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RESEARCH PAPER

Formulation of mixed fruits wine and its quality assessment during storage

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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

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INTRODUCTION

Grapes are known to be the most commonly used raw material for the production of wine (Satav and Pethe, 2017). Wine making is perhaps the most antiquated innovations and is presently quite possibly the most economically prosperous biotechnological measures. The best pH values in essential for yeast augmentation and ethanol materialization.

The wine sector is going now a day through a period of severe crisis mainly due to the process of globalization in which all the countries producing wine have entered into fierce competition with each other. One of the main factors affecting the cost of running the vineyard and, therefore, the final price of the wine is certainly the grape harvest (Catania *et al*., 2009).

The use of suitable yeast culture can be employed to enhance desirable flavor compounds while maintaining the fermentation reliability not only for grape wine but also for other fruit wines such as pineapple, pomegranate, apple, etc. Citrus is the simplest absorbed fruit as a good source of nutrients and another vitamin C. Oranges are grown all over the world. It usually eats up in raw form or fruit salads as well as juice so perform work has been carried out to inspect the suitability of orange juice for the formulation of wine (Patharkar *et al*., 2017). The

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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:

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.

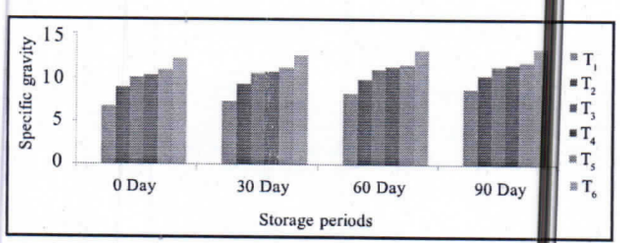

Fig. 1: Effect on specific gravity of 1% yeasting during storage period

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

decreases gradually. The TSS (°Brix) ranges from 12.33 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.

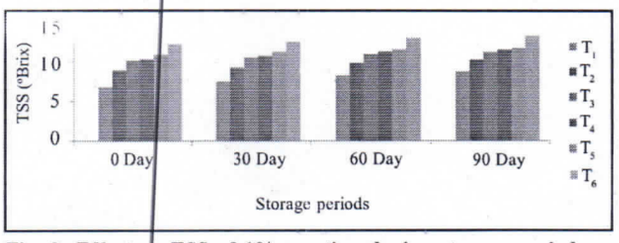

Fig. 2: Effect on TSS of 1% yeasting during storage period

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, density was 1224 kg/m³ on 1st day which increased to 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.

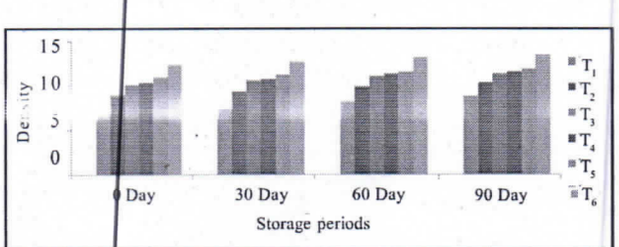

Fig. 3: Effect on density of 1% yeasting during storage period

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" 0.05 level of significance.

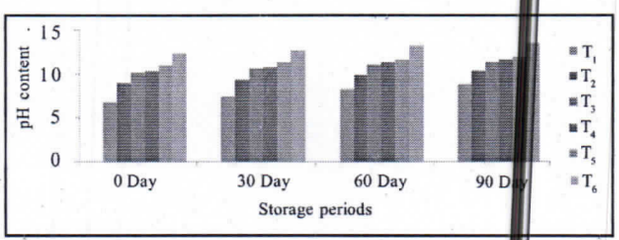

Fig. 4: Effect on pH content of 1% yeasting during storage period

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

content of T_2 which increased to 15.18 on 90th 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.

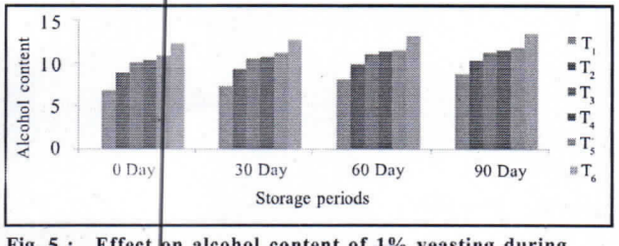

Fig. 5 : Effect on alcohol content of 1% yeasting during storage period

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 days. The data were analyzed to observe the effect of 1% yeasting concentration.

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RESEARCH PAPER

Studies of SRC bio pesticide to control the insect infestation in vegetables

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Abstract : Biopesticides are products formulated from naturally occurring organisms such as fungi, plant and bacteria that are pathogenic or toxic to insect pests. Advantages to these products are that they have low environmental risk, low risk to non-target organisms including mammals and beneficial insects, and can help reduce resistance to pesticides when used in an integrated pest management programme. Biopesticides were experimented on different vegetable crops from different farmers, in which it was found that Biopesticides destroys the insects that damage the crops, also increases the yield. Biopasticidase was used on brinjal, tomato and chili, in which along with pest control, the yield of brinjal increased by 8.5%, the yield of tomato by 7.3% and the yield of chili was increased by 8.08%.

Key Words : SRC bio pesticide, Insect infestation, Vegetables

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INTRODUCTION

An organic insecticide (SRC Bio-Pestcide) was prepared by the Department of Agriculture, Shri Ram College to reduce the side effect of chemicals being used in agriculture. It is well known fact that in today's time, the use of chemicals is increasing which has side effect on human body. These poisonous substances enter inside human digestion system which leads to develop dangerous diseases. Beneficial micro-organisms living inside and outside of soil are destroyed which is important for crop production. Besides , cost of production of crop is increased many fold . Due to high cost of production farmers are getting less benefit. Slowly and slowly framers comes under pressure of loan and commit suicide. To overcome this problems we need a pesticide which is low cost, having low residual effect and can increase yield. The indigenous bio-pesticide can be a better tool for controlling the insect and improving the benefit of farmers. Keeping this in mind department of Agriculture has taken initiatives and prepared the bio-pesticide which is popularly called SRC Bio-Pesticide).

Material used:

The following materials were used for preparation of SRC Bio Pesticide. (1) Parthenium grass -1. 5 kg (2) *Neem* leaves -5 kg (3) Cow urine- 500 g,(4) Reetha powder- 50 g (5) 10 days old Lassi -3 kg.

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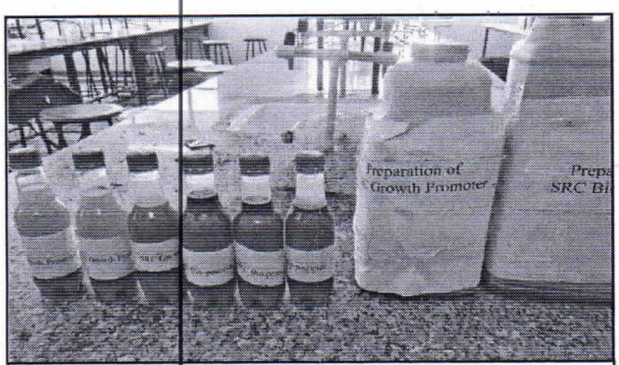

Fig. 1 : Bio-pesticide prepared in lab

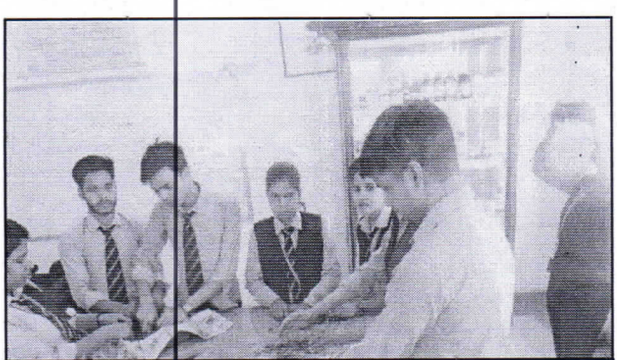

Fig. 2 : Preparation of bio pesticide in lab

MATERIAL AND METHODS

To prepare the SRC Bio pesticide solution. First of all, 5 kg Parthenium and 5 kg *Neem* leaves were boiled in 5 liters of water, stop boiling when the water remained around 1 liter. Filter the boiled water and keep in a container. Mix rest of the ingredients(Cow urine- 500 g, Reetha powder- 50 g and 10 days old Lassi-3 kg) in it and kept for 10 days. After 10 days filter the solution and store in bottle.

How to use in crop:

Take 500 ml SRC bio-pesticide solution and mix thoroughly into 14 liters water and spray on the crop leaves with the help of a sprayer.

Effect of SRC-bio-pesticide on crop:

It was observed that after spray of SRC bio-pesticide on crop effect was seen within 3 days.

Type of crop chosen for the study. In the beginning plants of brinjil, tomato, chilies grown in pot were selected for the study.

RESULTS AND DISCUSSION

A preliminary study shows that after 3 days of spray significant improvement in the selected plant was observed.. With the application of SRC bio-pesticide 7.5 % increase in tomato yield, 9 % increase in brinjal yield and 7.8 % increase in chilli yield was noticed. These results were observed in a simple trial. The results have to be validating in a detail study.

Validation of trial:

The result observed in trial was discussed with industrialist who is involved in making Bio- pesticide.

Table 1 : Agronomical practices followed to grow brinjal, tomato and chilli in 400 sq meter at farmers field

Crop name	Chilli *capsicum annuum* L.) Solanaceae	Tomato *Lycopersicon esculentum* Mill	Brinjal *Solanum melongena* L.
Seed rate	15-20 g	10-15 g	15-18g
Varaities	Aparna	Pusa ruby	Pusa purple long
Transplanting	15 may	20 may	25 may
Plant distance	60x45 cm	90 x 60 cm	90x60 cm
Fertilizer	F.Y.M-1T.	F.Y.M- 1T.	FYM -1T
	N-5 kg	N-3 kg	N-2kg
	P-2.5kg	P-4kg	P-2kg
	K-2.3 kg	K-2kg	K-1.5kg
Irrigation	8-9	9-10	Every 3-4 dyas hot duration
Weed control	Pendimethalin 40g	Pendimethalin 40g	Pendimethalin 40g
Insect managment	Carbofuran 1% g @ 400 sq	Spray *Bacillus thuringiensis* 2g/lit	Spray *Neem* oil 2ml/lit
Disease management	Thiram or capton @ 4g	Copper oxychloride 0.2%	2% bordeaux mixture.
Harvesting	75 days	110- 115 days from transplanting	55 – 60 days
Yield	1 tonn	3-4tonn	2tonn

They were happy and encourage the efforts made by Shri Ram college. They offered a proposal of Rs. two lacks for conducting two years trials in different vegetables during 2020-21 at farmers field. Department of Agriculture has started the trials in brinja, tomato and chilli crops at different location on 5 farmers field. The one year trial conducted in 2020-21 report is given as under.

The trials on brinjal, tomato and chili were conducted in farmers field at 5 location in 400 square meter area. Recommended agronomical practices (Table 1) were adopted to grow the crops. To control the insects SRC Bio-pesticide was used in place of chemical insecticide available in the market. In one field SRC bio pesticide was sprayed at three times and in another plot no insecticide was used. Yield of each plot was taken and analyzed. Results of different vegetables are discussed as under.

Brinjal :

Pusa purple long variety of brinjal was grown for trial. Data on yield shown in Table 2 indicates that in control plots yield varied between 24-28 q/ha whereas in SRC biopesticide plots yield varied between 25-31 q/ha. In control plots minimum yield of brinjal was found in plot -3 (24 q/ha) whereas the maximum yield (28q/ha) was recorded in plot no. 2 with an average of 25.6q/ha. Similarly in SRC Bio-pesticide plots yield varies from 25-31 q/h with minimum 25 q/ha in plot 3 and maximum 31 q/ha in plot 4 with a average of 27.8 q/ha in SRC bio pesticide treated plot, respectively. On the basis of average yield recorded in control and SRC bio pesticide treated plot a 8.5% increase in yield was observed.

Tomato :

Pusa ruby variety of tomato was grown for trial. Data on yield shown in Table 2 indicates that in control

Table 2 : Yield obtained at farmers field under SRC bio-pesticide and control field

Sr. No.	Name of farmer	Village	Yield (q/ha)	
			Control	SRC Bio-pesticide
Brinjal (Pusa Purple Long)				
1.	Brajpal	Dudhali	25	27
2.	Sonu Kumar	Jhinjhana	28	29
3.	Kapil kumar	Patnipur	24	25
4.	Nitin Kumar	Manat	26	31
5.	Rahul Singh	Akabargarh	25	27
Tomato (Pusa Ruby)				
1.	Raj kumar	Charthawal	35	37
2.	Rohit Kumar	Talra	32	35
3.	Suresh Singh	Rasoolpur	34	37
4.	Jaiveer Singh	Rasoolpur	33	36
5.	Arun Chouchan	Baruki	36	37.8
Chili(Aparna)				
1.	Dharmpal	Khari	15	15.9
2.	Mahipal	Talra	10	10.8
3.	Mahaveer	Kadargarh	16	17.6
4.	Tejapl	Salapur	14	15.5
5.	Bijendra	Wazidpur	13	14.1

Table 3 : Effect of SRC bio-pesticide on the yield of vegetables during 2020-21

Sr. No.	Name of Vegetable	No of trials	Minimum yield (q/ha)		Maximum yield (q/ha)		Average yield (q/ha)		% increase over control
			Bio-pesticide	Control	Bio-pesticide	control	Bio-pesticide	control	
1.	Brinjal	5	25	24	3.1	28	27.8	25.6	8.5
2.	Tomato	5	33	32	36	38	36.5	34.0	7.3
3.	chilli	5	10.8	10.0	17.6	16.0	14.7	13.6	8.08

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plots yield varied between 32-36 q/ha whereas in SRC biopesticide plots yield varied between 35-37.8 q/ha. In control plots minimum yield of tomato was found in plot -2 (32 q/ha) whereas the maximum yield (36q/ha) was recorded in plot no. 5 with an average of 34.0q/ha. Similarly in SRC Bio-pesticide plots yield varies from 35-37.8 q/h with minimum 35q/ha in plot 2 and maximum 37.8 q/ha in plot 5 with a average of 36.5 q/ha in SRC bio pesticide treated plot, respectively. On the basis of average yield recorded in control and SRC bio pesticide treated plot a 7.3% increase in yield was observed.

Chili :

Trial of chilli at 5 farmer's field was conducted to compare the effect of SRC bio-pesticide over control with Aparna variety. Data on yield shown in Table 2 indicates that in control plots yield varied between 10-16 q/ha whereas in SRC biopesticide plots yield varied between 10.8-17.6 q/ha . In control plots minimum yield of chilli was found in plot-2 (10 q/ha) whereas the maximum yield (16q/ha) was recorded in plot no. 3 with an average of 13.6/ha. Similarly in SRC Bio-pesticide plots yield varies from 10.8-17.6 q/h with minimum 10.8q/ha in plot 2 and maximum 17.6 q/ha in plot 3 with a average of 14.7 q/ha in SRC bio pesticide treated plot, respectively. On the basis of average yield recorded in control and SRC bio pesticide treated plot a 8.08 % increase in yield was observed.

Result of the effect of SRC bio-pesticide on the yield of brinjal, tomato and chili as shown in Table 3 shows that SRC biopesticide are found superior over control. As per results obtained in trial at farmers field SRC bio-pesticide may be a replacement of chemical and will be cost effective also. The results are in the line of results found by Gahukar (2013), Patel *et al.* (2019) and Akutse *et al.* (2020) also find the similar results.

Conclusion:

On the basis of finding in the trials we can conclude that SRC Bio pesticide may be effective and harmless bio-pesticide and can be used in organic farming successfully.

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RESEARCH PAPER

Effect of *Dactylorhiza hatagirea* (Salep orchid) on quality and standard of Ice-Cream

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Abstract : The study examined the various quality parameters test of prepared ice-cream and cost analysis. Five Ice-Cream samples were found rich in nutritive value, antioxidant, antimicrobial, antifungal, sensory quality and economically cost. The determined and collected data of various parameters were analyzed by Random Block Design and data checked out at $p<0.05$ level. This study concentrates on Experimental treatment of Ice-Cream manufactured methods which was subjected to organolaptic properties. As per sampling, *Dactylorhiza hatagirea* powder was added at the rate of 0%, 1%, 2%, 3% and 4% levels, respectively and determined the physical, chemical, antioxidant, rheological properties and cost increases as added levels was increase in herbal Ice-Cream. The result revealed that best score in sensory characteristics of *Dactylorhiza hatagirea* powder included Ice-Cream were @ 3% followed by 1%, 2% and 4% used of herbs, respectively in selected Ice-Cream and also control Ice-Cream sample. The study was carried out to find the functional properties quantitative of *Dactylorhiza hatagirea* powder incorporated Ice-Cream. These herbs were used in making improvement and enhancement of medicinal value in Ice-Cream.

Key Words : *Dactylorhiza hatagirea*, Salep orchid, Functional, Sensory, Texture profile, DPPH, FRAP

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INTRODUCTION

Milk is known as the most necessary food for life in infant. Milk and dairy products have formed an integral element of human diet since the earliest domestication animals. Milk has a high nutrient density and thus contributes significantly to the daily intake of several nutrients. It contains many constituents including proteins, fats, carbohydrates, vitamins and minerals (Cakmak *et al.*, 2012). Ice-Cream is a dairy product, is a complex food colloid that consists of air bubbles, fat globules, ice crystals and an unfrozen serum phase. It is a frozen dessert that is delicious, nutritious and relatively cheap. It is made from dairy products such as cream combined with flavours and sweeteners such as sugar (Mohan *et al.*, 2014). Herbal Ice-Cream is having number of medicinal properties *viz* anti-septic, anti-microbial, anti-viral, antidiabetic, antioxidants and etc (Ali *et al.*, 2014). Bioactive compounds are naturally occurring in the medicinal plants, leaves, vegetables and roots (Ponnusamy *et al*, 2009). The medicinal value of plants lies in some chemical substances that produce a definite physiological action as the human body (Zhang, 2009).

