STUDY OF HEAVY METALS AND CHEMICALS IN WATER BODIES IN DISTRICT MUZAFFARNAGAR

chakradhar
CHEMICALS PVT. LTD.

CIN No. U27204DL1989PTC211681

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Ref No G-117

Dated" 10.06.2019

To

Dr Rajdeep Saharawat
Department of Basic Science,
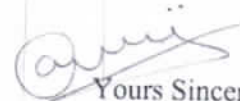Shri Ram College
Muzaffarnagar

Sanction of Grant of Rs. 50,000/-

Dear Dr Rajdeep,

We are herewith sanctioning Rs. 50,000/- as grant for the research project namely "Study of Heavy Metals and Chemicals in Water Bodies in District Muzaffarnagar".

You are requested to start the work and submit quarterly progress report of the same. Kindly note that IPR shall belonging to our establishment of the findings of the research work.

Thanking you,

Yours Sincerely
For Chakradhar Chemical Pvt Ltd

(Authorised Signatory)

Enclosure: Cheque of Rs. 50,000/-.

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ISO 14001 : 2015
OHSAS 18001:2007

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GOEL RAKESH & CO.

CHARTERED ACCOUNTANTS

57-A, Agarwal Market, First Floor,
Mahavir Chowk,
Muzaffarnagar (U.P) – 251001
Phone No. 0131-2622405

Utilization Certificate

S.N.	Detail of sanction of Fund with Project name and Duration	Amount
1.	365- Day project on Study of Heavy Metals and Chemicals in Water Bodies in District Muzaffarnagar, Date of Sanction of Fund- 05.05.2019 as per Sanction Letter	50000.00
	TOTAL	50000.00

It is Certified that out of Rs. 50000.00 (Rs. Fifty Thousand Only) of grants sanctioned by **M/s Chakradhar Chemicals (P) Ltd, Muzaffarnagar** during the year 2019-20 in favor of **Shri Ram College, Muzaffarnagar,** a sum of Rs. 57004.00 has been utilized for the purpose of the project for which it was sanctioned and that the balance of Rs. **Nil** remaining unutilized at the end of the year has been surrendered. The Extra amount (If any) is met out by Shri Ram College.

2. Certified that we have satisfied our self that the conditions on which the grant was sanctioned have been duly fulfilled/are being fulfilled and that we have exercised the following checks to see that the money was actually utilized for the purpose for which it was sanctioned.

Kinds of checks exercise-
1 Checking of cash book
2 Checking of payment vouchers.
3 Checking of expenses bills.

For Shri Ram College

Secretary

Place: Muzaffarnagar
Date: 13.09.2020

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For Goel Rakesh & Co.
Chartered Accountants

Rakesh Kumar Goel
Proprietor
M. No. 071858
FRN : 003374C

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PROPOSAL

Proposed Research Topic:

STUDY OF HEAVY METALS AND CHEMICALS IN WATER BODIES IN DISTRICT MUZAFFARNAGAR.

Rivers are the foremost sources of water being utilized in cities and its surroundings and this water is either be treated or untreated. River banks could also be used for activities ranging from agriculture to industrial activities and other domestic household activities are conducted. The present study aimed at investigating the effect on water bodies contamination from the selected fertilizers and chemical viz. Chakradhar chemicals and fertilizers by analyzing heavy metal contaminants in River Kali Nadi near Muzaffarnagar area.

Proposed Methodology:

