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STUDY ON THE EFFECT OF PESTICIDES IN LABEO ROHITA FROM SOME WATER RESERVOIRS OF RAIPUR CHHATTISGARH

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ABSTRACT

The use of pesticides has become a common practice in today's agricultural work in large scale to advance the production of crops. Pesticides help to control or kill harmful pests without harming humans directly, when used cautiously in regulated quantities. The water quality is a very important parameter in reproduction and growth of aquatic organisms like fishes. Pesticides not only change the quality of water like its chemical composition, pH etc but also decreases the oxygen level. Fishes consumes the oxygen present in water and along with that the pesticides enter the internal organs too. Fishes are very sensitive towards minute changes in the water composition and pesticides even when used in small quantities, causes changes in water composition and thus causes changes in the internal structure of fish organs slowly. Fish is high in omega-3 and protein; lipids that the human body needs to stay healthy. However, potentially dangerous pesticides are absorbed in the body tissues of fish. Physical reactions of fish to lethal concentrations of pesticides were examined along with control group. The control group showed normal behavior. No immediate change in swimming pattern and opercula movements wasnoted.

In the present investigation, acute toxicity due to pesticides and the physical behaviors of fish and its opercula movements response to pesticides. The quality of water for fish production is determined by various physicochemical and biological factors. Water quality is direct and indirect necessary for the survival and development of fish. The overall results of physico- chemical characteristics reveal that there are distinguishable seasonal variations in the water quality. It was concluded that during the pre-monsoon period, about 41% of the observed sample are within the permissible limit for drinking purpose as per BIS.

Keywords: Pesticides, physicochemical, chemical, Fishes, toxicity**.**

1. INTRODUCTION

Water is one of the most vital and essential natural resources. Water is not only a crucial commodity to our day-to-day life, but also plays a major role in economic and social development processes (Gupta 2004). The pressure of increasing population, the growth of industries, urbanization and lack of environmental awareness are recognized as the keycauses for the availability of freshwater resources. Industrial water pollution can have far reaching effects on the ecosystem (FAO 2009). The water used in various industrial processes and the wastes generated from the industries, when discharged into fresh water bodies and to the land systems without any treatment pose a major threat to the population and the environment (Bennett et al. 2010).

The use of pesticides also has become a common practice in today's agricultural work in large scale to advance the production of crops (Hoppin et al. 2002). Pesticides help to control or kill harmful pests without harming humans directly, when used cautiously in regulated quantities (Gupta et al. 2008). The water quality is a very important parameterin reproduction and growth of aquatic organisms like fishes. Pesticides not only change the quality of water like its chemical composition, pH etc but also decreases the oxygen level (Hanazato 2010). Fishes consumes the oxygen present in water and along with that the pesticides enter the internal organs too. Fishes are very sensitive towards minute changes in the water composition and pesticides even when used in small quantities, causes changes in water composition and thus causes changes in the internal structure of fish organs slowly (Grant et al. 2012)

2. SAMPLE AND SAMPLING SITES

The samples were collected from marked spots (at the time of the survey). Raipur district is geographically located at a latitude of 21º 23'' to a longitude of 81º 65''. The five different spots were marked near the farm area. The water Samples were collected from August 2020 to September 2021. A total of 100 samples were collected from 5 different spots (Table 5.1) in the Raipur district. Chhattisgarh. The sample size was 100 ponds and a further 5 ponds/spots were screened for the present research work based on objectives. Fresh and healthy samples were collected and brought to the laboratory for further analytical work.