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In traditional medicine *Dactylorhiza hatagirea* has been prescribed for dressing and treating of glottal inflammations, antibiotic; prevent the cancer also and especially used for sexual strength (Faraji *et al.*, 2013). *Dactylorhiza hatagirea* is a food ingre-dient used for different purposes in food formu-lations and obtained by milling of dried tubers of wild orchids. It is in powder form, white colored and generally used for the traditional production of salep drink and Kahramanmara° type Ice-Cream in Turkey (Syed and Shah, 2016). *Dactylorhiza hatagirea* contains glucomannan and starch as well as some minerals and water (Goff *et al.*, 2008). *Dactylorhiza hatagirea* is mostly used in food formulations as a stabilizing agent in food technology due to its strong thicken-ing ability when incorporated into the solutions. It is also preferred for its characteristic flavor which plays an important role in the sensory properties of the final product. *Dactylorhiza hatagirea* drink (Salep drink) is a traditional bev-erage prepared by boiling milk with salep powder and sugar in world. It is a hot drink and generally consumed in winters. The *Dactylorhiza hatagirea* powder is preferred by consumers from all ages. Therefore, the current experiment was designed to affect of *Dactylorhiza hatagirea* powder on quality aspects of Ice-Cream as *Dactylorhiza hatagirea* powder including in Ice-Cream for natural flavour and antioxidative health benefits. The *Dactylorhiza hatagirea* powder effects on physico-chemical, sensory, rheological, antioxidant, microbiological characteristics and cost of Ice-Cream were also studied.

Material and Methods

Raw materials :

Fully matured and dried *Dactylorhiza hatagirea* powder was procured from local market at Deoband in Saharanpur district of Uttar Pradesh. Whole milk, Skim milk powder, cream and others additives was purchased from local market, Allahabad.

Preparation of different *Dactylorhiza Hatagirea* (Salep Orchid) used Ice-Cream samples

Ice-Cream samples were prepared as incorporated different levels of *Dactylorhiza hatagirea* powder *viz.*, 0%, 1%, 2%, 3% and 4% respectively and 0% control treatment was prepared without *Dactylorhiza hatagirea* powder. Preparation process of the Ice-Cream was specified and standard methods of FSSAI-2006. The best treatments combinations of different Ice-Creams were selected on the basis of sensory evaluation and evaluated for their nutritional, functional and antioxidant qualities.

Physico-chemical analysis :

Fresh Ice-Cream samples prepared by different levels of *Dactylorhiza hatagirea* powder were analyzed for physic-chemical properties as per standard methods. Samples of four levels powder were selected for physical and chemical parameters. While total solid, fat, protein, carbohydrate, acidity, ash, melting time and overrun were measured according to FSSAI (2012).

Sensory analysis :

Sensory evaluation of the Ice-Cream was conducted by a department panel of four semi-trained judges using in 9-point hedonic scale for different parameters like colour appearance, body texture, flavour taste and overall acceptability (Wood, 2011).

Texture profile analysis :

TPA of Ice-Cream samples analyzed to TPA device according by food product texture profile analysis. Analyzed parameter by texture profile analysis as: consistency, cohesiveness, index of viscosity as per the procedure prescribed by Pon *et al.* (2015).

Antioxidant activity :

Antioxidant activities in Ice-Cream samples were analyzed to standard methods *viz.*, *Diphenylpicryl hydrazyl* (DPPH) and Ferric reducing antioxidant power (FRAP) test. The Ferric reducing antioxidant power (FRAP) test was conducted according to the method described by Kuhnen *et al.* (2014). Antioxidant activity of herbal Ice-Cream was determined using stable radical, 1, 1-diphenyl-2-picrylhydrazyl (DPPH), as described by Ashwani and Dinesh (2016).

Microbiological analysis :

The microbiological analysis were recorded using selected standard methods *viz.*, standard plat count, yeast and mould count and coliform count tests. The Ice-Cream samples were analyzed for Standard Plate Count (SPC) using media nutrient agar, coliform count using media Mc Conkey agar and yeast and mould count using media potato dextrose agar, described by Naim *et al.* (2014).

Cost analysis :

Cost of Ice-Cream per kg analyzed to all calculated amount of ingredients using for Ice-Cream samples. Ice-Cream ingredients calculation was calculated according by formula from book of Jana (2016).

Statistical analysis :

All analytical parameters were recorded in triplicates and the means value of each parameter were described. The data were assessed by Random Block Design (Smith, 2015).

RESULTS AND DISCUSSION

The results indicate that the *Dactylorhiza hatagirea* powder based Ice-Cream showed physic-chemical properties, sensory attributes, rheological quality, antioxidant activity and microbial load. The Ice-Cream manufactured by different concentrations of *Dactylorhiza hatagirea* powder in 1%, 2%, 3% and 4%, respectively and control treatment was prepare without *Dactylorhiza hatagirea* powder.

Effect of different levels of *Dactylorhiza hatagirea* powder on the physico-chemical properties of Ice-Cream :

The averages value of total solid, fat, carbohydrate, protein, ash, acidity, overrun and melting time of freshly manufactured Ice-Cream are presented in Table 1. The effect of included *Dactylorhiza hatagirea* powder in Ice-Cream was found to exercise significant ($p < 0.05$) influence in the total solid, carbohydrate, protein, acidity both being slightly but significantly for all experimental samples. The experimental analysis of fat, ash, melting time and overrun both average values was analyzed non-significant ($p < 0.05$). There was proportionate increase in the total solid, fat, carbohydrate, protein, ash melting time and overrun in experimental samples with increasing level of incorporations of *Dactylorhiza hatagirea* powder. The maximum chemical composition and physical properties of Ice-Cream samples were founded 4% level inclusion of *Dactylorhiza hatagirea* powder followed by 3%, 2%, 1%, 0% level inclusion of *Dactylorhiza hatagirea* powder, respectively. Further, addition of *Dactylorhiza hatagirea* powder significantly increased the chemicals characteristic of experimental Ice-Cream. The compositional attributes of all samples are well above maximum and minimum values specified for Ice-Cream by 'food safety standard authority of India' (2011).

Effect of different levels of *Dactylorhiza hatagirea* powder on the sensory attributes, texture profile analysis and antioxidant activity of Ice-Cream :

The Ice-Cream of best sample *i.e.* 3% *Dactylorhiza hatagirea* powder included Ice-Cream was evaluated for various sensory qualities, rheological properties and antioxidant activity and were also other levels of powder included Ice-Cream and the data sowed in Table 2. Parameters of sensory quality assessment were flavour and taste, body and texture, colour and appearance, overall acceptability. The maximum score of overall acceptability was found in 3% powder included Ice-Cream while minimum score was recorded of 0% powder included Ice-Cream. Statistical analysis of colour and appearance, overall acceptability both data was found significantly ($p < 0.05$) and flavour and taste, body and texture data were found no significant ($p < 0.05$). Rheological properties 3% *Dactylorhiza hatagirea* powder included Ice-Cream were found averages and minimum consistency value of 1% and maximum value of 3% powder added Ice-Cream ($p < 0.05$).

Antioxidant analyses were analyzed by DPPH and FRAP both methods. The maximum antioxidant activity were founded 4% level inclusion of *Dactylorhiza*

Table 1: The average value of chemical and physical attribute of *Dactylorhiza hatagirea* based ice-cream

Treatments	*Dactylorhiza hatagirea* powder percentage (%)	Chemical attributes (%)						Physical attribute	
		Total solids	Fat	Protein	Carbohydrate	Ash	Acidity	Overrun (%)	Melting time (ml/min.)
T_0	0%	37.64	10.02	3.64	23.32	0.66	0.19	67.74	0.66
T_3S_1	1%	38.54	10.05	3.71	24.09	0.69	0.19	69.00	0.65
T_3S_2	2%	39.40	10.05	3.79	24.84	0.72	0.20	70.44	0.63
T_3S_3	3%	40.42	10.09	3.86	25.73	0.74	0.21	70.79	0.62
T_3S_4	4%	41.30	10.13	3.93	26.47	0.77	0.22	71.31	0.60

Note T_0 Control sample, T_3S_1 1% Dactylorhiza hatagirea powder, T_3S_2 2% Dactylorhiza hatagirea powder, T_3S_3 3% Dactylorhiza hatagirea powder, T_3S_4 4% Dactylorhiza hatagirea powder incorporated ice-cream

hatagirea powder followed by 3%, 2%, 1% level inclusion of *Dactylorhiza hatagirea* powder respectively data showed in Table 2 and Fig. 1 DPPH and 2 FRAP average value. Statistical analysis of antioxidant activity data was found significantly ($p < 0.05$).

Effect of different levels of *Dactylorhiza hatagirea* powder on the Microbial quality of Ice-Cream :

The above result indicates that initially there was

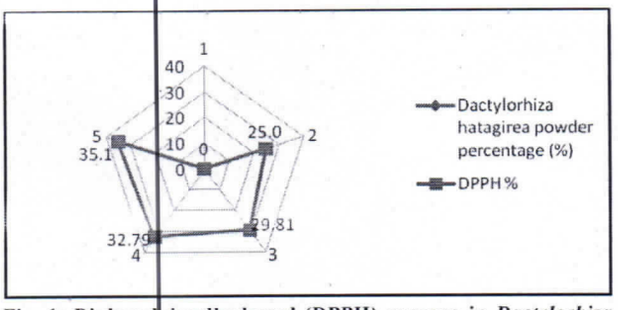

Fig. 1: Diphenylpicrylhydrazyl (DPPH) average in *Dactylorhiza hatagirea* based ice-cream

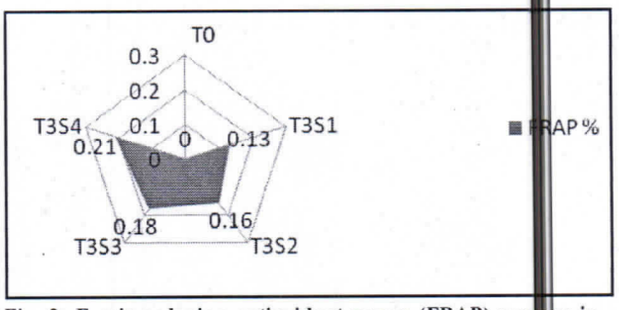

Fig. 2: Ferric reducing antioxidant power (FRAP) average in *Dactylorhiza hatagirea* based ice-cream

Table 2 : The average value of sensory attributes, texture profile analysis and antioxidant activity of ice-cream

Treatments	*Dactylorhiza hatagirea* powder percentage (%)	Sensory attributes (Score)				Rheological properties (+/- S.D.)			Antioxidant activity	
		Flavour and taste	Body and texture	Colour and appearance	Overall acceptability	consistency	cohesiveness	Index of viscosity	DPPH activity (%)	FRAP activity (µM)
T_0	0%	7.24	7.56	7.36	7.32	2596.167	-125.71	-349.34	Blank sample	Blank sample
T_3S_1	1%	7.56	7.72	7.56	7.59	2282.973	-190.67	-284.81	25.00±0.03	0.13±0.01
T_3S_2	2%	7.68	7.92	7.76	7.77	3118.900	-214.52	-264.29	29.81±0.01	0.16±0.01
T_3S_3	3%	7.72	8.00	7.96	7.88	2931.199	-185.82	-286.10	32.79±0.02	0.18±0.02
T_3S_4	4%	7.64	7.84	7.96	7.85	2741.013	-175.32	-432.92	35.10±0.03	0.21±0.02

Note: T_0 Control sample, T_3S_1 1% Dactylorhiza hatagirea powder, T_3S_2 2% Dactylorhiza hatagirea powder, T_3S_3 3% Dactylorhiza hatagirea powder, T_3S_4 4% Dactylorhiza hatagirea powder incorporated Ice-Cream.

Table 3: The average value of standard plate count and yeast & mould count in ice-cream at different days

Treatments	*Dactylorhiza hatagirea* powder percentage (%)	MEAN of SPC X 10^3 C.F.U/g												
		0th DAY	*7th DAY*	*14th DAY*	*21th DAY*	*28th DAY*	*35th DAY*	*42th DAY*	*49th DAY*	*56th DAY*	*63th DAY*	*70th DAY*	*77th DAY*	*84th DAY*	*91th DAY*
T_0	0%	6.4	8.60	13.8	18.40	23.4	28.40	30.4	34.8	44.0	51.60	58.4	65.40	71.80	76.20
T_3S_1	1%	5.6	7.20	12.2	14.20	22.8	25.60	30.2	34.2	43.2	50.20	56.0	64.80	70.60	74.80
T_3S_2	2%	5.2	6.80	12.0	14.20	21.6	25.00	29.6	33.0	42.4	49.80	53.6	62.80	69.40	74.20
T_3S_3	3%	4.8	6.40	11.6	13.40	21.0	25.20	29.0	31.4	41.6	48.40	52.8	61.60	67.80	71.80
T_3S_4	4%	5.0	6.00	11.6	12.80	20.4	25.20	28.6	30.8	41.6	47.60	52.0	60.80	66.80	71.20
Yeast and Mould count X 10^1 C.F.U/g															
T_0	0%	0.00	0.00	0.40	0.80	1.20	2.00	2.60	3.80	4.00	4.60	6.40	7.20	7.80	8.60
T_3S_1	1%	0.00	0.00	0.20	0.20	1.00	1.40	2.40	3.40	3.60	4.40	5.40	4.80	5.40	8.40
T_3S_2	2%	0.00	0.00	0.00	0.60	1.00	1.20	2.00	3.00	3.20	4.00	4.40	4.60	5.20	7.60
T_3S_3	3%	0.00	0.00	0.00	0.40	0.80	1.20	2.20	2.60	2.80	3.80	4.20	4.40	5.00	6.80
T_3S_4	4%	0.00	0.00	0.00	0.20	0.60	1.00	1.60	2.60	2.80	3.40	3.60	3.60	4.80	6.60

Note: T_0 Control sample, T_3S_1 1% Dactylorhiza hatagirea powder, T_3S_2 2% Dactylorhiza hatagirea powder, T_3S_3 3% Dactylorhiza hatagirea powder, T_3S_4 4% Dactylorhiza hatagirea powder incorporated ice-cream

an increase of 4×10^3 to 6.4×10^3 C.F.U/g. SPC in all the samples during the first day of storage. Thereafter gradual increase was observed in samples ranging from (4.8 to 76.20) $\times 10^3$ C.F.U/gm. within 91 days of storage data value sowed in Table 3. The minimum SPC in Ice-Cream prepared by 4%, 3%, 2%, 1% and 0% level of *Dactylorhiza hatagirea* powder at 0 to 91 days were found @ 4 % followed by 3%, 2%, 1% and 0% inclusion *Dactylorhiza hatagirea* powder in Ice-Cream. Statistical analysis of SPC of 4% inclusion of *Dactylorhiza hatagirea* powder in Ice-Cream 0 to 91 day was found high significantly difference ($p < 0.05$). The standard of the SPC with progressive storage may be attributed to the use of dairy ingredients that might have contributed to the microbial load of the Ice-Cream not more than 250×10^3 cfu/ml (Kenneth, 2013; FSSAI, 2015; Jana, 2016).

Yeast and Mould Count analyzed at different level of *Dactylorhiza hatagirea* powder used in Ice-Cream gives high antifungal value which was confirmed by method used for the Yeast and mould Count. Result at 0 and 7 day was nil Yeast and mould Count in total treatment. The minimum Yeast and mould Count of Ice-Cream were found at 14 to 91 day was found 4% level of *Dactylorhiza hatagirea* powder followed by 3%, 2% and 1% used of *Dactylorhiza hatagirea* powder in Ice-Cream. Statistical analysis factorial design of Yeast and mould Count of 4 % inclusion of *Dactylorhiza hatagirea* powder in Ice-Cream at 14 to 91 day was found high significant difference ($p < 0.05$). Reported that yeast and mould with progressive storage may be attributed to the use of dairy ingredients that might have contributed to the microbial load of the Ice-Cream was yeast 1×10^3 cfu/ml and mould 1×10^2 cfu/ml (Hosen and Kober 2009) and also yeast and mould count in Ice-Cream of yeast 1.5×10^5 cfu/ml and mould 1.2×10^3 cfu/ml (Caglayanlar *et al.*, 2009).

Coliform Count of Ice-Cream was recorded at different 7 days interval (0 to 91 days). The coliform count is used as an index of sanitation during the handling and processing of milk products. Coliforms are killed by pasteurization, thus, when present in milk product, they are regarded as post pasteurization contaminants resulting from poor sanitation. In the present investigation coliforms were found to be absent in all the samples (fresh and stored). This indicates that proper hygienic precautions had been taken during the production, packaging and storage of Ice-Cream.

Cost of *Dactylorhiza hatagirea* used Ice-Cream :

Cost of Ice-Cream was calculated by cost of ingredients using in Ice-Cream. Maximum cost was found 335.31 rupees per kg of 4% *Dactylorhiza hatagirea* powder included Ice-Cream, 274.95 rupees per kg cost of 3%, 214.72 rupees per kg 2% and minimum cost 153.99 rupees per kg was 1% *Dactylorhiza hatagirea* added Ice-Cream and plain Ice-Cream 94.14 rupees per kg. The cost wise *Dactylorhiza hatagirea* Ice-Cream treatment combinations were also more economical as compared to the Ice-Cream available in present day market.

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

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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

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Role of Caste Category in Indian Politics

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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

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Exploring Prospects and Challenges in the Indian Textile Industry

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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

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

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

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 [illegible] 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

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.

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

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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

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.

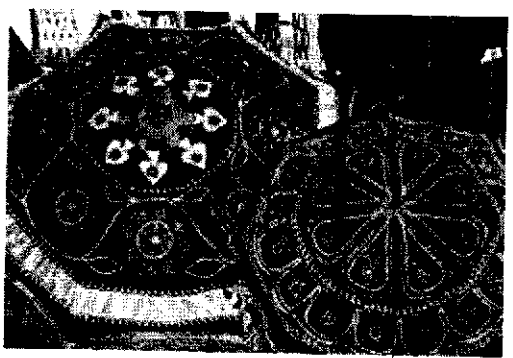

Figure 1: Ritual umbrella

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.

