग भारत की स्वतंत्रता के संघर्ष को दबाने में अंग्रेजों ने पाशविक शक्ति का नृशंसता से प्रयोग करना आरम्भ कर दिया, बंगाल में भयंकर दुनिल पड़ा, देश के विभाजन, साम्प्रदायिक दंगों और कई करोड शरणार्थियों के आगमन ने लोगों का हृदय हिला दिया। इन सामाजिक, सांस्कृतिक तथा राजनीतिक परिस्थितियों ने कलाकारों को भावों का प्यार रोकने में असमर्थ कर दिया। प्रतीकवाद और रहस्यवाद के छलावे को छोड़कर तथा सहज मानवीय सहानुभूति से प्रेरित होकर भारत के अनेक कलाकारों ने समाज की समस्याओं और इन नय विकृतियों को सशक्त रूपों में चित्रित किया फुटपाथ पर जीवन बिताने वाले दीन हीनों, मानवीय पीड़ा और निराशा, राक्षसी क्रूरता छटपटाहट तथा मानव चरित्र की उद्दाम प्रवृत्तियों आदि को व्यक्त करने वाले कलाकारों में रवीन्द्रनाथ ठाकुर (डिंग), रामकिंकर (मातृत्व), के०सी०एस० पनिक्कर (मेवमेण्ट ड्वेलर्स), रामकुमार (टाउन), सतीश गुजराल (डेसोलेशन), फ्रांसिस न्यूटन सूजा (बार्सीलोना), अविनाशचन्द्र (जंगल) आदि प्रमुख हैं जिन्होंने गहरे–गहरे रंगोका ही प्रयोग नहीं किया है बल्कि तनावपूर्ण रेखा आदि के द्वारा दवी हुई मन की शक्तियों को भी बन्धन–मुक्त किया है । इन चित्रों में गर्भवती महिलाओं की मार्मिक वेदना और यातना, आधुनिक शहरों के विषाक्त होते हुए बातावरण, गरीबों के अव्यवस्थित जीवन तथा सामाजिक जीवन के घृणित पक्षों आदि को दर्शकों को झकझोर देने वाले रूपों में प्रस्तुत किया गया है। चित्रों में रेखा, रंग, धरातलीय प्रभाव आदि की विकृतियों तथा चित्रों के सम्पूर्ण व्यंजनात्मक संयोजन की दृष्टि से नन्दलाल गगु (माँ और शिशु), शैलोज मुखर्जी (वन में शृंगार), अकबर पदमसी (नारंगी अनावृता), नारायण श्रीधर बेन्द्रे (पूरक रंगों में भेस तथा सारस), तथा गुलाम रसूल सन्तोष (लेटी हुई अनावृता) आदि भी सुन्दर उदाहरण है। विषय–वस्तु की सीमा में रहकर भारतीयता को अक्षुण्ण रखने का प्रयत्न के०के० हैय्यार (महाबलेश्वर, कविता का जन्म, बाजार जाते ग्रामीण एवं गुर्गों की लड़ाई) तथा मकबूल फिदा हुसैन (सूर्योदय एवं विश्वामित्र तथा रामायण और महाभारत चित्र श्रृंखलाएँ) आदि ने किया है। इनकी शैली में भारतीय परम्परागत कलाओं तथा भारतीय साहित्य आदि का प्रभाव स्पष्ट है।

कुछ अन्य भारतीय चित्रकारों ने भारतीय अथवा ईसाई धार्मिक, पौराणिक अथवा साहित्यिक विषयों का चित्रण अभिव्यंजनावादी विधि से अथवा अभिव्यंजनात्मकता के किंचित् प्रभाव के साथ किया है। यामिनीराय तथा लक्ष्मण पे में रेखात्मक तथा आलंकारिक अभिव्यजना है। के०एस० कुलकर्णी, दिनकर कौशिक, भवेश सान्याल तथा गोपाल घोष आदि में अभिव्यंजनावाद तथा शास्त्रीयतावाद के समन्वय की प्रवृत्ति है। सतीश गुजराल की कला में मेक्सिकन पद्धति का अभिव्यंजनावाद है जो पीड़ा, भयानकता, वीभत्सता तथा आतक आदि की ध्वनियों से तरंगित रहता है। रामकुमार, कृष्ण खन्ना, ए० रामचन्द्रन तथा तैयब मेहता आदि की कला में रंगों तथा रेखाओ के सन्तुलित रूप में अभिव्यंजनावाद का प्रयोग हुआ है। इन दोनों में रंग प्रतीक के स्तर पर भी सक्रिय है। जेराम पटेल में दिवास्वप्न के समान अनुभूति होती है। कृष्ण रेड्डी, कॅवल कृष्ण, देवयानी कृष्ण, जगमोहन चोपडा, मनु पारेन, जतीनदास, स्वामीनाथन तथा गायतोंडे भी सशक्त अभिव्यंजनाओं में समर्थ हैं। मोहन सामन्त ने भी अभिव्यंजनावादी पद्धति में अनेक चित्र बनाये हैं। विवान सुन्दरम, सुधीर पटवर्धन, नलिनी मलानी आदि आज की परिस्थितियों को रंगों तथा मनोवैज्ञानिक स्थितियों द्वारा व्यक्त कर रहे हैं। गणेश पाइन ने लोककला तथा बंगला साहित्य से प्रेरणा ली है। गुलाम मुहम्मद शेख सामाजिक यथार्थवाद से जुड़ गये है। रामेश्वर बूटा सामाजिक व्यग्य के लिए हिप्पी सस्कृति आदि के विषय लेते है। इस प्रकार भारतीय अभिव्यजनावाद का मुख्य दौर गुजर जाने के बाद भी इसमें अनेक कलाकार प्रभावशाली कार्य कर रहे हैं।

उपसंहार

कला सृष्टि का बोधगम्य संसार मानव मस्तिष्क की सृजन प्रक्रिया से ही बनता है। फिर इन अनुभूत गुणों के आधार पर हम उन्हें विभिन्न अर्थ प्रदान करते हैं। इस तरह प्रकृति के विभिन्न आकार–निराकार और अर्थ के संयोग से अपने चारों ओर वस्तुओं और व्यक्तियों का संसार निर्मित करते हैं, लेकिन काल हमेशा परिवर्तनशील है। उसी तरह विकासमान कला के मापदण्ड बड़ी तेजी से बदलते जा रहे हैं। वर्तमान सदी में समकालीन कला अनेक नये रूपों में विकसित होती रही है और कला का यह प्रयास नूतन युग का सूचक है।

सन्दर्भ ग्रन्थ सूची

- भारतीय चित्रकला– वाचस्पति गैरोला– इलाहाबाद–1963
- प्रगैतिहासिक भारतीय कला– डा0 जगदीश गुप्त– दिल्ली–1967
- भारतीय कला– वासुदेव शरण अग्रवाल– बनारस–1966
- आधुनिक भारतीय चित्रकला– डा0 गिर्राज किशोर अग्रवाल–अलीगढ–1995
- भारतीय चित्रकला का इतिहास– अविनाश बहादुर वर्मा– बरेली–1992
- कला और आधुनिक प्रवृष्टियाँ– रामचन्द्र शुक्ल–लखनऊ–1974
- प्राचीन भारतीय कला– गयाचरण त्रिपाठी–कानपुर–1971
- मुगल चित्रशैली– डा0 सोम प्रकाश वर्मा–जयपुर–1998
- राजूपत पेन्टिग्स– आनन्द कुमार स्वामी–दिल्ली–1976
- चित्रेगीत–गोविन्द–क्षितीन्द्र नाथ मजूमदार–इलाहाबाद–1952
- पहाड़ी चित्रकला– किशोरी लाल वैध–दिल्ली

Co-ordinator
IQAC, Shri Ram College
Muzaffarnagar

Chairman
IQAC, Shri Ram College,
Muzaffarnagar

- कला एक मीमीसां– डश्रा0 चिरंजी लाल झा– गाजियाबाद–1960
- भारतीय चित्रकला पद्धति– शैलेन्द्र नाथ डे– इलाहाबाद– 1940
- इण्डियन पेन्टिग्स– पर्सी ब्राउन– कलकत्ता– 1947

———



Co-ordinator
IQAC, Shri Ram College
Muzaffarnagar

Chairman
IQAC, Shri Ram College,
Muzaffarnagar

Home ▶ All Journals ▶ Journal of Crop Improvement ▶ List of Issues ▶ Volume 38, Issue 4 ▶ Understanding life cycle of parasitic we ....

Taylor & Francis Online

Journal of Crop Improvement ›
Volume 38, 2024 - Issue 4

98 Views 0 CrossRef citations to date 0 Altmetric

Research Articles

Understanding life cycle of parasitic weed *Phelipanche ramosa* infesting *Brassica juncea* in India: new host species and seed coat structure

Anshul Watts, Ritesh Kumar Raipuria, Ashu Chaudhary, Manisha Chauhan, Khushi Joshi, Naveen Singh & ...show all

Pages 329-343 | Received 05 Oct 2023, Accepted 18 Apr 2024, Published online: 28 Apr 2024

Cite this article https://doi.org/10.1080/15427528.2024.2346335

Sample our Environment & Agriculture Journals
Sign in here to access to the latest two years of 14 days

Full Article Figures & data References Citations Metrics Reprints & Permissions Read this article

ABSTRACT

Broomrape (*Phelipanche ramosa*) is an obligate root parasitic plant that is known to infest many important crops. It is emerging as a serious biotic threat for *Brassica juncea* cultivation in India. There is very limited information available about broomrape species and its infestation in *B. juncea*. Hence, the present study encompassed a comprehensive five-year field survey spanning from 2018 to 2023 of 47 different *B. juncea* fields in the states of Rajasthan and Haryana in India. The level of broomrape infestation varied from season to season and field to field. In the *B. juncea* fields, broomrape with blue/violet color corolla, along with occasionally white color type were also noticed. The hairy anther, corolla shape and use of mitochondrial DNA-specific molecular markers revealed that both these broomrape types belong to *Phelipanche ramosa*. Scanning electron microscopy (SEM) analysis showed that *P. ramosa* seeds have varying shapes and seed coat have fibrillar periclinal cell wall. In addition to all the known host species for *P. ramosa* till date, we also identified a new host, a wild Brassicaceae weed species; *Lepidium didymum* in Haryana. The presence of an alternative weed host may help *P. ramosa* survive even in the absence of major crop host species. Overall, the present study revealed some insights into the *P. ramosa-B. juncea* host-parasite complex and its effect on *B. juncea* which could be further investigated in more detail.

KEYWORDS: Broomrape | *Lepidium didymum* | mustard | plant parasite | scanning electron microscopy (SEM)

Acknowledgments

We acknowledge ICAR-National Institute for Plant Biotechnology and Department of Biotechnology, Government of India (BT/IN/UK/PORI/03/AKP/2018-19) for providing financial assistance for different tour programmes for survey of broomrape problem in various mustard fields. We are grateful to Dr. S.R. Bhat, Emeritus Scientist ICAR-NIPB for giving useful suggestions and help in writing the manuscript.

Co-ordinator
IQAC, Shri Ram College
Muzaffarnagar

Chairman
IQAC, Shri Ram College,
Muzaffarnagar

3.3.1 Number of research papers published per teacher in the Journals notified on UGC CARE list during the last five years

Title of paper	Name of the author/s	Department of the teacher	Name of journal	Calendar Year of publication	ISSN number	Link to the recognition in UGC enlistment of the Journal		
						Link to website of the Journal	Link to article / paper / abstract of the article	Is it listed in UGC Care list
Qualitative Physiochemical and Phytochemical Analysis of Saintly Herb Indian Hemp (Cannabis sativa L.) with UV-VIS Spectrophotometer	Zehra Husaini	Bioscience	International journal of innovative science and research technology	2023-2024	2456-2165			YES
Understanding life cycle of parasitic weed Phelipanche ramosa infesting Brassica juncea in India : New host species and seed coat structure	Ashu	Bioscience	Taylor and francis	2023-2024	2166-3831	ndfonline.com/toc/v	https://www.tandfonline.com/doi/abs/10.1080/15427528.2024.2346335	YES
ANALYSIS OF RIVER WATER AND ITS EFFECTS ON SEED GERMINATION ON CHICKPEA (Cicer arietinum)	Sachin Kumar	Bioscience	International Journal of Scientific Research & Engineering Trends	2023-2024	2348-4098	https://ijsret.com/	https://ijsret.com/wp-content/uploads/2023/11/IJSRET_V9_issue6_455.pdf	Yes

Co-ordinator
IQAC, Shri Ram College
Muzaffarnagar

Chairman
IQAC, Shri Ram College,
Muzaffarnagar

ANALYSIS OF RIVER WATER AND ITS EFFECTS ON SEED GERMINATION ON CHICKPEA (Cicer arietinum)	Vikas Kumar	Bioscience	International Journal of Scientific Research & Engineering Trends	2023-2024	2348-4098		https://ijsret.com/wp-content/uploads/2023/11/IJSRET_V9_issue6_455.pdf	Yes
ANALYSIS OF RIVER WATER AND ITS EFFECTS ON SEED GERMINATION ON CHICKPEA (Cicer arietinum)	Dr.Vipin Kumar Saini	Bioscience	International Journal of Scientific Research & Engineering Trends	2023-2024	2348-4098		https://ijsret.com/wp-content/uploads/2023/11/IJSRET_V9_issue6_455.pdf	Yes
ANALYSIS OF RIVER WATER AND ITS EFFECTS ON SEED GERMINATION ON CHICKPEA (Cicer arietinum)	Ankit Kumar	Bioscience	International Journal of Scientific Research & Engineering Trends	2023-2024	2348-4098		https://ijsret.com/wp-content/uploads/2023/11/IJSRET_V9_issue6_455.pdf	Yes
ANALYSIS OF RIVER WATER AND ITS EFFECTS ON SEED GERMINATION ON CHICKPEA (Cicer arietinum)	Saba Rana	Bioscience	International Journal of Scientific Research & Engineering Trends	2023-2024	2348-4098		https://ijsret.com/wp-content/uploads/2023/11/IJSRET_V9_issue6_455.pdf	Yes

Co-ordinator
IQAC, Shri Ram College
Muzaffarnagar

Chairman
IQAC, Shri Ram College,
Muzaffarnagar

ANALYSIS OF RIVER WATER AND ITS EFFECTS ON SEED GERMINATION ON CHICKPEA (Cicer arietinum)	Disha Sharma	Bioscience	International Journal of Scientific Research & Engineering Trends	2023-2024	2348-4098		https://ijsret.com/wp-content/uploads/2023/11/IJSRET_V9_issue6_455.pdf	Yes
Isolation and analysis of cellulase-producing bacteria from soil samples	Ankit Kumar	Bioscience	International Journal of Scientific Research & Engineering Trends	2023-2024	2348-4098		https://ijsret.com/wp-content/uploads/2023/11/IJSRET_V9_issue6_454.pdf	Yes
Isolation and analysis of cellulase-producing bacteria from soil samples	Dr. Vipin Kumar Saini	Bioscience	International Journal of Scientific Research & Engineering Trends	2023-2024	2348-4098		https://ijsret.com/wp-content/uploads/2023/11/IJSRET_V9_issue6_454.pdf	Yes
Isolation and analysis of cellulase-producing bacteria from soil samples	Vikas Kumar	Bioscience	International Journal of Scientific Research & Engineering Trends	2023-2024	2348-4098		https://ijsret.com/wp-content/uploads/2023/11/IJSRET_V9_issue6_454.pdf	Yes
Isolation and analysis of cellulase-producing bacteria from soil samples	Disha Sharma	Bioscience	International Journal of Scientific Research & Engineering Trends	2023-2024	2348-4098		https://ijsret.com/wp-content/uploads/2023/11/IJSRET_V9_issue6_454.pdf	Yes

Co-ordinator
IQAC, Shri Ram College
Muzaffarnagar

Chairman
IQAC, Shri Ram College
Muzaffarnagar

Isolation and analysis of cellulase-producing bacteria from soil samples	Saba Rana	Bioscience	International Journal of Scientific Research & Engineering Trends	2023-2024	2348-4098		https://ijsret.com/wp-content/uploads/2023/11/IJSRET_V9_issue6_454.pdf	Yes
Isolation and analysis of cellulase-producing bacteria from soil samples	Shalini Mishra	Bioscience	International Journal of Scientific Research & Engineering Trends	2023-2024	2348-4098	https://ijsret.com/	https://ijsret.com/wp-content/uploads/2023/11/IJSRET_V9_issue6_454.pdf	Yes
Nutraceutical Contribution of Aloe-vera gel for making of milk cake during festive seasons in india	Shriya Garg	Bioscience	Plant Archives	2023-2024	0972-5210	http://www.plantarchives.org	https://doi.org/10.51470/PLANTARCHIVES.2023.v23.no2.062	Yes
Nutraceutical Contribution of Aloe-vera gel for making of milk cake during festive seasons in india	Monika Saini	Bioscience	Plant Archives	2023-2024	0972-5210	http://www.plantarchives.org	https://doi.org/10.51470/PLANTARCHIVES.2023.v23.no2.062	Yes

Co-ordinator
IQAC, Shri Ram College
Muzaffarnagar

Chairman
IQAC, Shri Ram College,
Muzaffarnagar

Volume 8, Issue 12, December – 2023 International Journal of Innovative Science and Research Technology
ISSN No:-2456-2165

Qualitative Physiochemical and Phytochemical Analysis of Saintly Herb Indian Hemp (*Cannabis sativa L.*) with UV-VIS Spectrophotometer

Ashwani Kumar[1*]; Zehra Husaini[2]; Khyati Lehari[1]; Ritika Yadav[1]; Supriya Tomar[1]
[1]Department of Biotechnology, KVSCOS, Swami Vivekanand Subharti University, Meerut UP
[2]Department of Biosciences, Shri Ram College Muzaffarnagar, UP

Corresponding Author:- Ashwani Kumar[1*]

Abstract:- The Cannabaceae family includes Cannabis sativa. Carl Linneus made the initial discovery of the species in 1753. Native to Eastern Asia, Cannabis sativa is an annual herbaceous flowering plant that is now widely cultivated and distributed throughout the world. Its phytochemical byproducts, hashish and marijuana, are the most produced and commonly used illegal drugs in Europe and India, where they are also deeply ingrained in Indian culture and religious customs. Although this plant is most well-known for its narcotic qualities, pre-clinical research on hemp derivatives revealed potential anti-oxidative, anti-hypertensive, anti-inflammatory, anti-diabetic, anti-neuroinflammatory, anti-arthritic, anti-acne, and anti-microbial effects. This research presents a comprehensive overview of its phytoconstituents, antioxidants, antimicrobials, and therapeutic features. Considering the numerous significant new discoveries concerning this plant. This plant produces a broad variety of secondary metabolites that have been identified and show an extensive spectrum of biological activity. Cannabidiol (CBD) and delta-9 tetrahydrocannabinol (delta9-THC) are the main components of cannabis that give it its pharmacological effects. To sum up, Cannabis sativa is a researched plant with potential medical uses. With an eye toward the sociolegal context and potential directions for future research, this attempts to bring up to date the existing knowledge and data regarding the use of cannabis and its derivatives.

Keywords:- Cannabis Sativa, Indian Hemp, Phytochemical, Saintly Herb, Marijuana.

I. INTRODUCTION

Hemp, a fast-growing industrial strain of *Cannabis sativa*, was initially identified as Cannabis sativa. For thousands of years, people have been growing hemp, which is utilized for biofuel as well as textiles, food, fiber, building materials, paper, and medical applications. Particularly, hemp is produced to have THC contents of less than 0.3%. https://www.thewellnesssoldier.com. Dioecious, annual, blooming cannabis sativa is a herb. Typically, staminate plants are higher than pistillate plants, but they are weaker. Tall stems range in length from 0.2 to 2.0 meters. Nonetheless, most plants only grow to a height of 1-3 meters. (SG Gigliano). Humanity first found fire, which allowed us to burn herbs and incense in a regulated manner for inhalation. It was then that we learned the mysteries of cannabis. The term *Cannabis* (or marijuana) is used when describing a *Cannabis sativa* (HEMP) plant that is bred for its potent, resinous glands (known as trichomes), which contains high amount of THC. THC is an acronym for tetrahydro-cannabinol. (www.thewellnesssoldier.com).The indigenous plant of *Cannabis* are widely found everywhere in India, especially in Uttar Pradesh, West Bengal & Bihar. Hemp is prepared by drying the leaves of the male plants of *Cannabis* and the flowers of the female plants and the resinous substance deposited on the branches and leaves of *Cannabis* is called 'charas'.

Co-ordinator
IQAC, Shri Ram College
Muzaffarnagar

Chairman
IQAC, Shri Ram College,
Muzaffarnagar

Taylor & Francis
Online

Journal of Crop Improvement >
Volume 38, 2024 - Issue 4

98 0 0
Crossref citations to date Altmetric

Research Articles

Understanding life cycle of parasitic weed *Phelipanche ramosa* infesting *Brassica juncea* in India: new host species and seed coat structure

Anshul Watts, Ritesh Kumar Raipuria, Ashu Chaudhary, Manisha Chauhan, Khushi Joshi, Naveen Singh & show all

Received 03 Oct 2023, Accepted 18 Apr 2024, Published online: 28 Apr 2024

Cite this article https://doi.org/10.1080/15427528.2024.2346335 Check for updates

Sample our Applied Environmental Science journals

Figures & data References Citations Metrics Reprints & Permissions Read this article

ABSTRACT

Broomrape (*Phelipanche ramosa*) is an obligate root parasitic plant that is known to infest many important crops. It is emerging as a serious biotic threat for *Brassica juncea* cultivation in India. There is very limited information available about broomrape species and its infestation in *B. juncea*. Hence, the present study encompassed a comprehensive five-year field survey spanning from 2018 to 2023 of 47 different *B. juncea* fields in the states of Rajasthan and Haryana in India. The level of broomrape infestation varied from season to season and field to field. In the *B. juncea* fields, broomrape with blue/violet color corolla, along with occasionally white color type were also noticed. The hairy anther, corolla shape and use of mitochondrial DNA-specific molecular markers revealed that both these broomrape types belong to *Phelipanche ramosa*. Scanning electron microscopy (SEM) analysis showed that *P. ramosa* seeds have varying shapes and seed coat have fibrillar periclinal cell wall. In addition to all the known host species for *P. ramosa* till date, we also identified a new host, a wild Brassicaceae weed species; *Lepidium didymum* in Haryana. The presence of an alternative weed host may help *P. ramosa* survive even in the absence of major crop host species. Overall, the present study revealed some insights into the *P. ramosa-B. juncea* host-parasite complex and its effect on *B. juncea* which could be further investigated in more detail.

KEYWORDS: [redacted] [redacted] mustard [redacted] Scanning electron microscopy (SEM)

Acknowledgments

We acknowledge ICAR-National Institute for Plant Biotechnology and Department of Biotechnology, Government of India (BT/IN/UK/PORI/03/AKP/2018-19) for providing financial assistance for different tour programmes for survey of broomrape problem in various mustard fields. We are grateful to Dr. S.R. Bhat, Emeritus Scientist ICAR-NIPB for giving useful suggestions and help in writing the manuscript.

Co-ordinator
IQAC, Shri Ram College
Muzaffarnagar

Chairman
IQAC, Shri Ram College,
Muzaffarnagar

International Journal of Scientific Research & Engineering Trends
Volume 9, Issue 6, Nov-Dec-2023, ISSN (Online): 2395-566X

Analysis of River Water and its Effects on Seed Germination on Chickpea (Cicer Arietinum)

Sachin kumar[1], Vikas kumar[2], Sanjeev Tyagi[3], Vipin Kumar Saini[4], Ankit kumar[5], Saba Rana[6], Disha Sharma[7]
Department of Biosciences, Shri Ram College, Muzaffarnagar[1,2,4,5,6,7]
Department of Botany, DAV College, Muzaffarnagar[3]

Abstract- This research paper investigates the ecological and environmental dynamics along the banks of the Black River near Shamli Bus Stand in Muzaffarnagar, Uttar Pradesh, India. The study addresses the pressing challenges posed by water pollution and scarcity in the region, exacerbated by industrial and sewage contamination of groundwater resources. Through meticulous surveying and collection of vegetation samples, coupled with comprehensive physio-chemical analysis of water samples, the study provides valuable insights into the current state of the river ecosystem. The methodology employed rigorous sampling techniques and standardized analysis procedures to gather accurate data on vegetation dynamics and water quality parameters. The results highlight the relatively uncontaminated nature of the Black River entry point at Shamli Road, alongside deviations from water quality standards in terms of electrical conductivity, total dissolved solids, dissolved oxygen, and total hardness. Additionally, the study explores the impact of Black River water on plant growth through seed germination experiments, revealing varying responses to water concentration levels. Overall, the findings underscore the need for sustainable water management practices and remediation efforts to mitigate pollution and safeguard ecosystem health in the Black River watershed and similar environments.

Index Terms-River water analysis, BOD, Cicer arietinum, Hardness, TDS

I. INTRODUCTION

The district of Muzaffarnagar in western Uttar Pradesh, India, is a vital agricultural zone characterized by intensive cultivation practices, particularly focusing on sugarcane, wheat, and paddy crops (Choudhary S.K., et. al., 1987). However, the sustainability of agricultural production in the region is threatened by the deteriorating quality of groundwater resources, exacerbated by industrial and sewage pollution in the Yamuna-Krishna sub-basin (Ghanbari A., et. al., 2007). As surface water availability diminishes, there is a growing reliance on groundwater for irrigation, leading to concerns about the potential contamination of water sources. Anthropogenic activities such as population growth, urbanization, industrialization, and modern agricultural practices contribute to water pollution, gradually degrading its quality (Gupta, R.K., et. al., 1961). Consequently, there is a pressing need to explore alternative water resources for irrigation, with wastewater emerging as a significant source rich in organic and inorganic nutrients. The Black River, traversing through Saharanpur, Muzaffarnagar, and Baghpat districts, exemplifies this issue, with sewage and industrial effluents rendering water unsuitable for drinking and irrigation purposes (Jena V, et. al., 2013). Past studies have investigated the impact of wastewater on soil characteristics and crop growth, highlighting both its potential benefits and drawbacks. However, careful assessment of wastewater quality and its compatibility with different plant species is imperative to ensure sustainable crop production in the face of water scarcity and pollution challenges (Keeling, K.A., et .al., 1997).

The challenges posed by water pollution and scarcity in Muzaffarnagar underscore the pressing need for sustainable water management practices. As the region grapples with the complex interplay between agricultural needs, industrial growth, and environmental conservation, concerted efforts are required to safeguard water resources for future generations while ensuring the continued prosperity of the agricultural sector.

II. MATERIALS & METHODS

The materials and methods utilized in this research endeavour were meticulously crafted to facilitate a comprehensive investigation into both the vegetation dynamics and water quality along the banks of the Black River near Shamli Bus Stand in Muzaffarnagar. The methodology encompassed several key steps, each designed to gather accurate data and

© 2023 IJSRET

Co-ordinator
IQAC, Shri Ram College
Muzaffarnagar

Chairman
IQAC, Shri Ram College,
Muzaffarnagar

International Journal of Scientific Research & Engineering Trends
Volume 9, Issue 6, Nov-Dec-2023, ISSN (Online): 2395-566X

Analysis of River Water and its Effects on Seed Germination on Chickpea (Cicer Arietinum)

Sachin kumar[1], Vikas kumar[2], Sanjeev Tyagi[3], Vipin Kumar Saini[4], Ankit kumar[5], Saba Rana[6], Disha Sharma[7]
Department of Biosciences, Shri Ram College, Muzaffarnagar[1,2,4,5,6,7]
Department of Botany, DAV College, Muzaffarnagar[3]

Abstract- This research paper investigates the ecological and environmental dynamics along the banks of the Black River near Shamli Bus Stand in Muzaffarnagar, Uttar Pradesh, India. The study addresses the pressing challenges posed by water pollution and scarcity in the region, exacerbated by industrial and sewage contamination of groundwater resources. Through meticulous surveying and collection of vegetation samples, coupled with comprehensive physio-chemical analysis of water samples, the study provides valuable insights into the current state of the river ecosystem. The methodology employed rigorous sampling techniques and standardized analysis procedures to gather accurate data on vegetation dynamics and water quality parameters. The results highlight the relatively uncontaminated nature of the Black River entry point at Shamli Road, alongside deviations from water quality standards in terms of electrical conductivity, total dissolved solids, dissolved oxygen, and total hardness. Additionally, the study explores the impact of Black River water on plant growth through seed germination experiments, revealing varying responses to water concentration levels. Overall, the findings underscore the need for sustainable water management practices and remediation efforts to mitigate pollution and safeguard ecosystem health in the Black River watershed and similar environments.

Index Terms-River water analysis, BOD, Cicer arietinum, Hardness, TDS

I. INTRODUCTION

The district of Muzaffarnagar in western Uttar Pradesh, India, is a vital agricultural zone characterized by intensive cultivation practices, particularly focusing on sugarcane, wheat, and paddy crops (Choudhary S.K., et. al., 1987). However, the sustainability of agricultural production in the region is threatened by the deteriorating quality of groundwater resources, exacerbated by industrial and sewage pollution in the Yamuna-Krishna sub-basin (Ghanbari A., et. al., 2007). As surface water availability diminishes, there is a growing reliance on groundwater for irrigation, leading to concerns about the potential contamination of water sources. Anthropogenic activities such as population growth, urbanization, industrialization, and modern agricultural practices contribute to water pollution, gradually degrading its quality (Gupta, R.K., et. al., 1961). Consequently, there is a pressing need to explore alternative water resources for irrigation, with wastewater emerging as a significant source rich in organic and inorganic nutrients. The Black River, traversing through Saharanpur, Muzaffarnagar, and Baghpat districts, exemplifies this issue, with sewage and industrial effluents rendering water unsuitable for drinking and irrigation purposes (Jena V, et. al., 2013). Past studies have investigated the impact of wastewater on soil characteristics and crop growth, highlighting both its potential benefits and drawbacks. However, careful assessment of wastewater quality and its compatibility with different plant species is imperative to ensure sustainable crop production in the face of water scarcity and pollution challenges (Keeling, K.A., et. al., 1997).

The challenges posed by water pollution and scarcity in Muzaffarnagar underscore the pressing need for sustainable water management practices. As the region grapples with the complex interplay between agricultural needs, industrial growth, and environmental conservation, concerted efforts are required to safeguard water resources for future generations while ensuring the continued prosperity of the agricultural sector.