SAMPLE COLLECTION

Water and residues were taken as a sample in seven sockets along the river introduced by sewage, mining, industrial waste, human defrayals, cultivation wastage agricultural activities for four different seasons in River Kali Nadi. Sample collection months were decided July, October, January, April from pre-decided seven sockets consecutively. Samplequantitatively preserved in 500 ml cuvettes & collected in chemistry lab Shri Ram College Muzaffarnagar.
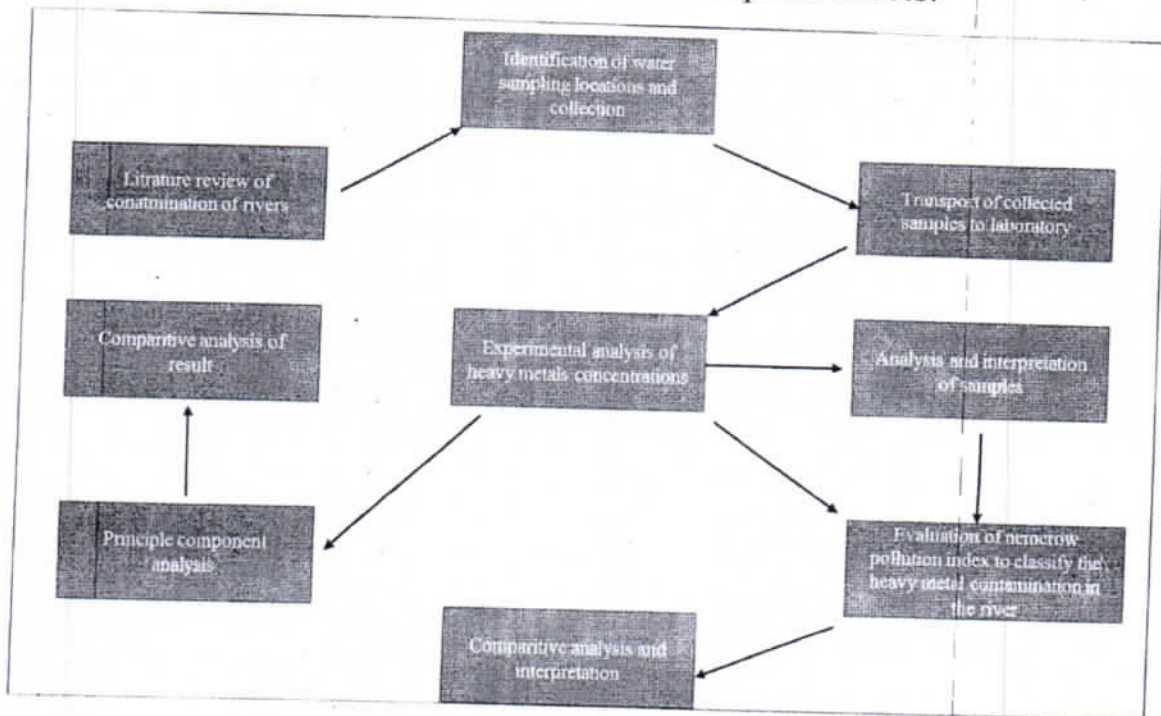
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LAB TESTING

The samples were analyzed for Iron, Lead, Copper, Cadmium and Arsenic using HPLC and AAS. Interpretation of results was conducted using Minitab statistical software and Excel spreadsheets.


Probable outcome- The range of metals in water during the dry season was Fe (0.19-0.32) mg/l, Pb, Cu, Cd and As were below the detection limits. The range of metals in water during the short rain was Fe (0.12-1.25) mg/l and BDL for all other analysed metals. The range of metals in water during the long rain season was Fe (0.07-1.82) mg/l, Cu (0.08-0.11) mg/l and BDL for all the other analysed metals. The range of metals in sediments during dry season was Fe (0.13-1.44) ppm, Pb (0.08-