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

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.

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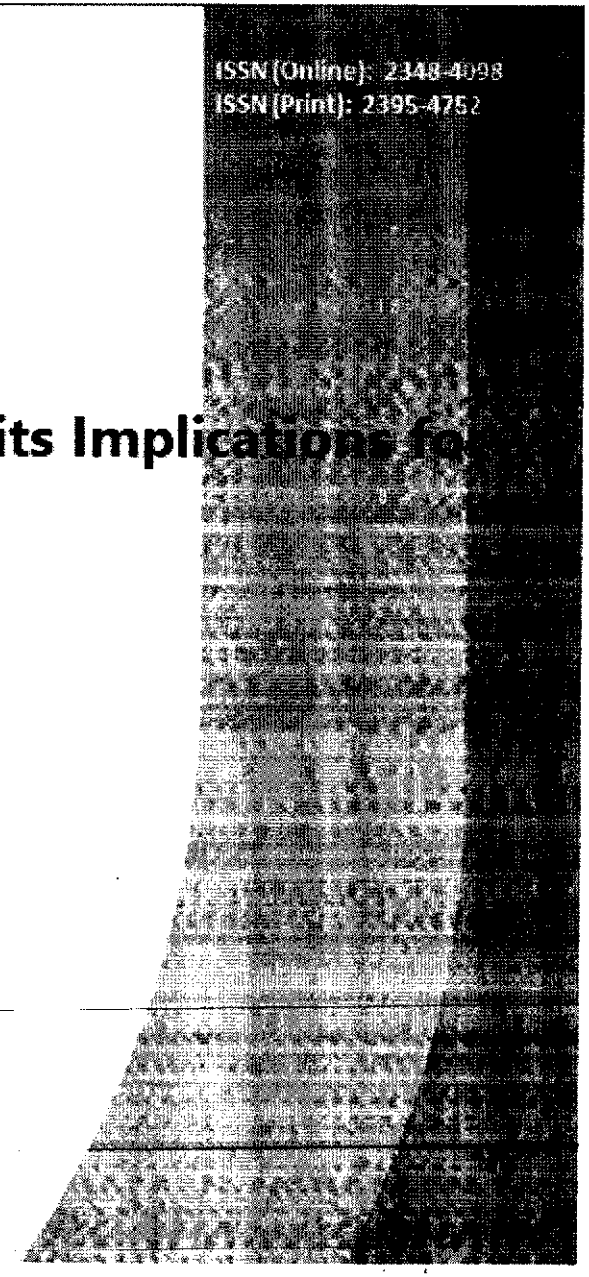

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A STUDY ON THE FUTURE OF OTT PLA

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ABSTRACT

OTT or over the top platforms has seen a likely boom in recent years with ho original shows. It has engulfed the entire world of digital content. The primary paper is to know the future of OTT platform how much people's trend towards OTT coming time, along with how much time people spend on OTT and what content this tidal wave of new mode of entertainment and how it has impacted the viewers flocking towards this new generation of digital entertainment. The data on the researched through a questionnaire which was floated among the people through goggle forms the change in the behavior, cost, convenience, and demand of original and new generation. Particularly the original and new content and convenience playing a major paper sheds light into the changing behavior of the consumers and how OTT has adapted to their 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 net drive and the YouTube which grow as major channel for viewers. TV itself brought evolution as LED, touch screen, inbuilt availability, etc. With these variations the trends in market is OTT video streaming availability of content, easy access to var shows, user friendly nature and cost helps the users to subscription of

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CHARTING THE PATH FORWARD: EVOLUTION AND HURDLES IN FEDERATED LEARNING

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Abstract: Federated Learning (FL) has emerged as a promising paradigm for training machine learning models across decentralized edge devices without centralizing sensitive data. This paper provides a comprehensive review of recent advancements, challenges, and future directions in FL. We discuss key advancements in FL techniques, including communication-efficient algorithms, robust aggregation methods, and privacy-preserving mechanisms. Furthermore, we analyze the challenges posed by data heterogeneity, privacy concerns, scalability issues, and model aggregation complexities. Through a critical examination of existing literature and empirical evidence, we identify emerging trends and research directions that will shape the future of FL.

Index Terms - Federated Learning, Machine Learning, Decentralized Systems, Privacy Preservation, Edge Computing, Scalability, Privacy-Preserving Mechanisms.

1. INTRODUCTION

The proliferation of edge devices and the increasing need for privacy-preserving machine learning have propelled Federated Learning (FL) into the spotlight. FL enables collaborative model training across decentralized devices while keeping data localized, thus addressing privacy concerns and regulatory constraints. In this section, we provide an overview of FL, its significance in contemporary distributed systems, and the motivation for exploring advancements, challenges, and future directions in this field.

2. ADVANCEMENTS IN FEDERATED LEARNING

2.1 Communication- Efficient Algorithms:

Recent advancements in federated learning have focused on developing communication-efficient algorithms to alleviate the burden of transmitting large model updates over bandwidth-constrained networks. Techniques such as federated averaging with quantization, sparsification, and differential privacy have been proposed to reduce the amount of information exchanged between the central server and participating clients. Additionally, advancements in gradient compression algorithms have enabled the transmission of model updates with significantly reduced communication overhead, thereby accelerating convergence and improving scalability in federated learning settings.

2.2 Robust Aggregation Methods:

Robust aggregation methods have been a key area of advancement in federated learning, particularly in addressing the challenges posed by non-IID (non-independent and identically distributed) data across decentralized clients. Novel aggregation schemes, such as weighted

federated averaging and adaptive aggregation, have been proposed to mitigate the impact of data heterogeneity and client-level variations on the global model. Moreover, advancements in personalized federated learning techniques have enabled the customization of model updates based on individual client characteristics and preferences, thereby improving overall model performance and convergence speed.

2.3 Privacy-Preserving Mechanisms:

Privacy preservation remains a critical aspect of federated learning, and recent advancements have focused on enhancing existing privacy-preserving mechanisms and developing novel techniques to safeguard sensitive data during model training. Differential privacy, in particular, has seen significant advancements in federated learning, with tailored mechanisms for injecting noise into model updates while preserving individual privacy guarantees. Additionally, advancements in secure aggregation techniques, such as homomorphic encryption and secure multi-party computation, have enabled the aggregation of encrypted model updates without compromising data confidentiality. These advancements have paved the way for federated learning deployments in privacy-sensitive domains, such as healthcare and finance, where data security and confidentiality are paramount.

2.4 Optimization Techniques:

Optimization techniques play a crucial role in improving the efficiency and effectiveness of federated learning algorithms. Recent advancements in optimization have focused on developing adaptive learning rate scheduling methods, model regularization techniques, and meta-learning approaches to enhance convergence speed and generalization performance in federated settings. Moreover, advancements in federated meta-learning have enabled the transfer of knowledge and model updates across heterogeneous clients and tasks, thereby facilitating faster adaptation to new environments and domains. These optimization advancements have contributed to the broader adoption of federated learning across various applications and domains, including edge computing, IoT, and personalized recommendation systems.

2.5 Federated Transfer Learning:

Federated transfer learning has emerged as a promising research direction in federated learning, enabling the transfer of knowledge and model parameters across different domains and tasks. Recent advancements in federated transfer learning have focused on developing domain adaptation techniques, model distillation methods, and knowledge distillation algorithms to facilitate knowledge transfer and reuse across decentralized clients. By leveraging transfer learning principles in federated settings, researchers aim to address data scarcity, domain shift, and task heterogeneity challenges, thereby improving model generalization and performance in real-world applications.

2.6 Federated Reinforcement Learning:

Federated reinforcement learning (FRL) has garnered increasing interest as an extension of federated learning to sequential decision-making tasks. Recent advancements in FRL have focused on developing distributed reinforcement learning algorithms, communication-efficient policy optimization methods, and decentralized value function approximation techniques to

enable collaborative learning across distributed agents. Moreover, advancements in federated meta-reinforcement learning have enabled agents to adapt and generalize across diverse environments and tasks in federated settings, thereby facilitating the deployment of autonomous and adaptive systems in decentralized environments.

2.7 Hybrid Federated Learning Approaches:

Hybrid federated learning approaches, which combine federated learning with centralized learning paradigms, have emerged as a promising research direction to address the limitations of existing federated learning methods. Recent advancements in hybrid federated learning have focused on developing hybrid aggregation schemes, collaborative learning architectures, and model fusion techniques to leverage the complementary strengths of federated and centralized learning approaches. By combining the benefits of distributed data processing in federated learning with the scalability and efficiency of centralized learning, hybrid federated learning approaches aim to accelerate model training, improve convergence, and enhance model performance in large-scale distributed systems.

3. CHALLENGES IN FEDERATED LEARNING

3.1 Data Heterogeneity:

One of the primary challenges in federated learning is dealing with data heterogeneity across decentralized clients. In many real-world scenarios, clients possess diverse datasets with varying distributions, feature representations, and quality levels. Addressing data heterogeneity is crucial for ensuring the convergence and generalization performance of federated learning models. However, aggregating updates from heterogeneous clients while maintaining model consistency poses significant technical challenges.

3.2 Privacy Concerns:

Privacy preservation remains a major challenge in federated learning, especially in applications involving sensitive data such as healthcare and finance. While federated learning inherently distributes model training across decentralized clients to preserve data privacy, the aggregation of model updates at a central server can still pose privacy risks. Clients may be reluctant to share their data due to privacy concerns, leading to participation bias and limited model performance. Moreover, ensuring differential privacy guarantees while maintaining model accuracy is a non-trivial task.

3.3 Scalability Issues:

Scalability is another key challenge in federated learning, particularly in large-scale deployments involving a massive number of participating clients. As the number of clients increases, communication overhead and computational complexity also escalate, leading to resource constraints and performance bottlenecks. Efficiently managing communication, synchronization, and resource allocation in distributed environments is essential for scaling federated learning to handle millions of edge devices and users.

3.4 Model Aggregation Complexities:

Aggregating model updates from decentralized clients introduces complexities related to non-IID (non-independent and identically distributed) data, client participation rates, and model drift.

Traditional aggregation methods may not be well-suited for handling non-IID data distributions, leading to suboptimal model convergence and performance. Moreover, varying client participation rates and unreliable network conditions can affect the quality of aggregated updates, resulting in model degradation and inefficiency. Addressing these aggregation complexities requires the development of robust aggregation algorithms and adaptive learning mechanisms.

3.5 Communication Overhead:

Communication overhead poses a significant challenge in federated learning, particularly in bandwidth-constrained environments and low-latency applications. Transmitting model updates between the central server and decentralized clients incurs communication costs, which can adversely impact convergence speed and resource utilization. Minimizing communication overhead while maintaining model accuracy is essential for deploying federated learning in resource-constrained environments and real-time applications.

3.6 Federated Learning Frameworks and Infrastructure:

The lack of standardized federated learning frameworks and infrastructure poses a practical challenge for researchers and developers. Existing federated learning frameworks often lack interoperability, compatibility, and scalability, hindering the adoption and deployment of federated learning solutions across diverse platforms and environments. Moreover, the complexity of setting up and managing federated learning systems requires specialized expertise and infrastructure, limiting accessibility and usability for non-expert users.

3.7 Regulatory and Ethical Considerations:

Navigating regulatory and ethical considerations is a critical challenge in federated learning, especially in domains governed by strict data protection laws and regulations. Ensuring compliance with data privacy regulations, such as GDPR and HIPAA, while conducting federated learning research and deployments requires careful consideration of data governance, consent management, and accountability mechanisms. Moreover, addressing ethical concerns related to bias, fairness, and transparency in federated learning algorithms and applications is essential for building trust and ensuring responsible AI development.

3.8 Federated Learning in Edge and IoT Environments:

Deploying federated learning in edge and IoT environments presents unique challenges due to resource constraints, intermittent connectivity, and heterogeneous device capabilities. Edge devices often have limited computational power, memory, and energy resources, making traditional federated learning approaches impractical. Designing lightweight federated learning algorithms, energy-efficient communication protocols, and adaptive learning strategies tailored to edge and IoT constraints is essential for enabling federated learning in decentralized and resource-constrained environments.

4. PRIVACY AND SECURITY CONSIDERATIONS IN FEDERATED LEARNING

4.1 Differential Privacy:

Differential privacy is a fundamental principle in federated learning aimed at protecting the privacy of individual data contributors. However, achieving differential privacy in federated

learning poses challenges due to the distributed nature of data and computation. Mechanisms for adding noise to model updates while preserving privacy guarantees must be carefully designed to balance privacy protection and model accuracy. Moreover, ensuring differential privacy across heterogeneous clients with varying data distributions and sensitivities requires tailored privacy-preserving techniques and robust privacy budgets.

4.2 Secure Aggregation:

Secure aggregation methods play a crucial role in federated learning by enabling the aggregation of encrypted model updates without revealing raw data. Techniques such as homomorphic encryption, secure multi-party computation (MPC), and secret sharing facilitate secure aggregation while preserving data confidentiality. However, implementing secure aggregation in federated learning systems introduces computational overhead and communication complexity, impacting scalability and efficiency. Moreover, ensuring the integrity and authenticity of aggregated updates in the presence of malicious clients or adversaries remains a challenge in federated learning settings.

4.3 Federated Learning Frameworks with Built-in Privacy Mechanisms:

Developing federated learning frameworks with built-in privacy mechanisms is essential for simplifying the deployment and management of privacy-preserving federated learning systems. These frameworks typically incorporate privacy-preserving algorithms, cryptographic primitives, and secure communication protocols to safeguard sensitive data during model training and aggregation. However, ensuring compatibility, interoperability, and efficiency across different federated learning frameworks poses technical challenges. Moreover, integrating privacy mechanisms into existing federated learning frameworks requires careful consideration of performance, usability, and regulatory compliance requirements.

4.4 Privacy-Preserving Model Updates:

Ensuring privacy-preserving model updates is critical for protecting sensitive information while aggregating model parameters across decentralized clients. Techniques such as federated averaging with differential privacy, secure aggregation with homomorphic encryption, and randomized response mechanisms enable privacy-preserving model updates in federated learning settings. However, balancing privacy protection and model utility remains a challenge, as adding noise or encryption to model updates may degrade model accuracy and convergence speed. Moreover, designing adaptive privacy mechanisms that dynamically adjust privacy levels based on client data sensitivity and privacy preferences is an ongoing research area in federated learning.

4.5 Adversarial Attacks and Defense Mechanisms:

Federated learning systems are vulnerable to adversarial attacks aimed at compromising model privacy, integrity, and availability. Adversaries may launch membership inference attacks, model inversion attacks, or data poisoning attacks to infer sensitive information about individual data contributors, reverse-engineer model parameters, or manipulate model training. Developing robust defense mechanisms against adversarial attacks in federated learning requires integrating techniques such as differential privacy, secure aggregation, and adversarial training into

federated learning algorithms. Moreover, detecting and mitigating adversarial attacks in federated learning settings requires collaborative efforts from researchers, developers, and practitioners across multiple disciplines.

4.6 Regulatory Compliance and Data Governance:

Ensuring regulatory compliance and data governance is essential for deploying federated learning systems in compliance with data protection laws and regulations. Federated learning frameworks must incorporate mechanisms for managing data consent, anonymizing sensitive information, and auditing model training processes to comply with privacy regulations such as GDPR, HIPAA, and CCPA. Moreover, establishing transparent data governance practices, accountability mechanisms, and regulatory frameworks for federated learning is crucial for building trust and ensuring responsible data stewardship. Collaborative efforts between policymakers, industry stakeholders, and privacy experts are essential for developing regulatory frameworks that balance privacy protection with innovation and data-driven decision-making.

5. SCALABILITY AND EFFICIENCY

5.1 Communication Efficiency:

Communication efficiency is a critical factor in the scalability of federated learning systems, especially in large-scale deployments involving a massive number of decentralized clients. Techniques such as gradient compression, quantization, and sparsification help reduce the size of model updates transmitted between clients and the central server, thereby minimizing communication overhead. Additionally, asynchronous communication protocols and federated learning frameworks with built-in communication optimizations enable parallelized and efficient model training across distributed clients while mitigating network latency and bandwidth constraints.

5.2 Resource Management:

Effective resource management is essential for ensuring the scalability and efficiency of federated learning systems, particularly in resource-constrained edge and IoT environments. Techniques such as dynamic client selection, adaptive learning rate scheduling, and federated model aggregation enable efficient utilization of computational resources and energy-efficient model training across decentralized clients. Moreover, fault tolerance mechanisms and robustness to client failures enhance system reliability and resilience, ensuring uninterrupted model training and aggregation in dynamic and heterogeneous environments.

5.3 Model Parallelization:

Model parallelization techniques play a crucial role in scaling federated learning to large model architectures and complex learning tasks. Partitioning model parameters across decentralized clients and parallelizing model updates enable distributed computation and collaborative model training without centralizing sensitive data. Furthermore, advancements in federated optimization algorithms, such as federated averaging with momentum and decentralized optimization methods, facilitate efficient model parallelization and convergence in federated learning settings with a large number of participating clients.

5.4 Edge Computing Integration:

Integration with edge computing infrastructure is essential for enhancing the scalability and efficiency of federated learning systems, particularly in edge and IoT environments. Edge devices serve as local compute nodes for model training and inference, enabling decentralized and real-time processing of data while minimizing data transmission and latency. Federated learning algorithms tailored to edge computing environments leverage distributed computation, edge caching, and edge intelligence to improve scalability, efficiency, and responsiveness in federated learning deployments at the network edge.

5.5 Federated Learning Frameworks and Infrastructure:

Scalable and efficient federated learning frameworks and infrastructure are essential for simplifying the deployment and management of federated learning systems across diverse platforms and environments. Federated learning frameworks with built-in scalability optimizations, distributed training algorithms, and federated model aggregation mechanisms facilitate efficient utilization of computational resources and seamless integration with existing machine learning pipelines. Moreover, federated learning platforms with scalable infrastructure and cloud-native services enable elastic scaling, auto-scaling, and resource provisioning for federated learning workloads, ensuring high availability and performance in dynamic and heterogeneous environments.