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Sampling sites and sample size

Table 1

Spot	Name of spot	Sample size	Total sample
1	Kharun River	20	**100**
2	Panchmukhi Pond Sarona	20	
3	Karbala Pond	20	
4	Naraharadeo Pond	20	
5	Maharajabandh Pond	20	

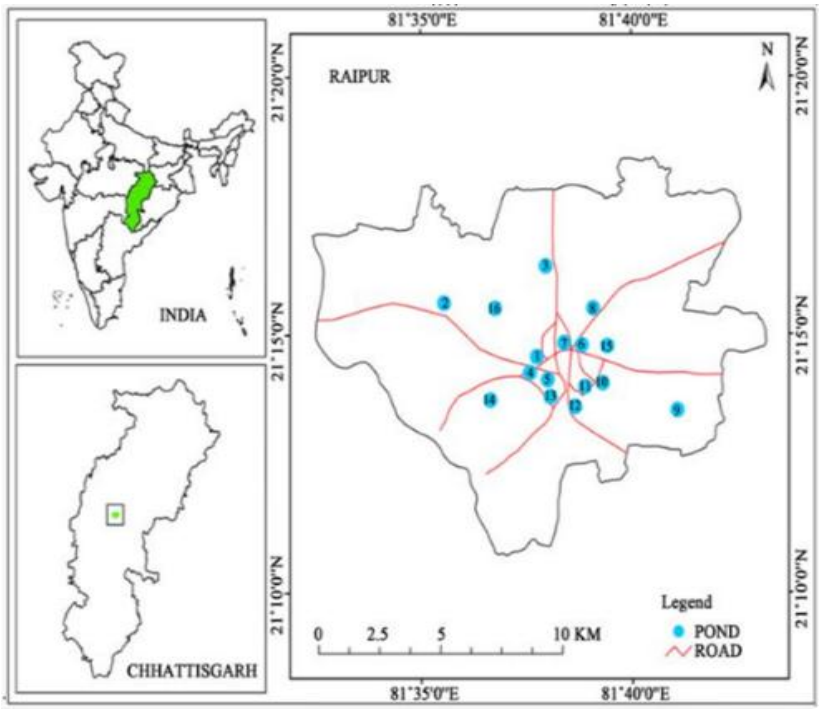

Fig 1- Representation of Raipur district in India

3. MATERIALS AND METHODS

The details regarding the location of the sample collection like physiography, climate, geomorphology, soil types, occurrence of groundwater in the study area; the analyticalinstruments used and the analytical methods etc.

3.1 Description of the Study Area and sampling

Raipur being Geographically located almost at the centre of the Chhattisgarh State, Raipur District extends from latitude 21º 23'' to longitude 81º 65'' area. Water Sample was collected from 5 different spots of Raipur district, Chhattisgarh. The sample were divides into two part one for the test physicochemical parameter and other for study on the effect of heavy metals on fish population.

3.2 Test Fish

Rohu (Labeo rohita) collected from Raipur District

Table 2

Kingdom	Animalia
Phylum	Chordata
Class	Actinopterygii
Order	Cypriniformes
Family	Cyprinidae
Genus	Labeo
Species	rohita

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3.3 Analytical procedures of water –

The major instruments used for the present study, principles of analytical methods etc.

3.3.1 Atomic Absorption Spectrophotometer (AAS)

Atomic absorption spectrophotometer is widely used for the determination of trace and ultra trace elements in all kind of samples. In AAS, a light source used to measure all atoms. The wavelength at which light is absorbed is specific for each element.

Gas Chromatography – Mass Spectroscopy (GC- MS)

GC-MS is a combination of two different analytical techniques, Gas Chromatography (GC) and Mass Spectrometry (MS), is used to analyze complex organic and biochemical mixtures. The GC-MS instrument consists of two main components. The gas chromatography portion separates different compounds in the sample into pulses of pure chemicals based on their volatility by flowing an inert gas (mobile phase), which carries the sample, through a stationary phase fixed in the column. Spectra of compounds are collected as they exit a chromatographic column by the mass spectrometer, which identifies and quantifies thechemicals according their mass to charge ratio (m/z). These spectra can then be stored on thecomputer and analyzed.

4. RESULTS AND DISCUSSION

4.1 Sample collection- Water Sample was collected during August 2020 to September 2021. All samples collected from 5 different spots (Kharun River, Panchmukhi Pond Sarona, Karbala Pond, Naraharadeo Pond and Maharajabandh Lake) of Raipur district, Chhattisgarh.