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0.54) ppm, and BDL for all other analysed metals. The range of metals in sediments during short rain season was Fe (0.23-1.73) ppm, Pb (0.12-0.27) ppm, and BDL for all other analysed metals. The range of metals in sediments during the long rain season was Fe (0.25-2.75) ppm, Pb (0.09-0.34) ppm, Cu (0.10-0.14) ppm, and BDL for all other analysed metals.
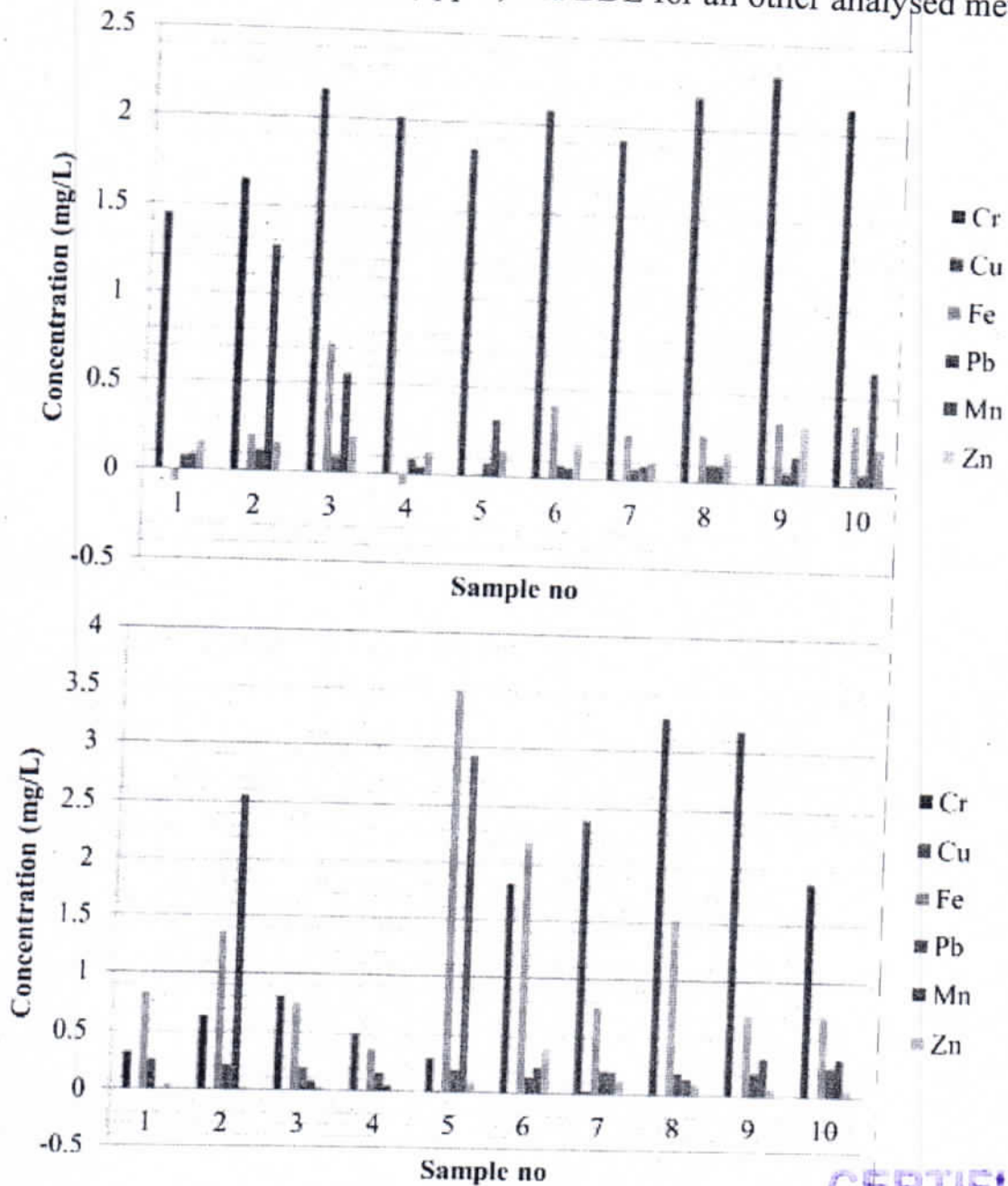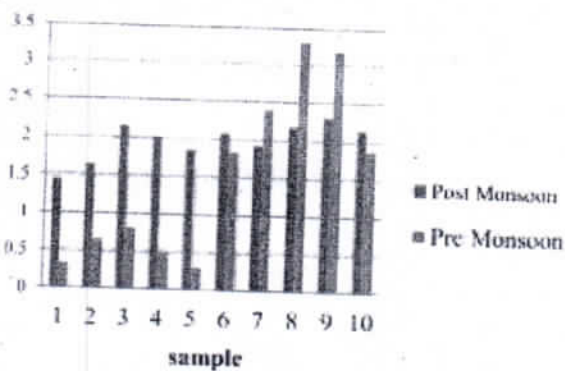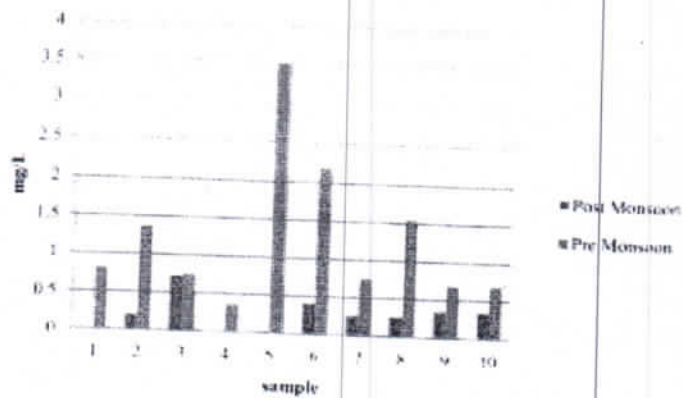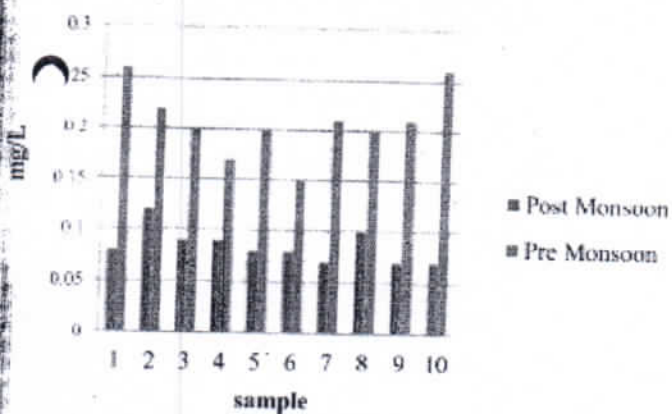
Concentration of Cr