5.6 Adaptive Learning and Optimization:

Adaptive learning and optimization techniques play a crucial role in improving the scalability and efficiency of federated learning algorithms across distributed clients with varying data distributions and computational capabilities. Adaptive learning rate scheduling, federated meta-learning, and adaptive aggregation methods enable dynamic adjustment of learning parameters and model aggregation strategies based on client feedback and environmental conditions. Furthermore, federated learning algorithms with adaptive optimization mechanisms leverage reinforcement learning, evolutionary algorithms, and online learning techniques to adaptively optimize model performance and convergence in federated learning settings.

6. FUTURE DIRECTIONS AND EMERGING TRENDS

6.1 Federated Transfer Learning:

Federated transfer learning is an emerging research direction that aims to leverage knowledge transfer across domains and tasks in federated learning settings. By enabling models to learn from related datasets and tasks across decentralized clients, federated transfer learning can facilitate faster adaptation to new environments, reduce data labeling costs, and improve model generalization performance. Future research in federated transfer learning will focus on developing domain adaptation techniques, meta-learning algorithms, and transferable knowledge representations to enable knowledge transfer and reuse across heterogeneous clients and tasks.

6.2 Adaptive Federated Learning:

Adaptive federated learning is an area of research that seeks to develop techniques for dynamically adjusting model aggregation strategies, learning parameters, and communication protocols based on client feedback and environmental conditions. By adapting to changing data

distributions, client participation rates, and network conditions in real-time, adaptive federated learning algorithms can improve convergence speed, model robustness, and resource utilization in dynamic and heterogeneous federated learning environments. Future research in adaptive federated learning will explore reinforcement learning, online learning, and self-adaptive optimization methods to enable autonomous and adaptive model training across decentralized clients.

6.3 Federated Meta-Learning:

Federated meta-learning is a promising research direction that aims to enable models to learn to learn across heterogeneous clients and tasks in federated learning settings. By leveraging meta-learning principles, federated meta-learning algorithms can enable models to adapt and generalize across diverse environments, datasets, and learning objectives without explicit data exchange. Future research in federated meta-learning will focus on developing meta-learning algorithms, transfer learning techniques, and knowledge distillation methods tailored to federated learning settings to facilitate knowledge transfer, adaptation, and generalization across decentralized clients and tasks.

6.4 Federated Reinforcement Learning:

Federated reinforcement learning (FRL) is an emerging area of research that extends federated learning to sequential decision-making tasks. By enabling distributed agents to learn collaboratively from decentralized experiences, FRL algorithms can facilitate the development of autonomous and adaptive systems in decentralized environments. Future research in FRL will focus on developing distributed reinforcement learning algorithms, communication-efficient policy optimization methods, and decentralized value function approximation techniques to enable collaborative learning and decision-making across distributed agents in federated learning settings.

6.5 Hybrid Federated Learning Approaches:

Hybrid federated learning approaches combine federated learning with centralized learning paradigms to address the limitations of existing federated learning methods. By leveraging the complementary strengths of federated and centralized learning approaches, hybrid federated learning algorithms can accelerate model training, improve convergence, and enhance model performance in large-scale distributed systems. Future research in hybrid federated learning will focus on developing hybrid aggregation schemes, collaborative learning architectures, and model fusion techniques to integrate federated learning with centralized learning paradigms seamlessly.

6.6 Federated Learning for Edge and IoT:

Federated learning for edge and IoT environments is an emerging research area that focuses on developing lightweight federated learning algorithms, energy-efficient communication protocols, and adaptive learning strategies tailored to resource-constrained edge devices and IoT sensors. By leveraging edge computing infrastructure and decentralized data processing capabilities, federated learning algorithms can enable collaborative model training and inference at the network edge while minimizing data transmission and latency. Future research in federated learning for edge and IoT will explore federated optimization algorithms, edge caching

techniques, and federated model aggregation mechanisms optimized for edge and IoT constraints to enable efficient and scalable federated learning deployments in decentralized and resource-constrained environments.

7. CONCLUSION

Future directions and emerging trends in federated learning will shape the evolution of decentralized machine learning paradigms, enabling collaborative, privacy-preserving, and adaptive model training across diverse applications and domains. By exploring federated transfer learning, adaptive federated learning, federated meta-learning, federated reinforcement learning, hybrid federated learning approaches, and federated learning for edge and IoT, researchers and practitioners can advance the state-of-the-art in federated learning and unlock new opportunities for innovation and collaboration in decentralized machine learning settings. Collaborative efforts from academia, industry, and government are essential for driving research, development, and adoption of federated learning technologies and applications in the years to come.

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Discussion On Various Properties of Linear Transformation

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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.

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:

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 $(x2)$
$\cos(\frac{\pi}{2}) + \cos(\frac{\pi}{3}) \neq \cos(\frac{5\pi}{6})$

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.

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

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.

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CHARTING THE PATH FORWARD: EVOLUTION AND HURDLES IN FEDERATED LEARNING

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Abstract: Federated Learning (FL) has emerged as a promising paradigm for training machine learning models across decentralized edge devices without centralizing sensitive data. This paper provides a comprehensive review of recent advancements, challenges, and future directions in FL. We discuss key advancements in FL techniques, including communication-efficient algorithms, robust aggregation methods, and privacy-preserving mechanisms. Furthermore, we analyze the challenges posed by data heterogeneity, privacy concerns, scalability issues, and model aggregation complexities. Through a critical examination of existing literature and empirical evidence, we identify emerging trends and research directions that will shape the future of FL.

Index Terms - Federated Learning, Machine Learning, Decentralized Systems, Privacy Preservation, Edge Computing, Scalability, Privacy-Preserving Mechanisms.

1. INTRODUCTION

The proliferation of edge devices and the increasing need for privacy-preserving machine learning have propelled Federated Learning (FL) into the spotlight. FL enables collaborative model training across decentralized devices while keeping data localized, thus addressing privacy concerns and regulatory constraints. In this section, we provide an overview of FL, its significance in contemporary distributed systems, and the motivation for exploring advancements, challenges, and future directions in this field.

2. ADVANCEMENTS IN FEDERATED LEARNING

2.1 Communication- Efficient Algorithms:

Recent advancements in federated learning have focused on developing communication-efficient algorithms to alleviate the burden of transmitting large model updates over bandwidth-constrained networks. Techniques such as federated averaging with quantization, sparsification, and differential privacy have been proposed to reduce the amount of information exchanged between the central server and participating clients. Additionally, advancements in gradient compression algorithms have enabled the transmission of model updates with significantly reduced communication overhead, thereby accelerating convergence and improving scalability in federated learning settings.

2.2 Robust Aggregation Methods:

Robust aggregation methods have been a key area of advancement in federated learning, particularly in addressing the challenges posed by non-IID (non-independent and identically distributed) data across decentralized clients. Novel aggregation schemes, such as weighted

federated averaging and adaptive aggregation, have been proposed to mitigate the impact of data heterogeneity and client-level variations on the global model. Moreover, advancements in personalized federated learning techniques have enabled the customization of model updates based on individual client characteristics and preferences, thereby improving overall model performance and convergence speed.

2.3 Privacy-Preserving Mechanisms:

Privacy preservation remains a critical aspect of federated learning, and recent advancements have focused on enhancing existing privacy-preserving mechanisms and developing novel techniques to safeguard sensitive data during model training. Differential privacy, in particular, has seen significant advancements in federated learning, with tailored mechanisms for injecting noise into model updates while preserving individual privacy guarantees. Additionally, advancements in secure aggregation techniques, such as homomorphic encryption and secure multi-party computation, have enabled the aggregation of encrypted model updates without compromising data confidentiality. These advancements have paved the way for federated learning deployments in privacy-sensitive domains, such as healthcare and finance, where data security and confidentiality are paramount.

2.4 Optimization Techniques:

Optimization techniques play a crucial role in improving the efficiency and effectiveness of federated learning algorithms. Recent advancements in optimization have focused on developing adaptive learning rate scheduling methods, model regularization techniques, and meta-learning approaches to enhance convergence speed and generalization performance in federated settings. Moreover, advancements in federated meta-learning have enabled the transfer of knowledge and model updates across heterogeneous clients and tasks, thereby facilitating faster adaptation to new environments and domains. These optimization advancements have contributed to the broader adoption of federated learning across various applications and domains, including edge computing, IoT, and personalized recommendation systems.

2.5 Federated Transfer Learning:

Federated transfer learning has emerged as a promising research direction in federated learning, enabling the transfer of knowledge and model parameters across different domains and tasks. Recent advancements in federated transfer learning have focused on developing domain adaptation techniques, model distillation methods, and knowledge distillation algorithms to facilitate knowledge transfer and reuse across decentralized clients. By leveraging transfer learning principles in federated settings, researchers aim to address data scarcity, domain shift, and task heterogeneity challenges, thereby improving model generalization and performance in real-world applications.

2.6 Federated Reinforcement Learning:

Federated reinforcement learning (FRL) has garnered increasing interest as an extension of federated learning to sequential decision-making tasks. Recent advancements in FRL have focused on developing distributed reinforcement learning algorithms, communication-efficient policy optimization methods, and decentralized value function approximation techniques to

enable collaborative learning across distributed agents. Moreover, advancements in federated meta-reinforcement learning have enabled agents to adapt and generalize across diverse environments and tasks in federated settings, thereby facilitating the deployment of autonomous and adaptive systems in decentralized environments.

2.7 Hybrid Federated Learning Approaches:

Hybrid federated learning approaches, which combine federated learning with centralized learning paradigms, have emerged as a promising research direction to address the limitations of existing federated learning methods. Recent advancements in hybrid federated learning have focused on developing hybrid aggregation schemes, collaborative learning architectures, and model fusion techniques to leverage the complementary strengths of federated and centralized learning approaches. By combining the benefits of distributed data processing in federated learning with the scalability and efficiency of centralized learning, hybrid federated learning approaches aim to accelerate model training, improve convergence, and enhance model performance in large-scale distributed systems.

3. CHALLENGES IN FEDERATED LEARNING

3.1 Data Heterogeneity:

One of the primary challenges in federated learning is dealing with data heterogeneity across decentralized clients. In many real-world scenarios, clients possess diverse datasets with varying distributions, feature representations, and quality levels. Addressing data heterogeneity is crucial for ensuring the convergence and generalization performance of federated learning models. However, aggregating updates from heterogeneous clients while maintaining model consistency poses significant technical challenges.

3.2 Privacy Concerns:

Privacy preservation remains a major challenge in federated learning, especially in applications involving sensitive data such as healthcare and finance. While federated learning inherently distributes model training across decentralized clients to preserve data privacy, the aggregation of model updates at a central server can still pose privacy risks. Clients may be reluctant to share their data due to privacy concerns, leading to participation bias and limited model performance. Moreover, ensuring differential privacy guarantees while maintaining model accuracy is a non-trivial task.

3.3 Scalability Issues:

Scalability is another key challenge in federated learning, particularly in large-scale deployments involving a massive number of participating clients. As the number of clients increases, communication overhead and computational complexity also escalate, leading to resource constraints and performance bottlenecks. Efficiently managing communication, synchronization, and resource allocation in distributed environments is essential for scaling federated learning to handle millions of edge devices and users.

3.4 Model Aggregation Complexities:

Aggregating model updates from decentralized clients introduces complexities related to non-IID (non-independent and identically distributed) data, client participation rates, and model drift.

Traditional aggregation methods may not be well-suited for handling non-IID data distributions, leading to suboptimal model convergence and performance. Moreover, varying client participation rates and unreliable network conditions can affect the quality of aggregated updates, resulting in model degradation and inefficiency. Addressing these aggregation complexities requires the development of robust aggregation algorithms and adaptive learning mechanisms.

3.5 Communication Overhead:

Communication overhead poses a significant challenge in federated learning, particularly in bandwidth-constrained environments and low-latency applications. Transmitting model updates between the central server and decentralized clients incurs communication costs, which can adversely impact convergence speed and resource utilization. Minimizing communication overhead while maintaining model accuracy is essential for deploying federated learning in resource-constrained environments and real-time applications.

3.6 Federated Learning Frameworks and Infrastructure:

The lack of standardized federated learning frameworks and infrastructure poses a practical challenge for researchers and developers. Existing federated learning frameworks often lack interoperability, compatibility, and scalability, hindering the adoption and deployment of federated learning solutions across diverse platforms and environments. Moreover, the complexity of setting up and managing federated learning systems requires specialized expertise and infrastructure, limiting accessibility and usability for non-expert users.

3.7 Regulatory and Ethical Considerations:

Navigating regulatory and ethical considerations is a critical challenge in federated learning, especially in domains governed by strict data protection laws and regulations. Ensuring compliance with data privacy regulations, such as GDPR and HIPAA, while conducting federated learning research and deployments requires careful consideration of data governance, consent management, and accountability mechanisms. Moreover, addressing ethical concerns related to bias, fairness, and transparency in federated learning algorithms and applications is essential for building trust and ensuring responsible AI development.

3.8 Federated Learning in Edge and IoT Environments:

Deploying federated learning in edge and IoT environments presents unique challenges due to resource constraints, intermittent connectivity, and heterogeneous device capabilities. Edge devices often have limited computational power, memory, and energy resources, making traditional federated learning approaches impractical. Designing lightweight federated learning algorithms, energy-efficient communication protocols, and adaptive learning strategies tailored to edge and IoT constraints is essential for enabling federated learning in decentralized and resource-constrained environments.

4. PRIVACY AND SECURITY CONSIDERATIONS IN FEDERATED LEARNING

4.1 Differential Privacy:

Differential privacy is a fundamental principle in federated learning aimed at protecting the privacy of individual data contributors. However, achieving differential privacy in federated

learning poses challenges due to the distributed nature of data and computation. Mechanisms for adding noise to model updates while preserving privacy guarantees must be carefully designed to balance privacy protection and model accuracy. Moreover, ensuring differential privacy across heterogeneous clients with varying data distributions and sensitivities requires tailored privacy-preserving techniques and robust privacy budgets.

4.2 Secure Aggregation:

Secure aggregation methods play a crucial role in federated learning by enabling the aggregation of encrypted model updates without revealing raw data. Techniques such as homomorphic encryption, secure multi-party computation (MPC), and secret sharing facilitate secure aggregation while preserving data confidentiality. However, implementing secure aggregation in federated learning systems introduces computational overhead and communication complexity, impacting scalability and efficiency. Moreover, ensuring the integrity and authenticity of aggregated updates in the presence of malicious clients or adversaries remains a challenge in federated learning settings.

4.3 Federated Learning Frameworks with Built-in Privacy Mechanisms:

Developing federated learning frameworks with built-in privacy mechanisms is essential for simplifying the deployment and management of privacy-preserving federated learning systems. These frameworks typically incorporate privacy-preserving algorithms, cryptographic primitives, and secure communication protocols to safeguard sensitive data during model training and aggregation. However, ensuring compatibility, interoperability, and efficiency across different federated learning frameworks poses technical challenges. Moreover, integrating privacy mechanisms into existing federated learning frameworks requires careful consideration of performance, usability, and regulatory compliance requirements.

4.4 Privacy-Preserving Model Updates:

Ensuring privacy-preserving model updates is critical for protecting sensitive information while aggregating model parameters across decentralized clients. Techniques such as federated averaging with differential privacy, secure aggregation with homomorphic encryption, and randomized response mechanisms enable privacy-preserving model updates in federated learning settings. However, balancing privacy protection and model utility remains a challenge, as adding noise or encryption to model updates may degrade model accuracy and convergence speed. Moreover, designing adaptive privacy mechanisms that dynamically adjust privacy levels based on client data sensitivity and privacy preferences is an ongoing research area in federated learning.

4.5 Adversarial Attacks and Defense Mechanisms:

Federated learning systems are vulnerable to adversarial attacks aimed at compromising model privacy, integrity, and availability. Adversaries may launch membership inference attacks, model inversion attacks, or data poisoning attacks to infer sensitive information about individual data contributors, reverse-engineer model parameters, or manipulate model training. Developing robust defense mechanisms against adversarial attacks in federated learning requires integrating techniques such as differential privacy, secure aggregation, and adversarial training into

federated learning algorithms. Moreover, detecting and mitigating adversarial attacks in federated learning settings requires collaborative efforts from researchers, developers, and practitioners across multiple disciplines.

4.6 Regulatory Compliance and Data Governance:

Ensuring regulatory compliance and data governance is essential for deploying federated learning systems in compliance with data protection laws and regulations. Federated learning frameworks must incorporate mechanisms for managing data consent, anonymizing sensitive information, and auditing model training processes to comply with privacy regulations such as GDPR, HIPAA, and CCPA. Moreover, establishing transparent data governance practices, accountability mechanisms, and regulatory frameworks for federated learning is crucial for building trust and ensuring responsible data stewardship. Collaborative efforts between policymakers, industry stakeholders, and privacy experts are essential for developing regulatory frameworks that balance privacy protection with innovation and data-driven decision-making.

5. SCALABILITY AND EFFICIENCY

5.1 Communication Efficiency:

Communication efficiency is a critical factor in the scalability of federated learning systems, especially in large-scale deployments involving a massive number of decentralized clients. Techniques such as gradient compression, quantization, and sparsification help reduce the size of model updates transmitted between clients and the central server, thereby minimizing communication overhead. Additionally, asynchronous communication protocols and federated learning frameworks with built-in communication optimizations enable parallelized and efficient model training across distributed clients while mitigating network latency and bandwidth constraints.

5.2 Resource Management:

Effective resource management is essential for ensuring the scalability and efficiency of federated learning systems, particularly in resource-constrained edge and IoT environments. Techniques such as dynamic client selection, adaptive learning rate scheduling, and federated model aggregation enable efficient utilization of computational resources and energy-efficient model training across decentralized clients. Moreover, fault tolerance mechanisms and robustness to client failures enhance system reliability and resilience, ensuring uninterrupted model training and aggregation in dynamic and heterogeneous environments.