II. MATERIALS & METHODS

The materials and methods utilized in this research endeavour were meticulously crafted to facilitate a comprehensive investigation into both the vegetation dynamics and water quality along the banks of the Black River near Shamli Bus Stand in Muzaffarnagar. The methodology encompassed several key steps, each designed to gather accurate data and

© 2023 IJSRET

Co-ordinator
IQAC, Shri Ram College
Muzaffarnagar

Chairman
IQAC, Shri Ram College,
Muzaffarnagar

International Journal of Scientific Research & Engineering Trends
Volume 9, Issue 6, Nov-Dec-2023, ISSN (Online): 2395-566X

Analysis of River Water and its Effects on Seed Germination on Chickpea (Cicer Arietinum)

Sachin kumar[1], Vikas kumar[2], Sanjeev Tyagi[3], Vipin Kumar Saini[4], Ankit kumar[5], Saba Rana[6], Disha Sharma[7]
Department of Biosciences, Shri Ram College, Muzaffarnagar[1,2,4,5,6,7]
Department of Botany, DAV College, Muzaffarnagar[3]

Abstract- This research paper investigates the ecological and environmental dynamics along the banks of the Black River near Shamli Bus Stand in Muzaffarnagar, Uttar Pradesh, India. The study addresses the pressing challenges posed by water pollution and scarcity in the region, exacerbated by industrial and sewage contamination of groundwater resources. Through meticulous surveying and collection of vegetation samples, coupled with comprehensive physio-chemical analysis of water samples, the study provides valuable insights into the current state of the river ecosystem. The methodology employed rigorous sampling techniques and standardized analysis procedures to gather accurate data on vegetation dynamics and water quality parameters. The results highlight the relatively uncontaminated nature of the Black River entry point at Shamli Road, alongside deviations from water quality standards in terms of electrical conductivity, total dissolved solids, dissolved oxygen, and total hardness. Additionally, the study explores the impact of Black River water on plant growth through seed germination experiments, revealing varying responses to water concentration levels. Overall, the findings underscore the need for sustainable water management practices and remediation efforts to mitigate pollution and safeguard ecosystem health in the Black River watershed and similar environments.

Index Terms-River water analysis, BOD, Cicer arietinum, Hardness, TDS

I. INTRODUCTION

The district of Muzaffarnagar in western Uttar Pradesh, India, is a vital agricultural zone characterized by intensive cultivation practices, particularly focusing on sugarcane, wheat, and paddy crops (Choudhary S.K., et. al., 1987). However, the sustainability of agricultural production in the region is threatened by the deteriorating quality of groundwater resources, exacerbated by industrial and sewage pollution in the Yamuna-Krishna sub-basin (Ghanbari A., et. al., 2007). As surface water availability diminishes, there is a growing reliance on groundwater for irrigation, leading to concerns about the potential contamination of water sources. Anthropogenic activities such as population growth, urbanization, industrialization, and modern agricultural practices contribute to water pollution, gradually degrading its quality (Gupta, R.K., et. al., 1961). Consequently, there is a pressing need to explore alternative water resources for irrigation, with wastewater emerging as a significant source rich in organic and inorganic nutrients. The Black River, traversing through Saharanpur, Muzaffarnagar, and Baghpat districts, exemplifies this issue, with sewage and industrial effluents rendering water unsuitable for drinking and irrigation purposes (Jena V, et. al., 2013). Past studies have investigated the impact of wastewater on soil characteristics and crop growth, highlighting both its potential benefits and drawbacks. However, careful assessment of wastewater quality and its compatibility with different plant species is imperative to ensure sustainable crop production in the face of water scarcity and pollution challenges (Keeling, K.A., et. al., 1997).

The challenges posed by water pollution and scarcity in Muzaffarnagar underscore the pressing need for sustainable water management practices. As the region grapples with the complex interplay between agricultural needs, industrial growth, and environmental conservation, concerted efforts are required to safeguard water resources for future generations while ensuring the continued prosperity of the agricultural sector.

II. MATERIALS & METHODS

The materials and methods utilized in this research endeavour were meticulously crafted to facilitate a comprehensive investigation into both the vegetation dynamics and water quality along the banks of the Black River near Shamli Bus Stand in Muzaffarnagar. The methodology encompassed several key steps, each designed to gather accurate data and

© 2023 IJSRET

Co-ordinator
IQAC, Shri Ram College
Muzaffarnagar

Chairman
IQAC, Shri Ram College
Muzaffarnagar

International Journal of Scientific Research & Engineering Trends
Volume 9, Issue 6, Nov-Dec-2023, ISSN (Online): 2395-566X

Analysis of River Water and its Effects on Seed Germination on Chickpea (Cicer Arietinum)

Sachin kumar[1], Vikas kumar[2], Sanjeev Tyagi[3], Vipin Kumar Saini[4], Ankit kumar[5], Saba Rana[6], Disha Sharma[7]
Department of Biosciences, Shri Ram College, Muzaffarnagar[1,2,4,5,6,7]
Department of Botany, DAV College, Muzaffarnagar[3]

Abstract- This research paper investigates the ecological and environmental dynamics along the banks of the Black River near Shamli Bus Stand in Muzaffarnagar, Uttar Pradesh, India. The study addresses the pressing challenges posed by water pollution and scarcity in the region, exacerbated by industrial and sewage contamination of groundwater resources. Through meticulous surveying and collection of vegetation samples, coupled with comprehensive physio-chemical analysis of water samples, the study provides valuable insights into the current state of the river ecosystem. The methodology employed rigorous sampling techniques and standardized analysis procedures to gather accurate data on vegetation dynamics and water quality parameters. The results highlight the relatively uncontaminated nature of the Black River entry point at Shamli Road, alongside deviations from water quality standards in terms of electrical conductivity, total dissolved solids, dissolved oxygen, and total hardness. Additionally, the study explores the impact of Black River water on plant growth through seed germination experiments, revealing varying responses to water concentration levels. Overall, the findings underscore the need for sustainable water management practices and remediation efforts to mitigate pollution and safeguard ecosystem health in the Black River watershed and similar environments.

Index Terms-River water analysis, BOD, Cicer arietinum, Hardness, TDS

I. INTRODUCTION

The district of Muzaffarnagar in western Uttar Pradesh, India, is a vital agricultural zone characterized by intensive cultivation practices, particularly focusing on sugarcane, wheat, and paddy crops (Choudhary S.K., et. al., 1987). However, the sustainability of agricultural production in the region is threatened by the deteriorating quality of groundwater resources, exacerbated by industrial and sewage pollution in the Yamuna-Krishna sub-basin (Ghanbari A., et. al., 2007). As surface water availability diminishes, there is a growing reliance on groundwater for irrigation, leading to concerns about the potential contamination of water sources. Anthropogenic activities such as population growth, urbanization, industrialization, and modern agricultural practices contribute to water pollution, gradually degrading its quality (Gupta, R.K., et. al., 1961). Consequently, there is a pressing need to explore alternative water resources for irrigation, with wastewater emerging as a significant source rich in organic and inorganic nutrients. The Black River, traversing through Saharanpur, Muzaffarnagar, and Baghpat districts, exemplifies this issue, with sewage and industrial effluents rendering water unsuitable for drinking and irrigation purposes (Jena V, et. al., 2013). Past studies have investigated the impact of wastewater on soil characteristics and crop growth, highlighting both its potential benefits and drawbacks. However, careful assessment of wastewater quality and its compatibility with different plant species is imperative to ensure sustainable crop production in the face of water scarcity and pollution challenges (Keeling, K.A., et .al., 1997).

The challenges posed by water pollution and scarcity in Muzaffarnagar underscore the pressing need for sustainable water management practices. As the region grapples with the complex interplay between agricultural needs, industrial growth, and environmental conservation, concerted efforts are required to safeguard water resources for future generations while ensuring the continued prosperity of the agricultural sector.

II. MATERIALS & METHODS

The materials and methods utilized in this research endeavour were meticulously crafted to facilitate a comprehensive investigation into both the vegetation dynamics and water quality along the banks of the Black River near Shamli Bus Stand in Muzaffarnagar. The methodology encompassed several key steps, each designed to gather accurate data and

© 2023 IJSRET

Co-ordinator
IQAC, Shri Ram College
Muzaffarnagar

Chairman
IQAC, Shri Ram College,
Muzaffarnagar

International Journal of Scientific Research & Engineering Trends
Volume 9, Issue 6, Nov-Dec-2023, ISSN (Online): 2395-566X

Analysis of River Water and its Effects on Seed Germination on Chickpea (Cicer Arietinum)

Sachin kumar[1], Vikas kumar[2], Sanjeev Tyagi[3], Vipin Kumar Saini[4], Ankit kumar[5], Saba Rana[6], Disha Sharma[7]
Department of Biosciences, Shri Ram College, Muzaffarnagar[1,2,4,5,6,7]
Department of Botany, DAV College, Muzaffarnagar[3]

Abstract- This research paper investigates the ecological and environmental dynamics along the banks of the Black River near Shamli Bus Stand in Muzaffarnagar, Uttar Pradesh, India. The study addresses the pressing challenges posed by water pollution and scarcity in the region, exacerbated by industrial and sewage contamination of groundwater resources. Through meticulous surveying and collection of vegetation samples, coupled with comprehensive physio-chemical analysis of water samples, the study provides valuable insights into the current state of the river ecosystem. The methodology employed rigorous sampling techniques and standardized analysis procedures to gather accurate data on vegetation dynamics and water quality parameters. The results highlight the relatively uncontaminated nature of the Black River entry point at Shamli Road, alongside deviations from water quality standards in terms of electrical conductivity, total dissolved solids, dissolved oxygen, and total hardness. Additionally, the study explores the impact of Black River water on plant growth through seed germination experiments, revealing varying responses to water concentration levels. Overall, the findings underscore the need for sustainable water management practices and remediation efforts to mitigate pollution and safeguard ecosystem health in the Black River watershed and similar environments.

Index Terms-River water analysis, BOD, Cicer arietinum, Hardness, TDS

I. INTRODUCTION

The district of Muzaffarnagar in western Uttar Pradesh, India, is a vital agricultural zone characterized by intensive cultivation practices, particularly focusing on sugarcane, wheat, and paddy crops (Choudhary S.K., et. al., 1987). However, the sustainability of agricultural production in the region is threatened by the deteriorating quality of groundwater resources, exacerbated by industrial and sewage pollution in the Yamuna-Krishna sub-basin (Ghanbari A., et. al., 2007). As surface water availability diminishes, there is a growing reliance on groundwater for irrigation, leading to concerns about the potential contamination of water sources. Anthropogenic activities such as population growth, urbanization, industrialization, and modern agricultural practices contribute to water pollution, gradually degrading its quality (Gupta, R.K., et. al., 1961). Consequently, there is a pressing need to explore alternative water resources for irrigation, with wastewater emerging as a significant source rich in organic and inorganic nutrients. The Black River, traversing through Saharanpur, Muzaffarnagar, and Baghpat districts, exemplifies this issue, with sewage and industrial effluents rendering water unsuitable for drinking and irrigation purposes (Jena V, et. al., 2013). Past studies have investigated the impact of wastewater on soil characteristics and crop growth, highlighting both its potential benefits and drawbacks. However, careful assessment of wastewater quality and its compatibility with different plant species is imperative to ensure sustainable crop production in the face of water scarcity and pollution challenges (Keeling, K.A., et .al., 1997).

The challenges posed by water pollution and scarcity in Muzaffarnagar underscore the pressing need for sustainable water management practices. As the region grapples with the complex interplay between agricultural needs, industrial growth, and environmental conservation, concerted efforts are required to safeguard water resources for future generations while ensuring the continued prosperity of the agricultural sector.

II. MATERIALS & METHODS

The materials and methods utilized in this research endeavour were meticulously crafted to facilitate a comprehensive investigation into both the vegetation dynamics and water quality along the banks of the Black River near Shamli Bus Stand in Muzaffarnagar. The methodology encompassed several key steps, each designed to gather accurate data and

© 2023 IJSRET

Co-ordinator
IQAC, Shri Ram College
Muzaffarnagar

Chairman
IQAC, Shri Ram College,
Muzaffarnagar

International Journal of Scientific Research & Engineering Trends
Volume 9, Issue 6, Nov-Dec-2023, ISSN (Online): 2395-566X

Analysis of River Water and its Effects on Seed Germination on Chickpea (Cicer Arietinum)

Sachin kumar[1], Vikas kumar[2], Sanjeev Tyagi[3], Vipin Kumar Saini[4], Ankit kumar[5], Saba Rana[6], Disha Sharma[7]
Department of Biosciences, Shri Ram College, Muzaffarnagar[1,2,4,5,6,7]
Department of Botany, DAV College, Muzaffarnagar[3]

Abstract- This research paper investigates the ecological and environmental dynamics along the banks of the Black River near Shamli Bus Stand in Muzaffarnagar, Uttar Pradesh, India. The study addresses the pressing challenges posed by water pollution and scarcity in the region, exacerbated by industrial and sewage contamination of groundwater resources. Through meticulous surveying and collection of vegetation samples, coupled with comprehensive physio-chemical analysis of water samples, the study provides valuable insights into the current state of the river ecosystem. The methodology employed rigorous sampling techniques and standardized analysis procedures to gather accurate data on vegetation dynamics and water quality parameters. The results highlight the relatively uncontaminated nature of the Black River entry point at Shamli Road, alongside deviations from water quality standards in terms of electrical conductivity, total dissolved solids, dissolved oxygen, and total hardness. Additionally, the study explores the impact of Black River water on plant growth through seed germination experiments, revealing varying responses to water concentration levels. Overall, the findings underscore the need for sustainable water management practices and remediation efforts to mitigate pollution and safeguard ecosystem health in the Black River watershed and similar environments.

Index Terms-River water analysis, BOD, Cicer arietinum, Hardness, TDS

I. INTRODUCTION

The district of Muzaffarnagar in western Uttar Pradesh, India, is a vital agricultural zone characterized by intensive cultivation practices, particularly focusing on sugarcane, wheat, and paddy crops (Choudhary S.K., et. al., 1987). However, the sustainability of agricultural production in the region is threatened by the deteriorating quality of groundwater resources, exacerbated by industrial and sewage pollution in the Yamuna-Krishna sub-basin (Ghanbari A., et. al., 2007). As surface water availability diminishes, there is a growing reliance on groundwater for irrigation, leading to concerns about the potential contamination of water sources. Anthropogenic activities such as population growth, urbanization, industrialization, and modern agricultural practices contribute to water pollution, gradually degrading its quality (Gupta, R.K., et. al., 1961). Consequently, there is a pressing need to explore alternative water resources for irrigation, with wastewater emerging as a significant source rich in organic and inorganic nutrients. The Black River, traversing through Saharanpur, Muzaffarnagar, and Baghpat districts, exemplifies this issue, with sewage and industrial effluents rendering water unsuitable for drinking and irrigation purposes (Jena V, et. al., 2013). Past studies have investigated the impact of wastewater on soil characteristics and crop growth, highlighting both its potential benefits and drawbacks. However, careful assessment of wastewater quality and its compatibility with different plant species is imperative to ensure sustainable crop production in the face of water scarcity and pollution challenges (Keeling, K.A., et .al., 1997).

The challenges posed by water pollution and scarcity in Muzaffarnagar underscore the pressing need for sustainable water management practices. As the region grapples with the complex interplay between agricultural needs, industrial growth, and environmental conservation, concerted efforts are required to safeguard water resources for future generations while ensuring the continued prosperity of the agricultural sector.

II. MATERIALS & METHODS

The materials and methods utilized in this research endeavour were meticulously crafted to facilitate a comprehensive investigation into both the vegetation dynamics and water quality along the banks of the Black River near Shamli Bus Stand in Muzaffarnagar. The methodology encompassed several key steps, each designed to gather accurate data and

© 2023 IJSRET

Co-ordinator
IQAC, Shri Ram College
Muzaffarnagar

Chairman
IQAC, Shri Ram College,
Muzaffarnagar

International Journal of Scientific Research & Engineering Trends
Volume 9, Issue 6, Nov-Dec-2023, ISSN (Online): 2395-566X

Isolation and Analysis of Cellulase-Producing Bacteria from Soil Samples

Ankit Kumar, Vipin Kumar Saini, Vikas Kumar, Disha Sharma, Saba Rana, Shalini Mishra
Department of Biosciences
Shri Ram College, Muzaffarnagar

Abstract- The aim of this study is to reveal the ability of various isolates obtained from soil to produce cellulase. Cellulose is degraded in soils by cellulolytic microorganism such as fungi and bacteria. Soil samples were collected from Shri Ram College nursery. A total of 10 species were isolated from soil. The two isolates were showed better results on cellulolytic activity using Congo red on Carboxy methyl cellulose (CMC) agar plates. A Gram stain test was carried out to identify the two isolates as Gram-positive rods. Morphological and biochemical analysis on the basis of standard indicated that they all associated mainly with members of the Bacillus sp.

Index Terms- Hydrolysis, Bacteria, Cellulase, Carboxy methyl cellulose, enzyme production

I. INTRODUCTION

Cellulose is commonly degraded by cellulase. Cellulolytic enzyme system consists of three major components such as endoglucanases, exoglucanases and ß-glycosidase. Cellulases have a potentiality to use in biotechnology and in industry such as, starch processing, alcoholic beverage, malting and brewing, clarify of juice, pulp bleaching, textile industry and animal feed (Bhat 2000; Dutta et al., 2008; Sukumaran et al., 2005).

Cellulolytic enzymes are synthesized by a number of microorganisms. Fungi and bacteria are the main natural agents of cellulose degradation (Islam & Roy 2018; Das et al., 2010). Cellulose utilizing groups include aerobic and anaerobic mesophilic bacteria, filamentous fungi, thermophilic and alkaliphilic bacteria, actinomycetes and some protozoa (Alexander, 1961).

However, fungi in general are well known as decomposers of organic matter, especially cellulosic matrices (Afzal, et al., 2012; Shabeb et al., 2010).

Mainly efficient cellulase activities are observed in fungi but there is increasing interest in cellulase production by bacteria because bacteria have high growth rate as compared to fungi and it can be used effectively in cellulase production (Immanuel et al., 2007; Dashtban et al., 2010).

The search for a novel bacterial strain, having hyper cellulase productivity with more activity and high stability against temperature, pH and under non-aseptic conditions might make the process more economical (Bhagat and Kokitkar, 2021).

II. MATERIALS AND METHODS

1. Collection and Serial Dilution of Soil Samples
The soil samples were collected from different areas from shri ram college muzaffarnagar. Tenfold serial dilutions of each soil sample were prepared in sterilized distilled water and 0.1ml of that diluted sample was spread on carboxymethyl-cellulose medium.

2. Isolation of Cellulase Producing Bacteria
Cellulolytic bacterial isolates were isolated from soil by using serial dilutions and pour & spread plate technique. The medium used for isolation of cellulolytic bacteria contains 1.0 % peptone, 1.0 % carboxymethylcellulose (CMC), 0.2 % K2HPO4, 1 % agar, 0.03 % MgSO4.7H2O, 0.25%(NH4)2SO4 and 0.2 % gelatin at pH 7 for 48 hours of incubation at 30°C. Bacterial colonies were purified by repeated streaking. The purified colonies were preserved at 4°C for further identification and screening for cellulase production.

3. Screening of Cellulase Producing Isolates
Pure cultures of bacterial isolates were individually transferred in CMC agar plates. After incubation for 48 hours, CMC agar plates were flooded with 1 % Congo red and allowed to stand for 15 min at room temperature. One molar NaCl was thoroughly used for counterstaining the plates. Clear zones were appeared around growing bacterial colonies indicating cellulose hydrolysis. The bacterial colonies having the largest clear zone were selected for identification and screening (Ghose, 1987). Plates containing discrete colonies were also stored at 4oC for further identification and screening of cellulase producing bacteria.

© 2023 IJSRET

Co-ordinator
IQAC, Shri Ram College
Muzaffarnagar

Chairman
IQAC, Shri Ram College,
Muzaffarnagar

International Journal of Scientific Research & Engineering Trends
Volume 9, Issue 6, Nov-Dec-2023, ISSN (Online): 2395-566X

Isolation and Analysis of Cellulase-Producing Bacteria from Soil Samples

Ankit Kumar, Vipin Kumar Saini, Vikas Kumar, Disha Sharma, Saba Rana, Shalini Mishra
Department of Biosciences
Shri Ram College, Muzaffarnagar

Abstract- The aim of this study is to reveal the ability of various isolates obtained from soil to produce cellulase. Cellulose is degraded in soils by cellulolytic microorganism such as fungi and bacteria. Soil samples were collected from Shri Ram College nursery. A total of 10 species were isolated from soil. The two isolates were showed better results on cellulolytic activity using Congo red on Carboxy methyl cellulose (CMC) agar plates. A Gram stain test was carried out to identify the two isolates as Gram-positive rods. Morphological and biochemical analysis on the basis of standard indicated that they all associated mainly with members of the Bacillus sp.

Index Terms- Hydrolysis, Bacteria, Cellulase, Carboxy methyl cellulose, enzyme production

I. INTRODUCTION

Cellulose is commonly degraded by cellulase. Cellulolytic enzyme system consists of three major components such as endoglucanases, exoglucanases and ß-glycosidase. Cellulases have a potentiality to use in biotechnology and in industry such as, starch processing, alcoholic beverage, malting and brewing, clarify of juice, pulp bleaching, textile industry and animal feed (Bhat 2000; Dutta et al., 2008; Sukumaran et al., 2005).

Cellulolytic enzymes are synthesized by a number of microorganisms. Fungi and bacteria are the main natural agents of cellulose degradation (Islam & Roy 2018; Das et al., 2010). Cellulose utilizing groups include aerobic and anaerobic mesophilic bacteria, filamentous fungi, thermophilic and alkaliphilic bacteria, actinomycetes and some protozoa (Alexander, 1961).

However, fungi in general are well known as decomposers of organic matter, especially cellulosic matrices (Afzal, et al., 2012; Shabeb et al., 2010).

Mainly efficient cellulase activities are observed in fungi but there is increasing interest in cellulase production by bacteria because bacteria have high growth rate as compared to fungi and it can be used effectively in cellulase production (Immanuel et al., 2007; Dashtban et al., 2010).

The search for a novel bacterial strain, having hyper cellulase productivity with more activity and high stability against temperature, pH and under non-aseptic conditions might make the process more economical (Bhagat and Kokitkar, 2021).

II. MATERIALS AND METHODS

1. Collection and Serial Dilution of Soil Samples
The soil samples were collected from different areas from shri ram college muzaffarnagar. Tenfold serial dilutions of each soil sample were prepared in sterilized distilled water and 0.1ml of that diluted sample was spread on carboxymethyl-cellulose medium.

2. Isolation of Cellulase Producing Bacteria
Cellulolytic bacterial isolates were isolated from soil by using serial dilutions and pour & spread plate technique. The medium used for isolation of cellulolytic bacteria contains 1.0 % peptone, 1.0 % carboxymethylcellulose (CMC), 0.2 % K2HPO4, 1 % agar, 0.03 % MgSO4.7H2O, 0.25%(NH4)2SO4 and 0.2 % gelatin at pH 7 for 48 hours of incubation at 30°C. Bacterial colonies were purified by repeated streaking. The purified colonies were preserved at 4°C for further identification and screening for cellulase production.

3. Screening of Cellulase Producing Isolates
Pure cultures of bacterial isolates were individually transferred in CMC agar plates. After incubation for 48 hours, CMC agar plates were flooded with 1 % Congo red and allowed to stand for 15 min at room temperature. One molar NaCl was thoroughly used for counterstaining the plates. Clear zones were appeared around growing bacterial colonies indicating cellulose hydrolysis. The bacterial colonies having the largest clear zone were selected for identification and screening (Ghose, 1987). Plates containing discrete colonies were also stored at 4oC for further identification and screening of cellulase producing bacteria.

© 2023 IJSRET

Co-ordinator
IQAC, Shri Ram College
Muzaffarnagar

Chairman
IQAC, Shri Ram College,
Muzaffarnagar

International Journal of Scientific Research & Engineering Trends
Volume 9, Issue 6, Nov-Dec-2023, ISSN (Online): 2395-566X

Isolation and Analysis of Cellulase-Producing Bacteria from Soil Samples

Ankit Kumar, Vipin Kumar Saini, Vikas Kumar, Disha Sharma, Saba Rana, Shalini Mishra
Department of Biosciences
Shri Ram College, Muzaffarnagar

Abstract- The aim of this study is to reveal the ability of various isolates obtained from soil to produce cellulase. Cellulose is degraded in soils by cellulolytic microorganism such as fungi and bacteria. Soil samples were collected from Shri Ram College nursery. A total of 10 species were isolated from soil. The two isolates were showed better results on cellulolytic activity using Congo red on Carboxy methyl cellulose (CMC) agar plates. A Gram stain test was carried out to identify the two isolates as Gram-positive rods. Morphological and biochemical analysis on the basis of standard indicated that they all associated mainly with members of the Bacillus sp.

Index Terms- Hydrolysis, Bacteria, Cellulase, Carboxy methyl cellulose, enzyme production

I. INTRODUCTION

Cellulose is commonly degraded by cellulase. Cellulolytic enzyme system consists of three major components such as endoglucanases, exoglucanases and ß-glycosidase. Cellulases have a potentiality to use in biotechnology and in industry such as, starch processing, alcoholic beverage, malting and brewing, clarify of juice, pulp bleaching, textile industry and animal feed (Bhat 2000; Dutta et al., 2008; Sukumaran et al., 2005).

Cellulolytic enzymes are synthesized by a number of microorganisms. Fungi and bacteria are the main natural agents of cellulose degradation (Islam & Roy 2018; Das et al., 2010). Cellulose utilizing groups include aerobic and anaerobic mesophilic bacteria, filamentous fungi, thermophilic and alkaliphilic bacteria, actinomycetes and some protozoa (Alexander, 1961).

However, fungi in general are well known as decomposers of organic matter, especially cellulosic matrices (Afzal, et al., 2012; Shabeb et al., 2010).

Mainly efficient cellulase activities are observed in fungi but there is increasing interest in cellulase production by bacteria because bacteria have high growth rate as compared to fungi and it can be used effectively in cellulase production (Immanuel et al., 2007; Dashtban et al., 2010).

The search for a novel bacterial strain, having hyper cellulase productivity with more activity and high stability against temperature, pH and under non-aseptic conditions might make the process more economical (Bhagat and Kokitkar. 2021).

II. MATERIALS AND METHODS

1. Collection and Serial Dilution of Soil Samples
The soil samples were collected from different areas from shri ram college muzaffarnagar. Tenfold serial dilutions of each soil sample were prepared in sterilized distilled water and 0.1ml of that diluted sample was spread on carboxymethyl-cellulose medium.

2. Isolation of Cellulase Producing Bacteria
Cellulolytic bacterial isolates were isolated from soil by using serial dilutions and pour & spread plate technique. The medium used for isolation of cellulolytic bacteria contains 1.0 % peptone, 1.0 % carboxymethylcellulose (CMC), 0.2 % K2HPO4, 1 % agar, 0.03 % MgSO4.7H2O, 0.25%(NH4)2SO4 and 0.2 % gelatin at pH 7 for 48 hours of incubation at 30°C. Bacterial colonies were purified by repeated streaking. The purified colonies were preserved at 4°C for further identification and screening for cellulase production.

3. Screening of Cellulase Producing Isolates
Pure cultures of bacterial isolates were individually transferred in CMC agar plates. After incubation for 48 hours, CMC agar plates were flooded with 1 % Congo red and allowed to stand for 15 min at room temperature. One molar NaCl was thoroughly used for counterstaining the plates. Clear zones were appeared around growing bacterial colonies indicating cellulose hydrolysis. The bacterial colonies having the largest clear zone were selected for identification and screening (Ghose, 1987). Plates containing discrete colonies were also stored at 4oC for further identification and screening of cellulase producing bacteria.

© 2023 IJSRET

Co-ordinator
IQAC, Shri Ram College
Muzaffarnagar

Chairman
IQAC, Shri Ram College,
Muzaffarnagar

International Journal of Scientific Research & Engineering Trends
Volume 9, Issue 6, Nov-Dec-2023, ISSN (Online): 2395-566X

Isolation and Analysis of Cellulase-Producing Bacteria from Soil Samples

Ankit Kumar, Vipin Kumar Saini, Vikas Kumar, Disha Sharma, Saba Rana, Shalini Mishra
Department of Biosciences
Shri Ram College, Muzaffarnagar

Abstract- The aim of this study is to reveal the ability of various isolates obtained from soil to produce cellulase. Cellulose is degraded in soils by cellulolytic microorganism such as fungi and bacteria. Soil samples were collected from Shri Ram College nursery. A total of 10 species were isolated from soil. The two isolates were showed better results on cellulolytic activity using Congo red on Carboxy methyl cellulose (CMC) agar plates. A Gram stain test was carried out to identify the two isolates as Gram-positive rods. Morphological and biochemical analysis on the basis of standard indicated that they all associated mainly with members of the Bacillus sp.

Index Terms- Hydrolysis, Bacteria, Cellulase, Carboxy methyl cellulose, enzyme production

I. INTRODUCTION

Cellulose is commonly degraded by cellulase. Cellulolytic enzyme system consists of three major components such as endoglucanases, exoglucanases and ß-glycosidase. Cellulases have a potentiality to use in biotechnology and in industry such as, starch processing, alcoholic beverage, malting and brewing, clarify of juice, pulp bleaching, textile industry and animal feed (Bhat 2000; Dutta et al., 2008; Sukumaran et al., 2005).

Cellulolytic enzymes are synthesized by a number of microorganisms. Fungi and bacteria are the main natural agents of cellulose degradation (Islam & Roy 2018; Das et al., 2010). Cellulose utilizing groups include aerobic and anaerobic mesophilic bacteria, filamentous fungi, thermophilic and alkaliphilic bacteria, actinomycetes and some protozoa (Alexander, 1961).

However, fungi in general are well known as decomposers of organic matter, especially cellulosic matrices (Afzal, et al., 2012; Shabeb et al., 2010).

Mainly efficient cellulase activities are observed in fungi but there is increasing interest in cellulase production by bacteria because bacteria have high growth rate as compared to fungi and it can be used effectively in cellulase production (Immanuel et al., 2007; Dashtban et al., 2010).