Concentration of Fe

Concentration of Pb

Concentration of Mn

Concentration of Zn

BUDGET

PROJECT TITLE- STUDY OF HEAVY METALS AND CHEMICALS IN WATER BODIES IN DISTRICT MUZAFFARNAGAR.

PROJECT PERIOD- 1 YEAR (12 MONTHS)

BUDGET & EXPENDITURES-

S. N.	Head(Expenses)	Requirement	Amount
1.	Manpower	3 students intern (@1000/- pm) 1 Principal Investigator)	6 months * 3 individuals =18,000/-
2.	Consumables	As per list attatched	39,004/-
		Total	57,004/-

Consumables Chemicals-

S.No.	Items	Unit	Req	Rate	per	Amount
1	Absolute Alcohol	ml	4 x 500	549	500 ml	2196
2	Ammonia	litre	4 x 2.5	523	2.50 Ltr	1359
3	Anthracene	gram	5 x 500	749	100gm	5355
4	Benzene	litre	2 x 2.5	1225	2.50 Ltr	1529
5	Butane-2-ol	ml	2 x 500	564	500ml	733
6	Chloroform	ml	5 x 500	348	500ml	1131
7	Copper Acetate	gram	6 x 500	754	250gm	3920
8	Benzophenone	gram	3x500	891	500gm	1737
9	Erichrome Black –T	gram	1 x 25	234	25gm	152
10	Fuming Nitric Acid	litre	1 x 2.5	760	2.50ltr	494
11	Glycerol	ml	4 x 500	760	2.50 ltr	832
12	Lead Acetate	gram	2 x 500	432	500gm	561
13	Lead Carbonate	gram	2 x 500	518	500gm	673
14	Lead Chloride	gram	4 x 500	688	500gm	1788

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15	Lead Nitrate	gram	6 x 500	493	500gm	1922
16	Manganese Chloride	gram	2 x 500	602	500gm	782
17	Methyl Alcohol	litre	2 x 2.5	549	2.50 ltr	713
18	Napthalene	gram	3 x 500	407	500gm	793
19	Napthol Alpha	gram	1 x 500	326	100gm	1059
20	Nesslar's reagent	ml	5 x 100	188	125ml	611
21	Nickel ammonium sulphate	gram	5 x 500	706	250gm	2753
22	p – Choloroanilene	gram	1 x 500	388	250gm	504
23	p – Nitroanilene	gram	1 x 500	246	100gm	799
24	potassium permegnatate	gram	2 x 500	509	500gm	661
25	Pthalic Anhydride	gram	2 x 500	354	500gm	690
26	Sodium Hydroxide	gram	2 x 500	694	500gm	213
27	Sodium Sulphate	gram	3 x 500	197	500gm	384
28	Stannous Chloride	gram	2 x 500	1532	250gm	1991
29	Sulphuric acid	litre	2 x 2.5	977	2.50ltr	1270
31	Zinc Chloride Anhydrous	gram	2 x 500	446	500gm	579
32	Zinc Sulphate	gram	4 x 500	255	500gm	663
33	Spirit	litre	1 x 10	268	500gm	174