5.3 Model Parallelization:

Model parallelization techniques play a crucial role in scaling federated learning to large model architectures and complex learning tasks. Partitioning model parameters across decentralized clients and parallelizing model updates enable distributed computation and collaborative model training without centralizing sensitive data. Furthermore, advancements in federated optimization algorithms, such as federated averaging with momentum and decentralized optimization methods, facilitate efficient model parallelization and convergence in federated learning settings with a large number of participating clients.

5.4 Edge Computing Integration:

Integration with edge computing infrastructure is essential for enhancing the scalability and efficiency of federated learning systems, particularly in edge and IoT environments. Edge devices serve as local compute nodes for model training and inference, enabling decentralized and real-time processing of data while minimizing data transmission and latency. Federated learning algorithms tailored to edge computing environments leverage distributed computation, edge caching, and edge intelligence to improve scalability, efficiency, and responsiveness in federated learning deployments at the network edge.

5.5 Federated Learning Frameworks and Infrastructure:

Scalable and efficient federated learning frameworks and infrastructure are essential for simplifying the deployment and management of federated learning systems across diverse platforms and environments. Federated learning frameworks with built-in scalability optimizations, distributed training algorithms, and federated model aggregation mechanisms facilitate efficient utilization of computational resources and seamless integration with existing machine learning pipelines. Moreover, federated learning platforms with scalable infrastructure and cloud-native services enable elastic scaling, auto-scaling, and resource provisioning for federated learning workloads, ensuring high availability and performance in dynamic and heterogeneous environments.

5.6 Adaptive Learning and Optimization:

Adaptive learning and optimization techniques play a crucial role in improving the scalability and efficiency of federated learning algorithms across distributed clients with varying data distributions and computational capabilities. Adaptive learning rate scheduling, federated meta-learning, and adaptive aggregation methods enable dynamic adjustment of learning parameters and model aggregation strategies based on client feedback and environmental conditions. Furthermore, federated learning algorithms with adaptive optimization mechanisms leverage reinforcement learning, evolutionary algorithms, and online learning techniques to adaptively optimize model performance and convergence in federated learning settings.

6. FUTURE DIRECTIONS AND EMERGING TRENDS

6.1 Federated Transfer Learning:

Federated transfer learning is an emerging research direction that aims to leverage knowledge transfer across domains and tasks in federated learning settings. By enabling models to learn from related datasets and tasks across decentralized clients, federated transfer learning can facilitate faster adaptation to new environments, reduce data labeling costs, and improve model generalization performance. Future research in federated transfer learning will focus on developing domain adaptation techniques, meta-learning algorithms, and transferable knowledge representations to enable knowledge transfer and reuse across heterogeneous clients and tasks.

6.2 Adaptive Federated Learning:

Adaptive federated learning is an area of research that seeks to develop techniques for dynamically adjusting model aggregation strategies, learning parameters, and communication protocols based on client feedback and environmental conditions. By adapting to changing data

distributions, client participation rates, and network conditions in real-time, adaptive federated learning algorithms can improve convergence speed, model robustness, and resource utilization in dynamic and heterogeneous federated learning environments. Future research in adaptive federated learning will explore reinforcement learning, online learning, and self-adaptive optimization methods to enable autonomous and adaptive model training across decentralized clients.

6.3 Federated Meta-Learning:

Federated meta-learning is a promising research direction that aims to enable models to learn to learn across heterogeneous clients and tasks in federated learning settings. By leveraging meta-learning principles, federated meta-learning algorithms can enable models to adapt and generalize across diverse environments, datasets, and learning objectives without explicit data exchange. Future research in federated meta-learning will focus on developing meta-learning algorithms, transfer learning techniques, and knowledge distillation methods tailored to federated learning settings to facilitate knowledge transfer, adaptation, and generalization across decentralized clients and tasks.

6.4 Federated Reinforcement Learning:

Federated reinforcement learning (FRL) is an emerging area of research that extends federated learning to sequential decision-making tasks. By enabling distributed agents to learn collaboratively from decentralized experiences, FRL algorithms can facilitate the development of autonomous and adaptive systems in decentralized environments. Future research in FRL will focus on developing distributed reinforcement learning algorithms, communication-efficient policy optimization methods, and decentralized value function approximation techniques to enable collaborative learning and decision-making across distributed agents in federated learning settings.

6.5 Hybrid Federated Learning Approaches:

Hybrid federated learning approaches combine federated learning with centralized learning paradigms to address the limitations of existing federated learning methods. By leveraging the complementary strengths of federated and centralized learning approaches, hybrid federated learning algorithms can accelerate model training, improve convergence, and enhance model performance in large-scale distributed systems. Future research in hybrid federated learning will focus on developing hybrid aggregation schemes, collaborative learning architectures, and model fusion techniques to integrate federated learning with centralized learning paradigms seamlessly.

6.6 Federated Learning for Edge and IoT:

Federated learning for edge and IoT environments is an emerging research area that focuses on developing lightweight federated learning algorithms, energy-efficient communication protocols, and adaptive learning strategies tailored to resource-constrained edge devices and IoT sensors. By leveraging edge computing infrastructure and decentralized data processing capabilities, federated learning algorithms can enable collaborative model training and inference at the network edge while minimizing data transmission and latency. Future research in federated learning for edge and IoT will explore federated optimization algorithms, edge caching

techniques, and federated model aggregation mechanisms optimized for edge and IoT constraints to enable efficient and scalable federated learning deployments in decentralized and resource-constrained environments.

7. CONCLUSION

Future directions and emerging trends in federated learning will shape the evolution of decentralized machine learning paradigms, enabling collaborative, privacy-preserving, and adaptive model training across diverse applications and domains. By exploring federated transfer learning, adaptive federated learning, federated meta-learning, federated reinforcement learning, hybrid federated learning approaches, and federated learning for edge and IoT, researchers and practitioners can advance the state-of-the-art in federated learning and unlock new opportunities for innovation and collaboration in decentralized machine learning settings. Collaborative efforts from academia, industry, and government are essential for driving research, development, and adoption of federated learning technologies and applications in the years to come.

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Capital Markets & Green Finance: A Growth Pathway of Indian Economy

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ABSTRACT

India's corporate sector is currently undergoing an intriguing transformation. Indian businesses are becoming more well-known globally and are embracing sustainability. They are going above and beyond regulatory compliance to create shared value and build a solid reputation in the global business community. The term "green finance" describes financing arrangements intended specifically for projects that address climate change or are environmentally friendly. Green finance is the collective term for financial products including carbon market instruments, green bonds, and financial institutions like green funds and banks. Appropriate incentive structures are needed to maximise funding allocated to the adoption and establishment of green projects.

The economy must meet certain requirements before new funding tools and methods may be successfully implemented. By rerouting capital from carbon-emitting to carbon-mitigating sectors, the financial sector can significantly reduce the overall risks associated with climate change.

Keywords: - greenfinance, sustainableeconomic growth,financial markets,financialinstruments

INTRODUCTION

The energy mix in India is changing as a result of the growing share of renewable energy sources. Finding the money needed to meet the revolutionary target of producing 175 megawatts of renewable energy by 2022 is one of the main obstacles in the way of such a shift. The issue is exacerbated by the budget's limited resources and the challenges of raising private finance for the industry. In light of this, we provide a detailed analysis of the related difficulties in raising such funds by utilising India's viewpoint.

REVIEWOFLITERATURE

India's corporate sector is currently undergoing an intriguing transformation. Indian businesses are becoming more well-known globally and are embracing sustainability. They are going above and beyond regulatory compliance to create shared value and build a solid reputation in the global business community. Since corporations understand the long-term benefits connected to this positive value generation, all of this is essentially voluntary. The integration of sustainable development throughout the system is a priority for the government. Development that is sustainableis everyone's route to the future. It provides a paradigm for achieving social fairness,

fostering economic growth, practicing environmental stewardship, and bolstering government. Using environmentally friendly technologies has become more and more important for countries all over the world as a means of safeguarding and significantly improving the environment.

To have access to natural resources for future generations is the only definition of sustainability. Maintaining natural resources and utilising them for long-term economic growth is referred to as sustainable economic growth. The ecology actually offers sources of production for sustainable economic growth; hence it shouldn't be damaged. In order to meet the needs of future generations, sustainability refers to managing natural resources with the least amount of depletion possible.

The focus of structural list approaches to economic development is on the sectoral specificity of growth, with a particular emphasis on the manufacturing sector. The underlying assumption of a sectoral approach is that different activities within sectors share significant common traits that are pertinent to growth. This perspective holds that while there are significant "common denominators" across the traits of sectors that are pertinent to growth, it is equally critical to appropriately acknowledge the variability within sectors. The degree of technological advancement, export orientation, strength of backward and forward linkages, productivity and potential for increases in cumulative productivity, potential for increasing returns to scale, and other growth-related factors vary greatly amongst activities within sectors.

The degree of aggregation in a sectoral classification is partially related to this heterogeneity. Naturally, the degree of heterogeneity decreases with increasing classification disaggregation (a higher number of digits in the International Standard Industrial Classification (ISIC) system, for example). Nonetheless, it's critical to acknowledge that, even within the same industry, there might be significant distinctions between certain operations.

The Indian financial community is beginning to understand that information from enterprises about sustainability may be used as a sustainable tool when making financing decisions. Many institutional investors demand open disclosures from the businesses they invest in about their use of water, energy efficiency, and the impact they have on forests both directly and indirectly through their supply chains. There's more that may be done to build upon the impetus that current initiatives—whether from the Reserve Bank of India or other national and private banks, stock exchanges, financial institutions, and players in the capital market—have offered. It is also imperative that the financial sector operate effectively on a sustainable funding strategy.

The 2011 National Manufacturing Policy placed a strong emphasis on "green manufacturing" by dictating a number of environmental protections and industrial production compliance requirements, such as regular environmental audits, green building standards for units above a certain threshold, water conservation, waste water treatment, rainwater harvesting, and renewable energy use. With the intention of outlining the general framework of policies for reducing the effects of climate change, the National Action Plan on Climate Change (NAPCC) was created (Jain, 2020). The Ministry of Finance established the Climate Change Finance Unit CCFU) in 2011 to serve as a coordinating body for the different organisations in charge of green

finance in India. Since 2012, implementing the sustainability disclosure standards has been a major strategic initiative.

Since 2012, the top 100 listed companies at the BSE and NSE based on market capitalization have been required by the Security and Exchange Board of India (SEBI) to produce annual corporate responsibility reports, which are periodically amended. SEBI released guidelines in May 2017 outlining the disclosure requirements for the issuance of green bonds. Incentives related to finances and taxes have been implemented in India. sales and production (Jain, 2020). The State Bank of India has launched a "green car loans" scheme for electric vehicles with a 20-basis point cheaper interest rate and a longer payback window, compared to the current car loans, in an effort to combat the high upfront cost of such vehicles.

Additionally, the government has introduced a Production Linked Incentive (PLI) Scheme to facilitate the production of highly efficient modules for the renewable energy industry.

GREENFINANCE

The term "green finance" describes financing arrangements intended specifically for projects that address climate change or are environmentally friendly. Energy-producing projects that are environmentally sustainable include those that use renewable energy sources like solar, wind, or biogas; clean transportation initiatives that reduce greenhouse gas emissions; energy-efficient projects like green buildings; and waste management initiatives that include recycling, effective disposal, and energy conversion, among other things. The GoI introduced the Faster Adoption and Manufacturing of Hybrid and Electric automobiles initiative in two parts in 2015 and 2019 with the goals of improving loan availability, lowering the upfront cost of all automobiles, and building the necessary infrastructure to support the use of environmentally friendly vehicles.

Green finance is the collective term for financial products including carbon market instruments, green bonds, and financial institutions like green funds and banks. Appropriate incentive structures are needed to maximise funding allocated to the adoption and establishment of green projects. Other production variables may follow for the sustained development of the green and environmentally friendly sectors once funding from the traditional industries is directed towards them. It eventually results in the best possible distribution of resources to sustain long-term growth. Targeted green finance policies that link all parties involved in economic growth have been formulated in major global economies in order to accomplish these goals.

1.Making an investment in sustainability
2. Eco-financial system within institutions
3. Offering rewards for public sector investments
4. Funding for small and medium-sized businesses based on energy efficiency through profit lines
5. Diversion of money flows between borders

Thegovernment has tofocus on thefollowingaspects forsustainabledevelopment

1. Credits for equity
2. Credits for production taxes
3. Endorsement of energy service providers
4. Supporting the IREDA, an institution for green funding
5. To grow the amount of equity convertible bonds used to finance green projects
6. Including renewable energy in sectors that are priorities
7. Outcome-based incentives
8. The National Clean Energy

MARKETINNOVATIONS

1. Credit improvement according to credit score
2. Linking the green agenda with the corporate bond market
3. Bonds made of green materials
4. To put yield companies in a position to grow as a sustainable plot form.

Twenty percent of India's total power energy comes from renewable sources. The capital structure of the companies must be repeatable, liquid, and inexpensive. Since they are more readily available on the market, stocks are the most suitable option for financing the growing industry's financial needs. Furthermore, dividend increase is contingent upon project expansion via equity sources as opposed to leveraged capital. Low-cost debt, however, can also be used to finance expansion. Fixed income securities are used by some businesses. In order to encourage and assist green finance activities, the Reserve Bank has also been implementing proactive policy measures. 2015 saw the addition of the small renewable energy industry to its Priority industry Lending (PSL) programme.

Thirteen businesses in the renewable energy sector are qualified for loans up to ~Rs. 30 crores under this initiative. Loans up to Rs. 10 lakhs are available to homeowners to invest in renewable energy. India declared in September 2019 that it wanted to achieve 450 GW of renewable energy.

production of energy by 2030. The Reserve Bank is promoting international green bond investments, information exchange on environmental hazards, and an improvement in the field of green finance in general.

The six subject areas covered by the recommendations of the Indian Inquiry concentrate particularly on actions inside the financial system: 1. Formulating a plan for sustainable capital markets: Increasing credit availability, modifying risk weightings, offering tax breaks, and building on SEBI's recent market rules might all contribute to the market's continued expansion for green bonds. By creating a sustainable financial system in India, infrastructure investment trusts, sometimes referred to as yield companies in the US, have a significant opportunity to generate equity money for illiquid green assets.

STRENGTHENING KEYSTONE FINANCIAL INSTITUTIONS

By creating products for takeout, guarantees, and loan-life extension, the Indian Renewable

Energy Development Agency (IREDA) could further enhance its crucial role. Revisions to operating rules and a clearly stated vision could increase the efficacy of the NCEF.

ALIGNING FINANCIAL REGULATIONSWITHSUSTAINABILITY

It is possible to take more steps to meet the requirements of Priority Sector Lending in order to allow the admission of more sustainable finance projects. Furthermore, renewable energy might have a separate exposure limit apart from the power industry as a whole. Ultimately, there is now a chance to integrate sustainability concerns into the oversight of India's financial sector thanks to the recently implemented Indian Financial Code (IFC).

BUILDING FINANCIAL SECTOR CAPACITIES

The financial sector needs to continue building its capacity in a number of areas, most notably financial ratings, financial disclosure, and "green credit" decision-making, which includes forestry and agricultural commodities.

INCREASING ACCESS TOSUSTAINABLE FINANCE

In order to promote energy conservation and climate change adaptation, access to sustainable finance is still insufficient in many regions, most notably for the Small and Medium Enterprises (SME) sector. Additional incentives are also needed to direct funding towards waste management, sanitation, and water resources.

MOBILIZINGINTERNATIONAL FINANCIAL FLOWS

India has a lot of potential to take advantage of the new International Solar Alliance and the Green Climate Fund. Lastly, modifications to external commercial borrowing regulations can enhance the amount of "green credit" coming from outside, and channels like the Green Infrastructure Investment Coalition, which has a substantial Indian representation, can draw in global institutional investors. Policymakers, regulators, and participants in the financial market can welcome the start of a new financial system design that addresses the demands, obstacles, and opportunities resulting from India's sustainable growth objectives within the parameters of these six thematic areas of interventions.

To strengthen India's financial system and ensure sustained growth, attention must be paid to the following factors:

It is imperative that the financial system be better equipped to address climate change and other sustainable development concerns by promoting innovation in the banking, insurance, securities, and investment sectors.

BANKING ON SUSTAINABILITY:

Investing in sustainable infrastructure and boosting the long-term viability of infrastructure projects is necessary to develop a sustainability-oriented market framework.Facilitating the Institutional Finance Ecosystem: The financial industry has to improve its skill set. Encouraging Public Sector Investments: Financing choices must consider sustainability as a criterion in order to create an institutional framework that supports the financing of sustainable infrastructure.

ACCELERATING EFFICIENCY GAINS IN SMALL AND MEDIUM-SIZED ENTERPRISES:

To improve energy consumption transparency and to seek finance support for filling capacity shortages related to enterprise efficiency, the SME sector has to strengthen its ability.Redirecting Cross-Border Financial Flows: In order to achieve long-term positive efficiency improvements, evidence-based

POLICIES AND REWARD SYSTEMS

There is need to provide incentives in particular sectors such as output based support or result basedfinancingforthewaste management sector.

The existing guidelines of National Clean Energy Fund need to be amended in order to sharpen itsoperational framework and improve its effectiveness and performance. A separate window should becreatedto allocatefundingforspecifictypes of projects thatimproveenergyaccess.

MARKETINNOVATION

- There is a need for credit rating and credit enhancement facility within the Government or FinancialInstitutionsthatwouldencouragethePensionFundsor Insurance Fundstoinvestincleanprojects.
- Green Bonds market is characterized by longer tenure and hence, it could be an attractive option ofinvestment in the clean energy space. To grow the green bonds market in India, the global bondsmarketandthesavings inIndiaortheprivatecapitalmarketcould betappedto addressthisagenda.
- Yield Company, an income-oriented investment vehicle being adopted by the companies to unlockvalue of long-term contracted assets that may be undervalued in existing business, access broad yieldfocused public investor base and create a buyer/ long-term owner for project developers. Yield Coenable access to low cost, liquid and repeatable capital source and generate predictable cash flows bybundlingup renewableassets withlong-term Power PurchaseAgreements(PPAs).