The search for a novel bacterial strain, having hyper cellulase productivity with more activity and high stability against temperature, pH and under non-aseptic conditions might make the process more economical (Bhagat and Kokitkar, 2021).

II. MATERIALS AND METHODS

1. Collection and Serial Dilution of Soil Samples
The soil samples were collected from different areas from shri ram college muzaffarnagar. Tenfold serial dilutions of each soil sample were prepared in sterilized distilled water and 0.1ml of that diluted sample was spread on carboxymethyl-cellulose medium.

2. Isolation of Cellulase Producing Bacteria
Cellulolytic bacterial isolates were isolated from soil by using serial dilutions and pour & spread plate technique. The medium used for isolation of cellulolytic bacteria contains 1.0 % peptone, 1.0 % carboxymethylcellulose (CMC), 0.2 % K2HPO4, 1 % agar, 0.03 % MgSO4.7H2O, 0.25%(NH4)2SO4 and 0.2 % gelatin at pH 7 for 48 hours of incubation at 30°C. Bacterial colonies were purified by repeated streaking. The purified colonies were preserved at 4°C for further identification and screening for cellulase production.

3. Screening of Cellulase Producing Isolates
Pure cultures of bacterial isolates were individually transferred in CMC agar plates. After incubation for 48 hours, CMC agar plates were flooded with 1 % Congo red and allowed to stand for 15 min at room temperature. One molar NaCl was thoroughly used for counterstaining the plates. Clear zones were appeared around growing bacterial colonies indicating cellulose hydrolysis. The bacterial colonies having the largest clear zone were selected for identification and screening (Ghose, 1987). Plates containing discrete colonies were also stored at 4oC for further identification and screening of cellulase producing bacteria.

© 2023 IJSRET

Co-ordinator
IQAC, Shri Ram College
Muzaffarnagar

Chairman
IQAC, Shri Ram College
Muzaffarnagar

International Journal of Scientific Research & Engineering Trends
Volume 9, Issue 6, Nov-Dec-2023, ISSN (Online): 2395-566X

Isolation and Analysis of Cellulase-Producing Bacteria from Soil Samples

Ankit Kumar, Vipin Kumar Saini, Vikas Kumar, Disha Sharma, Saba Rana, Shalini Mishra
Department of Biosciences
Shri Ram College, Muzaffarnagar

Abstract- The aim of this study is to reveal the ability of various isolates obtained from soil to produce cellulase. Cellulose is degraded in soils by cellulolytic microorganism such as fungi and bacteria. Soil samples were collected from Shri Ram College nursery. A total of 10 species were isolated from soil. The two isolates were showed better results on cellulolytic activity using Congo red on Carboxy methyl cellulose (CMC) agar plates. A Gram stain test was carried out to identify the two isolates as Gram-positive rods. Morphological and biochemical analysis on the basis of standard indicated that they all associated mainly with members of the Bacillus sp.

Index Terms- Hydrolysis, Bacteria, Cellulase, Carboxy methyl cellulose, enzyme production

I. INTRODUCTION

Cellulose is commonly degraded by cellulase. Cellulolytic enzyme system consists of three major components such as endoglucanases, exoglucanases and ß-glycosidase. Cellulases have a potentiality to use in biotechnology and in industry such as, starch processing, alcoholic beverage, malting and brewing, clarify of juice, pulp bleaching, textile industry and animal feed (Bhat 2000; Dutta et al., 2008; Sukumaran et al., 2005).

Cellulolytic enzymes are synthesized by a number of microorganisms. Fungi and bacteria are the main natural agents of cellulose degradation (Islam & Roy 2018; Das et al., 2010). Cellulose utilizing groups include aerobic and anaerobic mesophilic bacteria, filamentous fungi, thermophilic and alkaliphilic bacteria, actinomycetes and some protozoa (Alexander, 1961).

However, fungi in general are well known as decomposers of organic matter, especially cellulosic matrices (Afzal, et al., 2012; Shabeb et al., 2010).

Mainly efficient cellulase activities are observed in fungi but there is increasing interest in cellulase production by bacteria because bacteria have high growth rate as compared to fungi and it can be used effectively in cellulase production (Immanuel et al., 2007; Dashtban et al., 2010).

The search for a novel bacterial strain, having hyper cellulase productivity with more activity and high stability against temperature, pH and under non-aseptic conditions might make the process more economical (Bhagat and Kokitkar. 2021).

II. MATERIALS AND METHODS

1. Collection and Serial Dilution of Soil Samples

The soil samples were collected from different areas from shri ram college muzaffarnagar. Tenfold serial dilutions of each soil sample were prepared in sterilized distilled water and 0.1ml of that diluted sample was spread on carboxymethyl-cellulose medium.

2. Isolation of Cellulase Producing Bacteria

Cellulolytic bacterial isolates were isolated from soil by using serial dilutions and pour & spread plate technique. The medium used for isolation of cellulolytic bacteria contains 1.0 % peptone, 1.0 % carboxymethylcellulose (CMC), 0.2 % K_2HPO_4, 1 % agar, 0.03 % $MgSO_4.7H_2O$, 0.25%$(NH_4)_2SO_4$ and 0.2 % gelatin at pH 7 for 48 hours of incubation at 30°C. Bacterial colonies were purified by repeated streaking. The purified colonies were preserved at 4°C for further identification and screening for cellulase production.

3. Screening of Cellulase Producing Isolates

Pure cultures of bacterial isolates were individually transferred in CMC agar plates. After incubation for 48 hours, CMC agar plates were flooded with 1 % Congo red and allowed to stand for 15 min at room temperature. One molar NaCl was thoroughly used for counterstaining the plates. Clear zones were appeared around growing bacterial colonies indicating cellulose hydrolysis. The bacterial colonies having the largest clear zone were selected for identification and screening (Ghose, 1987). Plates containing discrete colonies were also stored at 4oC for further identification and screening of cellulase producing bacteria.

© 2023 IJSRET

Co-ordinator
IQAC, Shri Ram College
Muzaffarnagar

Chairman
IQAC, Shri Ram College,
Muzaffarnagar

International Journal of Scientific Research & Engineering Trends
Volume 9, Issue 6, Nov-Dec-2023, ISSN (Online): 2395-566X

Isolation and Analysis of Cellulase-Producing Bacteria from Soil Samples

Ankit Kumar, Vipin Kumar Saini, Vikas Kumar, Disha Sharma, Saba Rana, Shalini Mishra
Department of Biosciences
Shri Ram College, Muzaffarnagar

Abstract- The aim of this study is to reveal the ability of various isolates obtained from soil to produce cellulase. Cellulose is degraded in soils by cellulolytic microorganism such as fungi and bacteria. Soil samples were collected from Shri Ram College nursery. A total of 10 species were isolated from soil. The two isolates were showed better results on cellulolytic activity using Congo red on Carboxy methyl cellulose (CMC) agar plates. A Gram stain test was carried out to identify the two isolates as Gram-positive rods. Morphological and biochemical analysis on the basis of standard indicated that they all associated mainly with members of the Bacillus sp.

Index Terms- Hydrolysis, Bacteria, Cellulase, Carboxy methyl cellulose, enzyme production

I. INTRODUCTION

Cellulose is commonly degraded by cellulase. Cellulolytic enzyme system consists of three major components such as endoglucanases, exoglucanases and ß-glycosidase. Cellulases have a potentiality to use in biotechnology and in industry such as, starch processing, alcoholic beverage, malting and brewing, clarify of juice, pulp bleaching, textile industry and animal feed (Bhat 2000; Dutta et al., 2008; Sukumaran et al., 2005).

Cellulolytic enzymes are synthesized by a number of microorganisms. Fungi and bacteria are the main natural agents of cellulose degradation (Islam & Roy 2018; Das et al., 2010). Cellulose utilizing groups include aerobic and anaerobic mesophilic bacteria, filamentous fungi, thermophilic and alkaliphilic bacteria, actinomycetes and some protozoa (Alexander, 1961).

However, fungi in general are well known as decomposers of organic matter, especially cellulosic matrices (Afzal, et al., 2012; Shabeb et al., 2010).

Mainly efficient cellulase activities are observed in fungi but there is increasing interest in cellulase production by bacteria because bacteria have high growth rate as compared to fungi and it can be used effectively in cellulase production (Immanuel et al., 2007; Dashtban et al., 2010).

The search for a novel bacterial strain, having hyper cellulase productivity with more activity and high stability against temperature, pH and under non-aseptic conditions might make the process more economical (Bhagat and Kokitkar, 2021).

II. MATERIALS AND METHODS

1. Collection and Serial Dilution of Soil Samples
The soil samples were collected from different areas from shri ram college muzaffarnagar. Tenfold serial dilutions of each soil sample were prepared in sterilized distilled water and 0.1ml of that diluted sample was spread on carboxymethyl-cellulose medium.

2. Isolation of Cellulase Producing Bacteria
Cellulolytic bacterial isolates were isolated from soil by using serial dilutions and pour & spread plate technique. The medium used for isolation of cellulolytic bacteria contains 1.0 % peptone, 1.0 % carboxymethylcellulose (CMC), 0.2 % K_2HPO_4, 1 % agar, 0.03 % $MgSO_4.7H_2O$, 0.25%$(NH_4)_2SO_4$ and 0.2 % gelatin at pH 7 for 48 hours of incubation at 30°C. Bacterial colonies were purified by repeated streaking. The purified colonies were preserved at 4°C for further identification and screening for cellulase production.

3. Screening of Cellulase Producing Isolates
Pure cultures of bacterial isolates were individually transferred in CMC agar plates. After incubation for 48 hours, CMC agar plates were flooded with 1 % Congo red and allowed to stand for 15 min at room temperature. One molar NaCl was thoroughly used for counterstaining the plates. Clear zones were appeared around growing bacterial colonies indicating cellulose hydrolysis. The bacterial colonies having the largest clear zone were selected for identification and screening (Ghose, 1987). Plates containing discrete colonies were also stored at 4oC for further identification and screening of cellulase producing bacteria.

© 2023 IJSRET

Co-ordinator
IQAC, Shri Ram College
Muzaffarnagar

Chairman
IQAC, Shri Ram College,
Muzaffarnagar

Plant Archives Vol. 23, No. 2, 2023 pp.364-369 e-ISSN:2581-6063 (online), ISSN:0972-5210



Plant Archives

Journal homepage: http://www.plantarchives.org
DOI Url : https://doi.org/10.51470/PLANTARCHIVES.2023.v23.no2.062

NUTRACEUTICAL CONTRIBUTION OF ALOE-VERA GEL FOR MAKING OF MILK CAKE DURING FESTIVE SEASONS IN INDIA

Monika Saini[1], Shriya Garg[1], Raj Kapoor[2], Rishabh Chitranshi[3] and Rajiv Dutta[3]*
[1]Shri Ram Group of colleges, circular road, Muzaffarnagar, U.P., 251001, India
[2]National Commodities Management Services Limited, Udyog Vihar, Sector-19, Gurugram-122016, India
[3]School of Biological Engineering and Sciences, Shobhit University, Gangoh, Saharanpur UP- 247341, India
*Corresponding author E-mail: director.sbt@gmail.com
(Date of Receiving : 29-07-2023; Date of Acceptance : 30-09-2023)

ABSTRACT

This research was carried out to develop a homemade, nutrient-rich milk cake for the Indian festive season. This milk cake has been prepared with condensed milk, aloe vera gel, and honey as a sweetener. Each component utilized has undergone a thorough analysis to determine its nutritional worth. Energy (72.96 kcal), total protein (1.12 g), total carbohydrate (17.24 g), total fat (0.11 g), total sugar (0.83 g), vitamin C (4.49), calcium (27 mg), potassium (46 mg), iron (2.15 mg), and salt (2.89 mg) All of these included in an analysis of aloe gel's nutritional content. While the total flavonoid concentration (3.90/100 g) and fibre content illustrate the antioxidant potential of aloe gel. The same kind of study was done on honey. takihg into various factors like moisture percentage (17.2), reducing sugar (71.80), specific gravity at 27 °C (1.37), and total sugar (76.56) per 100 g. FTIR analysis of gel was also done during this work and it was observed throughout the duration of this assessment that the final product, which was made using just natural food ingredients and no chemicals, can prove to be a highly beneficial and popular appetite suppressant among individuals of all ages. This is owing to the fact it is energized and offers a variety of health advantages.

Keywords : Milk product. Aloe milk cake, Honey milk sweets, Nutraceutical Contribution.

Introduction

Aloe vera scientifically known as *Aloe barbadensis*, belongs to the family Liliaceae. The term "Aloe "originated from the Arabic word "aloeh," which means "bitter". (Sheikh *et al*. 2021) Because of its extraordinary abilities, the aloe vera plant is preferred for herbal and Ayurvedic medicines (Sánchez-Machado *et al*., 2017). Due to its vast medicinal and functional benefits, its adoption in producing contemporary culinary goods has increased (Campestriani *et al*., 2013: Pirsa and Hafezi, 2022). Water, as well as several other minerals, enzymes, vitamins, amino acids, and other high-quality nutrients, make up most aloe vera leaves (Ebrahim *et al*., 2020). Aloe vera has been utilized as emollient, anti-inflammatory, laxative, anti-microbial, aphrodisiac, antifungal, and antioxidant in homoeopathic, allopathic, and Ayurvedic medicine because of these qualities (Sahu *et al*., 2014). Additionally, it has many aesthetic benefits, and indigenous tribes also utilize it as their food (Benzidia *et al*. 2019). According to Nizam *et al*. (2021) the prolonged period of time between the extraction of Aloe vera juice and its concentration before being turned into powder alters the rheological qualities and may be caused by ongoing enzyme activity and oxidation. They discovered that HPP enhances the texture of the cubes by speeding up the moisture transfer rate in Aloe vera, a food ingredient (Bhatta *et al*., 2020). Because of its significant medicinal benefits, aloe vera is included in a variety of dairy products, including yoghurt and buttermilk. Aloe vera gel with yoghurt is a fantastic way to get bioactives in a tasty form. Aloe Vera enriched curd was attempted to be made by Govindammal *et al*. (2017) Aloe vera enriched yoghurt was shown to contain less fat and more fibre as well as phytonutrients such steroids, phlobatenin, saponins, and anthraquinones when compared to the control. Aloe vera's healing abilities and positive impacts are due to its high fibre content, low fat, and vitamin E, C, and content (Hęś *et al*., 2019). While in maize and soybeans, the tocopherols b and c predominate is found in abundant amount. Moreover, vegetable oils rich in tocopherols a and c, vitamin E (tocopherol) is extensively dispersed across the plant kingdom (Ubaldi *et al*., 2005) Because, it acts as an antioxidant and an inhibitor of cholesterol formation, vitamin E has a significant impact on nutrition (Tiwari and sonker, 2022). In the current study: dried and crashed gel with natural ingredients will be used to create an Aloe vera-based food product (Sweets). The new aloe-based cuisine will then be evaluated for several nutritional factors. It is possible to overlook the issues posed by antioxidant and other dietary deficiencies using this unique technique.

Material and Methods

Preparation of milk Cake with Aloe vera gel:

3-4 fresh, healthy and plump aloe vera leaves were taken at a time from the outer parts of the plant. Wash gently

Co-ordinator
IQAC, Shri Ram College
Muzaffarnagar

Chairman
IQAC, Shri Ram College,
Muzaffarnagar

Plant Archives Vol. 23, No. 2, 2023 pp.364-369 e-ISSN:2581-6063 (online), ISSN:0972-5210

Plant Archives

Journal homepage: http://www.plantarchives.org
DOI Url : https://doi.org/10.51470/PLANTARCHIVES.2023.v23.no2.062

NUTRACEUTICAL CONTRIBUTION OF ALOE-VERA GEL FOR MAKING OF MILK CAKE DURING FESTIVE SEASONS IN INDIA

Monika Saini[1], Shriya Garg[1], Raj Kapoor[2], Rishabh Chitranshi[3] and Rajiv Dutta[3]*
[1]Shri Ram Group of colleges, circular road, Muzaffarnagar, U.P., 251001, India
[2]National Commodities Management Services Limited, Udyog Vihar, Sector-19, Gurugram-122016, India
[3]School of Biological Engineering and Sciences, Shobhit University, Gangoh, Saharanpur UP- 247341, India
*Corresponding author E-mail: director.sbt@gmail.com
(Date of Receiving : 29-07-2023; Date of Acceptance : 30-09-2023)

ABSTRACT

This research was carried out to develop a homemade, nutrient-rich milk cake for the Indian festive season. This milk cake has been prepared with condensed milk, aloe vera gel, and honey as a sweetener. Each component utilized has undergone a thorough analysis to determine its nutritional worth. Energy (72.96 kcal), total protein (1.12 g), total carbohydrate (17.24 g), total fat (0.11 g), total sugar (0.83 g), vitamin C (4.49), calcium (27 mg), potassium (46 mg), iron (2.15 mg), and salt (2.89 mg) All of these included in an analysis of aloe gel's nutritional content. While the total flavonoid concentration (3.90/100 g) and fibre content illustrate the antioxidant potential of aloe gel. The same kind of study was done on honey, taking into various factors like moisture percentage (17.2), reducing sugar (71.80), specific gravity at 27 °C (1.37), and total sugar (76.56) per 100 g. FTIR analysis of gel was also done during this work and it was observed throughout the duration of this assessment that the final product, which was made using just natural food ingredients and no chemicals, can prove to be a highly beneficial and popular appetite suppressant among individuals of all ages. This is owing to the fact it is energized and offers a variety of health advantages.
Keywords : Milk product, Aloe milk cake, Honey milk sweets, Nutraceutical Contribution.

Introduction

Aloe vera scientifically known as *Aloe barbadensis*, belongs to the family Liliaceae. The term "Aloe "originated from the Arabic word "aloeh," which means "bitter". (Sheikh *et al.* 2021) Because of its extraordinary abilities, the aloe vera plant is preferred for herbal and Ayurvedic medicines (Sánchez-Machado *et al.*, 2017). Due to its vast medicinal and functional benefits, its adoption in producing contemporary culinary goods has increased (Campestriani *et al.*, 2013; Pirsa and Hafezi, 2022). Water, as well as several other minerals, enzymes, vitamins, amino acids, and other high-quality nutrients, make up most aloe vera leaves (Ebrahim *et al.*, 2020). Aloe vera has been utilized as emollient, anti-inflammatory, laxative, anti-microbial, aphrodisiac, antifungal, and antioxidant in homoeopathic, allopathic, and Ayurvedic medicine because of these qualities (Sahu *et al.*, 2014). Additionally, it has many aesthetic benefits, and indigenous tribes also utilize it as their food (Benzidia *et al.* 2019). According to Nizam *et al.* (2021) the prolonged period of time between the extraction of Aloe vera juice and its concentration before being turned into powder alters the rheological qualities and may be caused by ongoing enzyme activity and oxidation. They discovered that HPP enhances the texture of the cubes by speeding up the moisture transfer rate in Aloe vera, a food ingredient (Bhatta *et al.*, 2020). Because of its significant medicinal benefits, aloe vera is included in a variety of dairy products, including yoghurt and buttermilk. Aloe vera gel with yoghurt is a fantastic way to get bioactives in a tasty form. Aloe Vera enriched curd was attempted to be made by Govindammal *et al.* (2017) Aloe vera enriched yoghurt was shown to contain less fat and more fibre as well as phytonutrients such steroids, phlobatenin, saponins, and anthraquinones when compared to the control. Aloe vera's healing abilities and positive impacts are due to its high fibre content, low fat, and vitamin E, C, and content (Heś *et al.*, 2019). While in maize, and soybeans, the tocopherols b and c predominate is found in abundant amount. Moreover, vegetable oils rich in tocopherols a and c, vitamin E (tocopherol) is extensively dispersed across the plant kingdom (Ubaldi *et al.* 2005) Because, it acts as an antioxidant and an inhibitor of cholesterol formation, vitamin E has a significant impact on nutrition (Tiwari and sonker, 2022). In the current study, dried and crashed gel with natural ingredients will be used to create an Aloe vera-based food product (Sweets). The new aloe-based cuisine will then be evaluated for several nutritional factors. It is possible to overlook the issues posed by antioxidant and other dietary deficiencies using this unique technique.

Material and Methods

Preparation of milk Cake with Aloe vera gel:

3-4 fresh, healthy and plump aloe vera leaves were taken at a time from the outer parts of the plant. Wash gently

Co-ordinator
IQAC, Shri Ram College
Muzaffarnagar

Chairman
IQAC, Shri Ram College,
Muzaffarnagar

IJCRT.ORG ISSN : 2320-2882

INTERNATIONAL JOURNAL OF CREATIVE RESEARCH THOUGHTS (IJCRT)

An International Open Access, Peer-reviewed, Refereed Journal

समकालीन कला में कला और कलाकार की स्थिति – एक अध्ययन

अनु देवी, शोध छात्रा
चौ0चरण सिंह विश्वंविद्यालय, मेरठ व प्रवक्ता, ललित कला विभाग, श्रीराम कॉलेज, मुजफ्फरनगर।

डॉ0 वन्दना वर्मा, शोध निर्देशिका
एसोसिएट प्रोफेसर, चित्रकला विभाग, जैन कन्या (पी0जी0) कॉलेज, मुजफ्फरनगर

संक्षेप

समकालीन कला एक सांस्कृतिक संवाद का हिस्सा है जो व्यक्तिगत और सांस्कृतिक पहचान, परिवार, समुदाय और राष्ट्रीयता जैसे बड़े संदर्भ ढांचे की चिंता करता है। कलात्मक अभ्यास के अलावा, समकालीन कला में कला आलोचना ओर सिद्धान्त, कला शिक्षा अपने शिक्षण संस्थानों और कला स्कूलों, क्यूरेटरशिप, समकालीन कला प्रकाशनों, मीडिया और मीडिया, सार्वजनिक और निजी संग्रह, दीर्घाओं और मेलों जैसे क्षेत्र शामिल हैं। कला और साहित्य का महत्व उनकी अद्वितीयता और सांस्कृतिक धरोहर के संरक्षण में भी है, जो समृद्धि के लिए महत्वपूर्ण हैं। इसके साथ ही, यह व्यक्ति के मानसिक और आत्मिक विकास में भी मद्द करता है और समाज को सुन्दरता और सोचने की क्षमता का अनन्द देता है। समकालीन कला का जन्म वैज्ञानिक विचारधारा से हुआ है, और इसमें प्रयोगवादी दृष्टिकोण है जिसके फलस्वरूप आधुनिक चित्रकला का स्वरूप विभिन्न प्रारूपों में उपस्थित हो सका है। किन्तु इसमें प्रयोगवादी प्रक्रिया किसी निश्चित खोज को स्थापित नहीं कर पाई है। इसके कारण इसका कोई निश्चित स्वरूप अभी प्रकट नहीं हो सका है।

प्रमुख शब्द : समकालीन कला, कलाकार, अभिव्यक्ति।

प्रस्तावना

समकालीन कला वर्तमान की कला है, जो इक्कीसवीं सदी में निर्मित होती है। समकालीन कलाकार विश्व स्तर पर प्रभावित, सांस्कृतिक रूप से विविध और तकनीकि रूप से विश्व में कला को आगे बढ़ाने का काम करते हैं। उनकी कला सामग्री, विधियों, अवधारणाओं और विषयों का एक गतिशील संयोजन है जो उन सीमाओं की चुनौती को जारी रखते हैं जो 20वीं शताब्दी में पहले से ही चल रहे थे। समकालीन कला एक सांस्कृतिक संवाद का हिस्सा है जो व्यक्तिगत और सांस्कृतिक पहचान, परिवार, समुदाय और राष्ट्रीयता जैसे बड़े संदर्भ ढांचे की चिंता करता है।

कलात्मक अभ्यास के अलावा, समकालीन कला में कला आलोचना ओर सिद्धान्त, कला शिक्षा अपने शिक्षण संस्थानों और कला स्कूलों, क्यूरेटरशिप, समकालीन कला प्रकाशनों, मीडिया और मीडिया, सार्वजनिक और निजी संग्रह, दीर्घाओं और मेलों जैसे क्षेत्र शामिल हैं। समकालीन कला बाजार, समकालीन कला उत्पादन उद्योग और कला के समकालीन कार्यों को प्रदर्शित, संरक्षित और प्रलेखित किया जाता है। कला और साहित्य का महत्व उनकी अद्वितीयता और सांस्कृतिक धरोहर के संरक्षण में भी है, जो समृद्धि के लिए महत्वपूर्ण है। इसके साथ ही,

Co-ordinator IQAC, Shri Ram College Muzaffarnagar
Chairman Shri Ram College, Muzaffarnagar

यह व्यक्ति के मानसिक और आत्मिक विकास में भी मद्द करता है और समाज को सुन्दरता और सोचने की क्षमता का अनन्द देता है।

विश्व में कला और साहित्य का महत्व अत्यधिक है, यह कला केन्द्रीय संगठनों और आयोजनों के माध्यम से प्रमोट की जाती है ताकि लोग इस क्षेत्र में रूचि बनाये रखें। भारत में 'राष्ट्रीय ललित कला अकादमी' इस कार्य को संचालित करती है, इसका उद्देश्य मूर्तिकला, चित्रकला, ग्राफिक्स और गृहनिर्माण कला के क्षेत्र में योगदान करना है, साथ ही यह भारतीय कला के प्रसार प्रचार ओर विदेशों में भी जागरूकता बढ़ाने में भी सहायता करती है।

कला का अर्थ

"मनुष्य की रचना, जो उसके जीवन में आनन्द प्रदान करती है, कला कहलाती है।" भारतीय कला एक 'दर्शन' है। शास्त्रों के अध्ययन से पता चलता है कि सर्वप्रथम 'कला' शब्द का प्रयोग 'ऋग्वेद' में हुआ था, "यथा कला, यथा शफ, मध, शृण स नियामति" व कला शब्द का यर्थाथवादी प्रयोग 'भरत मुनि' ने अपने 'नाट्यशास्त्र' में प्रथम शताब्दी में किया – "न तज्ज्ञानं न तच्छिल्पं न साविधा–न सा कला।" अर्थात् ऐसा कोई ज्ञान नहीं, जिसमें कोई शिल्प नहीं, कोई विधा नहीं, जो कला न हो। भरत मुनि, ज्ञान, शिल्प और विधा से भी अलग 'कला' का क्या अभिप्राय ग्रहण करते थे, यह कहना कठिन है? अनुमान यहीं लगता है कि भरत के द्वारा प्रयुक्त 'कला' शब्द यहां 'ललित कला' के निकट है और 'शिल्प' शायद उपयोगी कला के लिए। हमारे यहाँ कला उन सारी जानकारियों या क्रियाओं को कहते हैं, जिसमें थोड़ी सी भी चतुराई की आवश्यकता है।

समकालीन कला में कला और कलाकार की स्थिति

कला में समकालीनता के अर्थ को समझने के लिए पहले "समकालीनता" पर विचार करना होगा। इस शब्द का अर्थ है 'एक ही समय में समय के साथ' या 'समय के साथ चलते हुए। पहले जिस कला संदर्भ के लिए "आधुनिक कला" शब्द का प्रयोग किया जाता था। उसी कला संदर्भ के लिए अब "समकालीन कला" शब्द का प्रयोग होता है। इन दोनों का शाब्दिक रूप से अर्थ अलग है परन्तु पारिभाषिक रूप से अर्थ लगभग समान है। आधुनिक कला आन्दोलन के बाद की सृजनात्मक कला को परिभाषित करने के लिए "आधुनिक कला" शब्द का प्रयोग 5 दशकों तक किया गया। परन्तु इस शब्द से सन्तुष्ट न होकर हर काल की आधुनिकता को समय के साथ देखने का प्रयास जारी हुआ और अब समकालीन कला शब्द का प्रयोग कला के उन्हीं संदर्भों के लिए हो रहा है, किन्तु यह शब्द भी कहीं–कहीं सार्थक नहीं हो रहा है, इसलिये अपनी बातों को कहने के लिये कुछ विद्वान "आज की कला" शब्द का व्यवहार करने लगे हैं। समकालीन कला का तात्पर्य उस कला से है जो वर्तमान में एक विशेष आन्दोलन से जुड़ा है और प्राचीन परम्पराओं और रूचि के अनुसार निरन्तर नये–नये प्रयोग हो रहे हैं। कला अभिव्यक्ति, मनोवैज्ञानिक, प्रतीकात्मक तथा जटिल होती जा रही है। समकालीन कलाकारों के लिये कोई भी विषय भारतीय समाज की जटिलतायें, कुण्ठाये आदि अछुती नहीं हैं। अगर संघर्षरत नये कलाकार की कृतियों पर नजर डालते हैं तो ये विसंगतियां पूरी जटिलता के साथ उनके चित्रों में दिखाई पड़ती हैं। समकालीन कलाकार व्यक्ति तथा समाज की भावनाओं को आत्मसात कर गहन खोज में लगा हुआ है।

Co-ordinator
IQAC, Shri Ram College
Muzaffarnagar

Chairman
IQAC, Shri Ram College,
Muzaffarnagar

समकालीन कला का अर्थ है कि वो कला जो आज के समय में बनाई जाती हैं और उसका योगदान आज के समय की सोच ओर परिपेक्ष्य में होता है। इसका मतलब है कि समकालीन कला हमारे वर्तमान समय की सामाजिक,. राजनीतिक और प्रातिकृतिक स्थितियों को दर्शाने का प्रयास करती है।

समय और परिस्थिति अनुसार प्रत्येक व्यक्ति के लिए समकालीनता का अर्थ अलग हो सकता है। कोई इसे अबस्ट्रैक्ट कला के रूप में मान सकता है, जबकि कोई इसे नई प्रौद्योगिकी के माध्यम के रूप में देख सकता हैं। समकालीन कला में कलाकार को अपनी स्वतन्त्रता बनाये रखने की स्वाधीनता है।

समकालीन कला कई कला आन्दोलनों और शैलियों का प्रतिनिधत्व करती है। इसमें विषय और माध्यम की सीमाएं टूट चुकी हैं, और कलाकार अधिक व्यक्तिगत और स्वतन्त्र होते हैं। समकालीन कलाकार विज्ञान, तकनीक, कम्प्यूटर, संचार माध्यमों ओर अन्य डिजिटल उपकरणों का उपयोग करते हैं। इसके अतिरिक्त समकालीन कला के लिए समसामयिक कला का ज्ञान आवश्यक है, कलाकार की आत्मिक अनुभूति के अलावा विशुद्धता का कोई मापदण्ड नहीं होता, क्योंकि यह समय के साथ बदलती रहती है।