39004/-	Total

Chief Co-ordinator

Mr. Rajdeep Saharawat
Basic science department

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Abstract

The River Kali is an important surface water body in the western Uttar Pradesh (U.P). It is an intermittent river which flows throughout the monsoonal months. The present study aims to assess the heavy metal contamination in the river Kali using pollution index (PI), based on five heavy metals (Fe, Zn, Cd, Pb, and Cr) during pre-usage of fertilizers and the post-usage of fertilizers in the year 2019. The Contamination index (CI) and Nemerow pollution index (PI) evaluated during pre-usage of fertilizers and the post-usage of fertilizers with respect to drinking water quality standards was found as 1.87 and 4.53 respectively, while the post-usage of fertilizers related to inland water quality standards were found as 1.88 and 4.54, respectively. The results indicate that the river Kali was severely contaminated (PI>3) in both seasons and the usage of chakradhar fertilizers does not have any significant role in this contamination yet have a positive outcome on agriculture basis and Therefore, still the water of Kali River is not fit for drinking as well as for agriculture purposes.

Introduction

River water, a natural source forms the lifeline of all living organisms. Water pollution, which is a major environmental issue in India, is the introduction of contaminating pollutions into the natural water leading to an adverse change. The rapi river industrialization near to water bodies and the untreated discharge of industrial effluents like toxic heavy metal contaminant degrade the water quality. Because of their bioaccumulation capacity and environmental persistence, special attention has been paid on toxic trace elements (Alveset al., 2014). These chemicals may enter aquatic compartments through a variety of routes, therefore impairing the quality of not only aquatic ecosystems, but also human health (Bao et al., 2012). As a consequence, multidisciplinary approaches combining chemical, ecotoxicological and ecological data in accordance with the Triad approach have been developed around the world (Benedetti et al., 2012). However, the number of potentially hazardous chemicals is ever growing, rendering a complete chemical characterization of contaminants almost impossible (Vink et al., 1999). The river water quality was being continuously degraded due to the ever increasing disposal of municipal and industrial waste from the nearby region (Jain et al.,1997). Traces of heavy metals such as Pb, Mn, Fe and Cr have been identified as deleterious to aquatic ecosystems and human health (Panakkal and Kumar,2014). Although several reports on water quality, planktonic and limnology of river have been published (Bhargava et al., 2009; Sirohi et al., 2014; Kapsikar et al., 2011; Ghosh and

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Mcbean, 1998; CPCB, 2012), but a comprehensive monitoring of heavy metals in the surface water of river Kali has not been carried out yet. Therefore, in the present study, an attempt has been made to assess the degree of heavy metals contamination in Kali River at seve sampling locations (R 1 to R 7) at Uttar Pradesh (U.P) to calculate the pollution with respect to (w.r.t) drinking water quality and inland water quality standards so that a suitable conservation plan could be prepared and implemented.

MATERIALS AND METHODS

River Kali East is an intermittent river which flows actively; in monsoonal months. It originates near Antwada village of district Muzzafarnagar in Uttar Pradesh at coordinate 29°9' 34.29" N to 27°1'321.34"N and 77°45' 15.10" E to 77°58'14.03"E. it covers catchment area of 1425.21 km 2 and travels a length of 150 km (approximately) before joining the river Ganga.

Calculation of contamination index (CI) and pollution index (PI):

Table 1. Different surface water sampling locations

S.No.	Sampling location	Coordinates	Code
1	Near Gesupur Village	29° 2'9.74"N to 77°47'10.90"E	R_1
2	Abu Nala 1	28°57'42.98"N to 77°45'53.47"E	R_2
3	Abu Nala 2	28°57'7.38"N to 77°44'37.81"E	R_3
4	Meerut drain	28°56'29.68"N to 77°44'18.26"E	R_4
5	Pipli Khera village	28°48'42.34"N N to 77°44'18.26"E	R_5
6	Kaol village	28°48'42.34"Nto 77°48'43.63"E	R_6
7	Ajrara village	28°47''71.41"N to 77°57'43.63"E	R_7