CONCLUSION

In India, financing renewable energy still faces a number of challenges, many of which are ingrained in the country's current financial system, including short loan terms, high capital costs, insufficient debt financing, etc., as well as industry-specific problems unique to the renewable energy industry. The economy must meet certain requirements in order for novel finance methods and tools to be successfully implemented. Transferring funds from carbon-emitting to carbon-mitigating sectors can be a crucial way for the financial industry to contribute to the overall reduction of climate change risks.

The last ten years have seen an increase in the rate of sustainable finance innovation in India, encompassing both state initiatives and a variety of voluntary market-led projects. In order to support green development nationwide, IREDA must be strengthened and given access to long-term funding and new credit lines. The Indian Banks Association has established voluntary national guidelines for responsible finance. The RBI's ruling on decentralised renewable energy and social infrastructure is part of the criteria for banks to lend to priority sectors. Guidelines for

the growth of the green bond market have been released by SEBI. Pradhan Mantri Fasal Crop insurance is extended via the Bima Yojana programme, and coal cess money is made available to the National Clean Energy Fund (NCEF). The primary financialfacilitators for greenfinanceto haveparadigmshift forsustainableeconomicgrowth.

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Trend and Growth analysis of area, production and productivity of Rice crop in different Climatic Zone in Chhattisgarh State in India

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ABSTRACT

ORIGINAL RESEARCH ARTICLE

Examined the trend analysis of area, production and productivity of rice crop in different climatic zone in Chhattisgarh state. The production was highly significant and low growth rate of 2.44 percent in Northern hills followed by Chhattisgarh plains (2.04 percent) and Bastar plateau (0.63 percent) of Chhattisgarh state. The productivity of rice in different area that rice yield had marginally growth in Northern hills (2.26%) followed by Chhattisgarh plains (1.38%) and Bastar plateau (0.10 percent) of Chhattisgarh state. In this study the overall rice area, production and productivity was low significant and growth rate of 0.54 percent, 1.93 percent and 1.38 percent.

INTRODUCTION

Agriculture is the only means of employment for almost all two-thirds of rural people in India and provides food grains to all the rising population in the country. It also provides fodder to sustain livestock comprising of cattle, buffaloes, sheep and poultry etc. Agriculture sector plays a vital role in Indian economy and it is the backbone of the country. Around 55 per cent of population is engaged in agriculture and allied activities and it contributes around 17 per cent to the country's Gross Value Added (Annual Report, 2016-17). Rice is the principal food crop in India. Rice is grown in an area of 43.79 M ha with a production of 116.42 Mt and productivity of 2659 kg/ha in the country occupying 22 per cent of gross cropped area of the country. Rice contributes 41 per cent of total food grain production occupying 35 per cent of food grain area of the country (2018-19).In Chhattisgarh, rice occupies average of 3.6 million hectares with the productivity of the state ranging between 1.2 to 1.6 tons per hectare depending upon the rainfall (Status Paper on Rice for Chhattisgarh). Under the conditions of low growth rates concerted efforts are required to increase the production in all major producing states to reach the projected demand of rice by 2050. Chhattisgarh is a state in central India; with a geographical area of 137.90 lakh hectares.

MATERIALS AND METHODOLOGY

The study was based on secondary data. The secondary data was collected from Chhattisgarh agriculture statistics, land record office, annual districts statistics and other published and unpublished reports. Methodology

Selection of Crop

Selection of area Chhattisgarh state from India was considered purposely for study purpose and all the 3 agro climatic zones viz Chhattisgarh plain, Bastar plateau and

northern hills were considered for details investigation. After considering zone, form each zone, all the covered districts were selected for analysis purpose. The rice crop was selected for the Present study in the all three agro climate region and all 27 district of Chhattisgarh state. The time series data from 2009-10 to 2018-19 were used to analyses absolute change, relative change, C.V, trend, growth rate, area effect, yield effect and interaction effect and projection purpose.

Analytical tools which are used to analyses the growth rates of rice crop in the Chhattisgarh state trend analysis was carried out using linear trend method.

Linear trend, Y = a + b x

Where, Y= Dependent variables (Area, Production and productivity)

a = Intercept

b = Regression co-efficient

x = Period (years)

N=number of observation Student

Student t test

$$t=|\boldsymbol{x}-\boldsymbol{\mu}|/\boldsymbol{s}\sqrt{\boldsymbol{n}}$$

Where, t= test statistics

$\boldsymbol{\mu}$=mean of sample

S=sample standard deviation

N=sample size

t calculated>t tabulated (significant)

t calculated< t tabulated (Nonsignificant)

Simple Growth Rate (SGR)

SGR (%) = $b/y \times 100$

Compound Growth Rate (CGR)

The compound growth rates (CGR) used to examine the growth rate in area, production and productivity of rice in Chhattisgarh state as a whole, using the exponential growth function of the form.

$Y= ab^t$

CGR (%) = (Antilog b – 1) x 100

RESULT AND DISCUSSION

Calculate the trend for area, production and productivity of rice crop in different agro climatic zone of Chhattisgarh state, the time series data of important variables viz area, production and productivity with special highlights on rice crop had been used for calculate the simple statistical tools like absolute change, relative change and coefficient of variation had been discussed accordingly. Linear trend was used for estimating the trend and growth rate. The value of regression coefficient of area, production and productivity of rice under different agro climatic zone of Chhattisgarh state had been provided in Table 1, 2 to 3.

Chhattisgarh plains

In case of Chhattisgarh plains, the value of regression coefficient of area in rice crop was found positive and significant at 5% and 1% level of significant in Balod, Balodabazar, Bemetara, Dhamtari, Durg, Gariyaband, Kabirdham, Kanker, Korba, Mahasamund, Mungeli and Rajnandgaon district, respectively while the regression coefficient of area in rice crop was found negative in case of Bilaspur, Janjgir-Champa, Raigarh and Raipur district in Chhattisgarh plain zone. In case of regression coefficient of production for rice crop out of 16 districts only 7 districts viz Balod, Balodabazar, Bemetara, Bilaspur, Kabirdham, Kanker and Raipur have negative trend value which shows that area of rice crop in this district were observed decreasing. while in remaining district viz Dhamtari, Durg, Gariyaband, Korba, Mahasamund, Mungeli, Raigarh and Rajnandgaon the value of regression coefficient was estimated positive and significant which indicate an increasing trend in area of rice crop. The value of regression coefficient of rice crop for productivity was found positive and significant at 5% level in Balodabazar, Bilaspur, Dhamtari, Durg, Gariyaband, Janjgir Champa, Korba, Raigarh, Raipur and Rajnandgaon districts. It was observed to be 0.01, 0.02, 0.04, 0.06, 0.04, 0.03, 0.01, 0.07, 0.12 and 0.001 percent, respectively. In case of productivity of rice crop the regression, coefficient was found negative and significant in Balod, Bemetara, Kabirdham, Mahasamund and Mungeli district with 0.04, 0.06, 0.03, 0.02, 0.01 and 0.04 percent, respectively.

Table 1: Linear trend in area, production and productivity of rice crop in Chhattisgarh plains zone of Chhattisgarh State

	Area		**Production**		**Productivity**	
District	**Regression co-efficient(b)**	**intercept(a)**	**Regression co-efficient(b)**	**intercept(a)**	**Regression co-efficient(b)**	**intercept(a)**
1.Balod	0.80* (1.57)	176.18	-5.54* (14.68)	350.22	-0.04* (0.11)	1.99
2.Balodabazar	0.95* (2.03)	222.84	-5.54* (14.68)	351.12	0.01* (0.07)	1.51
3.Bemetara	3.58* (3.52)	140.70	-4.05* (11.10)	246.74	-0.06* (0.08)	1.93
4.Bilaspur	-9.14* (1.25)	291.80	-7.11* (28.63)	446.18	0.02* (0.13)	1.58
5.Dhamtari	1.33* (5.92)	166.04	9.80* (37.69)	166.04	0.04* (0.16)	2.21
6.Durg	2.20* (2.75)	115.11	10.66* (24.85)	11.00	0.06* (0.17)	1.54
7.Gariyaband	1.98* (2.02)	125.50	8.22* (19.19)	154.76	0.04* (0.13)	1.25
8. Janjgir-Champa	-0.91* (3.41)	265.51	4.07* (30.42)	695.02	0.03* (0.11)	2.60
9.Kabirdham	1.94* (2.04)	90.78	-0.52** (7.29)	129.80	-0.03* (0.08)	1.41
10.Kanker	1.64* (1.65)	169.23	-1.55* (34.03)	344.18	-0.02* (0.19)	2.01
11.Korba	0.02* (0.10)	109.18	1.23* (9.51)	134.27	0.01* (0.09)	1.24
12.Mahasamund	2.86* (3.02)	258.31	2.55* (24.22)	419.72	-0.01* (0.09)	1.61
13.Mungeli	1.68** (1.67)	101.13	0.60** (9.62)	229.30	-0.04* (0.09)	2.24
14.Raigarh	-72.65* (1.95)	240.80	14.80* (27.22)	278.71	0.07* (0.11)	1.16
15.Raipur	-35.59* (2.81)	442.56	-29.77* (32.93)	600.47	0.12* (0.18)	1.22
16.Rajnandgaon	3.40** (4.10)	264.40	3.36* (3.97)	381.90	0.001* (0.13)	1.43
Total	-95.87	3180.0	-2.66	132.73	-57.86	1.69

*, ** shows 5 and 1 percent level of significance, respectivelyFiginbracketsshowstheSEo fconcernedregressionco-efficient

On the above table we concluded that the trend coefficient of production was positive and significant in Dhamtari Durg Gariyaband, Janjgir-Champa, Korba, Mahasamund, Mungeli, Raigarh and Rajnandgaon and in productivity the district covered was Balodabazar, Bilaspur, Dhamtari, Durg, Gariyaband, Janjgir Champa, Korba, Raigarh, Raipur and Rajnandgaon gained its impact of the crop. The analysis also revealed that there was a significant reduction in area under Bilaspur, Janjgir-Champa, Raigarh and Raipur districts although decreasing its impact

in area location but keep its productivity level in all the districts which is encouraging.

Bastar Plateau

As far as the trend coefficient of production of rice crop was concerned the value of coefficient was negative and significant in Bastar, Dantewada, Kondagaon and Narayanpur district but only in two districts viz Bijapur and Sukma were found positive and significant at 5% level. The trend coefficient for rice crop area were observed negative and significant in Bastar, Bijapur, Dantewada, and Narayanpur while in Kondagaon and Sukma districts the coefficient was positive and significant at 5% level. The trend coefficient for rice productivity was negative and significant in all the districts of Bastar plateau zone.

Table2: Linear trend in area, production and productivity of rice crop in Bastar Plateau zone of Chhattisgarh State

District	Area		Production		Productivity	
	Regression co-efficient (b)	intercept (a)	Regression co-efficient (b)	intercept (a)	Regression co-efficient (b)	intercept (a)
1. Bastar	-10.80* (0.5)	214.37	-6.82* (16.18)	257.65	-0.04* (0.12)	1.99
2. Bijapur	-0.98* (0.69)	98.89	0.53* (7.40)	57.47	-0.03* (0.12)	1.70
3. Dantewada	-60.26* (0.83)	115.68	-10.03* (11.15)	171.54	-0.04* (0.16)	1.62
4. Kondagaon	1.10* (1.14)	94.79	-0.87* (10.07)	157.28	-0.02* (0.10)	1.65
5. Narayanpur	-0.21* (0.57)	26.03	-1.23* (3.49)	39.30	-347.00** (0.12)	1.48
6. Sukma	1.93* (1.91)	65.64	2.47* (10.11)	113.16	-0.0004* (0.13)	1.69
Total	-69.22	615.4	-15.95	796.4	-347.13	10.13
*,**shows 5 and 1 percent level of significance, respectively Fig in brackets shows the SE of concerned regression co-efficient						

On the above table in case overall study we concluded that the area of rice was increased in Kondagaon and Sukma district and in production point of view Bijapur and Sukma district maintain its importance. But in case of productivity trend, all the districts found negative and significant trend which indicates that there is no impact of improved technology in that area.

Northern hills

The value of regression coefficient of area in rice crop was found positive and significant at 5% level of significant in Balrampur, Jaspur, Surajpur and Sarguja district respectively while the regression coefficient of area in rice crop was found negative in Korea district in Northern hills zone. In case of production the value of regression coefficient for rice crop out of 5 districts only 2 districts viz Jashpur and Sarguja have negative trend value which shows that area of rice crop in this district were observed decreasing while in remaining districts viz Balrampur, Korea and Surajpur the value of regression coefficient was estimated positive and significant which indicate an increasing trend in area of rice crop. In case of regression coefficient of productivity of rice crop was found negative and significant in Balrampur and Jashpur district with 0.02 and 0.04.

Table3: Linear trend in area, production and productivity of rice crop in Northern Hills zone of Chhattisgarh state

District	Area		Production		Productivity	
	Regression co-efficient(b)	**Intercept (a)**	**Regression co-efficient(b)**	**Intercept (a)**	**Regression co-efficient(b)**	**Intercept (a)**
1. Balrampur	0.98* (1.16)	75.48	0.27* (6.09)	129.14	-0.02* (0.01)	1.71
2. Jashpur	0.39* (0.52)	179.23	-7.16* (7.29)	268.93	-0.04* (0.09)	1.49
3. Korea	-0.14* (0.76)	69.39	1.43* (9.62)	84.39	0.02* (0.13)	1.20
4. Surajpur	0.04* (0.49)	105.70	1.67* (6.89)	154.60	0.01* (0.06)	1.46
5. Sarguja	18.36* (1.63)	255.74	-9.93* (9.86)	254.62	0.05* (0.07)	1.13
Total	19.63	685.54	-13.72	891.68	0.02	6.99
*,**shows 5 and 1 percent level of significance, respectively Fig in brackets shows the SE of concerned regression co-efficient						

According to above information overall we could be concluded that the area of rice was increased in Balarampur Jashpur Surajpur and Sarguja district. In production point of view Balrampur, Korea and Sarguja maintained it importance. But in case of productivity trend in Korea, Surajpur and Sarguja were positive and significant. The analysis also revealed that there was significant reduction in area under Korea district although decreasing its importance in area allocation but keeping its productivity level in all the districts which is encouraging.

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Conversion of Sugarcane Bagasse for production of Ethanol using Saccharomyces cerevisiae

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ABSTRACT

ORIGINAL RESEARCH ARTICLE

The purpose of this study is to use a fermentation procedure to manufacture bioethanol from sugarcane bagasse and to ascertain how temperature and pH affect the output of bioethanol. Utilizing enzymes like glucoamylase and alpha-amylase, the cellulose in sugarcane bagasse was broken down. In the experiment, yeast, specifically Saccharomyces cerevisiae, was also utilized for fermentation. To investigate the impacts of pH on ethanol yield at 37^0 C, five samples were prepared at different pH values. In addition, five samples were prepared while maintaining a constant pH of 4.5 to investigate the effects of temperature on ethanol output. After subjecting the samples to High-Performance Liquid Chromatography, the quantities of ethanol were ascertained (HPLC). The findings demonstrated that pH 4.5 and the maximum ethanol concentration were reached.

INTRODUCTION

Bioethanol, a type of renewable fuel, is gaining increasing attention as an alternative to traditional fossil fuels due to its potential to mitigate environmental impacts and reduce dependence on non-renewable resources. Produced through the fermentation of biomass, particularly sugars and starches derived from crops or organic waste, bioethanol offers a promising avenue for sustainable energy production (Misono and Yamaguchi, 1990).

The production of bioethanol involves several key steps, beginning with the selection and preparation of biomass feedstocks. Common feedstocks include sugarcane, corn, wheat, and cellulosic materials such as agricultural residues, forestry waste, and dedicated energy crops like switchgrass. These feedstocks are processed to extract fermentable sugars, which serve as the primary precursor for ethanol production. Once the biomass is obtained, it undergoes pretreatment to break down complex carbohydrates into simpler sugars, making them more accessible to fermentation microorganisms (McMeckin, *et al.*, 2002; This step may involve mechanical, chemical, or enzymatic treatments to optimize sugar release. Subsequently, the pretreated biomass is subjected to enzymatic hydrolysis, where enzymes break down polysaccharides into fermentable sugars such as glucose and xylose.

The next crucial stage is fermentation, where microorganisms such as yeast or bacteria metabolize the sugars present in the biomass feedstock to produce ethanol and carbon dioxide (Torija, et al., 2003). Yeasts are commonly used due to their high ethanol

tolerance and efficiency in converting sugars to ethanol under anaerobic conditions. Fermentation conditions such as temperature, pH, and nutrient availability are carefully controlled to maximize ethanol yield and minimize the formation of unwanted by-products (Lucero, *et al.*, 2000; Narendranath, *et al.*, 2001)

Following fermentation, the resulting ethanol mixture undergoes purification to remove impurities and water, typically through distillation, dehydration, and rectification. This purification step is essential for achieving the desired ethanol concentration suitable for blending with gasoline or other fuel applications (Narendranath and Power, 2005).

Bioethanol production offers several environmental and economic benefits. Firstly, it contributes to reducing greenhouse gas emissions compared to fossil fuels, as the carbon dioxide released during ethanol combustion is offset by the carbon dioxide absorbed during biomass growth. Additionally, bioethanol production can create opportunities for rural development, providing income for farmers and fostering regional economic growth (Pramanik K., 2003).

However, bioethanol production also poses certain challenges and considerations. Competition with food crops for land and resources raises concerns about food security and land use sustainability (Nigam, J. N., 1999; Togarepi, *et al.*, 2012). Furthermore, the energy balance of bioethanol production, including the energy inputs required for cultivation, processing, and transportation, must be carefully evaluated to ensure overall environmental sustainability (Yadav, et al., 1997).