समकालीन कला की प्रमुख कलाधाराएँ

कलाकार वस्तु के बाह्य रूप के सादृश्य से प्रतीकात्मक दर्शन को अधिक पसन्द करता है। वह अपनी कलाकृति को सामाजिक महत्व के निर्मित मानने के बजाय आन्तरिक आवश्यकता की पूर्ति मानता है।

कलाकृति का मूल्यांकन या रसग्रहण करते समय उसके सौन्दर्यात्मक गुणों का विचार करता है। इसके परिणामस्वरूप, समकालीन कला समय के साथ बदलती रहती है और विभिन्न दृष्टिकोणों से देखी जा सकती है। यह कला की एक नई और उत्कृष्ट रूप को प्रकट करती है, जो हमारे समय की जीवनशैली और तकनीकि उन्नति का परिचायक होता है।

कला, कला के आन्तरिक गुणों का प्रत्यक्षीकरण करती है, बाह्य रूप का नहीं। इस दृष्टि से कलाकार की तुलना रहस्यानुभवी से की जा सकती है। सृजन आत्मा और विषयवस्तु के काल्पनिक संयोग का परिणाम है। विषय वस्तु के सार तत्वों की अभिव्यक्ति तभी सम्भव है जब कलाकार उसके साथ पूरी तरह तदात्म्य स्थापित कर लेता हैं। आन्तरिक सत्य को पूरी तरह से आत्मसात कर लेता है। समकालीन कलाकारों ने इसी आन्तरिक रहस्य और चेतना शक्ति को पहचानने और उसे अपने निजी प्रयोगों में अभिव्यक्त करने की कोशिश की है, समकालीन कलाकारों ने आन्तरिक चक्षुओं द्वारा वस्तु के स्वभाव को आत्मसात करते हुए स्वयं को स्वतन्त्र कर लिया। अब वह प्रकृति की नकल नहीं करता और न ही उसे वस्तु के साम्य से कोई लगाव रखता है। प्रकृति कलाकार के अनुभव की वस्तु बन जाती है, वस्तु के मूल तत्वों द्वारा आकार का सृजन ही समकालीन कला की मूल रचना पद्धति है। जिसके द्वारा वह वस्तु का चित्रात्मक प्रत्यक्षीकरण करता है। वह न केवल विषय वस्तु के चाक्षुष स्वभाव को निश्चित करता है बल्कि रंग,रूप, धरातल और उभार आदि सभी चाक्षुष गुणों को निर्दिष्ट करते हुए नई दिशा, नये भाव और नये विचार प्रदान करता है। इसी सन्दर्भ में प्रसिद्ध चित्रकार "पाल क्ले" ने विचार और भाव को प्रधानता देते हुए कहा है कि – "प्रत्यक्ष अभिप्राय से उत्पन्न रूपाकारों की समस्त चेतना शक्ति, ब्रश द्वारा ही अभिव्यक्त होती है। ब्रश के प्रत्येक आघात में कलाकार का स्पर्श होता है, और हर आघात का अपना निजी स्वभाव होता है आघातों का पारस्परिक प्रभाव तथा उनके बीच का अन्तराल जिन तत्वों की सृष्टि करता है

Co-ordinator
IQAC, Shri Ram College
Muzaffarnagar
Chairman
IQAC, Shri Ram College,
Muzaffarnagar
Chairman
IQAC, Shri Ram College,
Muzaffarnagar

उनके घनत्व, शून्यत्व और गति में सन्तुलन बनाये रखना अति आवश्यक है। समकालीन कलाकार खुद को पहचानने में इतने अधीर हैं कि वह किसी भी वातावरण से समझौता नहीं करना चाहते। कला का कार्यक्षेत्र केवल यहां तक ही सीमित नहीं होता, बल्कि उसमें अगले एक्सप्रेशन का अन्तिकण मिलता है। यही कारण है कि समकालीन कला के क्षेत्र में असाधारण रचनाकार उत्पन्न होते हैं।"

कला का महत्व विभिन्न हो सकता है, इसका मतलब है कि लोगों के लिए कला का महत्व अलग–अलग हो सकता है। कुछ लोग कला को अपने जीवन का महत्वपूर्ण हिस्सा मानते हैं, क्योंकि वे इसे अपनी रूचि और स्वतन्त्रता का माध्यम मानते हैं, जबकि कुछ लोग इसे केवल मनोरंजन और मनोबल की उन्नति के लिए देखते हैं। कला का महत्व भी समाज और समय के साथ बदल सकता है, और व्यक्ति के परिपर्णता, शिक्षा और व्यक्तिगत रूप में उनकी रूचियों और मूल्यों पर निर्भर कर सकता है।

कला की रूचि एक व्यक्ति के व्यक्तिगत पसन्दों और रूचियों पर निर्भर करती है। कुछ लोग चित्रकला, संगीत, नृत्य अथवा अन्य कलाओं के प्रति अधिक रूचि रखते हैं, जबकि कुछ लोग फिल्म, थिएटर या अन्य कलाओं में रूचि रखते हैं। यह रूचियां व्यक्ति के व्यक्तिगत विकास का हिस्सा हो सकती हैं और उनके जीवन को सर्वांगीण रूप से प्रभावित कर सकती हैं। कला का प्रयोग व्यक्तिगत समृद्धि के लिए किया जा सकता है, और यह मनोबल और सांस्कृतिक समृद्धि का एक महत्वपूर्ण स्त्रोत भी हो सकता है।

कला का महत्व यह भी है कि यह समाज को सोचने ओर विचार करने का तरीका प्रदान करती है। कला के माध्यम से, लोग सामाजिक, सांस्कृतिक और राजनीतिक मुद्दों को बयां करते हैं और विचार करते हैं, जिससे समाज में सकारात्मक परिवर्तन हो सकता है। कला के माध्यम से लोग अपने जीवन को साझा करते हैं और सामाजिक वाद–विवाद को समझने का और उसका समाधान करने का एक माध्यम ढूँढते हैं।

समागम और कला

समागम और कला के साथ सभी मानव समुदायों का एक गहरा सम्बन्ध है, और कला एक माध्यम के रूप में लोगों की भावनाओं, विचारों और अनुभवनों को साझा करने का तरीका प्रदान करती है। इसके अलावा, कला, कला के माध्यम से अनुशासन, सृजनात्मकता और नवाचार की प्रोत्साहना कर सकती है, जो व्यक्तिगत और सामाजिक स्तर पर समृद्धि के प्रमुख उपाय हो सकते हैं।

कुल मिलाकर, कला का महत्व व्यक्तिगत और सामाजिक स्तर पर अद्वितीय होता है, और यह समृद्धि, सांस्कृतिक विविधता और समाज में सकारात्मक परिवर्तन का एक महत्वपूर्ण स्त्रोत हो सकता है। समकालीन कला का जन्म वैज्ञानिक विचारधारा से हुआ है, और इसमें प्रयोगवादी दृष्टिकोण है जिसके फलस्वरूप आधुनिक चित्रकला का स्वरूप विभिन्न प्रारूपों में उपस्थित हो सका है। किन्तु इसमें प्रयोगवादी प्रक्रिया किसी निश्चित खोज को स्थापित नहीं कर पाई है। इसके कारण इसका कोई निश्चित स्वरूप अभी प्रकट नहीं हो सका है।

अगर हम भारतीय चित्रकला का स्वरूप दर्शाना चाहें, तो हम यहीं कहेंगे कि भारतीय चित्रकला "कुछ–कुछ पाश्चात्य और अधिकतम नवीन प्रयोगवादी है। भारत में पाश्चात्य शैली के आगमन के बाद हम देखते हैं कि भारत में नवीन प्रयोगवादी दृष्टिकोण से निम्नलिखित शैलियों का विकास मुख्य रूप से हुआ

Co-ordinator
IQAC, Shri Ram College
Muzaffarnagar

Chairman
IQAC, Shri Ram College,
Muzaffarnagar

(1) अभिव्यंजनात्मक शैली

इस शैली को सरल रूप में नहीं दर्शाया जा सकता है क्योंकि यह एक अभिव्यंजनात्मक शैली है, जिसमें विभिन्न तरीकों से और अलग–अलग कला साधनों का प्रयोग किया जाता है ताकि व्यक्ति अपनी भावनाओं, रहस्यों और अनुभूतियों को अभिव्यक्त कर सके। इस शैली के कलाकार रंग, रेखाएं, आकृति, विकृतिकरण और अन्य तकनीकि का सहारा लेते हैं ताकि वे अपनी रचनाओं में भावनाओं को और भी गहराई से व्यक्त कर सकें।

इस शैली का प्रयोग भारतीय कलाकारों ने कम किया है, लेकिन कुछ कलाकारों ने इसे अपनाया है और मानवता के साथ जोड़ते हैं, जिससे वे दर्शकों को गहरा प्रभाव छोड़ सकते हैं। इस शैली का प्रयोग कला की नई दिशाओं में जाने क़ा एक माध्यम भी हो सकता है।

(2) यथार्थवाद शैली

"यथार्थवाद" कला का अर्थ है कि चित्र वास्तविकता के रूप में दिखाने का प्रयास करता है, जैसे कि वस्तुओं को हम नगरों से देखते हैं, और उसे चित्रित करने का प्रयास करता है। इस शैली का प्रयोग पश्चिमी कला में अधिक होता है, और इस शैली के भारत आगमन के बाद भारतीय चित्रकला पर पाश्चात्य कला का प्रभाव सबसे पहले इसी यथार्थवाद कला से होता है। आजकल यह यथार्थवाद कला भारतीय चित्रकला का महत्वपूर्ण हिस्सा बन गया है, और चित्रकला की शिक्षा का आरम्भ इसी शैली से होता है।

(3) घनवादी शैली

"घनवादी शैली" का अर्थ होता है वह कला शैली जिसमें चित्रकारी कला का ध्यान छः समान आकृतियों वाले ठोस पदार्थों पर रखा जाता है। यह एक नवाचारी कला शैली जिसमें आकृति के सभी अंग प्रत्येक ज्यामितीय आकारों में विभक्त करके चित्रित किए जाते हैं। आजकल भारत में इस शैली का काफी प्रचलन है। इसमें चित्रों में परिप्रेक्ष्य के स्थान पर घनत्व को अधिक महत्व दिया जाता है। घनवादी चित्रकारों की आकृतियों में शक्ति सौन्दर्य और वक्र रेखाओं का विशेष प्रयोग होता है।

(4) कोलाज

"कोलाज" बनाना दादावादी प्रवृति से आरम्भ हुआ था। इस प्रवृति में यूरोपीय कलाकारों ने समाज में व्याप्त बुराई को चित्रित किया। यह चित्रण व्यंग्यात्मक और प्रतीकात्मक था, जिससे इस प्रवृति के कलाकारों को पागल और सनकी कहा गया। हालांकि भारत में इस प्रवृति को सीधे नहीं अपनाया गया, वहीं "कोलाज" नामक एक शैली इसका प्रतिनिधित्व करती है। इस शैली में चित्रकार विभिन्न माध्यमों और तकनीकों का उपयोग करके चित्रण करता है। इन माध्यमों में शामिल हो सकते हैं अखबार, कागज के टुकड़े, लकड़ी, सींक, माचिस की तीली, रस्सी, कपड़ा, प्लास्टिक, कलपुर्जे या कोई भी बेकार का सामान आदि।

Co-ordinator
IQAC, Shri Ram College
Muzaffarnagar

Chairman
IQAC, Shri Ram College,
Muzaffarnagar

(5) जंगलवादी शैली

जंगलवादी शैली कला में एक विशेष धारा है, जिसमें रंगों को अधिक महत्व दिया जाता है। इस शैली के कला कर्मचारी आकृतियों को नहीं बल्कि रंगों के माध्यम से अपनी भावनाओं को अभिव्यक्त करते हैं। इस शैली के कलाकार आकृतियों को महत्व नहीं देते हैं। भारतीय चित्रकारों का इस शैली पर काफी प्रभाव पड़ा है।

इस शैली का इतिहास समकालीन कला के प्रयोगों पर आधारित है, जो आधुनिक कला की शुरूआत (20वीं शताब्दी की शुरूआत) के प्रयोगों पर आधारित है। इसमें कला को पारम्परिक और संस्थागत स्थानों से बाहर लाने की इच्छा है। इस शैली में कला नये और अनूठे तरीके से दिखाने का प्रयोस करती है और यह समाज के संकटों को दर्शाती है, मूल्यों की अभिव्यक्ति का स्थान बनाती है।

समकालीन कला

समकालीन कला आधुनिक विचारधाराओं के प्रयोगों पर आधाारित है, लेकिन आजकल यह शैली कुछ कमियों से गुजर रही है। यह कला आजकल नये व्यवहारों, कलात्मक मिश्रण और तकनीकी उन्नति के साथ आधुनिक विचारधाराओं के प्रति प्रतिबद्ध है। कलाकार वर्तमान में मीडिया टूल के रूप में कला का उपयोग करते हैं और नये दर्शकों को खींचते हैं। उत्तरआधुनिकता के विचार ने समकालीन कला में नई समस्याओं को तैयार किया है, जो वैचारिक धाराओं से मुक्त है, लेकिन कलाकारों को राजनीतिक या वैचारिक आलोचना करने से रोकते हैं।

समकालीन कला एक रोमांचक और नवाचारी शैली है, जो कला के माध्यम से समाज की समस्याओं का सामना करती है और नई दिशाओं में बदल जाती है। यह भी वास्तविता है कि समकालीन कला आधुनिक कला के प्रयोगों पर आधारित है। उत्तरआधुनिकता के विचार ने समकालीन कला में निहित अधिकांश समस्याओं को तैयार किया है, जो वैचारिक धाराओं (साम्यवाद और पूँजीवाद) से मुक्त हुए हैं, हालांकि, प्रतिबद्ध कलाकारों को राजनीतिक या वैचारिक कमियों की आलोचना करने से रोकते हैं। इसी प्रकार फ्रांस में, प्लास्टिक कला के संकायों का निर्माण ललित कलाओं के अकादमिक शिक्षण से लड़ने के लिए एक आधार बनाता है, यह कला शिक्षा, समाजशास्त्र, नृविज्ञान, सौंदर्यशास्त्र और अन्य के क्षेत्र के लिए पूर्व में विदेशी विषय और अपने हाल के विकास के साथ कलात्मक अनुसंधान का मार्गदर्शन करते हैं।

सौंदर्य के लिए औपचारिक खोज के बाद नए सौंदर्य अनुसंधान पथ हैं, जिनमें से सबसे अधिक कट्टरपंथी, वैचारिक कला, अतिसूक्ष्मवाद, प्रदर्शन, शरीरकला, कला के अर्थ और धारणा को स्थायी रूप से संशोधित करते हैं; जो कभी–कभी निर्विवाद रूप से पहली भ्रामक दृष्टि में बदल जाता है। माध्यम के प्रकारों का टूटना (पेंटिंग अक्सर प्रतिष्ठानों, प्रदर्शन या अन्य के पक्ष में छोड़ दिया जाता है) और कार्यों की सामग्री गहराई से कला मध्यस्थता के नेटवर्क को संशोधित करना है यह नई दिर्घाओं के अलावा, नई प्रदर्शनी संदर्भ और नए प्रसार मीडिया की उपस्थिति को दर्शाता है।

Co-ordinator
IQAC, Shri Ram College
Muzaffarnagar

Chairman
IQAC, Shri Ram College,
Muzaffarnagar

समकालीन कला और कलाकार के साहित्य की समीक्षा

इसी सम्बन्ध में भारतीय कलाकार अवनीन्द्रनाथ ठाकुर ने एक नई कला शैली का निर्माण किया, जिसे 'बंगाल शैली' कहा गया। उन्होंने कलकत्ता कला विद्यालय में प्रधानाचार्य के पद पर रहते हुए ईरानी, चीनी, जापानी, मुगल, राजपूत और अजन्ता की शैलियों के समन्वय से इस नई कला शैली का निर्माण किया। उन्होनें चीन और जापान की कला पद्धतियों के अध्ययन का भी समावेश किया। इस 'बंगाल शैली' को 'पुनरूथान कला' या 'पुनर्जागरण कला' भी कहा जाता है।

अवनीन्द्रनाथ ठाकुर के अतिरिक्त, पुनर्जागरण कला के प्रमुख चित्रकारों में गगनेन्द्रनाथ ठाकुर, नन्दलाल बसु, असीत कुमार हल्दार, क्षितीन्द्रनाथा मजूमदार, देवीप्रसाद राय चौधरी, जामिनी राय, अब्दुर्रहमान चुगतई, ईश्वर प्रसाद, शैलेन्द्रनाथ डे और शारदा उकील आदि प्रसिद्ध थे। इन चित्रकारों ने पुनर्जागरण कला के माध्यम से भारतीय चित्रकला को नया जीवन प्रदान किया है। इसके बाद कला विद्यालयों ने अपनी नीतियों को निर्धारित किया और कला विद्यार्थियों को विभिन्न कला माध्यमों की शिक्षा प्रदान करने लगे। उन्होनें अपने पाठ्यक्रम को तत्कालीन आवश्यकताओं के अनुसार परिवर्तित किया और भारतीय शैली को अध्ययन में शामिल किया। इससे आधुनिक भारतीय कला का पुर्नरूथान काल आरम्भ हुआ और भारतीय चित्रकला के इतिहास में महत्वपूर्ण कदम बढ़ा।

वैभव भी भारतीय कला के युवा चेहरे आये हैं और उन्होने 'इन्डो–यूरो आधुनिक कला' का नया रूप बनाया है। वह भारतीय, यूरोपीय और अन्य विभिन्न कला माध्यमों में कला को विकसित किया जिस कारण भारतीय कला का भविष्य वैश्विक मंच पर है। इसी प्रकार, नन्दलाल बसु और एन.एस. बेन्द्रे जैसे कलाकारों ने भारतीय कला को आधुनिकता की धारा के साथ आगे बढ़ाया और उसे विश्वकला में पटल पर लाया। इन कलाकारों ने भारतीय शैली के साथ अनेक प्रयोगवादी शैलियों और तकनीकों का संबन्ध बनाया और अपनी कला को विश्व में प्रस्तुत किया।

भारतीय कला का इतिहास यह दर्शाता है कि कला कल्चर ने हमें अपनी परंपराओं के साथ ही अधुनिकता की दिशा में आगे बढ़ने का मौका दिया है, और कलाकारों ने इसका एक सशक्त प्रतीक बनाया है। गगनेन्द्र नाथ ठाकुर ने नवयुग की कला प्रवृत्तियों को सर्वथा मौलिक ढंग से अपनाया है। उन्होनें पश्चिमी भावना और पूर्व की अंतदृष्टि को विकसित कर स्वतंत्र पद्धति पर यूरोपिय 'क्यूबिज्म' को भारतीय जामा पहनाकर प्रस्तुत किया। वे पश्चिमी पद्धति से प्रेरणा लेकर कला को आगे बढ़ा रहे हैं और उनकी कृतियों में उनके चिन्तन की स्पष्ट झलक भी मिलती है जो उनकी कृतियों में भारतीयता को दर्शाती है। कला में 'आधुनिकता' कलाकार का स्वतंत्र विचार है, यह कथन रविन्द्रनाथ ठाकुर की कला से स्पष्ट हो जाता है। उनकी कला पर यूरोपीय और समकालीन भारतीय कलाकारों का प्रभाव देखने को नहीं था। रविन्द्रनाथ ठाकुर ने अपने जीवन के संध्याकाल में कागज और कलम की भाषा को एक और रंगों और कूँची की भाषा को अपनाया और लगभग दो हजार से भी अधिक चित्र और रेखांकन बनाए। उन्होनें कला सृजन, मौलिक और स्वतंत्र चिंतन के साथ किया और अपने व्यक्तिगत सिद्धान्तों के आधार पर चित्र बनाए।

Co-ordinator
IQAC, Shri Ram College
Muzaffarnagar

Chairman
IQAC, Shri Ram College,
Muzaffarnagar

'समकालीन कला में लोक तत्व' ईश्वर चन्द गुप्ता, के द्वारा उद्धृत लोककलाएं मानव सभ्यता के विकास का जीता जागता उदाहरण है। इसकी उत्पत्ति धार्मिक भावनाओं, अंध विश्वासों, भय निवारण प्रवृत्ति और जातिगत भावनाओं की रक्षा के विचार से हुई है। इसका विकास महत्व मानव जीवन में इसलिए सर्वाधिक है कि यह सामाजिक संदर्भों को जोड़ती है और इसकी अभिव्यक्ति का आधार करूणा, स्नेह और मंगल भाव होता है। आज भारतीय संस्कृति में लोककला को विश्व में एक अलग पहचान मिली है, चाहे बिहार की मधुवनी लोकचित्र हो या बंगाल की पटुआ कला, महाराष्ट्र की बरली कला या राजस्थान की माण्डना कला, आधुनिक भारतीय चित्रकला में लोककलाओं की प्रेरणा के शुभारम्भ का श्रेय यामिनी रंजन राय को जाता है।

गीतिका गर्ग वर्तमान समय में लोककला प्रतीकों का प्रयोग कर रहीं है इन्हीं शीर्षक में भारत में अनेक प्रांतों में इसका प्रयोग मिलता है और इन सभी की अपनी एक कला है। हमारे समाज में जन्म से लेकर मृत्यु तक अनेक अनुष्ठान होते रहते हैं, जिनमें लोककला का अपना अलग महत्व है। लोक कला जनसामान्य की कला है और इसका निर्माण जन साधारण के द्वारा अधिकांशतः उत्सवों, त्योहारों, शादी विवाह आदि के अवसर पर घर की साज–सज्जा के लिए किया जाता है। लोक कला में प्रायः प्रतीकों का उपयोग होता है जो किसी लोक कथाओं, देवी–देवताओं, किवंदतियों और मिथकों को दर्शाते हैं। इन प्रतीकों के उपयोग का लक्ष्य उन चक्राकार रेखाएं, पान, आम, पीपल, सर्प, वृत्त, आयत, त्रिभुज, डमरू–नुमा त्रिभुजाकार, आयताकार मानवाकृतियाँ आदि देखने को मिलती हैं।

उपसंहार

प्रस्तुत शोधपत्र से चित्रकला में मानव मन की विशेष संवेदी स्थिति पर भी प्रकाश डालने का प्रयास किया गया है। आज जिस प्रकार प्रत्येक मनुष्य विश्व की प्रत्येक सूचना रखता है, उसी प्रकार कलाकार भी विश्व परिदृश्य से अपनी संवेदना जाग्रत करता है, वैचारिक सामग्री एकत्र करके अपनी चेतना से नए से नए माध्यम में, अपनी स्थानीयता के साथ स्वयं को व्यक्त करने की चेष्टा में रहता है। आज कलाकार के सामने समसामयिकी चित्रित करने के लिए विश्व के सांस्कृतिक अतीत का समृद्ध भंडार है, जिससे समसामयिक चित्रकार भी उन समृद्ध प्रवृत्तियों का धारक हो गया है। हमें यह भी देखना है कि कितने कलाकार समाज में व्याप्त बुराईयों को दूर करने हेतु उपचारात्मक कलाकृतियों के सृजन में संलग्न है किन्तु कितने सफल है, क्या वास्तव में उनकी कलाकृतियाँ विशेष संदेश देने, मन में वैचारिक क्रान्ति पैदा करने और एक विशेष शाँत वातावरण में हमें ले जाने में सफल हैं। इन सब विषयों पंर विशेष शोध आज की आवश्यकता होती है। अंत में कहा जा सकता है कि कला का उद्देश्य सम्पूर्ण मानव समाज के उत्थान हेतु निर्माण करना ही कलाकार का लक्ष्य होना चाहिए।

सन्दर्भग्रन्थ सूची

1. समकालीन कला, ललित कला अकादमी, नई दिल्ली, 2000.
2. कला, राज्य ललित कला अकादमी, उत्तर प्रदेश, त्रैमासिक अप्रैल से जून 2000.
3. कलाः सिद्धान्त एवं परम्परा, प्रो. बी.एल. सक्सेना, डॉ. श्रीमती सुधा सरन, डॉ. आनन्दा लखटकिया, विश्वभारती कला निकेतन, नई दिल्ली, 2010.

Co-ordinator IQAC, Shri Ram College Muzaffarnagar
Chairman IQAC, Shri Ram College, Muzaffarnagar

4. सौन्दर्य, डॉ.राजेन्द्र प्रसाद, ललित कला अकादमी, नई दिल्ली, 2001.
5. वृहद आधुनिक कला कोश, डॉ.विनोद भारद्वाज, दिल्ली, 2015.
6. समकालीन कला सन्दर्भ तथा स्थिति, ललित कला अकादमी, नई दिल्ली, 1980,
7. कला इतिहास का दर्शन, ग्रन्थ शिल्पी, आर्नल्ड हाउजर (अनुवादक गोपाल प्रधान), दिल्ली 2008.
8. आधुनिक भारतीय चित्रकला के आधार स्तम्भ, रा.हि.ग्र.अ., जयपुर 1995.
9. कला तथा आधुनिक प्रवृत्तियाँ, रामचन्द्र शुक्ल, लखनऊ 1988.
10. राजस्थान की मूर्तिकला परम्परा (रा.हि.ग्र.अ.) जयपुर 2001.

Co-ordinator
IQAC, Shri Ram College
Muzaffarnagar

Chairman
IQAC, Shri Ram College,
Muzaffarnagar

ISSN [ONLINE]: 2395-1052

The Procedure For Employing Data Mining Techniques To Clear Up The Contaminated Data

Navneet Singh Chauhan[1], Dr. Ajay Singh[2], KapilKumar[3]
[1, 2] Dept of CSE
[2]Associate Professor & HoD
[3]Assistant Professor, Dept of Computer Application
[1, 2] Bhagwant Institute of Technology, Muzaffarnagar
[3]Shri Ram College, Muzaffarnagar

Abstract- *The primary concern in excellent information management is data quality. Issues of Data Quality management might arise in any part of an information system. For businesses, it has long been unclear whether they should use data analytics to determine whether their data is unclean or if they should clean up their data before using it. Data cleaning provides a solution to these issues. It is the procedure used to identify data that is erroneous, lacking, or irrational, and then enhance the quality by fixing any mistakes and omissions that are found. In general, data cleaning lowers errors and raises the calibre of the data. Although it can be a time-consuming and laborious procedure, data inaccuracies must be corrected and erroneous information must be removed. One important method for cleansing data is data mining. One method for finding valuable information in data is data mining. A new method called "data quality mining" uses data mining techniques to find and fix issues with data quality in big datasets. From data collections, data mining automatically extracts intrinsic and hidden information.*

I. INTRODUCTION

Businesses struggle to find good or clean data. For businesses, the question of whether to use data analytics to determine whether their data is dirty or to clean up their data first remains unanswered. Which came first, the chicken or the egg? is the question that remains. There isn't a definitive response. Without high-quality data input, businesses risk analysis paralysis, and they can never have clean data without analytics to assist them find data issues.

In the information industry, a vast amount of data is available, and this number is growing daily. Before statisticians used terms like data fishing and data dredging, the term "data mining" was first used in 1990. Finding useful information in huge data sets, or "Big Data," is the main goal of data mining. Since data mining is the process of extracting knowledge from data, we may also define it this way. These days, data mining is utilised in a wide range of contemporary applications, including fraud detection, corporate analysis and risk management, market analysis and management, sports, astrology, science exploration, and Internet web surfing assistance. Data mining is the process of exploration and analysis, by automatic or semiautomatic means, of large amounts of data to find patterns for big data. In this paper we provide an overview of Data Quality Problems, Dirty Data and different methods to clean.

Businesses have been gathering a lot of data from many sources to create their own "Data Lakes," hoping to improve their data bank, which is now their most important asset. The majority of the time, errors in data are introduced during the data gathering and collecting process. Examples of these errors include typos, missing values, redundant data, inconsistent entries for the same real-world entity, outliers, and business rule violations. According to a Kaggle 2017 assessment on the state of data science and machine learning, the most frequent obstacle faced by data workers is the issue of unclean data (Kaggle 2017).

Not surprisingly, developing effective and efficient data cleaning solutions is a challenging venue and is rich with deep theoretical and engineering problems. There are number of surveys and published books on different aspects of data quality and data cleaning. Rahm and Do (Rahm and Do 2000) give a classification of different types of errors that can happen in an Extract-Transform-Load (ETL) process, and survey the tools available for cleaning data in an ETL process; Bertossi (Bertossi 2011) provides complexity results for repairing inconsistent data, and performing consistent query answering on inconsistent data; Hellerstein (Hellerstein 2008) focuses on cleaning quantitative data, such as integers and floating points, using mainly statistical outlier detection techniques; Fan and Geerts (Fan and Geerts 2012) discuss the use of data quality rules in data consistency, data currency, and data completeness, how different aspects of data quality issues might interact; Dasu and Johnson (Dasu and Johnson 2003) summarize how techniques in exploratory data mining can be integrated with data quality management; Ilyas and Chu (Ilyas et al 2015) provide taxonomies and example

Co-ordinator
IQAC, Shri Ram College
Muzaffarnagar

Chairman
IQAC, Shri Ram College,
Muzaffarnagar

algorithms of qualitative error detection and repairing techniques; and Ganti and Das Sarma (Ganti and Sarma 2013) focus on an operator-centric approach for developing a data cleaning solution, which involves the development of customizable operators that could be used as building blocks for developing common solutions.

II. PROBLEMS OF DIRTY DATA

It might sound a bit abrupt, but clean data is a myth. If data is dirty, so is everyone else's. Enterprises or individuals are more than dependent on data these days, and it is not going to change in coming years. They need to collect data in order to analyze it, which necessarily will not be 100% clean, pristine, or perfect in nature. Nearly all companies face the challenge of dirty data in the form of a lot of duplicates, incorrect fields, and missing values. This happens due to omnichannel data influx, followed by hundreds, if not thousands, of employees wrestling and torturing that data to derive professional outcomes and insights. Don't forget that even the best of the data has that tendency to decay in few weeks. Because the data is time relevant. The Figure (1) shows the fundamental reasons of Program Data Consolidation Inefficiency. (1) conformance, uniformity, density and uniqueness. Data quality problems are raised in industry and academic areas. Gathering data from heterogeneous, analyzing it for further usage are important and remarkable aspect of the data quality problems. i.e. Data Integration Single source and multiple sources are classifications of data quality problems. Single source problems occur in a single database whereas multiple source problems occur whenever data integrate from two or more sources. e.g. Overlapped data and differences in entity names.