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The pollution index of individual heavy metal was calculated by equation 1 and the contamination index for potentially toxic heavy metal in the river was calculated by equation 2-

$$PI = \frac{Measured\ concentrations\ of\ individual\ heavy\ metals}{Standard\ permissible concentration\ of\ heavy\ metals}$$ .eqn(1)

$$CI = \frac{1}{5}\ \Sigma\ PI$$ ....eqn(2)

$$PI = \sqrt{[\frac{1}{2}(Pi_{max}^2 + CI^2)]}$$ ....eqn(3)

Where, Pi is the pollution index of individual heavy metal; CI is the contamination index. The contamination index is classified as CI>5 (contaminated), CI; 1-5 (slightly contaminated) and CI<1 (not contaminated). Where, PI is the Nemerow pollution index; Pi max is the maximum value of pollution indices of all five heavy metals considered at particular sampling location. The range for which PI is classified as: P≤1 (water not contaminated); 2<P≤3 (slightly contaminated) and P>3 water severely contaminated.

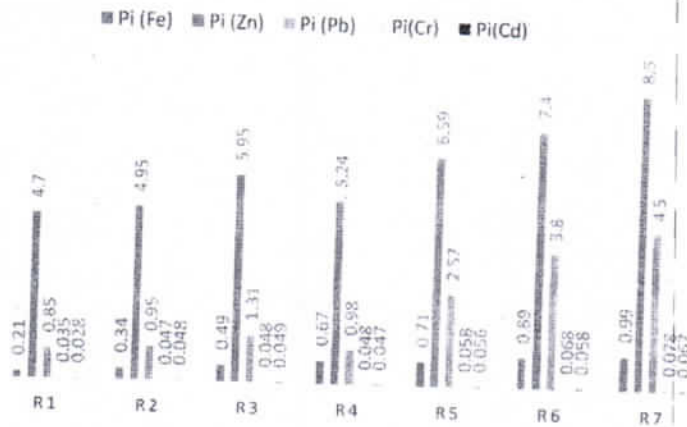| Sampling locations	Pi (Fe)	Pi (Zn)	Pi (Pb)	Pi (Cr)	Pi (Cd)	Contamination index (CI)	Pollution index (Pi max)	Nemerow pollution index PI	Water quality contamination
R1	0.21	4.7	0.85	.035	.028	1.21	4.7	3.10	Severe
R2	0.34	4.95	0.95	.047	.048	1.38	5.20	3.70	Severe
R3	0.49	5.95	1.31	.048	.049	1.61	5.95	4.45	Severe
R4	0.67	5.24	0.98	.048	.047	1.49	5.28	3.80	Severe
R5	0.71	6.59	2.57	.058	.056	1.98	6.75	4.87	Severe
R6	0.89	7.40	3.80	.068	.058	2.56	7.65	5.46	Severe
R7	0.99	8.50	4.50	.078	.067	2.89	8.58	6.35	Severe
					Average	1.87		4.53	Severe

Table-1 concentrations of metals(ppm) in selected 7 sites sample and their pollution index individually pre usage of chakradhar fertilizers

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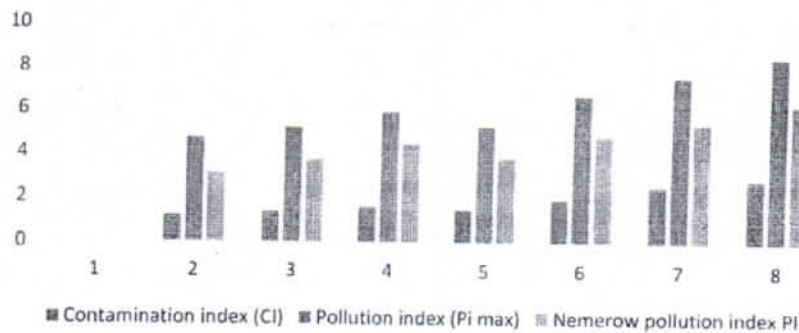Muzaffarnagar

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POLLUTION INDEX PRE USAGE

Graph-1 concentrations of metals(ppm) in selected 7 sites sample and their pollution index individually before usage of chakradhar fertilizers

PRE USAGE POLLUTION INDEXES REGIONWISE

Graph-2 The pollution indexes individually before usage of chakradhar fertilizers