In conclusion, bioethanol production represents a promising pathway towards sustainable energy production, offering the potential to reduce greenhouse gas emissions, promote rural development, and decrease reliance on finite fossil fuel resources. Continued research and technological advancements are essential to address challenges and optimize the efficiency and sustainability of bioethanol production processes.

MATERIAL & METHODS

The local market of Ganganagar, Meerut U.P. provided the sugarcane bagasse. After harvesting sugarcane bagasse, about 1 kg was removed and sun-dried for two weeks to extract all of the juice and remaining moisture. To make sure the bagasse was completely dry, it was further dried for two hours at 60 °C in an oven. The local milling machine was used to grind the dried bagasse. After grinding, 200g of powdered bagasse was found.

Enzymatic hydrolysis of sugarcane bagasse

10g of sugarcane **bagasse**was weighed. The weighed sample was placed into conical flask and 200ml of distilled water was added to the sample. 0.5 ml of NaOH was added to adjust the pH to 4.5. then 0.2 microliters of enzyme alpha- amylase diluted with phosphate buffer was added. The mixture was heated until 50^0C.The mixture was cooled down to 40^0C. Then, 0.2 microliters of secondary enzyme, glucoamylase was added. The mixture was maintained at 50^0C as the glucoamylase hydrolyzed the dextrin to fermentable glucose. The mixture was cooled down to 32^0C and 10 ml of *Saccharomyces cerevisiae*was added to the sample before transferred to conical flask.

Fermentation of sugarcane

Saccharomyces cerevisiae fermented the simple sugar to ethanol and carbon dioxide. To determine the effects of pH on ethanol yield, the temperature was kept constant at 37^0C while the pH was varied from 3, 3.5, 4, 4.5, and 5. To determine the effect of temperature on ethanol yield, the pH was kept constant at 4.5. The fermentation process continued for 48 hours (Yah, et al., 2010).

Distillation of ethanol

After 48 hours, the sample was filtered using Whatman Filter Paper to separate the ethanol from the residue. The bioethanol was distilled. The sample was heated at 80^0C to get the bioethanol.

Determine bioethanol yield

Bioethanol produced was analyzed by high-performance liquid

chromatography(HPLC). The HPLC analysis parameters were determined using the following conditions: column, C18 RP (53 x 7mm); injector temperature was 30°C, 20 µL of the sample was injected into the HPLC system. The mobile phase was phosphoric acid and the flow rate was 1.5mL/min; and detection was set at a wavelength of 210 nm (Phisalaphong, *et al.*, 2006).

RESULTS & DISCUSSION

Calibration curve

The standard was prepared at different concentrations to such as 25%, 50%, 75%, and 100%. The calibration equation of the ethanol standard was determined to be y = 367.94x-2853 (R^2 = 0.9515)

Table 1: Standard calculation

Concentration (%)	Volume of ethanol Standard (ml)	Volume of mobile phase (ml)	Peak Area
25	0.5	1.5	5241
50	1.0	1.0	15233
75	1.5	0.5	28750
100	2.0	0	31352

Effects of pH on ethanol concentration

The sample was fermented at different pH values from 3, 3.5, 4, 4.5, and 5 while the temperature was kept constant at 37^{0}C to obtain the maximum yield of bioethanol Table 2.

Table 2: The Effects of pH on Ethanol Concentration (%) in Water

pH	Ethanol concentration in water (%)
3.0	10.2
3.5	11.1
4.0	11.3
4.5	13.4
5.0	8.2

Based on the results obtained, pH 4.5 showed the highest ethanol content. The lowest ethanol concentration was achieved at pH 5.0. The maximum ethanol concentration in water at pH 4.5 reflects enzyme function in an environment [1] while the lower ethanol concentration in water at pH reflects lesser yeast activity.

Effects of temperature on ethanol concentration

Temperature is one of the major factors that determine ethanol production. Table 3 shows the ethanol concentration obtained at different temperatures. Based on the result obtained, no ethanol concentration in water was observed at 25 and 30^{0}C.

Table 3: Effects of temperature on ethanol concentration in water (%)

Temperature (^{0}C)	Ethanol concentration in water with water (%)
25	3.4
30	3.8
35	12.7
40	11.3
45	11.1

However, as the temperature increases beyond 30^0C it shows an increase in the production of ethanol. At 35^0C ethanol concentration in water was maximum and turned out to be 13.7% followed by 40^0C where 12.3% ethanol was obtained.

CONCLUSION

This study shows that pH 4.5 showed the highest ethanol content which is 14.8 %, followed by pH 4.0 which is 11.9 %, then pH 3.5 at 11.6 %, and pH 3.0 at 10.7 %. The lowest ethanol concentration was achieved at pH 5.0. The study also shows that at 35^0C ethanol concentration in water was maximum and turned out to be 13.7% followed by 40^0C where 12.3% ethanol. The Conclusion is that pH 4.5 and 35^0C are the optimum conditions for ethanol production.

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

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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

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.

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

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.

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Standardization and Organization of Student's learning Necessities enhancement Through Quality Function Deployment (QFD)

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EDUCATION – A SYSTEM TO IMPART KNOWLEDGE

Education is a system of imparting "knowledge" to the individual/group, that comes into existence due to some individual(s)experiences and past researches. Before mitigating to the aspects of education firstly we have to understand the term "Knowledge." Knowledge is a term having the familiarity with something, which can include facts, information, descriptions, or skills acquired through experience or education. It can refer to the theoretical or practical understanding of a subject. It can be implicit (as with practical skill or expertise) or explicit (as with the theoretical understanding of a subject); and it can be more or less formal or systematic [1].

An old proverb explains knowledge as "Wisdom." But knowledge as every common one understands is the capacity of mind to remember the things. The person who remembers the things more is more knowledge-full, isn't it? But is exactly the knowledge the same as we concern about it? What if remembered things are not demonstrated/utilized when needed? In such situations, it is total failure of the person and also the failure of the system of imparting knowledge, i.e., education.

Now evidently it becomes extremely important to reinforce/reconstruct the system of knowledge which duly emphasizes on learning. And now the question arises what are the things that encompass the knowledge with learning. Basically, knowledge is the modus operandi of some of the following aspects,

1. Understanding/utilization of things efficiently
2. Experiences
3. Education/Research

Although education is not the necessary aspect for grasping knowledge, but it is still vital from the view that one can be judiciously nourished if the systematic process approach is followed. To develop a system of knowledge as desired, one of the major obstructions while catering to the students' learning requirements is that, as our

traditional education culture not encompasses the gamut of holistic development. "*Traditional education focuses on teaching, not learning. It incorrectly assumes that for every ounce of teaching there is an ounce of learning by those who are taught. A child learns such fundamental things as how to walk, talk, eat, and dress, and so on without being taught these things. Adults learn most of what they use at work or at leisure while at work or leisure. Most of what is taught in classroom settings is forgotten and much of what is remembered is irrelevant*" [2]. It is imperative to grasp the knowledge from learning as Patrick White in his novel *The Solid Mandala* commented that "*I don't know...I forget what I was taught. I only remember what I've learnt."* Furthermore, Oscar Wilde argues that "*Education is an admirable thing, but it is well to remember from time to time that nothing that is worth learning can be taught."* Knowledge thus should be recognized as some such experiences which are remembered and utilized efficiently when needed. Therefore, emphasis is made to develop such schemes that cater to the mental power of utilization and remembrance.

Journey toward Excellence through Success

Success is the measure of a person's capabilities to do things efficiently or the degree of perfection. And often success is a result of learning through failures and experiences as supported by Malcolm Forbes, "*Failure is success if we learn from it*." Therefore, success is paradigm of both learning and mistakes as given below:

Success = Learning – Mistakes

It is prime responsibility to teach students "how to learn." Meanwhile one should also help students to get rid of usual common mistakes. Figure1 below demonstrates the ideology of failure, success and excellence.

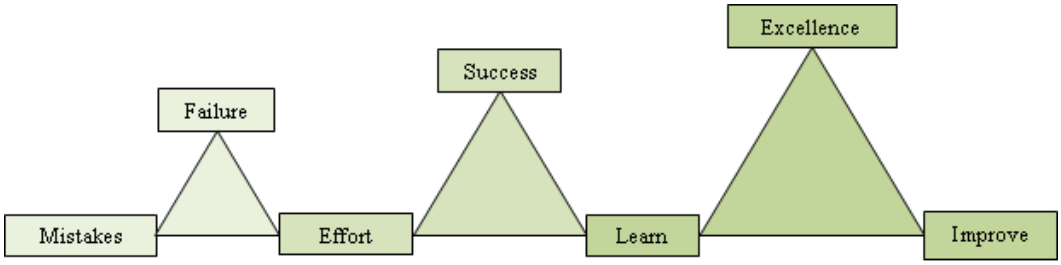

Fig. 1: *Journey from Failure to Excellence through Success.*

Figure 1 clearly depicts the fact that

1. Efforts + Mistakes = Failure
2. Learning + Efforts = Success
3. Learning + Improvement = Excellence

Therefore, eliminating the mistakes from the efforts, and applying the efforts with learning, and continuous improvement in learning are the key elements for achieving excellence. Figure1 clearly indicates how small changes in existing culture are intended to develop a new and better culture.

Developing Knowledge @ Learning

As learning proliferates from the ability to grasp the knowledge @ desires, people are always vital from prospect that they led and facilitate the development processes. Meaning of learning differs from person to person as the learning imperatives are the result of individual's perspectives. Rudyard Kipling in his famous rhyme says, "I keep six honest serving men, they taught me all I know- their names are *what* and *why* and *where* and *when* and *how* and *who*." His learning is the result of his ability to understand things through sets of questionnaires. Albert Einstein acknowledges abilities as the paradigm of hard working as he quotes, "*Genius is 1%talent and 99% percent hard work...."*Therefore, learning ability is compilation of training, hard work, and understanding.

One of the essential requirements is to properly nourish the learners in order to grant society-friendly development. Supported by Albert **Einstein**, "*Never regard study as a duty but as an enviable opportunity to learn to know the liberating influence of beauty in the realm of the spirit for your own personal joy and to the profit of the community to which your later works belong."* And knowledge should be intensified by developing ability of innovative thoughts as Abraham Maslow asserts, *"If the only tool you have is a hammer, you tend to see every problem as a nail."* Thus, only the open-minded approach facilitates the inventiveness and learning through understanding the process. Similarly, teaching should be broad focused as claimed by **Clay P. Bedford, "***You can teach a student a lesson for a day; but if you can teach him to learn by creating curiosity, he will continue the learning process as long as he lives.*" Supported by a famous **Chinese proverb, "***Tell me and I'll forget; show me and I may remember; involve me and I'll understand.*"

Therefore, learning ability is very important and presently a model to enhance learning is shown in Figure 2. The three main elements of learning are given as:

1. Explore
2. Grasp
3. Innovate

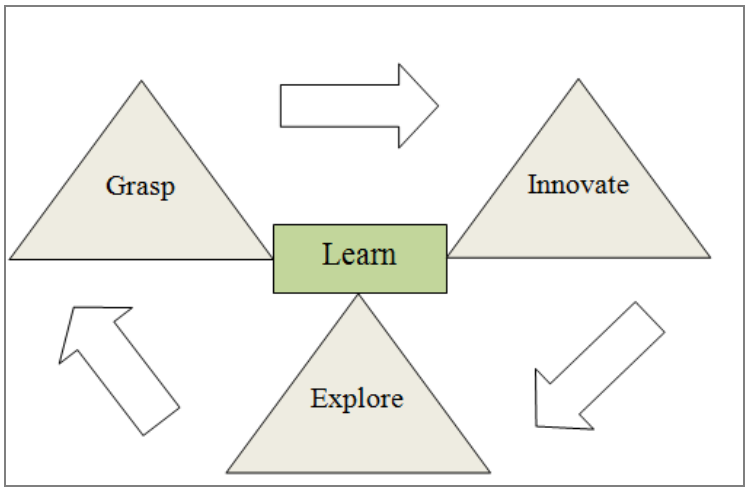

Fig. 2: *Three Vital Key Elements of Learning.*

First step towards learning is to explore the things and then grasp the knowledge allied with them, and then use knowledge as a base to innovate/develop new things/knowledge. Figure2 shows a cyclic workapproachin order to enhance learning abilities of individual(s). When a systematic process is allied in such a cyclic manner, then the motto should be to develop the following attributes amongst the learners:

1. Problem solving
2. Soft skill
3. Critical thinking
4. Ethical

Leading this way,the above four attributes can greatly impact on the socio-friendly development. When every individual is educated through such a learning process, the end result would be optimum. Therefore, it is very important to facilitate the learning scheme throughout education as only and only the learning @ utilization is key factor regarding future development.

Deploying Functionalities of Quality Attribute

Quality function deployment (QFD) is the tool used to fulfill the demanding customer's requirements up to their satisfaction. QFD is a structured method, developed by Akao (1990) "…*to transform user demands into design quality, to deploy the functions forming quality, and to deploy methods for achieving the design quality into subsystems and component parts, and*

ultimately to specific elements of the manufacturing process" [3].QFD works on the basic House of Quality (HOQ) for determining the customers' needs and transforms these needs into the process voice as shown in Figure 3.

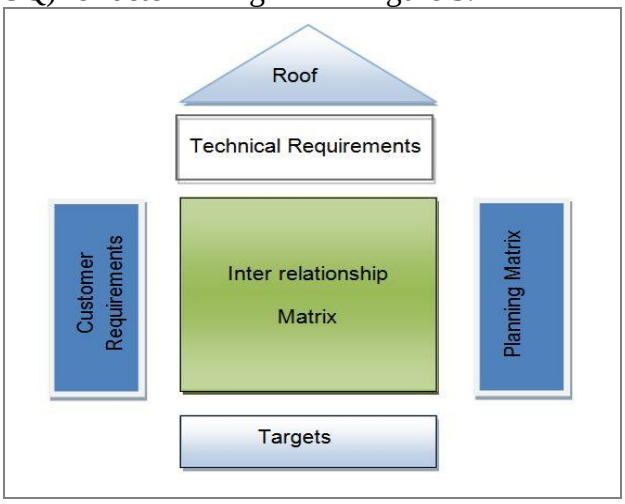

Fig. 3: *The Constructs of House of Quality.*

In the extreme left of the house, customers' requirement are placed, duly collected by surveying customers, and converted from stated voice to technical requirements. The second step is to evaluate one's own performance with that of competitors which helps compare how well this organization met the voice of customers as compared to that of her competitors. This matrix for peer comparison is on the extreme right. This comparison is done by giving a ranking "between" 1 to 5 to different organizations for their processes of fulfilling customer requirements. That helps in understanding organizations' provision well. The third matrix to be filled in is the top box below the roof. The bigger square – called interrelationship matrix is used to show the interaction between the customer's requirements and the technical requirements. It collates what's (left) and how's (right). In the roof of the house relation between various technical requirements are enumerated as strong relation, negative relation and no relation. The "target" component indicates the extreme limit to which an organization tries to fulfill the customers' needs.

Enhancing Learning Competencies through QFD

Derived elements of learning as problem solving, ethical, soft skills and critical thinking are taken as the basis input (VOC), to QFD and the outputs as shown in Table 1.

Table 1: *Listing various Customer Requirements and Process Voice.*

S. No.	Voice of customer	Voice of process
1	Problem solving	Innovation
2	Soft skill	Use of New Technology
3	Critical thinking	Brainstorming
4	Ethical	Cultural Renovation

The technical requirements commensurate to fulfill the holistic customer's needs and significant importance learning exerts on the developmentare:

1. **Innovation:** Innovation ensures two things better, i.e., development and updatedknowledge. It is,therefore,important imperatives for the sound and competitive education practices. Innovation is the creation of better or more effective products, processes, services, technologies, or ideas that are accepted by markets, governments, and society [4]. Therefore, innovation certainly acts as a problem-solving tool.

2. **New Technology:**The word *technology* comes from Greek *τεχνο-λογία (technologία)*; from *τέχνη (téchnē)*, meaning "art, skill, craft," and *-λογία (-logía)*, meaning "study of-"[5]. Technology is always vital to assist any individual for socio-techno-eco-friendly development. And the use of technology enhances the soft-skills of the individual.
3. **Brainstorming:** Brainstorming is a more effective method for generating ideas, as Osborn claimed that two principles contribute to "ideative efficacy." these are "*Defer judgment*" and "*Reach for quantity*" [6]. Brainstorming is actually the working in the group to generate new ideas with the principle as "1 + 1 = 3," i.e., combining of two ideas to generate a new idea. Thus, brainstorming helps to develop critical thinking amongst learners.
4. **Cultural Renovation:** Culture (Latin: *cultura*, lit. "Cultivation") is the term used for the pattern of human knowledge, belief, and behavior that depends upon the capacity for symbolic thought and social learning[7]. Thus, to cult the society with ethics everyone is liable and renovation in the culture towards pacifism plays an important role.

CONCLUSIONS

Every individual needs provocation about the righteous path to be followed. Thus, teacher's prime responsibility is to intentionally design the favorable path. When learning incompliance with education is used to grow the students, then the results would always be better. Learning abilities should always be groomed as:

1. Problem solving @ innovation
2. Soft skills @ technology
3. Critical thinking @ brainstorming
4. Ethical @ cultural renovation

Therefore, every individual should always be harnessed with quality (system, thinking, and approach), so that they lead the development with quality processes as quality in the product is the quality in the use.