Outlier Detection:

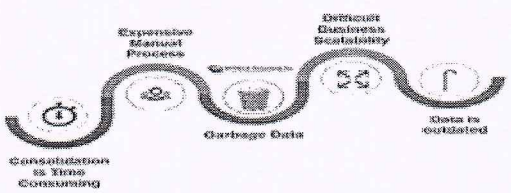


Figure 1

Nowadays, not only the public or private organizations but every one of us understands the value of Data. Data is the key to improve business, productivity, decision making and to support top-level decisions as well as strategy management for the organizations. However, as organizations

Outlier detection as the name suggests refers to the act of finding values lying outside the range or domain probably and is an quantitative error detection task. While definition of an outlier depends on the application, there are some commonly used definitions, such as "an outlier is an observation which deviates so much from other observations as to arouse suspicions that it was generated by a different mechanism" (Hawkins 1980). E.g., for a company whose employees' salaries are mostly around 100K, an employee with a salary of 10K can be considered to be an outlying record. Multiple surveys have been done and number of articles have been published to summarize different definitions of outliers, and algorithms for detecting them (Hodge and Austin 2004; Chawla and Sun 2006; Aggarwal 2013). In general, if we see that the outlier detection techniques can be categorized into three broad categories: statistics-based, distance-based, and model-based. Statistics-based outlier detection techniques assume that the normal data points would appear in high probability regions of a stochastic model, while outliers would occur in the low probability regions of a stochastic model (Grubbs 1969). They can often provide a statistical interpretation for discovered outliers, or a score/confidence interval for a data point being an outlier, rather than making a binary decision. Distance-based outlier detection techniques often define a distance between data points, which is used for defining a normal behavior, for example, normal data point should be close to a lot of other data points, and data points that deviate from such normal behavior are declared outliers (Knorr and Ng 1998). A major advantage of distance-based techniques is that they are unsupervised in nature and do not make any assumptions regarding the generative distribution for the data. Instead, they are purely data driven. Model-based outlier detection techniques first learn a classifier model from a set of labeled data points, and then apply the trained classifier to a test data point to determine whether it is an outlier (De Stefano et al 2000). Model-based approaches assume that a classifier can be trained to distinguish between the normal data points and the anomalous data points using the given feature space. They label data points as outliers if none of the learned models classify them as normal points.

III. DATA QUALITY PROBLEMS

Data quality is a root issue in many areas mainly in the pattern discovery. As it is very much clear that Data Quality problem may raise wrong output based on analysis of Dirty Data. If data quality satisfies a quality criteria and the data is treated as high quality data. Data quality criteria are accuracy, integrity, completeness, validity, consistency, schema begin to create integrated data warehouses for decision support, the resulting Data Quality (DQ) problems

Co-ordinator
IQAC, Shri Ram College
Muzaffarnagar

Chairman
IQAC, Shri Ram College,
Muzaffarnagar

become painfully clear. A study by the Meta Group revealed that 41% of the Data Warehouse projects fail, mainly due to insufficient DQ, leading to wrong decisions. The quality of the input data greatly influences the quality of the results.

The concept of DQ is vast not limited to a specific thing. It has different definitions and interpretations. It is essentially analyzed and discussed by two communities: Database and Management. The First one studies DQ from technical point of view, while the second one is also concerned with other aspects or dimensions (e.g. accessibility, believability, relevancy, interpretability, objectivity) involved in DQ.

The following Table 1 illustrates the basic DQ problems.

Table 1 – E.g. Basic data quality problems

DirtyData	DQ Problem
Cus1 = (name="Santosh Singh"...) Cus2=(name="S.Singh"...)	DuplicatedRecords
Country="SOUTHINDIA"...	MisfieldedValues
Age=00	MissingValues
PIN=825413 City=Hazaribag	Violated AttributeDepen dencies
Gender=Q	IllegalValues
Name="Santosh01-01-2020"	Multiple Values insinglecolumn

Figure 2 presents the well known typical model of data organization:(i) data is stored in multiple data sources; (ii) a data source is composed of several relations and relationships are established among them; (iii) a single relation is made up of several tuples; and (iv) a tuple is composed by a predefined number of attributes. This model results in a hierarchy of four levels of granularity: multiple data sources; multiple relations; single relation; and attribute/tuple.

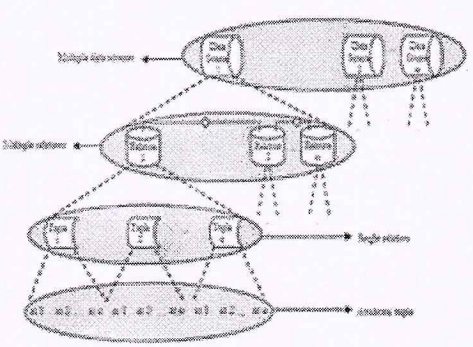


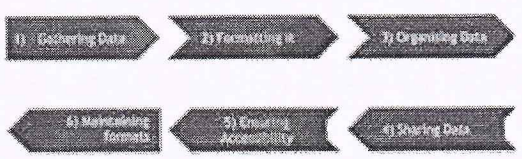
Figure 2: Typical model of Data Organization

With the advent of data socialization and data democratization, many organizations are organizing, sharing and making available the information in an efficient manner to all the employees. While most organizations are profiting by the liberal usage of such mine of information at their employees' fingertips, others are facing problems with the quality of data being used by them.

As most organizations also look at implementing systems with artificial intelligence or connecting their business via internet of things, this becomes especially important.

Business analysts determine market trends, performance data, and even present insights to executives that will help direct the future of the company. And as the world becomes even more data-driven, it is vitally important for business and data analysts to have the right data, in the right form, at the right time so they can turn it into insight.

The basic model that a company follows when implementing data socialization is:



However, many times, business analysts end up spending the majority of their time focused on data quality. This is a problem because data preparation and management isn't the business analyst's' primary responsibility. But they also don't need to depend on IT to do it for them either.

Some of the most common data quality-related issues faced by analysts and organizations in general are:

1. Duplicates: Multiple copies of same record.
2. Incomplete Data: Many times the data has not been entered correctly so it not gives proper information or message due to missing variables.
3. Inconsistent Format: If the data is not entered in proper format then it will be problematic for the software to analyze the data and to produce correct result.
4. Accessibility: The information the most of the data scientist use or the system analyst use to create, evaluate, theorize and predict the results and end products often gets lost.
5. System Upgrade: Every time when the system gets updated or the hardware required to be updated there are chances of information getting lost or corrupt.
6. Data purging and storage: With the management level in an organization there are chances that locally saved

Co-ordinator
IQAC, Shri Ram College
Muzaffarnagar

Chairman
IQAC, Shri Ram College,
Muzaffarnagar

information can be deleted either knowingly or un-knowingly. So, saving the data or the information safely is the important task.

IV. DATA CLEANING

Data cleaning is applied with comprehension in the different areas of data processing and maintenance. Data profiling examines the data available in an existing source and collects statistics information about that data. It is an application of data analysis technique. It determines actual content, structure and quality of the data

Data profiling gives overall idea about the database which are obliging for data cleaning to perform their work efficiently. Data cleaning is essential to maintain the data warehouse; it deals with detecting and removing errors and inconsistencies from data in order to improve the quality of data. It is applied in the field of data warehousing when several databases are merged. How data cleaning is important task in data warehousing is described in. Records referring to the same entity are represented in different formats in the different data sets or are represented erroneously. Thus, duplicate records will appear in the merged database. The issue is to identify and eliminate these duplicate records. This is called Merge/purge problem.

Generally data cleaning is updating a record with cleaned data but serious cleaning involves decomposing and reassembling the data. Data transformation is essential for extracting data from legacy data formats and for Business – to - Business Enterprise data integration. Data cleaning is performed by domain expert because it is valuable in identifying and eliminating of anomalies. Anomaly is a property of data values it may causes the errors in measurements, lazy input habits, omission of data and redundancies. Anomalies basically classified into three types Syntactic - describes characteristic values and format. Semantic - hides data collection from a comprehensive and non- redundant representation. Coverage anomalies - reduce the amount of entities and their properties.

4.1 Data Cleaning Process:

i. Data Auditing: Auditing the data is done to find the types of anomalies contained within it. Statistical methods are used for auditing. Syntactical anomalies are detected using parsing. The results of auditing the data support the specification of integrity constraints and domain formats. Integrity constraints are depending on the application domain and are specified by domain expert. Each constraint is checked to identify possible violating tuples. For onetime data cleansing only those constraints that are violated within the given data collection has to be further regarded within the cleansing process.

ii. Workflow Specification: Multiple operations over the data are applied for Detection and elimination of common order problems. This is called the data cleansing workflow. It is specified after auditing the data to gain information about the existing anomalies in the data collection at hand. One of the main challenges in data cleansing insists in the specification of a cleansing workflow that is to be applied to the dirty data automatically eliminating all anomalies in the data.

iii. Workflow Execution: The data cleaning workflow is executed after specification and verification of its correctness.

iv. Post-Processing/Control: After executing the cleansing workflow the results are checked to again verify the correctness of specified operations. Within the controlling step the tuples that could not be corrected initially are inspected intending to correct them manually.

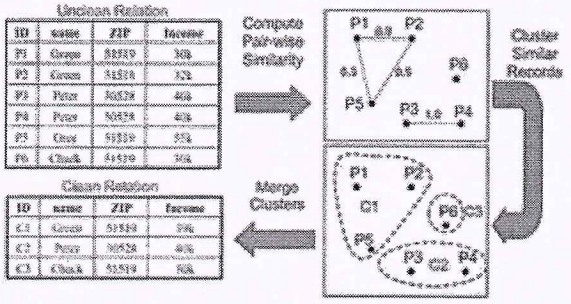
Applications of Data Cleaning

Data cleaning is an important step in all types of data-driven analytics. Different data cleaning tasks target different types of errors. Applications of outlier detection include network intrusion detection, financial fraud detection, and abnormal medical condition detection. For example, in the context of computer networks, different kinds of data, such as operating system calls and network traffic, are collected in large volumes. Outlier detection can help with detecting possible intrusions and malicious activities in the collected data. Rule-based data cleaning can help clean any relational databases where data quality rules can be defined. The richer the semantics of the data is, the better rule-based data cleaning techniques are at detecting and repairing violations. Data transformations are used in a variety of tasks, and at different stages of the ETL life cycle. For example, before running a data integration project, transformations are often used to standardize data formats, to enforce standard patterns, or to trim long strings. Transformations are also used at the end of the ETL process, for example, to merge clusters of duplicate records, to find a unique representation for a cluster of records (aka golden record), or to prepare data to be consumed by analytics tools. Data transformations can also be seen as a tool for data repair in rule-based data cleaning, since it can be used to "transform" erroneous data. Duplicate records can occur due to many reasons. For example, a customer might be recorded multiple times in a customer database if the customer used different names at the time of purchase; a single item might be represented multiple times in an online shopping Website; and a record might appear multiple time after a data

Co-ordinator
IQAC, Shri Ram College
Muzaffarnagar

Chairman
IQAC, Shri Ram College,
Muzaffarnagar

integration project because that record had different representations in original data sources. Data deduplication targets specifically duplicate records, and resolves them.



V. CONCLUSION

Data cleaning is very necessary part of data mining. Data cleaning is a complicated process, and an end-to-end data cleaning solution usually involves many different cleaning sub-tasks. We have discussed techniques for tackling data cleaning tasks. There are still many challenges and opportunities in building practical data cleaning systems:

(1) the scale of data renders many data cleaning techniques insufficient. New cleaning solutions must adapt to growing datasets of the Big Data era, for example, by leveraging sampling techniques or distributed computation. (2) although there are existing research about involving humans to perform data deduplication, for example, through active learning (Tejada et al 2001; Sarawagi and Bhamidipaty 2002; Arasu et al 2010), involving humans in other data cleaning tasks, such as repairing IC violations, and taking user feedback in discovering of data quality rules, is yet to be explored; (3) a significant portion of data is residing in semi- structured formats (e.g., JSON) and un- structured formats (e.g., text documents). Data quality problems for semi-structured and unstructured data remain largely unexplored; and (4) there is significant concerns about data privacy as increasingly more individual data are collected by governments and enterprises. Data cleaning is by nature a task that requires examining and searching through raw data, which may be restricted in some domains including finance and medicine. How to perform most data cleaning tasks, while preserving data privacy, remains an open challenge. From the above study we can see that there are different types of problems in data cleaning. Data cleaning methods and approaches depend upon the type of data which we want to clean and according to that we apply particular methods. There are different types of tools present for Data Cleaning Next we will do the comparison of data cleaning tools and determine the best tool. Each tool has its own specific features and depending upon the data we can use the tool to clean data. In future work we can check other functionality of these tools and suggest own.

REFERENCES

[1] Orr, -K. – "Data Quality and Systems Theory". Communications of the ACM, 41 (2). 1998. pp. 66-71. Meta Group – Data Warehouse Scorecard. Meta Group, 1999.

[2] Sattler, K. and Schallehn, E. – "A Data Preparation Framework based on a Multi database Language". In Proceedings of International Database Engineering and Applications Symposium (IDEAS – 2001), Grenoble, France. IEEE Computer Society. 2001. pp. 219 – 228.

[3] Galhardas, H.; Florescu, D.; Shasha, D.; Simon, E. and Saita, C.-A. – "Data Cleaning: Language, Model, and Algorithms". In Proceedings of the Very Large databases Conference (VLDB). 2001.

[4] Pipino, L.; Lee, Y. and Wang, R. – "Data Quality Assessment". Communications of the ACM, 45 (4). 2002. pp. 211 – 218.

[5] Wand, Y. and Wang, R. – "Anchoring Data Quality Dimensions in Ontological Foundations". Communications of the ACM 39 (11). 1996. pp. 86-95.

[6] Li Lee Mong , Cleansing Data for Mining and Datawarehousing, school of computing National University of Singapore, 1999 .

[7] Rahm E. & Hai Do Hong, Data Cleaning: Problems and current approaches, IEEE Bulletin of the Technical Committee on Data Engineering, 2000

[8] Müller Heiko & Christoph Freytag Johann , Problems, Methods, and Challenges in Comprehensive Data Cleansing ,Humboldt-Universität zu Berlin zu Berlin,10099 Berlin, Germany.

[9] Devi Sapna & Kalia Arvind, Study of Data Cleaning and Comparision of Data Cleaning Tools, International Journal of Computer Science and Mobile Computing, Vol 4, Issue 3, March 2015, pp. 360 – 370. https://analyticsindiamag.com/ accessed on 25.01.2020 at 12:20 pm.

[10] Abedjan Z, Morcos J, Ilyas IF, Ouzzani M, Papotti P, Stonebraker M (2016) Dataxformer: A robust transformation discovery system. In: Proc. 32nd Int. Conf. on Data Engineer- ing, pp 1134–1145.

[11] Aggarwal CC (2013) Outlier Analysis. Springer Arasu A, Gotz M, Kaushik R (2010) On active learning of record matching packages. In: Proc. ACM SIGMOD Int. Conf. on Management of Data, pp 783– 794

[12] Bertossi LE (2011) Database Repairing and Consistent Query Answering. Morgan & Claypool Publishers.

Co-ordinator
IQAC, Shri Ram College
Muzaffarnagar

Chairman
IQAC, Shri Ram College
Muzaffarnagar

International Journal of Scientific Research in Engineering and Management (IJSREM)
Volume: 08 Issue: 04 | April - 2024 SJIF Rating: 8.448 ISSN: 2582-3930

Data Cleaning: Challenges and Existing Solutions

Navneet Singh Chauhan[1], Dr. Ajay Singh[2], Kapil Kumar[3]

[1]Scholar, M.Tech (CSE), Bhagwant Institute of Technology, Muzaffarnagar

[2]Associate Professor & HoD, Bhagwant Institute of Technology, Muzaffarnagar

[3]Assistant Professor, Computer Application Department, Shri Ram College, Muzaffarnagar

Abstract

We classify data quality problems that are addressed by data cleaning and provide an overview of the main solution approaches. Data cleaning is especially required when integrating heterogeneous data sources and should be addressed together with schema-related data transformations. In data warehouses, data cleaning is a major part of the so-called ETL process. We also discuss current tool support for data cleaning.

1 Introduction

Data cleaning, also called data cleansing or scrubbing, deals with detecting and removing errors and inconsistencies from data in order to improve the quality of data. Data quality problems are present in single data collections, such as files and databases, e.g., due to misspellings during data entry, missing information or other invalid data. When multiple data sources need to be integrated, e.g., in data warehouses, federated database systems or global web-based information systems, the need for data cleaning increases significantly. This is because the sources often contain redundant data in different representations. In order to provide access to accurate and consistent data, consolidation of different data representations and elimination of duplicate information become necessary.

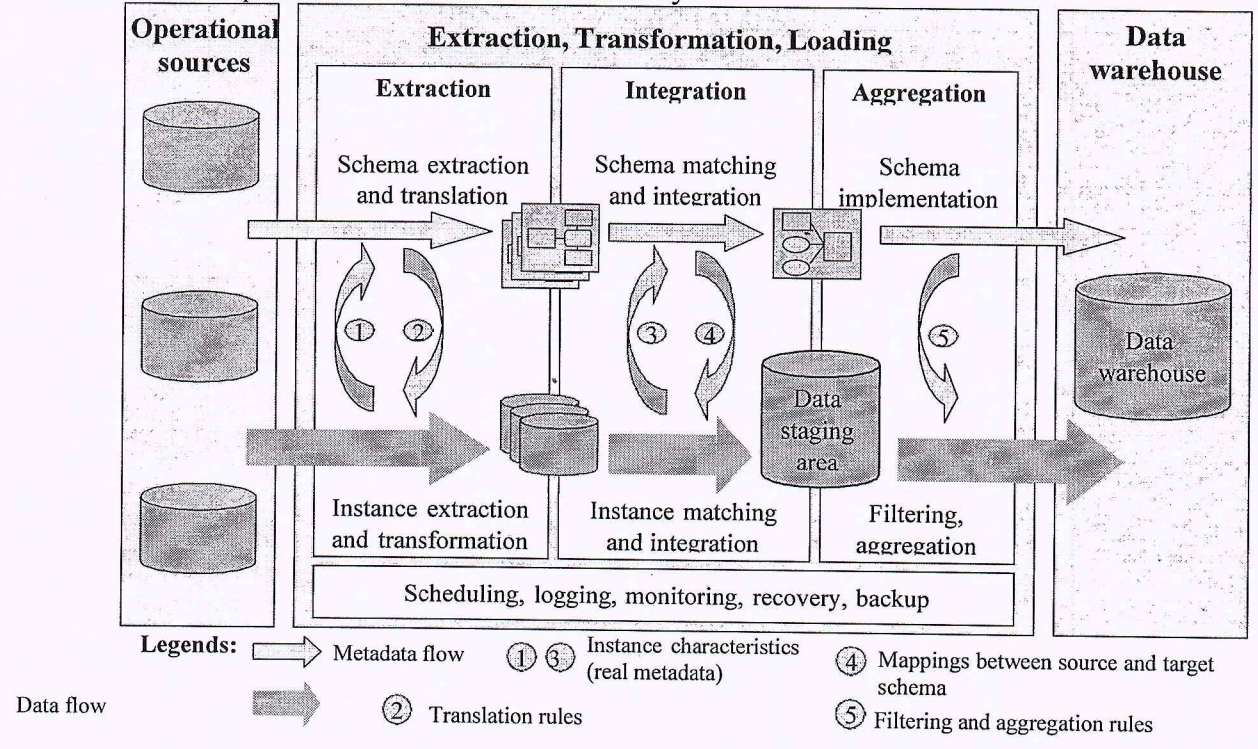


Figure 1. Steps of building a data warehouse: the ETL process

Co-ordinator
IQAC, Shri Ram College
Muzaffarnagar

Chairman
IQAC, Shri Ram College,
Muzaffarnagar

Data warehouses [6][16] require and provide extensive support for data cleaning. They load and continuously refresh huge amounts of data from a variety of sources so the probability that some of the sources contain "dirty data" is high. Furthermore, data warehouses are used for decision making, so that the correctness of their data is vital to avoid wrong conclusions. For instance, duplicated or missing information will produce incorrect or misleading statistics ("garbage in, garbage out"). Due to the wide range of possible

---

* This work was performed while on leave at Microsoft Research, Redmond, WA.

data inconsistencies and the sheer data volume, data cleaning is considered to be one of the biggest problems in data warehousing. During the so-called ETL process (extraction, transformation, loading), illustrated in Fig. 1, further data transformations deal with schema/data translation and integration, and with filtering and aggregating data to be stored in the warehouse. As indicated in Fig. 1, all data cleaning is typically performed in a separate data staging area before loading the transformed data into the warehouse. A large number of tools of varying functionality is available to support these tasks, but often a significant portion of the cleaning and transformation work has to be done manually or by low-level programs that are difficult to write and maintain.

Federated database systems and web-based information systems face data transformation steps similar to those of data warehouses. In particular, there is typically a *wrapper* per data source for extraction and a *mediator* for integration [32][31]. So far, these systems provide only limited support for data cleaning, focusing instead on data transformations for schema translation and schema integration. Data is not preintegrated as for data warehouses but needs to be extracted from multiple sources, transformed and combined during query runtime. The corresponding communication and processing delays can be significant, making it difficult to achieve acceptable response times. The effort needed for data cleaning during extraction and integration will further increase response times but is mandatory to achieve useful query results.

A data cleaning approach should satisfy several requirements. First of all, it should detect and remove all major errors and inconsistencies both in individual data sources and when integrating multiple sources. The approach should be supported by tools to limit manual inspection and programming effort and be extensible to easily cover additional sources. Furthermore, data cleaning should not be performed in isolation but together with schema-related data transformations based on comprehensive metadata. Mapping functions for data cleaning and other data transformations should be specified in a declarative way and be reusable for other data sources as well as for query processing. Especially for data warehouses, a workflow infrastructure should be supported to execute all data transformation steps for multiple sources and large data sets in a reliable and efficient way.

While a huge body of research deals with schema translation and schema integration, data cleaning has received only little attention in the research community. A number of authors focussed on the problem of duplicate identification and elimination, e.g., [11][12][15][19][22][23]. Some research groups concentrate on general problems not limited but relevant to data cleaning, such as special data mining approaches [30][29], and data transformations based on schema matching [1][21]. More recently, several research efforts propose and investigate a more comprehensive and uniform treatment of data cleaning covering several transformation phases, specific operators and their implementation [11][19][25].

In this paper we provide an overview of the problems to be addressed by data cleaning and their solution. In the next section we present a classification of the problems. Section 3 discusses the main cleaning approaches used in available tools and the research literature. Section 4 gives an overview of commercial tools for data cleaning, including ETL tools. Section 5 is the conclusion.

2 Data cleaning problems

This section classifies the major data quality problems to be solved by data cleaning and data transformation. As we will see, these problems are closely related and should thus be treated in a uniform way. Data transformations [26] are needed to support any changes in the structure, representation or content of data. These transformations become necessary in many situations, e.g., to deal with schema evolution, migrating a legacy system to a new information system, or when multiple data sources are to be integrated.

As shown in Fig. 2 we roughly distinguish between single-source and multi-source problems and between

Co-ordinator IQAC, Shri Ram College Muzaffarnagar
Chairman IQAC, Shri Ram College, Muzaffarnagar

schema- and instance-related problems. Schema-level problems of course are also reflected in the instances; they can be addressed at the schema level by an improved schema design (schema evolution), schema translation and schema integration. Instance-level problems, on the other hand, refer to errors and inconsistencies in the actual data contents which are not visible at the schema level. They are the primary focus of data cleaning. Fig. 2 also indicates some typical problems for the various cases. While not shown in Fig. 2, the single-source problems occur (with increased likelihood) in the multi-source case, too, besides specific multi-source problems.

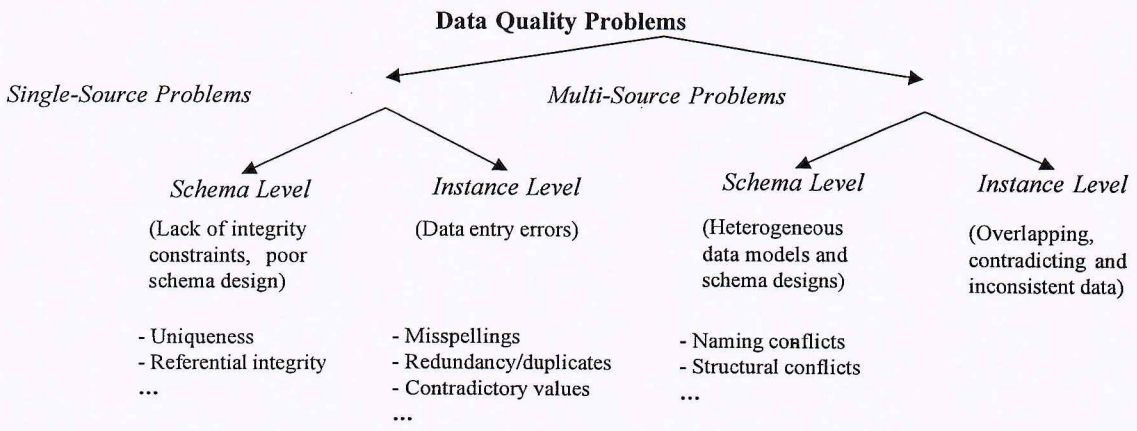


Figure 2. Classification of data quality problems in data sources

2.1 Single-source problems

The data quality of a source largely depends on the degree to which it is governed by schema and integrity constraints controlling permissable data values. For sources without schema, such as files, there are few restrictions on what data can be entered and stored, giving rise to a high probability of errors and inconsistencies. Database systems, on the other hand, enforce restrictions of a specific data model (e.g., the relational approach requires simple attribute values, referential integrity, etc.) as well as application-specific integrity constraints. Schema-related data quality problems thus occur because of the lack of appropriate model-specific or application-specific integrity constraints, e.g., due to data model limitations or poor schema design, or because only a few integrity constraints were defined to limit the overhead for integrity control. Instance-specific problems relate to errors and inconsistencies that cannot be prevented at the schema level (e.g., misspellings).

- Inconsistent aggregating
- Inconsistent timing...

Co-ordinator
IQAC, Shri Ram College
Muzaffarnagar

Chairman
IQAC, Shri Ram College,
Muzaffarnagar

Scope/Problem		Dirty Data	Reasons/Remarks
Attribute	Illegal values	bdate=30.13.70	values outside of domain range
Record	Violated attribute dependencies	age=22, bdate=12.02.70	age = (current date – birth date) should hold
Record type	Uniqueness violation	emp_1=(name="John Smith", SSN="123456") emp_2=(name="Peter Miller", SSN="123456")	uniqueness for SSN (social security number) violated
Source	Referential integrity violation	emp=(name="John Smith", deptno=127)	referenced department (127) not defined

Table 1. Examples for single-source problems at schema level (violated integrity constraints)

For both schema- and instance-level problems we can differentiate different problem scopes: attribute (field), record, record type and source; examples for the various cases are shown in Tables 1 and 2. Note that uniqueness constraints specified at the schema level do not prevent duplicated instances, e.g., if information on the same real world entity is entered twice with different attribute values (see example in Table 2).

Scope/Problem		Dirty Data	Reasons/Remarks
Attribute	Missing values	phone=9999-999999	unavailable values during data entry (dummy values or null)
	Misspellings	city="Liipzig"	usually typos, phonetic errors
	Cryptic values, Abbreviations	experience="B"; occupation="DB Prog."	
	Embedded values	name="J. Smith 12.02.70 New York"	multiple values entered in one attribute (e.g. in a free-form field)
	Misfielded values	city="Germany"	
Record	Violated attribute dependencies	city="Redmond", zip=77777	city and zip code should correspond
Record type	Word transpositions	$name_1$= "J. Smith", $name_2$="Miller P."	usually in a free-form field
	Duplicated records	emp_1=(name="John Smith",...); emp_2=(name="J. Smith",...)	same employee represented twice due to some data entry errors
	Contradicting records	emp_1=(name="John Smith", bdate=12.02.70); emp_2=(name="John Smith", bdate=12.12.70)	the same real world entity is described by different values
Source	Wrong references	emp=(name="John Smith", deptno=17)	referenced department (17) is defined but wrong

Table 2. Examples for single-source problems at instance level

Given that cleaning data sources is an expensive process, preventing dirty data to be entered is obviously an important step to reduce the cleaning problem. This requires an appropriate design of the database schema and integrity constraints as well as of data entry applications. Also, the discovery of data cleaning rules during warehouse design can suggest improvements to the constraints enforced by existing schemas.

2.2 Multi-source problems

The problems present in single sources are aggravated when multiple sources need to be integrated. Each source may contain dirty data and the data in the sources may be represented differently, overlap or contradict. This is because the sources are typically developed, deployed and maintained independently to serve specific needs. This results in a large degree of heterogeneity w.r.t. data management systems, data models, schema designs and the actual data.

At the schema level, data model and schema design differences are to be addressed by the steps of schema translation and schema integration, respectively. The main problems w.r.t. schema design are naming and structural conflicts [2][24][17]. Naming conflicts arise when the same name is used for different objects (homonyms) or different names are used for the same object (synonyms). Structural conflicts occur in many variations and refer to different representations of the same object in different sources, e.g., attribute vs. table representation, different component structure, different data types, different integrity constraints, etc.

In addition to schema-level conflicts, many conflicts appear only at the instance level (data conflicts). All problems from the single-source case can occur with different representations in different sources (e.g., duplicated records, contradicting records,…). Furthermore, even when there are the same attribute names and data types, there may be different value representations (e.g., for marital status) or different interpretation of the values (e.g., measurement units Dollar vs. Euro) across sources. Moreover, information in the sources may be provided at different aggregation levels (e.g., sales per product vs. sales per product group) or refer to different points in time (e.g. current sales as of yesterday for source 1 vs. as of last week for source 2).