Sampling locations	Pi (Fe)	Pi (Zn)	Pi (Pb)	Pi (Cr)	Pi (Cd)	Contamination index (CI)	Pollution index (Pi max)	Nemerow pollution index PI	Water quality contamination
R1	0.23	4.7	0.86	.035	.029	1.22	4.72	3.12	Severe
R2	0.38	4.95	0.96	.043	.049	1.41	5.22	3.71	Severe
R3	0.56	5.95	1.32	.052	.056	1.58	5.96	4.41	Severe
R4	0.66	5.24	0.99	.051	.048	1.46	5.25	3.81	Severe
R5	0.71	6.60	2.60	.060	.058	1.99	6.72	4.87	Severe
R6	0.92	7.45	3.84	.064	.055	2.58	7.66	5.49	Severe
R7	0.98	8.62	4.58	.084	.068	2.91	8.60	6.40	Severe
					Average	1.88		4.54	Severe

Table-2 concentrations of metals(ppm) in selected 7 sites sample and their pollution index individually post usage of chakradhar fertilizers
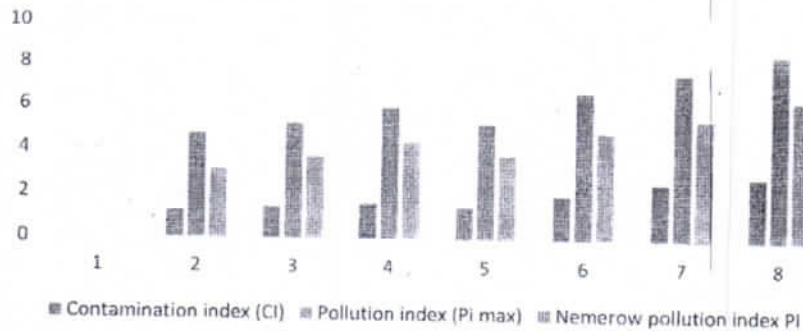
INDIVIDUAL POLLUTION INDEX POST USAGE
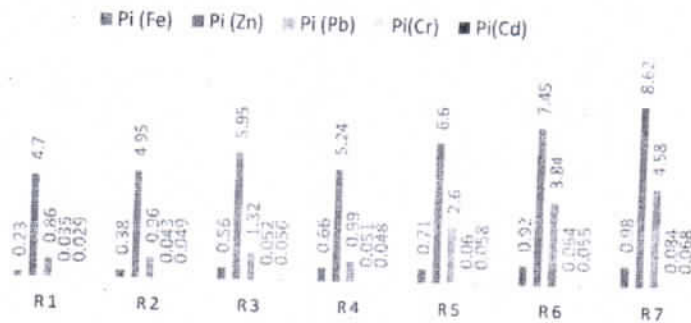
Graph-3 concentrations of metals(ppm) in selected 7 sites sample and their pollution index individually post usage of chakradhar fertilizers

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POST USAGE POLLUTION INDEXES REGIONWISE

Legend: ■ Contamination index (CI) ■ Pollution index (Pi max) ■ Nemerow pollution index PI

Graph-4 The pollution indexes individually after usage of chakradhar fertilizers

The data of heavy metal concentration for analysis and calculation of indices were obtained from the laboratory experiment during pre-usage of fertilizers and the post-usage of fertilizers in the year 2019 at seven sampling locations. Samples from surface water were collected directly by hand in a wide mouth glass jar, while the deep water samples were withdrawn by water sampler.

Conclusion

Based on the analysis of heavy metals, it has been revealed that Zn and Pb are the major parameters responsible for water pollution in the river Kali. The overall PI indicates that, the river water was severely contaminated (i.e. PI>3) in both seasons with respect to both standard for inland water quality and drinking water quality. This severe contamination was mainly due to land run off, dredging, other linked anthropogenic activities and the discharge of industrial/urban effluents into river Kali. To classify the contamination level, PI was more significant to CI. The The usage of Chakradhar fertilizer helped agricultural outcome and the PI variation in both pre usage of fertilizers and post usage of fertilizers indicated that the contamination of river does not significantly change after the usage of fertilizers. Hence in this way fertilizers were found environment friendly rather than other products found in market with a negligible variation. This variation may be due to the addition of waste water during rainy season. The result also revealed that river water is not fit for irrigation as well as drinking purposes but the fertilizers does not play any key role in this contamination.

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