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Determination of Antioxidant Activity in Milk Extracts

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ARTICLE INFO **ABSTRACT** **ORIGINAL RESEARCH ARTICLE**

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Antioxidants are mainly non-nutrient compounds in both human and animal feed, but have the antioxidant capacity in vitro to provide an artificial power index in preventing the destruction of cells and tissue potential by inhibiting nutrient oxidation. Milk contains lipophilic and hydrophilic antioxidants, which play a key role in maintaining. The efficiency of extraction for determining the antioxidant activity of milk corresponds to the method used for plant extraction and it is in a strong linear positive correlation. For this purpose, the phosphor molybdenum method based on the reduction of Mo (VI) in Mo (B) in samples of milk. Extracts obtained with methanol + ethanol Soxlet method. Green complexes formed at acidic pH value and spectrophotometric in the UV range at wavelength λ = 695 nm measurement. The values of milk primers are compared with respect to the calibration curve of IUPAC (3,4,5-Trihydroxybenzoic acid) or gallic acid, measuring range (0.00 to 14.00 µg / ml, y = 0.0344 + 0.0519, R^2 = 0.9709). Milk samples tested for antioxidant activity. 10 measurements of absorptions were made on each of the 4 samples of milk extracts and statistics in Excel. The results concentration, c = 3, 80; 2.35; 3.78; 4.85 / (µg / ml). The highest value of antioxidant activity in packs milk, which has 3.2% fat, also affects the fat and the presence of vitamin E, which found in fat droplets and has a synergistic effect with vitamin C. It concluded that the highest value of the total antioxidant activity in milk obtained from the first sample due to the use of several types of feed - alfalfa, two types of concentrated and straw, which proves the dependence of antioxidant activity on the impact of nutrients, that is, of their type and quantities.

INTRODUCTION:

Antioxidant activity is the result from the content of antioxidants - substances that inhibit oxidation, prevent or reduce oxidative damage in the body. There are three main types in nature: enzymes, vitamins and phytochemicals. Antioxidants are molecules that easily and safely deliver one or more electrons (Irshad, 2002). According to Pokorny J., and Korczak J., (2001), antioxidants defined as compounds that inhibit or delay the oxidation of other molecules by inhibiting initiation or the propagation of oxidative chain reactions. Studies of total antioxidant activity by Carlsen H.M., et al., (2010), have be performed on more than 3,100 foods, beverages, spices, plants, and supplements used in the human and non-plant world of non-plant foods. In practice, several in vitro tests and procedures are important for

the development of antioxidant activity in specimens of interest today. Some broader comparisons of different in vitro methods have be made by Badarinath A. V., et al., (2010) and discuss that methods and procedures can be grouped. According to Mavromichalis I., (2012), a natural guarantee for animals to get a good amount of food is the daily addition of antioxidants to their food such as vitamin C, vitamin E, selenium and beta-carotene.

Material and Methods:

Samples of milk extracts from four farms used for this purpose. The reaction of the extracts is in the formation of molybdenum. Based on the reduction of the molybdate Mo (VI) to Mo (V) in the samples, green complexes formed at acidic pH and the absorption and concentration of the samples are determined, spectrophotometrically at a wavelength of 695 nm. First the calibration solutions from the standard gallic acid read, a standard gallic acid curve is constructed. The absorbed readings from the samples applied to the standard curve and the concentrations of the samples read. Samples of cow's raw milk from three farms and one commercial milk for sale examined in the following order:

1. Raw cow's milk from farm A,
2. Raw cow's milk from farm B,
3. Raw cow's milk from farm C,
4. Cow's milk pasteurized with 3.2% fat (commercially in tetrapack).

Milk Extraction:

Samples of cow's raw milk from three farms (randomly) from three different sites were extracted with 6% trichloroacetic acid (CCl3COOH 99%, Sigma Aldrich). Preparation of the filtrate (whey fraction) Put 15 ml of 6% trichloroacetic acid (TCA) in a 50 ml vial, add 5 ml of milk and stir with a glass rod until fine suspension. Leave at room temperature for 5 minutes. The supernatant is then separated by centrifugation at 7550 rpm-1 (RCF = 5410g) in a Hettich Universal 320R (Andreas Hettich GmbH - Germany) centrifuge for 10 minutes. The resulting supernatant filtered through Whatman No. filter paper. 1.

Total antioxidant capacity

From the review of NurAlam et al. - NurAlam et al., (2013), who have listed 19 methods for determination of antioxidant activity in vitro and 10 methods in vivo, we used the method for determination of antioxidant activity in samples milk in vitro, phosphomolybdate method.

PHOSPHOMOLYBDATE METHOD:

The molybdate test used for this purpose based on the reduction of Mo (VI) to Mo (V) from the sample and the subsequent formation of a green phosphate / Mo (V) complex at an acid pH (NurAlam et al. NurAlam et al., 2013; Prieto et al., 1999; George et al., 2016; Houten, Raman - Houghton, Raman, 1998). Place 1 ml of test extract and 1 ml of reagent (0.6 M sulfuric acid - 95%, AnalaRNormapur, VWR Chemicals), 28 mM sodium phosphate, Merck and 4 mM ammonium molybdate (Merck) in a test tube. The tubes are incubated in a water bath at t = 950C for 90 minutes. The mixture then cooled to room temperature and the wavelength absorption of 695 nm per spectrophotometer (SpectroquantPharo 300 Merck) measured at each test. The spectrophotometer subjected to self-testing, zeroed with a blank test - water, and then for each test, which contains a test sample, a blank test is made containing 1 ml of reagent solution and an approximate volume of the same solvent. The procedure takes place under the same conditions as the analyzed samples only without a sample. The standard curve is prepared with known concentrations (0.2-14 μg / ml) of gallic acid (Galic acid, Cayman Chemical Company). The antioxidant capacity of the extracts expressed as the ratio of the gallic acid equivalent per gram of dry extract (m GAE / g). According to Prieto et al. - Prieto et al. (1999), ascorbic acid (2 mM) used as a positive control, corresponding to the value of 30.80 mM GAE.

Standard gallic acid curve:

Preparation of basic solution of gallic acid $C_6H_2(OH)_3COOH$ or (C7H6O5) with Mt = 170.02 g / mol or 1 M solution: weigh 0.170 g of gallic acid in a 100 ml flask (90 ml H2O and 10 ml of absolute methanol , CH3OH). Appropriate solutions with concentrations are prepared from the standard solution: 0.2 mM - 1.4 mM. Place 1 ml of standard extract and 1 ml of reagent (0.6 M sulfuric acid - 95%,

AnalaRNormapur, VWR Chemicals), 28 mM sodium phosphate, Merck and 4 mM ammonium molybdate (Merck) in a test tube. The tubes are incubated in a water bath at t = 950 C for 90 minutes. The mixture then cooled to room temperature and the wavelength absorption of 695 nm per spectrophotometer (SpectroquantPharo 300 Merck) measured at each test.

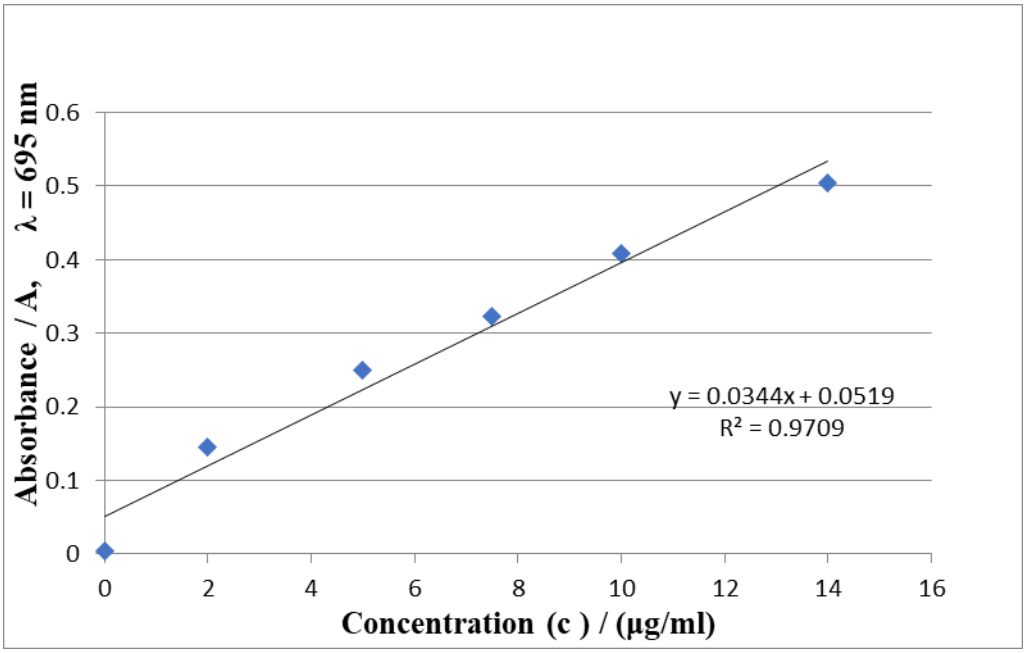
Statistical analysis:

The results expressed as mean ± standard deviation and the statistical significance of the differences was determined using one-way analysis of variance, student t-test. Differences are considered significant if p <0.05. The values are displayed as mean ± SD (n = 3).

RESULTS:

Standard gallic acid curve:

Concentrations of reduced Mo (VI) valence in Mo (V) valence in feed extracts are read on a standard gallic acid curve, the concentration values are graphically shown in Graph 1, in the measuring range (from 0.00 to 14, 00 µg / ml, y = 0.0344 + 0.0519, R2 = 0.9709).Graph 1 shows the absorptions and concentrations of gallic acid from which read the corresponding concentrations of reduced molybdenum Mo (V) for all samples, both for animal feed extracts and milk extracts.



Graph 1: Standard gallic acid curve

Table 1 shows the absorption values of 4 samples of milk extracts and statistics are made in Excel. The mean $(x)^{-}$,standard deviation s as well as the relative standard deviation RSD or coefficient of variation (CV) are calculated.

Milk samples				
No. measurements	**1**	**2**	**3**	**4**
1	0,215	0.17	0.167	0.209
2	0.211	0.171	0.167	0.219
3	0.178	0.171	0.173	0.219
4	0,173	0.139	0.172	0.188
5	0.188	0.14	0.150	0.248
6	0.198	0,139	0.155	0.24
7	0.178	0.14	0.153	0.247

8	0.175	0.17	0.160	0.198
9	0.19	0.13	0.170	0.21
10	0.18	0.132	0.177	0.22
n = 10				
$\bar{x}$	0.187	0.151	0.164	0.220
s	0.012	0.018	0.009	0.020
RSD /%	6.576	12.149	5.664	9.154

Table 1: Statistical analysis of reduced Mo (VI) absorbents in Mo (V) in milk extracts

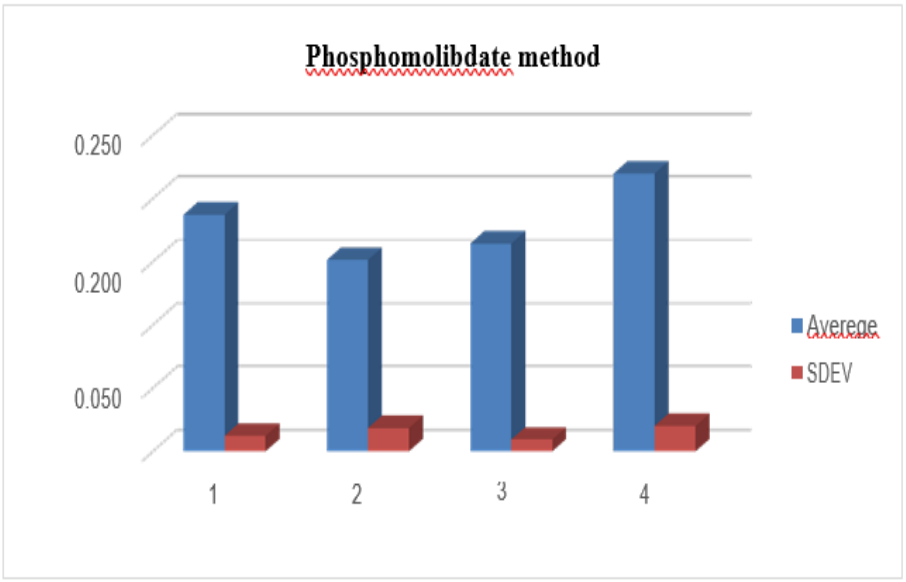
Table 2 shows the concentration and absorbance of reduced molybdenum Mo (VI) to Mo (VI) in milk extract samples.

Concentration (c) / (µg/ml)	**Absorbance (A) λ = 695 nm**
3.80	0.187
2.35	0.151
3.78	0.164
4.85	0.22

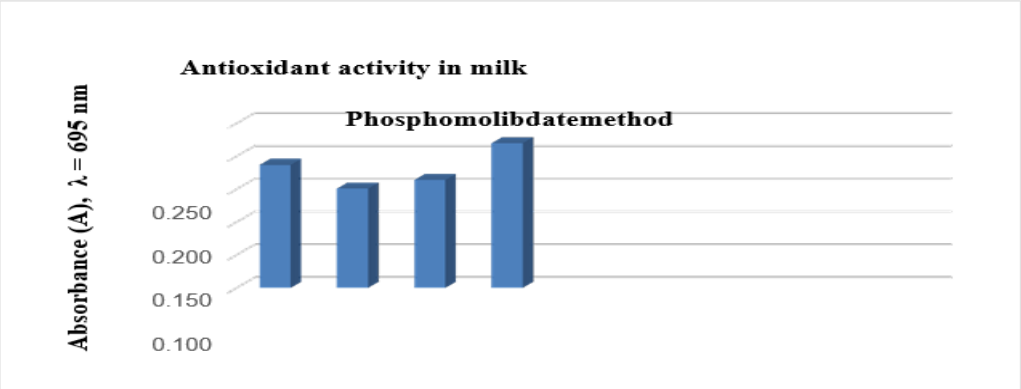
Table 2: Reduced molybdate concentrations in milk extracts

The mean values of the absorbance (A), at a wavelength λ = 695 nm of reduced molybdenum in the samples from the milk extracts, their deviations from the mean value, as well as the standard deviation are shown in Graph 2.

Graph 2 Absorption of reduced molybdenum from (VI) to (V) in milk extracts

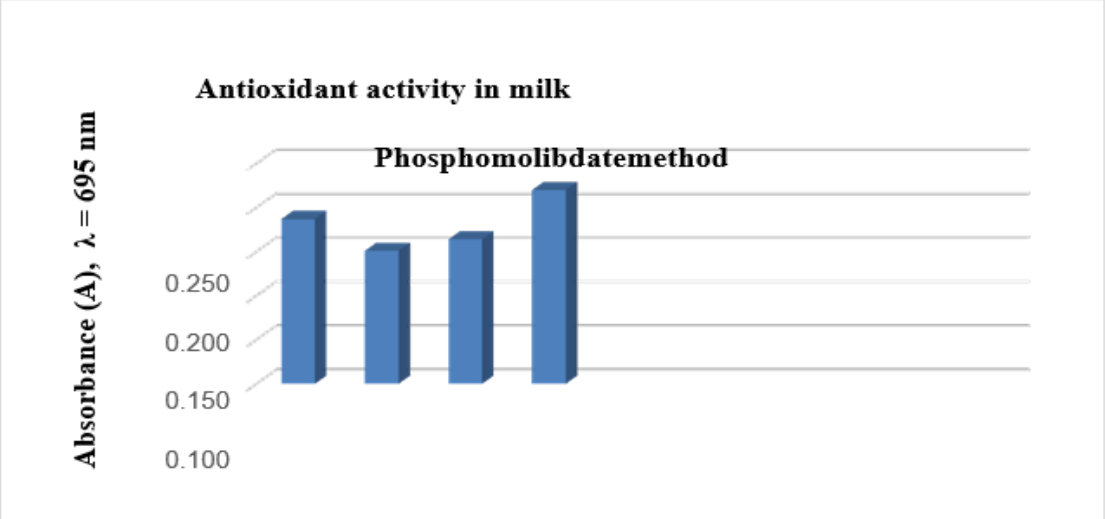


The concentration of reduced molybdenum from (VI) to (V) in the milk extract samples shown in Graph 3. By reducing the molybdenum, the antioxidant activity expressed in µg / mL at λ = 695 nm is read.



Graph 3: Concentration of reduced molybdenum from (VI) to (V) in milk extracts

The concentrations of reduced molybdenum from (VI) to (V) in milk extracts and the standard gallic acid curve shown in Graph 4, which shows the antioxidant activity of milk samples in relation to gallic acid.



Graph 4: Concentration of reduced molybdenum from (VI) to (V) in extracts of milk relative to the standard curve

Analysis of the total antioxidant capacity:

The analysis of total antioxidant capacity is determined as described by Prieto et al., (1998). Concentrations of milk extracts were extracted with 6% trichloroacetic acid and the addition of the same reagent (0.6 M sulfuric acid, 28 mM sodium phosphate and 4 mM ammonium molybdate). In our case, ascorbic acid is used as the standard, and the total antioxidant capacity is expressed as the equivalent of ascorbic acid. By applying the method of molybdate reduction, the values in the milk samples for antioxidant activity are observed significantly low values. According to the phosphomolybdate method, the highest value is in the milk in tetrapack 4.85 µg / mL, and then in the milk from farm A 3.8 µg / mL. We believe that the higher value of antioxidant activity in tetrapack milk, which has 3.2% fat, is due to the fat and the presence of vitamin E, which is found in fat droplets and has a synergistic effect with vitamin C.

CONCLUSION:

From the results obtained for the antioxidant activity with the phosphomolybdate method in milk extracts, it is concluded that the values of reduced Mo (VI) in Mo (V) in milk extracts compared to

pasteurized milk extract - tetrapack taken as standard are low. The highest value with the Phosphomolybdate method was measured in pasteurized milk - tetrapack, and the lowest value in raw milk from farm B. The highest value for the total antioxidant activity in raw milk is obtained from farm A due to the application of several types of food - alfalfa, two types of concentrates and straw, which proves the dependence of antioxidant activity on the impact of nutrients, ie their type and quantities.

Competing Interests Disclaimer:

Authors have declared that no competing interests exist. The products used for this research are commonly and predominantly use products in our area of research and country. There is absolutely no conflict of interest between the authors and producers of the products because we do not intend to use these products as an avenue for any litigation but for the advancement of knowledge. Also, the research was not funded by the producing company rather it was funded by personal efforts of the authors.

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