A main problem for cleaning data from multiple sources is to identify overlapping data, in particular matching records referring to the same real-world entity (e.g., customer). This problem is also referred to as

Co-ordinator IQAC, Shri Ram College Muzaffarnagar
Chairman IQAC, Shri Ram College, Muzaffarnagar

the object identity problem [11], duplicate elimination or the merge/purge problem [15]. Frequently, the information is only partially redundant and the sources may complement each other by providing additional information about an entity. Thus duplicate information should be purged out and complementing information should be consolidated and merged in order to achieve a consistent view of real world entities.

Customer (source 1)

CID	*Name*	*Street*	*City*	*Sex*
11	Kristen Smith	2 Hurley Pl	South Fork, MN 48503	0
24	Christian Smith	Hurley St 2	S Fork MN	1

Client (source 2)

Cno	*LastName*	*FirstName*	*Gender*	*Address*	*Phone/Fax*
24	Smith	Christoph	M	23 Harley St, Chicago IL, 60633-2394	333-222-6542 / 333-222-6599
493	Smith	Kris L.	F	2 Hurley Place, South Fork MN, 48503-5998	444-555-6666

Customers (integrated target with cleaned data)

No	*LName*	*FName*	*Gender*	*Street*	*City*	*State*	*ZIP*	*Phone*	*Fax*	*CID*	*Cno*
1	Smith	Kristen L.	F	2 Hurley Place	South Fork	MN	48503-5998	444-555-6666		11	493
2	Smith	Christian	M	2 Hurley Place	South Fork	MN	48503-5998			24	
3	Smith	Christoph	M	23 Harley Street	Chicago	IL	60633-2394	333-222-6542	333-222-6599		24

Figure 3. Examples of multi-source problems at schema and instance level

The two sources in the example of Fig. 3 are both in relational format but exhibit schema and data conflicts. At the schema level, there are name conflicts (synonyms *Customer/Client*, *Cid/Cno*, *Sex/Gender*) and structural conflicts (different representations for names and addresses). At the instance level, we note that there are different gender representations ("0"/"1" vs. "F"/"M") and presumably a duplicate record (Kristen Smith). The latter observation also reveals that while *Cid/Cno* are both source-specific identifiers, their contents are not comparable between the sources; different numbers (11/493) may refer to the same person while different persons can have the same number (24). Solving these problems requires both schema integration and data cleaning; the third table shows a possible solution. Note that the schema conflicts should be resolved first to allow data cleaning, in particular detection of duplicates based on a uniform representation of names and addresses, and matching of the *Gender/Sex* values.

3 Data cleaning approaches

In general, data cleaning involves several phases

- *Data analysis:* In order to detect which kinds of errors and inconsistencies are to be removed, a detailed data analysis is required. In addition to a manual inspection of the data or data samples, analysis programs should be used to gain metadata about the data properties and detect data quality problems.
- *Definition of transformation workflow and mapping rules:* Depending on the number of data sources, their degree of heterogeneity and the "dirtyness" of the data, a large number of data transformation and cleaning steps may have to be executed. Sometime, a schema translation is used to map sources to a common data model; for data warehouses, typically a relational representation is used. Early data cleaning steps can correct single-source instance problems and prepare the data for integration. Later steps deal with schema/data integration and cleaning multi-source instance problems, e.g., duplicates. For data warehousing, the control and data flow for these transformation and cleaning steps should be specified within a workflow that defines the ETL process (Fig. 1).

  The schema-related data transformations as well as the cleaning steps should be specified by a declarative query and mapping language as far as possible, to enable automatic generation of the transformation code. In addition, it should be possible to invoke user-written cleaning code and special-purpose tools during a data transformation workflow. The transformation steps may request user feedback on data instances for which they have no built-in cleaning logic.
- *Verification:* The correctness and effectiveness of a transformation workflow and the transformation definitions should be tested and evaluated, e.g., on a sample or copy of the source data, to improve the definitions if necessary. Multiple iterations of the analysis, design and verification steps may be needed, e.g., since some errors only become apparent after applying some transformations.
- *Transformation:* Execution of the transformation steps either by running the ETL workflow for loading

Chairman IQAC, Shri Ram College

and refreshing a data warehouse or during answering queries on multiple sources.

- *Backflow of cleaned data:* After (single-source) errors are removed, the cleaned data should also replace the dirty data in the original sources in order to give legacy applications the improved data too and to avoid redoing the cleaning work for future data extractions. For data warehousing, the cleaned data is available from the data staging area (Fig. 1).

The transformation process obviously requires a large amount of metadata, such as schemas, instance-level data characteristics, transformation mappings, workflow definitions, etc. For consistency, flexibility and ease of reuse, this metadata should be maintained in a DBMS-based repository [4]. To support data quality, detailed information about the transformation process is to be recorded, both in the repository and in the transformed instances, in particular information about the completeness and freshness of source data and lineage information about the origin of transformed objects and the changes applied to them. For instance, in Fig. 3, the derived table *Customers* contains the attributes *CID* and *Cno*, allowing one to trace back the source records.

In the following we describe in more detail possible approaches for data analysis (conflict detection), transformation definition and conflict resolution. For approaches to schema translation and schema integration, we refer to the literature as these problems have extensively been studied and described [2][24][26]. Name conflicts are typically resolved by renaming; structural conflicts require a partial restructuring and merging of the input schemas.

3.1 Data analysis

Metadata reflected in schemas is typically insufficient to assess the data quality of a source, especially if only a few integrity constraints are enforced. It is thus important to analyse the actual instances to obtain real (reengineered) metadata on data characteristics or unusual value patterns. This metadata helps finding data quality problems. Moreover, it can effectively contribute to identify attribute correspondences between source schemas (schema matching), based on which automatic data transformations can be derived [20][9].

There are two related approaches for data analysis, data profiling and data mining. *Data profiling* focusses on the instance analysis of individual attributes. It derives information such as the data type, length, value range, discrete values and their frequency, variance, uniqueness, occurrence of null values, typical string pattern (e.g., for phone numbers), etc., providing an exact view of various quality aspects of the attribute. Table 3 shows examples of how this metadata can help detecting data quality problems.

Problems	Metadata	Examples/Heuristics
Illegal values	cardinality	e.g., cardinality (gender) > 2 indicates problem
	max, min	max, min should not be outside of permissible range
	variance, deviation	variance, deviation of statistical values should not be higher than threshold
Misspellings	attribute values	sorting on values often brings misspelled values next to correct values
Missing values	null values	percentage/number of null values
	attribute values + default values	presence of default value may indicate real value is missing
Varying value Representations	attribute values	comparing attribute value set of a column of one table against that of a column of another table
Duplicates	cardinality + uniqueness	attribute cardinality = # rows should hold
	attribute values	sorting values by number of occurrences; more than 1 occurrence indicates duplicates

Table 3. Examples for the use of reengineered metadata to address data quality problems

Data mining helps discover specific data patterns in large data sets, e.g., relationships holding between several attributes. This is the focus of so-called descriptive data mining models including clustering, summarization, association discovery and sequence discovery [10]. As shown in [28], integrity constraints among attributes such as functional dependencies or application-specific "business rules" can be derived, which can be used to complete missing values, correct illegal values and identify duplicate records across data sources. For example, an association rule with high confidence can hint to data quality problems in instances violating this rule. So a confidence of 99% for rule "*total=quantity*unit price*" indicates that 1% of the records do not comply and may require closer examination.

Coordinator
IQAC, Shri Ram College
Muzaffarnagar

3.2 Defining data transformations

Chairman
IQAC, Shri Ram College
Muzaffarnagar

The data transformation process typically consists of multiple steps where each step may perform schema- and instance-related transformations (mappings). To allow a data transformation and cleaning system to

generate transformation code and thus to reduce the amount of self-programming it is necessary to specify the required transformations in an appropriate language, e.g., supported by a graphical user interface. Various ETL tools (see Section 4) offer this functionality by supporting proprietary rule languages. A more general and flexible approach is the use of the standard query language SQL to perform the data transformations and utilize the possibility of application-specific language extensions, in particular user-defined functions (UDFs) supported in SQL:99 [13][14]. UDFs can be implemented in SQL or a general-purpose programming language with embedded SQL statements. They allow implementing a wide range of data transformations and support easy reuse for different transformation and query processing tasks. Furthermore, their execution by the DBMS can reduce data access cost and thus improve performance. Finally, UDFs are part of the SQL:99 standard and should (eventually) be portable across many platforms and DBMSs.

```
CREATE VIEW Customer2 (LName, FName, Gender, Street, City, State, ZIP, CID) AS
SELECT LastNameExtract (Name), FirstNameExtract (Name), Sex, Street, CityExtract (City),
       StateExtract (City), ZIPExtract (City), CID
FROM Customer
```

Figure 4. Example of transformation step definition

Fig. 4 shows a transformation step specified in SQL:99. The example refers to Fig. 3 and covers part of the necessary data transformations to be applied to the first source. The transformation defines a view on which further mappings can be performed. The transformation performs a schema restructuring with additional attributes in the view obtained by splitting the name and address attributes of the source. The required data extractions are achieved by UDFs (shown in boldface). The UDF implementations can contain cleaning logic, e.g., to remove misspellings in city names or provide missing zip codes.

UDFs may still imply a substantial implementation effort and do not support all necessary schema transformations. In particular, simple and frequently needed functions such as attribute splitting or merging are not generically supported but need often to be re-implemented in application-specific variations (see specific extract functions in Fig. 4). More complex schema restructurings (e.g., folding and unfolding of attributes) are not supported at all. To generically support schema-related transformations, language extensions such as the SchemaSQL proposal are required [18]. Data cleaning at the instance level can also benefit from special language extensions such as a Match operator supporting "approximate joins" (see below). System support for such powerful operators can greatly simplify the programming effort for data transformations and improve performance. Some current research efforts on data cleaning are investigating the usefulness and implementation of such query language extensions [11][25].

3.3 Conflict resolution

A set of transformation steps has to be specified and executed to resolve the various schema- and instance-level data quality problems that are reflected in the data sources at hand. Several types of transformations are to be performed on the individual data sources in order to deal with single-source problems and to prepare for integration with other sources. In addition to a possible schema translation, these preparatory steps typically include:

- *Extracting values from free-form attributes (attribute split):* Free-form attributes often capture multiple individual values that should be extracted to achieve a more precise representation and support further cleaning steps such as instance matching and duplicate elimination. Typical examples are name and address fields (Table 2, Fig. 3, Fig. 4). Required transformations in this step are reordering of values within a field to deal with word transpositions, and value extraction for attribute splitting.
- *Validation and correction:* This step examines each source instance for data entry errors and tries to correct them automatically as far as possible. Spell checking based on dictionary lookup is useful for identifying and correcting misspellings. Furthermore, dictionaries on geographic names and zip codes help to correct address data. Attribute dependencies (birthdate – age, total price – unit price / quantity, city – phone area code,…) can be utilized to detect problems and substitute missing values or correct wrong values.
- *Standardization:* To facilitate instance matching and integration, attribute values should be converted to a consistent and uniform format. For example, date and time entries should be brought into a specific format; names and other string data should be converted to either upper or lower case, etc. Text data may be condensed and unified by performing stemming, removing prefixes, suffixes, and stop words. Furthermore, abbreviations and encoding schemes should consistently be resolved by consulting special synonym dictionaries or applying predefined conversion rules.

Chairman
BCA, Shri Ram College,
Muzaffarnagar

Dealing with multi-source problems requires restructuring of schemas to achieve a schema integration, including steps such as splitting, merging, folding and unfolding of attributes and tables. At the instance level, conflicting representations need to be resolved and overlapping data must to be dealt with. The *duplicate elimination* task is typically performed after most other transformation and cleaning steps, especially after having cleaned single-source errors and conflicting representations. It is performed either on two cleaned sources at a time or on a single already integrated data set. Duplicate elimination requires to first identify (i.e. match) similar records concerning the same real world entity. In a second step, similar records are merged into one record containing all relevant attributes without redundancy. Furthermore, redundant records are purged. In the following we discuss the key problem of instance matching. More details on the subject are provided elsewhere in this issue [22].

In the simplest case, there is an identifying attribute or attribute combination per record that can be used for matching records, e.g., if different sources share the same primary key or if there are other common unique attributes. Instance matching between different sources is then achieved by a standard equi-join on the identifying attribute(s). In the case of a single data set, matches can be determined by sorting on the identifying attribute and checking if neighboring records match. In both cases, efficient implementations can be achieved even for large data sets. Unfortunately, without common key attributes or in the presence of dirty data such straightforward approaches are often too restrictive. To determine most or all matches a "fuzzy matching" (approximate join) becomes necessary that finds similar records based on a matching rule, e.g., specified declaratively or implemented by a user-defined function [14][11]. For example, such a rule could state that person records are likely to correspond if name and portions of the address match. The degree of similarity between two records, often measured by a numerical value between 0 and 1, usually depends on application characteristics. For instance, different attributes in a matching rule may contribute different weight to the overall degree of similarity. For string components (e.g., customer name, company name,...) exact matching and fuzzy approaches based on wildcards, character frequency, edit distance, keyboard distance and phonetic similarity (soundex) are useful [11][15][19]. More complex string matching approaches also considering abbreviations are presented in [23]. A general approach for matching both string and text data is the use of common information retrieval metrics. WHIRL represents a promising representative of this category using the cosine distance in the vector-space model for determining the degree of similarity between text elements [7].

Determining matching instances with such an approach is typically a very expensive operation for large data sets. Calculating the similarity value for any two records implies evaluation of the matching rule on the cartesian product of the inputs. Furthermore sorting on the similarity value is needed to determine matching records covering duplicate information. All records for which the similarity value exceeds a threshold can be considered as matches, or as match candidates to be confirmed or rejected by the user. In [15] a multi-pass approach is proposed for instance matching to reduce the overhead. It is based on matching records independently on different attributes and combining the different match results. Assuming a single input file, each match pass sorts the records on a specific attribute and only tests nearby records within a certain window on whether they satisfy a predetermined matching rule. This reduces significantly the number of match rule evaluations compared to the cartesian product approach. The total set of matches is obtained by the union of the matching pairs of each pass and their transitive closure.

4 Tool support

A large variety of tools is available on the market to support data transformation and data cleaning tasks, in particular for data warehousing.[1] Some tools concentrate on a specific domain, such as cleaning name and address data, or a specific cleaning phase, such as data analysis or duplicate elimination. Due to their restricted domain, specialized tools typically perform very well but must be complemented by other tools to address the broad spectrum of transformation and cleaning problems. Other tools, e.g., ETL tools, provide comprehensive transformation and workflow capabilities to cover a large part of the data transformation and cleaning process. A general problem of ETL tools is their limited interoperability due to proprietary application programming interfaces (API) and proprietary metadata formats making it difficult to combine the functionality of several tools [8].

We first discuss tools for data analysis and data rengineering which process instance data to identify data errors and inconsistencies, and to derive corresponding cleaning transformations. We then present specialized cleaning tools and ETL tools, respectively.

4.1 Data analysis and reengineering tools

According to our classification in 3.1, *data analysis tools* can be divided into data profiling and data mining

Co-ordinator
IQAC, Shri Ram College
Muzaffarnagar
Chairman
IQAC, Shri Ram College
Muzaffarnagar

tools. MIGRATIONARCHITECT (Evoke Software) is one of the few commercial *data profiling tools*. For each attribute, it determines the following real metadata: data type, length, cardinality, discrete values and their percentage, minimum and maximum values, missing values, and uniqueness. MIGRATIONARCHITECT also assists in developing the target schema for data migration. *Data mining tools*, such as WIZRULE (WizSoft) and DATAMININGSUITE (InformationDiscovery), infer relationships among attributes and their values and compute a confidence rate indicating the number of qualifying rows. In particular, WIZRULE can reveal three kinds of rules: mathematical formula, if-then rules, and spelling-based rules indicating misspelled names, e.g., "*value* Edinburgh *appears 52 times in field* Customer*; 2 case(s) contain similar value(s)*". WIZRULE also automatically points to the deviations from the set of the discovered rules as suspected errors.

Data reengineering tools, e.g., INTEGRITY (Vality), utilize discovered patterns and rules to specify and perform cleaning transformations, i.e., they reengineer legacy data. In INTEGRITY, data instances undergo several analysis steps, such as parsing, data typing, pattern and frequency analysis. The result of these steps is a tabular representation of field contents, their patterns and frequencies, based on which the pattern for standardizing data can be selected. For specifying cleaning transformations, INTEGRITY provides a language including a set of operators for column transformations (e.g., move, split, delete) and row transformation

[1] For comprehensive vendor and tool listings, see commercial websites, e.g., Data Warehouse Information Center (www.dwinfocenter.org), Data Management Review (www.dmreview.com), Data Warehousing Institute (www.dw-institute.com)

(e.g., merge, split). INTEGRITY identifies and consolidates records using a statistical matching technique. Automated weighting factors are used to compute scores for ranking matches based on which the user can select the real duplicates.

4.2 Specialized cleaning tools

Specialized cleaning tools typically deal with a particular domain, mostly name and address data, or concentrate on duplicate elimination. The transformations are to be provided either in advance in the form of a rule library or interactively by the user. Alternatively, data transformations can automatically be derived from schema matching tools such as described in [21].

- *Special domain cleaning:* Names and addresses are recorded in many sources and typically have high cardinality. For example, finding customer matches is very important for customer relationship management. A number of commercial tools, e.g., IDCENTRIC (FirstLogic), PUREINTEGRATE (Oracle), QUICKADDRESS (QASSystems), REUNION (PitneyBowes), and TRILLIUM (TrilliumSoftware), focus on cleaning this kind of data. They provide techniques such as extracting and transforming name and address information into individual standard elements, validating street names, cities, and zip codes, in combination with a matching facility based on the cleaned data. They incorporate a huge library of pre-specified rules dealing with the problems commonly found in processing this data. For example, TRILLIUM's extraction (parser) and matcher module contains over 200,000 business rules. The tools also provide facilities to customize or extend the rule library with user-defined rules for specific needs.
- *Duplicate elimination:* Sample tools for duplicate identification and elimination include DATACLEANSER (EDD), MERGE/PURGELIBRARY (Sagent/QMSoftware), MATCHIT (HelpITSystems), and MASTERMERGE (PitneyBowes). Usually, they require the data sources already be cleaned for matching. Several approaches for matching attribute values are supported; tools such as DATACLEANSER and MERGE/PURGE LIBRARY also allow user-specified matching rules to be integrated.

4.3 ETL tools

A large number of commercial tools support the ETL process for data warehouses in a comprehensive way, e.g., COPYMANAGER (InformationBuilders), DATASTAGE (Informix/Ardent), EXTRACT (ETI), POWERMART (Informatica), DECISIONBASE (CA/Platinum), DATATRANSFORMATIONSERVICE (Microsoft), METASUITE (Minerva/Carleton), SAGENTSOLUTIONPLATFORM (Sagent), and WAREHOUSEADMINISTRATOR (SAS). They use a repository built on a DBMS to manage all metadata about the data sources, target schemas, mappings, script programs, etc., in a uniform way. Schemas and data are extracted from operational data sources via both native file and DBMS gateways as well as standard interfaces such as ODBC and EDA. Data transformations are defined with an easy-to-use graphical interface. To specify individual mapping steps, a proprietary rule language and a comprehensive library of predefined conversion functions are typically provided. The tools also support reusing existing transformation solutions, such as external C/C++ routines, by providing an interface to integrate them into the internal transformation library. Transformation processing is carried out either by an engine that interprets the specified transformations at runtime, or by compiled code. All engine-based tools (e.g., COPYMANAGER, DECISIONBASE, POWERMART, DATASTAGE,

Co-Ordinator IQAC, Shri Ram College Muzaffarnagar
Chairman IQAC, Shri Ram College Muzaffarnagar

WAREHOUSEADMINISTRATOR), possess a scheduler and support workflows with complex execution dependencies among mapping jobs. A workflow may also invoke external tools, e.g., for specialized cleaning tasks such as name/address cleaning or duplicate elimination.

ETL tools typically have little built-in data cleaning capabilities but allow the user to specify cleaning functionality via a proprietary API. There is usually no data analysis support to automatically detect data errors and inconsistencies. However, users can implement such logic with the metadata maintained and by determining content characteristics with the help of aggregation functions (sum, count, min, max, median, variance, deviation,...). The provided transformation library covers many data transformation and cleaning needs, such as data type conversions (e.g., date reformatting), string functions (e.g., split, merge, replace, sub-string search), arithmetic, scientific and statistical functions, etc. Extraction of values from free-form attributes is not completely automatic but the user has to specify the delimiters separating sub-values.

The rule languages typically cover *if-then* and *case* constructs that help handling exceptions in data values, such as misspellings, abbreviations, missing or cryptic values, and values outside of range. These problems can also be addressed by using a table lookup construct and join functionality. Support for instance matching is typically restricted to the use of the join construct and some simple string matching functions, e.g., exact or wildcard matching and soundex. However, user-defined field matching functions as well as functions for correlating field similarities can be programmed and added to the internal transformation library.

5 Conclusions

We provided a classification of data quality problems in data sources differentiating between single- and multi-source and between schema- and instance-level problems. We further outlined the major steps for data transformation and data cleaning and emphasized the need to cover schema- and instance-related data transformations in an integrated way. Furthermore, we provided an overview of commercial data cleaning tools. While the state-of-the-art in these tools is quite advanced, they do typically cover only part of the problem and still require substantial manual effort or self-programming. Furthermore, their interoperability is limited (proprietary APIs and metadata representations).

So far only a little research has appeared on data cleaning, although the large number of tools indicates both the importance and difficulty of the cleaning problem. We see several topics deserving further research. First of all, more work is needed on the design and implementation of the best language approach for supporting both schema and data transformations. For instance, operators such as Match, Merge or Mapping Composition have either been studied at the instance (data) or schema (metadata) level but may be built on similar implementation techniques. Data cleaning is not only needed for data warehousing but also for query processing on heterogeneous data sources, e.g., in web-based information systems. This environment poses much more restrictive performance constraints for data cleaning that need to be considered in the design of suitable approaches. Furthermore, data cleaning for semi-structured data, e.g., based on XML, is likely to be of great importance given the reduced structural constraints and the rapidly increasing amount of XML data.

Acknowledgments

We would like to thank Phil Bernstein, Helena Galhardas and Sunita Sarawagi for helpful comments.

References

[1] Abiteboul, S.; Clue, S.; Milo, T.; Mogilevsky, P.; Simeon, J.: *Tools for Data Translation and Integration.* In [26]:3-8, 1999.

[2] Batini, C.; Lenzerini, M.; Navathe, S.B.: *A Comparative Analysis of Methodologies for Database Schema Integration.* In Computing Surveys 18(4):323-364, 1986.

[3] Bernstein, P.A.; Bergstraesser, T.: *Metadata Support for Data Transformation Using Microsoft Repository.* In [26]:9-14, 1999

[4] Bernstein, P.A.; Dayal, U.: *An Overview of Repository Technology.* Proc. 20th VLDB, 1994.

[5] Bouzeghoub, M.; Fabret, F.; Galhardas, H.; Pereira, J; Simon, E.; Matulovic, M.: *Data Warehouse Refreshment.* In [16]:47-67.

[6] Chaudhuri, S., Dayal, U.: *An Overview of Data Warehousing and OLAP Technology.* ACM SIGMOD Record 26(1), 1997.

[7] Cohen, W.: *Integration of Heterogeneous Databases without Common Domains Using Queries Based Textual Similarity.* Proc. ACM SIGMOD Conf. on Data Management, 1998.

[8] Do, H.H.; Rahm, E.: *On Metadata Interoperability in Data Warehouses.* Techn. Report, Dept. of Computer Science, Univ. of Leipzig. http://dol.uni-leipzig.de/pub/2000-13.

[9] Doan, A.H.; Domingos, P.; Levy, A.Y.: *Learning Source Description for Data Integration.* Proc. 3rd Intl. Workshop The Web and Databases (WebDB), 2000.

[10] Fayyad, U.: *Mining Database: Towards Algorithms for Knowledge Discovery.* IEEE Techn. Bulletin Data Engi-

Coordinator IQAC, Shri Ram College Muzaffarnagar
Chairman IQAC, Shri Ram College Muzaffarnagar

neering 21(1), 1998.
[11] Galhardas, H.; Florescu, D.; Shasha, D.; Simon, E.: *Declaratively cleaning your data using AJAX.* In Journees Bases de Donnees, Oct. 2000. http://caravel.inria.fr/~galharda/BDA.ps.
[12] Galhardas, H.; Florescu, D.; Shasha, D.; Simon, E.: *AJAX: An Extensible Data Cleaning Tool.* Proc. ACM SIGMOD Conf., p. 590, 2000.
[13] Haas, L.M.; Miller, R.J.; Niswonger, B.; Tork Roth, M.; Schwarz, P.M.; Wimmers, E.L.: *Transforming Heterogeneous Data with Database Middleware: Beyond Integration.* In [26]:31-36, 1999.
[14] Hellerstein, J.M.; Stonebraker, M.; Caccia, R.: *Independent, Open Enterprise Data Integration.* In [26]:43-49, 1999.
[15] Hernandez, M.A.; Stolfo, S.J.: *Real-World Data is Dirty: Data Cleansing and the Merge/Purge Problem.* Data Mining and Knowledge Discovery 2(1):9-37, 1998.
[16] Jarke, M., Lenzerini, M., Vassiliou, Y., Vassiliadis, P.: *Fundamentals of Data Warehouses.* Springer, 2000.
[17] Kashyap, V.; Sheth, A.P.: *Semantic and Schematic Similarities between Database Objects: A Context-Based Approach.* VLDB Journal 5(4):276-304, 1996.
[18] Lakshmanan, L.; Sadri, F.; Subramanian, I.N.: *SchemaSQL – A Language for Interoperability in Relational Multi-Database Systems.* Proc. 26th VLDB, 1996.
[19] Lee, M.L.; Lu, H.; Ling, T.W.; Ko, Y.T.: *Cleansing Data for Mining and Warehousing.* Proc. 10th Intl. Conf. Database and Expert Systems Applications (DEXA), 1999.
[20] Li, W.S.; Clifton, S.: *SEMINT: A Tool for Identifying Attribute Correspondences in Heterogeneous Databases Using Neural Networks.* In Data and Knowledge Engineering 33(1):49-84, 2000.
[21] Milo, T.; Zohar, S.: *Using Schema Matching to Simplify Heterogeneous Data Translation.* Proc. 24th VLDB, 1998.
[22] Monge, A. E. *Matching Algorithm within a Duplicate Detection System.* IEEE Techn. Bulletin Data Engineering 23 (4), 2000 (this issue).
[23] Monge, A. E.; Elkan, P.C.: *The Field Matching Problem: Algorithms and Applications.* Proc. 2nd Intl. Conf. Knowledge Discovery and Data Mining (KDD), 1996.
[24] Parent, C.; Spaccapietra, S.: *Issues and Approaches of Database Integration.* Comm. ACM 41(5):166-178, 1998.
[25] Raman, V.; Hellerstein, J.M.: *Potter's Wheel: An Interactive Framework for Data Cleaning.* Working Paper, 1999. http://www.cs.berkeley.edu/~rshankar/papers/pwheel.pdf.
[26] Rundensteiner, E. (ed.): Special Issue on Data Transformation. IEEE Techn. Bull. Data Engineering 22(1), 1999.
[27] Quass, D.: *A Framework for Research in Data Cleaning.* Unpublished Manuscript. Brigham Young Univ., 1999
[28] Sapia, C.; Höfling, G.; Müller, M.; Hausdorf, C.; Stoyan, H.; Grimmer, U.: *On Supporting the Data Warehouse Design by Data Mining Techniques.* Proc. GI-Workshop Data Mining and Data Warehousing, 1999.
[29] Savasere, A.; Omiecinski, E.; Navathe, S.: *An Efficient Algorithm for Mining Association Rules in Large Databases.* Proc. 21st VLDB, 1995.
[30] Srikant, R.; Agrawal, R.: *Mining Generalized Association Rules.* Proc. 21st VLDB conf., 1995.
[31] Tork Roth, M.; Schwarz, P.M.: *Don't Scrap It, Wrap It! A Wrapper Architecture for Legacy Data Sources.* Proc. 23rd VLDB, 1997.
[32] Wiederhold, G.: *Mediators in the Architecture of Future Information Systems.* Computer 25(3): 38-49, 1992.

Co-ordinator
IQAC, Shri Ram College
Muzaffarnagar

Chairman
IQAC, Shri Ram College,
Muzaffarnagar

An International Open Access Peer Reviewed Journal • Impact Factor: 6.24 • E-ISSN: 2582-2160

Certificate of Publication

The editorial board of IJFMR is hereby awarding the certificate of publication to

Madhvi Kaushik

in recognition of publication of the paper titled

An Analysis of Demonetization and Its Effects on the Indian Economy

Published In: Volume 6, Issue 3 (May-June 2024)

Paper Id: 22567

www.ijfmr.com • editor@ijfmr.com

Editor / Publisher
IJFMR

Co-ordinator
IQAC, Shri Ram College
Muzaffarnagar

Chairman
IQAC, Shri Ram College,
Muzaffarnagar



International Journal of Applied Research

Peer Reviewed Journal, Refereed Journal, Indexed Journal

ISSN Print: 2394-7500, ISSN Online: 2394-5869, CODEN: IJARPF

Publication Certificate

This certificate confirms that **"Madhvi Kaushik"** has published manuscript titled **"Fundamental analysis and technical analysis of stocks: A comparative study"**.

Details of Published Article as follow:

Volume	:	**10**
Issue	:	**2**
Year	:	**2024**
Page Number	:	**01-04**

Certificate No.: **10-1-77**

Yours Sincerely,

Akhil Gupta

AKINIK Director Publications

Akhil Gupta
Publisher
International Journal of Applied Research
www.allresearchjournal.com
Tel: +91-9711224068

Co-ordinator
IQAC, Shri Ram College
Muzaffarnagar

Chairman
IQAC, Shri Ram College,
Muzaffarnagar

Explainable Artificial Intelligence (XAI) for Healthcare: Enhancing Transparency and Trust

Anuj Kumar, Himanshu Hora, Ankur Rohilla, Pramod Kumar, and Rahul Gautam

Abstract Artificial intelligence (AI) is an emerging field of computer science which is currently being used in many sophisticated applications such as e-commerce, military, education, industry, and healthcare. AI has several subfields like machine learning, neural network, Deep Learning, Natural Language Processing (NLP), and computer vision. In the medical domain, AI with deep learning model plays a crucial role to predict the symptoms of various kinds of disease and clinicians to make decision about analysis critical medical report provided by radiologists and pathologists. However, the adoption of many AI model in healthcare face challenges related to transparency, interpretability, and trustworthiness, due to their "Black-Box" in nature. Usually, it is essential for humans to understand the reasoning behind an AI model's decision-making. To make a better decision-making, Explainable AI (XAI) is a useful technique that aims to explain the information inside the black-box model of AI algorithms that reveals how the decisions are made. The aim of this paper is to provide a survey of the most novel XAI techniques used in healthcare and related medical imaging applica- tions. In addition, this paper provides the study of various applications of XAI in healthcare and focuses on challenges related to black-box AI models, emphasizing the requirement for interpretable arrangements in healthcare. Furthermore, this paper presents different XAI strategies, including Local Interpretable Model-Agnostic Explanations (LIME), Shapley Additive Explanations (SHAP), and rule-based frameworks, which are displayed and assessed for their viability in making

Himanshu Hora, Ankur Rohilla, Pramod Kumar and Rahul Gautam contributed equally to this work.

A. Kumar (✉) · A. Rohilla · P. Kumar · R. Gautam
School of Computing, Graphic Era Hill University, Bareilly Road, Haldwani, Uttarakhand 263139, India
e-mail: anujkumardixit@gehu.ac.in

R. Gautam
e-mail: rahulgautam.srgc@gamail.com

A. Kumar · H. Hora · A. Rohilla · P. Kumar · R. Gautam
Department of Computer Application, Shri Ram College, Circular Road, Muzaffarnagar, UP 251001, India

© The Author(s), under exclusive license to Springer Nature Singapore Pte Ltd. 2025

P. J. S. Gonçalves et al. (eds.), *Proceedings of Fifth International Conference on Computing, Communications, and Cyber-Security*, Lecture Notes in Networks and Systems 1128, https://doi.org/10.1007/978-981-97-7371-8_23

Co-ordinator
IQAC, Shri Ram College
Muzaffarnagar

Chairman
IQAC, Shri Ram College,
Muzaffarnagar

AI models interpretable. Finally, this survey paper provides future direction to help developers and researchers for future prospective investigations in healthcare and discusses future research possibilities in the area of XAI.

Keywords Artificial intelligence (AI) · Machine learning · Deep learning · Explainable artificial intelligence (XAI) · Medical imaging

1 Introduction

Artificial intelligence (AI) is an emerging field of computer science which is currently being used in many sophisticated applications such as e-commerce, military, education, industry, and healthcare. Machine learning, Deep learning, Artificial Neural Network (ANN), computer vision, and Natural Language Processing (NLP) [1] are the branches of AI. In the medical domain, AI with deep learning model plays a crucial role to predict the symptoms of various kinds of disease and clinicians to make decision about analysis critical medical report provided by radiologists and pathologists. The optimized machine learning algorithm solves many problems in several fields including healthcare [2]. Many deep learning models of AI are not transparent and trustworthy, making doctor unsure about the signs of diagnosis. The question arises of how one can provide better evidence of the predictive result. AI models work as a blackbox. It is a big issue that generate a gap between AI models and human understanding [3]. Humans simply need to understand what is going on inside the AI model's algorithm that is exactly where XAI came into the picture. This research field is often also called interpretable machine learning. XAI provides techniques to better understand and validate how our machine learning model works. Typically, XAI is associated with two terms "explainable" and "interpretable". AI frameworks can quickly analyse patient records, spot unpretentious designs in demonstrative pictures, and indeed foresee disease outbreaks by scrutinizing patterns in epidemiological information. By giving healthcare experts with actionable insights and expanding their decision-making capabilities, AI demonstrates to be a priceless instrument in optimizing patient care. AI's impact amplifies past information analysis—it's a driving force behind the rise of personalized medication. Through the examination of hereditary and clinical information, AI calculations can recognize individualized treatment plans custom-made to a patient's special hereditary makeup and medical history. This groundbreaking approach not as it was improving treatment adequacy but moreover diminishes unfavourable impacts, checking a significant stride towards patient-centred care. Beyond clinical applications, AI is driving operational proficiency in healthcare institutions. Administrative tasks, such as charging, arrangement planning, and asset assignment, can be computerized through AI, liberating up healthcare experts to focus more on patient care (Fig. 1).

Co-ordinator
IQAC, Shri Ram College
Muzaffarnagar

Chairman
IQAC, Shri Ram College,
Muzaffarnagar

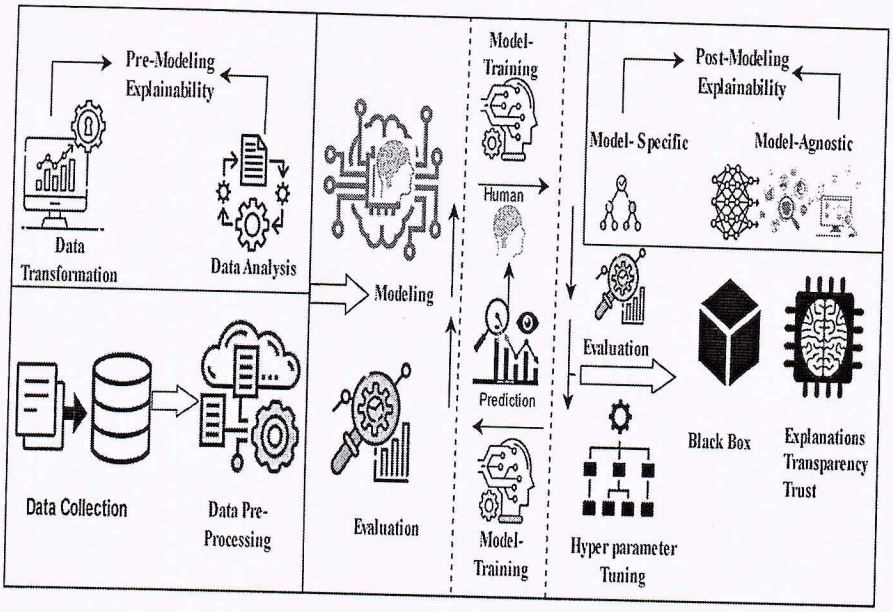


Fig. 1 Explainable artificial model architecture

1.1 Applications of XAI in Healthcare

Explainable Artificial Intelligence (XAI) has numerous applications in healthcare, where transparency and interpretability of AI models are crucial for ensuring patient safety, trust among healthcare professionals, and ethical compliance. Here are some key applications of XAI in healthcare [4].

1.1.1 Clinical Decision Support Systems (CDSS)

XAI can enhance CDSS by providing clear explanations for the recommendations or decisions made by AI algorithms. This helps healthcare professionals understand the reasoning behind AI-driven suggestions for diagnoses, treatment plans, and medication recommendations, leading to more informed clinical decisions (Fig. 2).

1.1.2 Medical Imaging Interpretation

XAI can be integrated into medical image analysis to assist radiologists and clinicians in interpreting complex imaging data. It can highlight areas of interest, provide explanations for image-based diagnoses, and help identify potential anomalies in X-rays, MRIs, CT scans, and pathology slides.

Co-ordinator
IQAC, Shri Ram College
Muzaffarnagar

Chairman
IQAC, Shri Ram College,
Muzaffarnagar

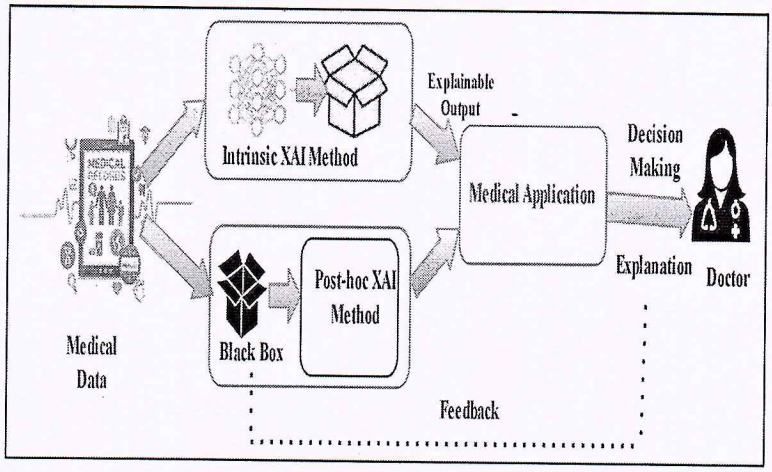


Fig. 2 Flow of a medical XAI application

1.1.3 Drug Discovery and Genomics

XAI can be applied to drug discovery by explaining the molecular mechanisms of diseases and the potential targets for drug development. It aids in identifying genetic markers and biomarkers for personalized medicine, making it easier for researchers to understand how specific genes or molecules are associated with diseases.

1.1.4 Patient Risk Assessment

XAI can be used to predict patient risk factors and outcomes, such as readmission risk, disease progression, or complications following surgery. By providing transparent risk assessments, XAI helps clinicians prioritize patient care and interventions more effectively.

1.1.5 Treatment Recommendation and Personalized Medicine

XAI-driven systems can explain why a particular treatment plan or medication is recommended for a specific patient. This personalization is based on the patient's medical history, genetic information, and other relevant data, increasing patient engagement and adherence.

Co-ordinator
IQAC, Shri Ram College
Muzaffarnagar

Chairman
IQAC, Shri Ram College,
Muzaffarnagar

1.1.6 Interpretable Electronic Health Records (EHRs)

XAI can be used to interpret and extract valuable insights from electronic health records (EHRs). It can help healthcare providers understand patient trends, identify early warning signs, and optimize treatment plans based on comprehensive and interpretable patient data.

1.1.7 Ethical Compliance and Bias Mitigation

XAI can play a critical role in addressing ethical concerns in healthcare AI, such as bias in algorithms. By providing transparency into decision-making processes, it allows for the identification and mitigation of biases in AI models, ensuring fair and equitable healthcare outcomes.

1.1.8 Clinical Trials and Research

XAI can assist researchers in explaining the results of clinical trials and observational studies. It aids in identifying significant factors and variables contributing to study outcomes, helping researchers make more informed conclusions and decisions.

1.1.9 Patient Engagement and Education

XAI-powered applications can explain medical conditions, treatment options, and potential outcomes to patients in a clear and understandable manner. This promotes patient engagement, informed consent, and shared decision-making in healthcare.

1.1.10 Regulatory Compliance

XAI can assist healthcare organizations in complying with regulatory requirements related to transparency and accountability. It helps ensure that AI-driven systems adhere to privacy and ethical standards, making them compliant with healthcare regulations.

2 Advancements in XAI Techniques

Researchers and developers have been working to make AI models easier to understand and transparent in recent years, which has resulted in substantial advancements in Explainable Artificial Intelligence (XAI) methodologies. These developments are

Co-ordinator
IQAC, Shri Ram College
Muzaffarnagar

Chairman
IQAC, Shri Ram College,
Muzaffarnagar

meant to solve the difficulty in comprehending and having faith in sophisticated AI systems. Here are some significant developments in XAI techniques.

2.1 *Local Interpretable Model-Agnostic Explanations (LIME)*

LIME is a method that concentrates on producing locally accurate explanations for intricate models. It creates interpretable surrogate models around certain predictions, making it simpler to comprehend why an AI model made a specific decision.

2.2 *Shapley Additive Explanations (SHAP)*

SHAP values are used to describe the role played by each feature or variable in the prediction made by a model. They offer a coherent framework for comprehending the significance of features in black-box models, including neural networks (Fig. 3)

2.3 *Counterfactual Explanations*

Alternative scenarios are created through counterfactual explanations to explain AI decisions. For instance, if an AI model approves a loan application, a counterfactual explanation could outline the adjustments that would have caused the application to be rejected.

2.4 *Rule-Based Models*

Rule-based models, also known as symbolic AI, use rules that can be understood by humans to describe AI decisions. To give clear decision reasoning, these models can be utilized in conjunction with intricate machine learning models [5].

Co-ordinator
IQAC, Shri Ram College
Muzaffarnagar

Chairman
IQAC, Shri Ram College,
Muzaffarnagar

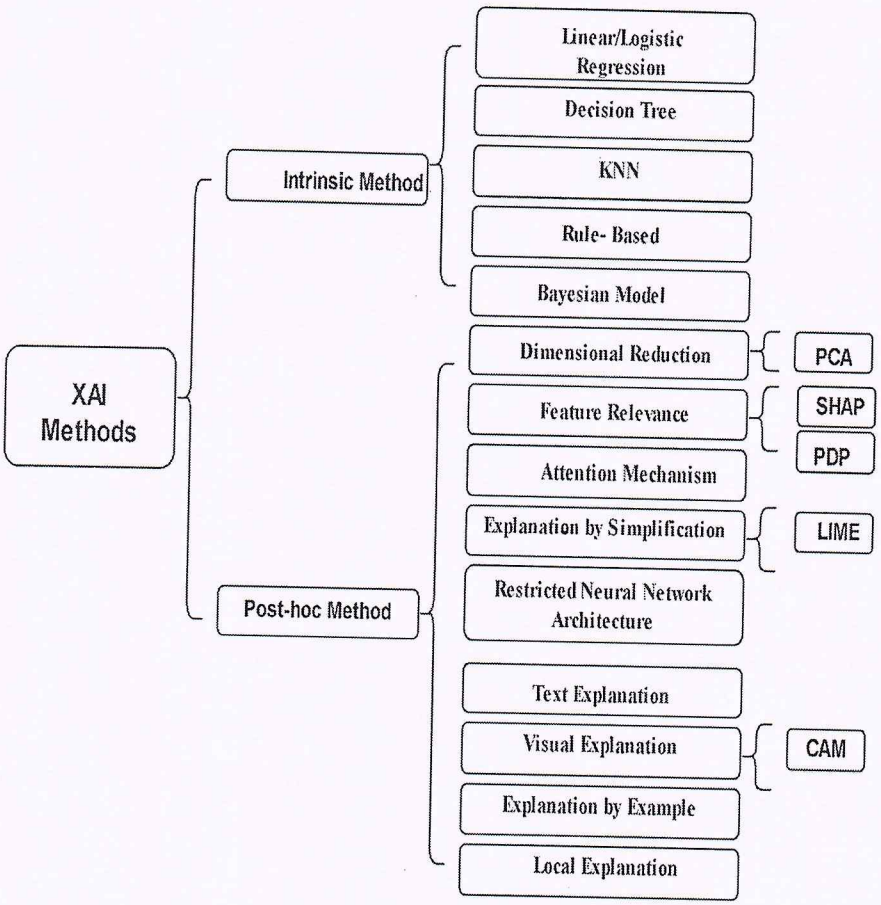


Fig. 3 Taxonomy of XAI method

2.5 *Gradient-Based Methods*

Methods such as Integrated Gradients and Smooth Grad employ gradients to elucidate the contribution of each input feature towards the output of a model. This facilitates the process of feature attribution and enables visual explanations.

2.6 *Attention Mechanisms*

Attention mechanisms, which were initially devised for natural language processing (NLP), have been modified to furnish elucidations for sequential data and image

Co-Chairman
IQAC, Shri Ram College
Muzaffarnagar

Chairman
IQAC, Shri Ram College,
Muzaffarnagar

recognition assignments. These mechanisms [6] accentuate the specific segments the input data that the model concentrates on while rendering predictions.

2.7 *Interpretable Neural Networks*

The scholars have devised neural network structures that are inherently interpretable. These networks frequently employ sparse activations or structured layers, which facilitate comprehension of the information flow within the model.

2.8 *Visualization Tools*

The progressions in visualization [7] methodologies have enabled users to perceive the functioning of AI models and the rationale behind their specific predictions. The utilization of tools such as activation maps, saliency maps, and feature visualization has facilitated users in acquiring a comprehensive understanding of the behaviour of the model.

2.9 *Natural Language Explanations*

Advancements in the field of natural language generation have facilitated the ability of artificial intelligence models to furnish explications in a language that is comprehensible to humans. This capability is especially advantageous in domains such as healthcare and law, where lucid and straightforward explanations are of paramount importance.

2.9.1 Hybrid Models

The amalgamation of interpretable models with intricate machine learning models in a hybrid methodology presents a harmonious equilibrium between precision and lucidity. This facilitates lucid explications without compromising prognostic [8] potential.

2.9.2 Standardization Efforts

Various organizations and researchers are currently engaged in the process of establish-ing standardized techniques for explainable Artificial Intelligence (XAI)

Co-ordinator
IQAC, Shri Ram College
Muzaffarnagar

Chairman
IQAC, Shri Ram College,
Muzaffarnagar

to guarantee uniform and dependable explanations across diverse AI models and applications.

3 Challenges

Healthcare Explainable Artificial Intelligence (XAI) confronts a number of obstacles that must be overcome in order for it to be successfully incorporated [9] into clinical practise. Here are a few of the main difficulties:

3.1 Complexity of Healthcare Data

Medical photographs, clinical notes, and structured EHR data are just a few examples of the many different forms of data that are frequently complicated, diverse, and present in healthcare. It is a huge challenge [10] to create XAI systems that can manage and interpret findings from such a wide range of data sources.

3.2 Model Complexity

Due to their intricacy, deep learning models, which are increasingly employed in healthcare, are sometimes referred to as "black-box" models. It's not easy to clinically meaningfully explain these models' judgement calls.

3.3 Interoperability

EHR systems and data formats used by healthcare organizations vary widely. It is difficult to make sure that XAI systems can be connected with these various systems and offer coherent justifications.

3.4 Privacy and Security

A fine line must be drawn between maintaining patient confidentiality and offering explanations. Techniques for XAI must be created to produce insightful explanations without disclosing private patient data [11].

Co-ordinator
IQAC, Shri Ram College
Muzaffarnagar

Chairman
IQAC, Shri Ram College,
Muzaffarnagar

3.5 Data Quality and Bias

It takes skill to maintain patient privacy while yet explaining things. It is necessary to develop XAI methods that can produce insightful explanations without divulging private patient data.

3.6 Clinical Validation

To make sure that their explanations are correct and consistent with clinical knowledge, XAI systems need to be carefully verified in clinical settings. Clinical validation studies may need a lot of time and resources.

3.7 User Acceptance

The explanations offered by AI systems must be trusted and understood by healthcare personnel. Clinical practitioners may be reluctant to depend on AI-driven suggestions without thorough and trustworthy justifications since user [12] acceptability of XAI in clinical practise is a substantial barrier.

3.8 Regulatory Compliance

It is essential to adhere to healthcare rules, such as those imposed by HIPAA in the US. These rules must be followed by XAI systems while processing patient data and offering explanations.

3.9 Scalability

XAI solutions must be scalable to accommodate the volume of data and the requirement for real-time decision assistance as healthcare generates enormous volumes of data.

Co-ordinator
IQAC, Shri Ram College
Muzaffarnagar

Chairman
IQAC, Shri Ram College
Muzaffarnagar

3.9.1 Education and Training

In order for healthcare practitioners to apply and understand XAI-driven suggestions and explanations effectively, they must get education and training in this area. The creation of educational resources and programmes is necessary [13] for this.

4 Future Directions

As AI and machine learning models are used to support medical decisions, diagnostics, and treatment recommendations, Explainable Artificial Intelligence (XAI) is becoming more and more significant in the healthcare industry. For these AI systems to earn the trust of medical personnel and patients, openness and interpretability are essential. The following are some potential paths for XAI in healthcare:

4.1 Model Transparency and Interpretability

The goal of research and development will remain to improve the readability and transparency of AI models. This covers methods like feature significance analysis, model visualization, and the creation of more comprehensible, straightforward model designs.

4.2 Integration with Electronic Health Records (EHRs)

In order to give explanations and insights immediately into the clinical process, XAI technologies will be more seamlessly connected with electronic health records. Clinicians may find this useful for comprehending the logic underlying AI-driven suggestions.

4.3 Human-AI Collaboration

Future XAI systems will place a focus on expert AI and human cooperation. This can entail interactive user interfaces that [14] let physicians examine various scenarios and treatment alternatives while also asking the AI system for clarifications.

Co-ordinator
IQAC, Shri Ram College
Muzaffarnagar

Chairman
IQAC, Shri Ram College
Muzaffarnagar

4.4 *Privacy-Preserving XAI*

Healthcare data privacy is a major problem; hence, it will be essential to use XAI approaches that can explain things without disclosing private patient data. One of the main study areas will be privacy-preserving XAI.

4.5 *Interpretable Deep Learning*

A major focus will be on creating methods to make deep learning models, which are sometimes referred to as "black-box models", more understandable. This can entail employing strategies like attention mechanisms or deep network feature extraction.

4.6 *Domain-Specific XAI*

Radiology, genetics, and drug discovery are just a few of the many subfields that make up the broad area of healthcare. To meet the unique requirements and difficulties of each area, XAI methodologies will need to be customized.

4.7 *Regulatory Guidelines*

It's possible that regulatory [15] organizations will set standards and regulations for XAI systems within the healthcare sector, like the FDA in the US. These recommendations will have an impact on how XAI solutions are developed and implemented.

4.8 *Education and Training*

Healthcare workers will need to be educated on how to utilize AI systems correctly and understand their results as XAI becomes more common in the industry. Concepts from XAI will need to be included in training programmes.

Chairman
IQAC, Shri Ram College,
Muzaffarnagar

Co-ordinator
IQAC, Shri Ram College
Muzaffarnagar

4.9 Bias and Fairness

In the healthcare industry, it is crucial to guarantee that XAI systems are impartial and generate fair results. The development of tools to identify and reduce bias in AI models will be the main focus of research.

4.9.1 Continuous Evaluation and Improvement

Healthcare XAI systems [16] will require ongoing evaluation and development. Clinicians' and patients' feedback will be crucial [17] for improving these systems and making them more reliable and effective.

5 Conclusion

In conclusion, Explainable Artificial Intelligence (XAI), which helps clinical decision-making, diagnostics, and therapy suggestions, shows huge potential for revolutionizing [17] healthcare. To enable its successful integration into the world of healthcare, it provides a number of difficult challenges that must be fixed. The potential of XAI to better healthcare processes and outcomes for patients is substantial. Healthcare professionals may better comprehend the reasoning behind AI-driven suggestions by using XAI's readily interpretable AI_models, which promote trust and cooperation between humans and computers. Additionally, XAI has the ability to find trends and conclusions [18] in enormous and complicated healthcare datasets, assisting in the early diagnosis of diseases, the personalization of procedures, and improving the quality of healthcare procedures.

References

1. Biswas S (2023) ChatGPT and the future of medical writing. Radiol Soc N Am
2. Nazar M, Alam MM, Yafi E, Su'ud MM (2021) A systematic review of human–computer interaction and explainable artificial intelligence in healthcare with artificial intelligence techniques. IEEE Access 9:153316–153348
3. Von Eschenbach WJ (2021) Transparency and the black box problem: Why we do not trust ai. Philos Technol 34(4):1607–1622
4. Zhang Y, Weng Y, Lund J (2022) Applications of explainable artificial intelligence in diagnosis and surgery. Diagnostics 12(2):237
5. Hulsen T, Jamuar SS, Moody AR, Karnes JH, Varga O, Hedensted S, Spreafico R, Hafler DA, McKinney EF (2019) From big data to precision medicine. Front Med 6:34
6. Celi LA, Cellini J, Charpignon M-L, Dee EC, Dernoncourt F, Eber R, Mitchell WG, Moukheiber L, Schirmer J, Situ J et al (2022) Sources of bias in artificial intelligence that perpetuate healthcare disparities—a global review. PLOS Digital Health 1(3):0000022

Co-ordinator
IQAC, Shri Ram College
Muzaffarnagar

Chairman
IQAC, Shri Ram College,

7. Vega-M´arquez B, Rubio-Escudero C, Riquelme JC, Nepomuceno-Chamorro I (2020) Creation of synthetic data with conditional generative adversarial networks. In: 14th International Conference on Soft Computing Models in Industrial and Environmental Applications (SOCO 2019) Seville, Spain, May 13–15, 2019, Proceedings 14, pp 231–240. Springer
8. Gunning D, Stefik M, Choi J, Miller T, Stumpf S, Yang G-Z (2019) Xai—explainable artificial intelligence. Sci Robot 4(37):7120
9. Jung J, Lee H, Jung H, Kim H (2023) Essential properties and explanation effec- tiveness of explainable artificial intelligence in healthcare: A systematic review. Heliyon
10. Ribeiro MT, Singh S, Guestrin C (2016) "why should i trust you?" explaining the predictions of any classifier. In: Proceedings of the 22nd ACM SIGKDD international conference on knowledge discovery and data mining, pp 1135–1144
11. Vu M-AT, Adalı T, Ba D, Buzs´aki G, Carlson D, Heller K, Liston C, Rudin C, Sohal VS, Widge AS, et al. (2018) A shared vision for machine learning in neuroscience. J Neurosci 38(7):1601–1607
12. Dur´an JM (2021) Dissecting scientific explanation in ai (sxai): A case for medicine and healthcare. Artif Intell 297:103498
13. Zhang C, Li D, Liang J (2020) Multi-granularity three-way decisions with adjustable hesitant fuzzy linguistic multigranulation decision-theoretic rough sets over two universes. Inf Sci 507:665–683
14. Phillips PJ, Hahn CA, Fontana PC, Broniatowski DA, Przybocki MA (2020) Four principles of explainable artificial intelligence. Gaithersburg, Maryland 18
15. Sheu R-K, Pardeshi MS (2022) A survey on medical explainable ai (xai): Recent progress, explainability approach, human interaction and scoring system. Sensors 22(20):8068
16. Kong X, Liu S, Zhu L (2024) Toward human-centered xai in practice: A survey. Mach Intell Res 1–31
17. Wang C, Zhang J, Lassi N, Zhang X (2022) Privacy protection in using artificial intelligence for healthcare: Chinese regulation in comparative perspective. Healthcare 10:1878. MDPI
18. Klein G, Hoffman RR (2008) Macrocognition, mental models, and cognitive task analysis methodology. Nat Decis Mak Macrocognition 57–80

Chairman
IQAC, Shri Ram College
Muzaffarnagar

Co-ordinator
IQAC, Shri Ram College
Muzaffarnagar

International Journal of Scientific Research and Engineering Trends (IJSRET)

This is to certify that
Shayma Saifi
has published a paper entitled
"Food Waste in Agriculture: Exploring Prevention Strategies and their Potential to Improve Food Abundance and Zero-Waste"
in International Journal of Scientific Research and Engineering Trends, in Volume 10, Issue 02, Jan-Feb-2024

Co-ordinator
IQAC, Shri Ram College
Muzaffarnagar

Chairman
IQAC, Shri Ram College,
Muzaffarnagar

Editor-in-Chief
IJSRET
www.ijsret.com
ISSN : 2395-566X

International Journal of Scientific Research and Engineering Trends (IJSRET)

This is to certify that
Vikas Kumar
has published a paper entitled
"Scopes and Advances of Nano-fertilizers in Agricultural Development"
in International Journal of Scientific Research and Engineering Trends, in Volume 10, Issue 02, Jan-Feb-2024

Co-ordinator
IQAC, Shri Ram College
Muzaffarnagar

Chairman
IQAC, Shri Ram College,
Muzaffarnagar

Editor-in-Chief
IJSRET

www.ijsret.com
ISSN : 2395-566X

International Journal of Scientific Research and Engineering Trends (IJSRET)

This is to certify that
Ashu Chaudhary
has published a paper entitled
"Scopes and Advances of Nano-fertilizers in Agricultural Development"
in International Journal of Scientific Research and Engineering Trends, in Volume 10, Issue 02, Jan-Feb-2024

Co-ordinator
IQAC, Shri Ram College
Muzaffarnagar

Chairman
IQAC, Shri Ram College,
Muzaffarnagar

Editor-in-Chief
IJSRET
www.ijsret.com
ISSN : 2395-566X

International Journal of Scientific Research and Engineering Trends (IJSRET)

This is to certify that
Dr. Manoj Kumar Mittal
has published a paper entitled
"Topological Insulators: A Review"
in International Journal of Scientific Research and Engineering Trends, in Volume 10, Issue 01, Jan-Feb-2024

Co-ordinator
IQAC, Shri Ram College
Muzaffarnagar

Chairman
IQAC, Shri Ram College,
Muzaffarnagar

Editor-in-Chief
IJSRET
www.ijsret.com
ISSN : 2395-566X

International Journal of Scientific Research and Engineering Trends (IJSRET)

This is to certify that
Assistant Professor Mr. Vivek
has published a paper entitled
"Topological Insulators: A Review"
in International Journal of Scientific Research and Engineering Trends, in Volume 10, Issue 01, Jan-Feb-2024

Co-ordinator
IQAC, Shri Ram College
Muzaffarnagar

Chairman
IQAC, Shri Ram College,
Muzaffarnagar

Editor-in-Chief
IJSRET
www.ijsret.com
ISSN : 2395-566X

International Journal of Scientific Research and Engineering Trends (IJSRET)

This is to certify that
Saba Rana
has published a paper entitled
"Scopes and Advances of Nano-fertilizers in Agricultural Development"
in International Journal of Scientific Research and Engineering Trends, in Volume 10, Issue 02, Jan-Feb-2024

Co-ordinator
IQAC, Shri Ram College
Muzaffarnagar

Chairman
IQAC, Shri Ram College,
Muzaffarnagar

Editor-in-Chief
IJSRET

www.ijsret.com
ISSN : 2395-566X

International Journal of Scientific Research and Engineering Trends (IJSRET)

This is to certify that
Ankit Kumar
has published a paper entitled
"Microbial Farming: Harnessing Soil Microbiomes for Sustainable Agriculture"
in International Journal of Scientific Research and Engineering Trends, in Volume 10, Issue 01, Jan-Feb-2024

Co-ordinator
IQAC, Shri Ram College
Muzaffarnagar

Chairman
IQAC, Shri Ram College,
Muzaffarnagar

Editor-in-Chief
IJSRET
www.ijsret.com
ISSN : 2395-566X

International Journal of Scientific Research and Engineering Trends (IJSRET)

This is to certify that
Ashu Chaudhary
has published a paper entitled
"Microbial Farming: Harnessing Soil Microbiomes for Sustainable Agriculture"
in International Journal of Scientific Research and Engineering Trends, in Volume 10, Issue 01, Jan-Feb-2024

Co-ordinator
IQAC, Shri Ram College
Muzaffarnagar

Chairman
IQAC, Shri Ram College,
Muzaffarnagar

Editor-in-Chief
IJSRET
www.ijsret.com
ISSN : 2395-566X

International Journal of Scientific Research and Engineering Trends (IJSRET)

This is to certify that

Saba Rana

has published a paper entitled

"Microbial Farming: Harnessing Soil Microbiomes for Sustainable Agriculture"

in International Journal of Scientific Research and Engineering Trends, in Volume 10, Issue 01, Jan-Feb-2024

Co-ordinator
IQAC, Shri Ram College
Muzaffarnagar

Chairman
IQAC, Shri Ram College,
Muzaffarnagar

Editor-in-Chief
IJSRET

www.ijsret.com
ISSN : 2395-566X

International Journal of Scientific Research and Engineering Trends (IJSRET)

This is to certify that
Vikas Kumar
has published a paper entitled
"Microbial Farming: Harnessing Soil Microbiomes for Sustainable Agriculture"
in International Journal of Scientific Research and Engineering Trends, in Volume 10, Issue 01, Jan-Feb-2024

Co-ordinator
IQAC, Shri Ram College
Muzaffarnagar

Chairman
IQAC, Shri Ram College,
Muzaffarnagar

Editor-in-Chief
IJSRET
www.ijsret.com
ISSN : 2395-566X

International Journal of Scientific Research and Engineering Trends (IJSRET)

This is to certify that
Vipin Kumar Saini
has published a paper entitled
"Microbial Farming: Harnessing Soil Microbiomes for Sustainable Agriculture"
in International Journal of Scientific Research and Engineering Trends, in Volume 10, Issue 01, Jan-Feb-2024

Co-ordinator
IQAC, Shri Ram College
Muzaffarnagar

Chairman
IQAC, Shri Ram College,
Muzaffarnagar

Editor-in-Chief
IJSRET
www.ijsret.com
ISSN : 2395-566X

International Journal of Scientific Research and Engineering Trends (IJSRET)

This is to certify that
Zehra Husaini
has published a paper entitled
"Microbial Farming: Harnessing Soil Microbiomes for Sustainable Agriculture"
in International Journal of Scientific Research and Engineering Trends, in Volume 10, Issue 01, Jan-Feb-2024

Co-ordinator
IQAC, Shri Ram College
Muzaffarnagar

Chairman
IQAC, Shri Ram College,
Muzaffarnagar

Editor-In-Chief
IJSRET
www.ijsret.com
ISSN : 2395-566X

International Journal of Scientific Research and Engineering Trends (IJSRET)

This is to certify that
Assistant Professor Aabid Ahmad
has published a paper entitled
"To Study the Impact of Agricultural Fibers for the Removal of Heavy Metals & Phenol from Waste Water"
in International Journal of Scientific Research and Engineering Trends, in Volume 9, Issue 06, Nov-Dec-2023

Co-ordinator
IQAC, Shri Ram College
Muzaffarnagar

Chairman
IQAC, Shri Ram College,
Muzaffarnagar

Editor-in-Chief
IJSRET
www.ijsret.com
ISSN : 2395-566X

International Journal of Scientific Research and Engineering Trends (IJSRET)

This is to certify that
Assistant Professor Anjali Jakhar
has published a paper entitled
"To Study the Impact of Agricultural Fibers for the Removal of Heavy Metals & Phenol from Waste Water"
in International Journal of Scientific Research and Engineering Trends, in Volume 9, Issue 06, Nov-Dec-2023

Co-ordinator
IQAC, Shri Ram College
Muzaffarnagar

Chairman
IQAC, Shri Ram College,
Muzaffarnagar

Editor-in-Chief
IJSRET
www.ijsret.com
ISSN : 2395-566X

International Journal of Scientific Research and Engineering Trends (IJSRET)

This is to certify that
Assistant Professor Suhal Sardar
has published a paper entitled
"To Study the Impact of Agricultural Fibers for the Removal of Heavy Metals & Phenol from Waste Water"
in International Journal of Scientific Research and Engineering Trends, in Volume 9, Issue 06, Nov-Dec-2023

Co-ordinator
IQAC, Shri Ram College
Muzaffarnagar

Chairman
IQAC, Shri Ram College
Muzaffarnagar

Editor-in-Chief
IJSRET
www.ijsret.com
ISSN : 2395-566X

International Journal of Scientific Research and Engineering Trends (IJSRET)

This is to certify that
Vikrant Kumar
has published a paper entitled
"To Study the Impact of Agricultural Fibers for the Removal of Heavy Metals & Phenol from Waste Water"
in International Journal of Scientific Research and Engineering Trends, in Volume 9, Issue 06, Nov-Dec-2023

Co-ordinator
IQAC, Shri Ram College
Muzaffarnagar

Chairman
IQAC, Shri Ram College,
Muzaffarnagar

Editor-in-Chief
IJSRET

www.ijsret.com
ISSN : 2395-566X

International Journal of Scientific Research and Engineering Trends (IJSRET)

This is to certify that
Aayushi Pal
has published a paper entitled
"Impact of Plant Growth Regulators on Bottle Gourd (Lagenaria Siceraria (Molina) Standl.)Yield"
in International Journal of Scientific Research and Engineering Trends, in Volume 9, Issue 05, Sept-Oct-2023

Co-ordinator
IQAC, Shri Ram College
Muzaffarnagar

Chairman
IQAC, Shri Ram College,
Muzaffarnagar

Editor-in-Chief
IJSRET
www.ijsret.com
ISSN : 2395-566X

International Journal of Scientific Research and Engineering Trends (IJSRET)

This is to certify that
Disha Sharma
has published a paper entitled
"Impact of Plant Growth Regulators on Bottle Gourd (Lagenaria Siceraria (Molina) Standl.)Yield"
in International Journal of Scientific Research and Engineering Trends, in Volume 9, Issue 05, Sept-Oct-2023

Co-ordinator
IQAC, Shri Ram College
Muzaffarnagar

Chairman
IQAC, Shri Ram College,
Muzaffarnagar

Editor-in-Chief
IJSRET
www.ijsret.com
ISSN : 2395-566X

International Journal of Scientific Research and Engineering Trends (IJSRET)

This is to certify that
Vipin Kumar Saini
has published a paper entitled
"Impact of Plant Growth Regulators on Bottle Gourd (Lagenaria Siceraria (Molina) StandL.)Yield"
in International Journal of Scientific Research and Engineering Trends, in Volume 9, Issue 05, Sept-Oct-2023

Co-ordinator
IQAC, Shri Ram College
Muzaffarnagar

Chairman
IQAC, Shri Ram College,
Muzaffarnagar

Editor-in-Chief
IJSRET
www.ijsret.com
ISSN : 2395-566X

International Journal of Scientific Research and Engineering Trends (IJSRET)

This is to certify that
Assistant Professor Anjali Jakhar
has published a paper entitled
"Dairy Waste Water – A Case Study"
in International Journal of Scientific Research and Engineering Trends, in Volume 9, Issue 04, July-Aug-2023

Co-ordinator
IQAC, Shri Ram College
Muzaffarnagar

Chairman
IQAC, Shri Ram College,
Muzaffarnagar

Editor-in-Chief
IJSRET

www.ijsret.com
ISSN : 2395-566X

International Journal of Scientific Research and Engineering Trends (IJSRET)

This is to certify that
Assistant Professor Mohd Nayeem Ali
has published a paper entitled
"Dairy Waste Water – A Case Study"
in International Journal of Scientific Research and Engineering Trends, in Volume 9, Issue 04, July-Aug-2023

Co-ordinator
IQAC, Shri Ram College
Muzaffarnagar

Chairman
IQAC, Shri Ram College,
Muzaffarnagar

Editor-in-Chief
IJSRET
www.ijsret.com
ISSN : 2395-566X

International Journal of Scientific Research and Engineering Trends (IJSRET)

This is to certify that
Assistant Professor Vikrant Kumar
has published a paper entitled
"Dairy Waste Water – A Case Study"
in International Journal of Scientific Research and Engineering Trends, in Volume 9, Issue 04, July-Aug-2023

Co-ordinator
IQAC, Shri Ram College
Muzaffarnagar

Chairman
IQAC, Shri Ram College,
Muzaffarnagar

Editor-in-Chief
IJSRET
www.ijsret.com
ISSN : 2395-566X

International Journal of Scientific Research and Engineering Trends (IJSRET)

This is to certify that
Darshika Sharma
has published a paper entitled
"Soil Health and Agroecology: Techniques, Impacts on the Quality of Soil, and Carbon Segregation"
in International Journal of Scientific Research and Engineering Trends, in Volume 9, Issue 05, Sept-Oct-2023

Co-ordinator
IQAC, Shri Ram College
Muzaffarnagar

Chairman
IQAC, Shri Ram College,
Muzaffarnagar

Editor-in-Chief
IJSRET

www.ijsret.com
ISSN : 2395-566X

International Journal of Scientific Research and Engineering Trends (IJSRET)

This is to certify that
Shayma Saifi
has published a paper entitled
"Soil Health and Agroecology: Techniques, Impacts on the Quality of Soil, and Carbon Segregation"
in International Journal of Scientific Research and Engineering Trends, in Volume 9, Issue 05, Sept-Oct-2023

Co-ordinator
IQAC, Shri Ram College
Muzaffarnagar

Chairman
IQAC, Shri Ram College
Muzaffarnagar

Editor-in-Chief
IJSRET

www.ijsret.com
ISSN : 2395-566X

International Journal of Scientific Research and Engineering Trends (IJSRET)

This is to certify that
Zehra Husaini
has published a paper entitled
"Soil Health and Agroecology: Techniques, Impacts on the Quality of Soil, and Carbon Segregation"
in International Journal of Scientific Research and Engineering Trends, in Volume 9, Issue 05, Sept-Oct-2023

Co-ordinator
IQAC, Shri Ram College
Muzaffarnagar

Chairman
IQAC, Shri Ram College,
Muzaffarnagar

Editor-in-Chief
IJSRET
www.ijsret.com
ISSN : 2395-566X

International Journal of Scientific Research and Engineering Trends (IJSRET)

This is to certify that
Assistant Professor Aabid Ahmad
has published a paper entitled
"Waste Governance Models: Factors for Successful Waste Management and Food Waste Reduction"
in International Journal of Scientific Research and Engineering Trends, in Volume 9, Issue 04, July-Aug-2023

Co-ordinator
IQAC, Shri Ram College
Muzaffarnagar

Chairman
IQAC, Shri Ram College,
Muzaffarnagar

Editor-in-Chief
IJSRET
www.ijsret.com
ISSN : 2395-566X

International Journal of Scientific Research and Engineering Trends (IJSRET)

This is to certify that
Assistant Professor Anjali Jakhar
has published a paper entitled
"Waste Governance Models: Factors for Successful Waste Management and Food Waste Reduction"
in International Journal of Scientific Research and Engineering Trends, in Volume 9, Issue 04, July-Aug-2023

Co-ordinator
IQAC, Shri Ram College
Muzaffarnagar

Chairman
IQAC, Shri Ram College
Muzaffarnagar

Editor-in-Chief
IJSRET
www.ijsret.com
ISSN : 2395-566X

International Journal of Scientific Research and Engineering Trends (IJSRET)

This is to certify that
Assistant Professor Mohd Nayeem Ali
has published a paper entitled
"Waste Governance Models: Factors for Successful Waste Management and Food Waste Reduction"
in International Journal of Scientific Research and Engineering Trends, in Volume 9, Issue 04, July-Aug-2023

Co-ordinator
IQAC, Shri Ram College
Muzaffarnagar

Chairman
IQAC, Shri Ram College
Muzaffarnagar

Editor-in-Chief
IJSRET

www.ijsret.com
ISSN : 2395-566X

International Journal of Scientific Research and Engineering Trends (IJSRET)

This is to certify that
Assistant Professor Parveen Malik
has published a paper entitled
"Waste Governance Models: Factors for Successful Waste Management and Food Waste Reduction"
in International Journal of Scientific Research and Engineering Trends, in Volume 9, Issue 04, July-Aug-2023

Co-ordinator
IQAC, Shri Ram College
Muzaffarnagar

Chairman
IQAC, Shri Ram College,
Muzaffarnagar

Editor-in-Chief
IJSRET
www.ijsret.com
ISSN : 2395-566X

International Journal of Scientific Research and Engineering Trends (IJSRET)

This is to certify that
Assistant Professor Vikrant Kumar
has published a paper entitled
"Waste Governance Models: Factors for Successful Waste Management and Food Waste Reduction"
in International Journal of Scientific Research and Engineering Trends, in Volume 9, Issue 04, July-Aug-2023

Co-ordinator
IQAC, Shri Ram College
Muzaffarnagar

Chairman
IQAC, Shri Ram College
Muzaffarnagar

Editor-in-Chief
IJSRET
www.ijsret.com
ISSN : 2395-566X

International Journal of Scientific Research and Engineering Trends (IJSRET)

This is to certify that
Assistant Professor Aabid Ahmad
has published a paper entitled
"Laws and Regulations of Waste Management on Environment Protection and 3R's"
in International Journal of Scientific Research and Engineering Trends, in Volume 9, Issue 04, July-Aug-2023

Co-ordinator
IQAC, Shri Ram College
Muzaffarnagar

Chairman
IQAC, Shri Ram College
Muzaffarnagar

Editor-in-Chief
IJSRET
www.ijsret.com
ISSN : 2395-566X

International Journal of Scientific Research and Engineering Trends (IJSRET)

This is to certify that
Assistant Professor Anjali Jakhar
has published a paper entitled
"Laws and Regulations of Waste Management on Environment Protection and 3R's"
in International Journal of Scientific Research and Engineering Trends, in Volume 9, Issue 04, July-Aug-2023

Co-ordinator
IQAC, Shri Ram College
Muzaffarnagar

Chairman
IQAC, Shri Ram College,
Muzaffarnagar

Editor-in-Chief
IJSRET

www.ijsret.com
ISSN : 2395-566X

International Journal of Scientific Research and Engineering Trends (IJSRET)

This is to certify that
Assistant Professor Mohd Nayeem Ali
has published a paper entitled
"Laws and Regulations of Waste Management on Environment Protection and 3R's"
in International Journal of Scientific Research and Engineering Trends, in Volume 9, Issue 04, July-Aug-2023

Co-ordinator
IQAC, Shri Ram College
Muzaffarnagar

Chairman
IQAC, Shri Ram College
Muzaffarnagar

Editor-in-Chief
IJSRET
www.ijsret.com
ISSN : 2395-566X

International Journal of Scientific Research and Engineering Trends (IJSRET)

This is to certify that
Assistant Professor Parveen Malik
has published a paper entitled
"Laws and Regulations of Waste Management on Environment Protection and 3R's"
in International Journal of Scientific Research and Engineering Trends, in Volume 9, Issue 04, July-Aug-2023

Co-ordinator
IQAC, Shri Ram College
Muzaffarnagar

Chairman
IQAC, Shri Ram College
Muzaffarnagar

Editor-in-Chief
IJSRET

www.ijsret.com
ISSN : 2395-566X

International Journal of Scientific Research and Engineering Trends (IJSRET)

This is to certify that
Assistant Professor Vikrant Kumar
has published a paper entitled
"Laws and Regulations of Waste Management on Environment Protection and 3R's"
in International Journal of Scientific Research and Engineering Trends, in Volume 9, Issue 04, July-Aug-2023

Co-ordinator
IQAC, Shri Ram College
Muzaffarnagar

Chairman
IQAC, Shri Ram College,
Muzaffarnagar

Editor-in-Chief
IJSRET

www.ijsret.com
ISSN : 2395-566X

International Journal of Scientific Research and Engineering Trends (IJSRET)

This is to certify that
Disha Sharma
has published a paper entitled
"Isolation and Analysis of Amylase Producing Bacteria from Soil Samples"
in International Journal of Scientific Research and Engineering Trends, in Volume 10, Issue 01, May-June-2024

Co-ordinator
IQAC, Shri Ram College
Muzaffarnagar

Chairman
IQAC, Shri Ram College,
Muzaffarnagar

Editor-in-Chief
IJSRET
www.ijsret.com
ISSN : 2395-566X

International Journal of Scientific Research and Engineering Trends (IJSRET)

This is to certify that
Mohd Salman
has published a paper entitled
"Isolation and Analysis of Amylase Producing Bacteria from Soil Samples"
in International Journal of Scientific Research and Engineering Trends, in Volume 10, Issue 01, May-June-2024

Co-ordinator
IQAC, Shri Ram College
Muzaffarnagar

Chairman
IQAC, Shri Ram College
Muzaffarnagar

Editor-in-Chief
IJSRET
www.ijsret.com
ISSN : 2395-566X

International Journal of Scientific Research and Engineering Trends (IJSRET)

This is to certify that

Saba Rana

has published a paper entitled

"Isolation and Analysis of Amylase Producing Bacteria from Soil Samples"

in International Journal of Scientific Research and Engineering Trends, in Volume 10, Issue 01, May-June-2024

Co-ordinator
IQAC, Shri Ram College
Muzaffarnagar

Chairman
IQAC, Shri Ram College,
Muzaffarnagar

Editor-in-Chief
IJSRET
www.ijsret.com
ISSN : 2395-566X

International Journal of Scientific Research and Engineering Trends (IJSRET)

This is to certify that
Shalini Mishra
has published a paper entitled
"Isolation and Analysis of Amylase Producing Bacteria from Soil Samples"
in International Journal of Scientific Research and Engineering Trends, in Volume 10, Issue 01, May-June-2024

Co-ordinator
IQAC, Shri Ram College
Muzaffarnagar

Chairman
IQAC, Shri Ram College,
Muzaffarnagar

Editor-in-Chief
IJSRET

www.ijsret.com
ISSN : 2395-566X

International Journal of Scientific Research and Engineering Trends (IJSRET)

This is to certify that
Shayma Saifi
has published a paper entitled
"Isolation and Analysis of Amylase Producing Bacteria from Soil Samples"
in International Journal of Scientific Research and Engineering Trends, in Volume 10, Issue 01, May-June-2024

Co-ordinator
IQAC, Shri Ram College
Muzaffarnagar

Chairman
IQAC, Shri Ram College,
Muzaffarnagar

Editor-in-Chief
IJSRET

www.ijsret.com
ISSN : 2395-566X

International Journal of Scientific Research and Engineering Trends (IJSRET)

This is to certify that
Vipin Kumar Saini
has published a paper entitled
"Isolation and Analysis of Amylase Producing Bacteria from Soil Samples"
in International Journal of Scientific Research and Engineering Trends, in Volume 10, Issue 01, May-June-2024

Co-ordinator
IQAC, Shri Ram College
Muzaffarnagar

Chairman
IQAC, Shri Ram College,
Muzaffarnagar

Editor-in-Chief
IJSRET

www.ijsret.com
ISSN : 2395-566X

International Journal of Scientific Research and Engineering Trends (IJSRET)

This is to certify that
Zehra Husaini
has published a paper entitled
"Isolation and Analysis of Amylase Producing Bacteria from Soil Samples"
in International Journal of Scientific Research and Engineering Trends, in Volume 10, Issue 01, May-June-2024

Co-ordinator
IQAC, Shri Ram College
Muzaffarnagar

Chairman
IQAC, Shri Ram College
Muzaffarnagar

Editor-in-Chief
IJSRET
www.ijsret.com
ISSN : 2395-566X

International Journal of Scientific Research and Engineering Trends (IJSRET)

This is to certify that
Assistant Professor Aabid Ahmad
has published a paper entitled
"Effect of Unique Chromium Reductase Activity on Bioremediation of Chromium in Proteus SP. Isolated from Waste Water"
in International Journal of Scientific Research and Engineering Trends, in Volume 10, Issue 01, May-June-2024

Co-ordinator
IQAC, Shri Ram College
Muzaffarnagar

Chairman
IQAC, Shri Ram College,
Muzaffarnagar

Editor-in-Chief
IJSRET
www.ijsret.com
ISSN : 2395-566X

International Journal of Scientific Research and Engineering Trends (IJSRET)

This is to certify that
Assistant Professor Anjali Jakhar
has published a paper entitled
"Effect of Unique Chromium Reductase Activity on Bioremediation of Chromium in Proteus SP. Isolated from Waste Water"
in International Journal of Scientific Research and Engineering Trends, in Volume 10, Issue 01, May-June-2024

Co-ordinator
IQAC, Shri Ram College
Muzaffarnagar

Chairman
IQAC, Shri Ram College,
Muzaffarnagar

Editor-in-Chief
IJSRET
www.ijsret.com
ISSN : 2395-566X

International Journal of Scientific Research and Engineering Trends (IJSRET)

This is to certify that
Assistant Professor Suhal Sardar
has published a paper entitled
"Effect of Unique Chromium Reductase Activity on Bioremediation of Chromium in Proteus SP. Isolated from Waste Water"
in International Journal of Scientific Research and Engineering Trends, in Volume 10, Issue 01, May-June-2024

Co-ordinator
IQAC, Shri Ram College
Muzaffarnagar

Chairman
IQAC, Shri Ram College,
Muzaffarnagar

Editor-In-Chief
IJSRET
www.ijsret.com
ISSN : 2395-566X

International Journal of Scientific Research and Engineering Trends (IJSRET)

This is to certify that
Assistant Professor Vikrant Kumar
has published a paper entitled
"Effect of Unique Chromium Reductase Activity on Bioremediation of Chromium in Proteus SP. Isolated from Waste Water"
in International Journal of Scientific Research and Engineering Trends, in Volume 10, Issue 01, May-June-2024

Co-ordinator
IQAC, Shri Ram College
Muzaffarnagar

Chairman
IQAC, Shri Ram College
Muzaffarnagar

Editor-in-Chief
IJSRET
www.ijsret.com
ISSN : 2395-566X

International Journal of Scientific Research and Engineering Trends (IJSRET)

This is to certify that
Assistant Professor Anjali Jakhar
has published a paper entitled
"Effect of Solid Waste on Climate Change- A Review"
in International Journal of Scientific Research
and Engineering Trends, in Volume 9, Issue 04,
July-Aug-2023

Co-ordinator
IQAC, Shri Ram College
Muzaffarnagar

Chairman
IQAC, Shri Ram College,
Muzaffarnagar

Editor-in-Chief
IJSRET

www.ijsret.com
ISSN : 2395-566X

International Journal of Scientific Research and Engineering Trends (IJSRET)

This is to certify that
Assistant Professor Mohd Nayeem Ali
has published a paper entitled
"Effect of Solid Waste on Climate Change- A Review"
in International Journal of Scientific Research
and Engineering Trends, in Volume 9, Issue 04,
July-Aug-2023

Co-ordinator
IQAC, Shri Ram College
Muzaffarnagar

Chairman
IQAC, Shri Ram College
Muzaffarnagar

Editor-in-Chief
IJSRET

www.ijsret.com
ISSN : 2395-566X

International Journal of Scientific Research and Engineering Trends (IJSRET)

This is to certify that
Assistant Professor Vikrant Kumar
has published a paper entitled
"Effect of Solid Waste on Climate Change- A Review"
in International Journal of Scientific Research
and Engineering Trends, in Volume 9, Issue 04,
July-Aug-2023

Co-ordinator
IQAC, Shri Ram College
Muzaffarnagar

Chairman
IQAC, Shri Ram College,
Muzaffarnagar

Editor-in-Chief
IJSRET
www.ijsret.com
ISSN : 2395-566X

International Journal of Scientific Research and Engineering Trends (IJSRET)

This is to certify that
Ankit Kumar
has published a paper entitled
"Soil Microbial Communities in the Continuous Sugarcane Cropping Fields: A Study"
in International Journal of Scientific Research and Engineering Trends, in Volume 10, Issue 01, May-June-2024

Co-ordinator
IQAC, Shri Ram College
Muzaffarnagar

Chairman
IQAC, Shri Ram College,
Muzaffarnagar

Editor-in-Chief
IJSRET
www.ijsret.com
ISSN : 2395-566X

International Journal of Scientific Research and Engineering Trends (IJSRET)

This is to certify that
Ashu Chaudhary
has published a paper entitled
"Soil Microbial Communities in the Continuous Sugarcane Cropping Fields: A Study"
in International Journal of Scientific Research and Engineering Trends, in Volume 10, Issue 01, May-June-2024

Co-ordinator
IQAC, Shri Ram College
Muzaffarnagar

Chairman
IQAC, Shri Ram College,
Muzaffarnagar

Editor-in-Chief
IJSRET
www.ijsret.com
ISSN : 2395-566X

International Journal of Scientific Research and Engineering Trends (IJSRET)

This is to certify that
Darshika Sharma
has published a paper entitled
"Soil Microbial Communities in the Continuous Sugarcane Cropping Fields: A Study"
in International Journal of Scientific Research and Engineering Trends, in Volume 10, Issue 01, May-June-2024

Co-ordinator
IQAC, Shri Ram College
Muzaffarnagar

Chairman
IQAC, Shri Ram College
Muzaffarnagar

Editor-in-Chief
IJSRET
www.ijsret.com
ISSN : 2395-566X

International Journal of Scientific Research and Engineering Trends (IJSRET)

This is to certify that
Shayma Saifi
has published a paper entitled
"Soil Microbial Communities in the Continuous Sugarcane Cropping Fields: A Study"
in International Journal of Scientific Research and Engineering Trends, in Volume 10, Issue 01, May-June-2024

Co-ordinator
IQAC, Shri Ram College
Muzaffarnagar

Chairman
IQAC, Shri Ram College,
Muzaffarnagar

Editor-in-Chief
IJSRET
www.ijsret.com
ISSN : 2395-566X

International Journal of Scientific Research and Engineering Trends (IJSRET)

This is to certify that
Vandana Sharma
has published a paper entitled
"Soil Microbial Communities in the Continuous Sugarcane Cropping Fields: A Study"
in International Journal of Scientific Research and Engineering Trends, in Volume 10, Issue 01, May-June-2024

Co-ordinator
IQAC, Shri Ram College
Muzaffarnagar

Chairman
IQAC, Shri Ram College,
Muzaffarnagar

Editor-in-Chief
IJSRET
www.ijsret.com
ISSN : 2395-566X

International Journal of Scientific Research and Engineering Trends (IJSRET)

This is to certify that
Vikas Kumar
has published a paper entitled
"Soil Microbial Communities in the Continuous Sugarcane Cropping Fields: A Study"
in International Journal of Scientific Research and Engineering Trends, in Volume 10, Issue 01, May-June-2024

Co-ordinator
IQAC, Shri Ram College
Muzaffarnagar

Chairman
IQAC, Shri Ram College
Muzaffarnagar

Editor-In-Chief
IJSRET
www.ijsret.com
ISSN : 2395-566X

International Journal of Scientific Research and Engineering Trends (IJSRET)

This is to certify that
Vipin Kumar Saini
has published a paper entitled
"Soil Microbial Communities in the Continuous Sugarcane Cropping Fields: A Study"
in International Journal of Scientific Research and Engineering Trends, in Volume 10, Issue 01, May-June-2024

Co-ordinator
IQAC, Shri Ram College
Muzaffarnagar

Chairman
IQAC, Shri Ram College
Muzaffarnagar

Editor-in-Chief
IJSRET
www.ijsret.com
ISSN : 2395-566X

International Journal of Scientific Research and Engineering Trends (IJSRET)

This is to certify that
Zehra Husaini
has published a paper entitled
"Soil Microbial Communities in the Continuous Sugarcane Cropping Fields: A Study"
in International Journal of Scientific Research and Engineering Trends, in Volume 10, Issue 01, May-June-2024

Co-ordinator
IQAC, Shri Ram College
Muzaffarnagar

Chairman
IQAC, Shri Ram College, ISSN : 2395-566X
Muzaffarnagar

Editor-in-Chief
IJSRET
www.ijsret.com

ijset journal
www.ijset.in

ISSN (Online): 2348-4098
ISSN (Print): 2395-4752

Certificate of Publication

This is to certify that Manuscript, entitled by

The Impact of Association on Supply Chain Efficiency

Authored by

Mr. Abhishek Kumar

has satisfactory Reviewed and Published in Volume 12, Issue 3, 2024.

International Journal of Science, Engineering and Technology

Co-ordinator
IQAC, Shri Ram College
Muzaffarnagar

Chairman
IQAC, Shri Ram College,
Muzaffarnagar

ijset journal

www.ijset.in

ISSN (Online): 2348-4098
ISSN (Print): 2395-4752

Certificate of Publication

This is to certify that Manuscript, entitled by

The Impact of Association on Supply Chain Efficiency

Authored by

Assistant Professor Ms. Anika

has satisfactory Reviewed and Published in Volume 12, Issue 3, 2024.

International Journal of Science, Engineering and Technology

Co-ordinator
IQAC, Shri Ram College
Muzaffarnagar

Chairman
IQAC, Shri Ram College,
Muzaffarnagar

ijset journal
www.ijset.in

ISSN (Online): 2348-4098
ISSN (Print): 2395-4752

Certificate of Publication

This is to certify that Manuscript, entitled by

The Impact of Association on Supply Chain Efficiency

Authored by

Ms. Zeba Tahir

has satisfactory Reviewed and Published in Volume 12, Issue 3, 2024.

International Journal of Science, Engineering and Technology

Co-ordinator
IQAC, Shri Ram College
Muzaffarnagar

Chairman
IQAC, Shri Ram College,
Muzaffarnagar

ijset journal
www.ijset.in

ISSN (Online): 2348-4098
ISSN (Print): 2395-4752

Certificate of Publication

This is to certify that Manuscript, entitled by

Reimagining the Financial Landscape of Higher Education: Opportunities and Challenges of Privatization

Authored by

Assistant Professor Dr Mohd. Danish

has satisfactory Reviewed and Published in Volume 12, Issue 2, 2024.

Managing Editor
International Journal of Science, Engineering and Technology

Co-ordinator
IQAC, Shri Ram College
Muzaffarnagar

Chairman
IQAC, Shri Ram College,
Muzaffarnagar

ijset journal
www.ijset.in

ISSN [Online]: 2348-4098
ISSN [Print]: 2395-4752

Certificate of Publication

This is to certify that Manuscript, entitled by

Reimagining the Financial Landscape of Higher Education: Opportunities and Challenges of Privatization

Authored by

Mohd Tasleem

has satisfactory Reviewed and Published in Volume 12, Issue 2, 2024.

Managing Editor
International Journal of Science, Engineering and Technology

Co-ordinator
IQAC, Shri Ram College
Muzaffarnagar

Chairman
IQAC, Shri Ram College,
Muzaffarnagar