Table 3- Five different spots near the industrial area and total sample collection.

Kharun River (Spot 1)	Panchmukhi Pond Sarona (Spot 2)	Karbala Pond (Spot 3)	Naraharadeo Pond (Spot 4)	Maharajabandh Lake (Spot 5)
20	20	20	20	20
Total size of sample = 100				

4.2 Summary of Water Classification-

Water quality and classification on the bases on the legends and dissolving and non dissolving particles present in water sample.

Table 4- Water classification in winter, post monsoon and summer.

Sample ID	Water Type		
	Winter	Post Monsoon	Summer
S1	Na-Cl-SO_4	Na-Mg-Cl-HCO_3	Na-Mg-Cl-HCO_3
S2	Na-Mg-Cl-HCO_3	Ca-HCO_3	Na-Ca-Cl-SO_4-HCO_3
S3	Ca-Na-HCO_3-Cl	Na-Ca-Cl-SO_4-HCO_3	Na-Cl-SO_4
S4	Ca-Mg-HCO_3	Na-Mg-Ca-HCO_3	Ca-Mg-HCO_3
S5	Ca-Na-Cl-HCO_3	Ca-Na-HCO_3-Cl	Na-Cl-SO_4

4.3 Analytical Procedures of Water

Table 5 - Physico- chemical Characteristics of Water samples (winter)

Sample code	Temp.	pH	EC	TDS	TA	TH	Cl^-	Br^-	I^-	F^-	2- SO4	Na^+	K^+	$Ca2^+$	Mg2 +	Fe^{2+}
Sample 1	28.9	6.1	293.0	104.2	101.1	46.7	51.3	0.13	0.005	0.1	12.4	13.4	2.4	9.6	17.2	BDL
Sample 2	28.4	5.9	159.4	145.8	113.4	75.8	52.4	0.10	0.008	0.3	10.7	28.2	2.1	23.4	22.6	0.01
Sample 3	28.6	5.6	67.6	122.2	92.2	35.9	32.4	0.19	0.003	0.1	7.6	17.8	1.8	19.5	13.5	0.01
Sample 4	28.1	6.3	167.7	152.4	87.7	91.5	65.3	0.21	0.007	0.2	7.9	12.4	3.8	11.6	18.3	0.01
Sample 5	28.5	5.9	217.4	167.2	153.8	83.5	42.5	0.09	0.002	0.1	11.7	11.3	9.1	12.4	21.1	BDL

All values except Temperature, pH and Electrical Conductivity are expressed as mg/l, Temperature as ^{0}C, pH as pH unit andElectrical Conductivity (EC) as µS/cm at 25 ^{0}C. BDL – Below Detectable Level.

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Table 6 - Physico- chemical Characteristics of Water Samples (post-monsoon)

Sample code	Temp.	pH	EC	TDS	TA	TH	- Cl	- Br	- I	- F	2- SO 4	+ Na	+ K	2+ Ca	2+ Mg	2+ Fe
Sample 1	**28.2**	**5.8**	**167.7**	**45.4**	**55.1**	**18.7**	**34.3**	**0.01**	**0.01**	**0.2**	**8.1**	**21.4**	**0.8**	**0.8**	**14.2**	**BDL**
Sample 2	**29.1**	**4.9**	**121.4**	**102.8**	**63.7**	**55.6**	**43.9**	**BDL**	**0.04**	**0.1**	**7.8**	**18.1**	**1.9**	**14.6**	**0.9**	**BDL**
Sample 3	**28.2**	**6.6**	**167.8**	**101.2**	**67.9**	**11.6**	**21.4**	**BDL**	**0.01**	**0.1**	**2.6**	**10.8**	**3.1**	**17.4**	**11.4**	**BDL**
Sample 4	**29.1**	**5.8**	**121.4**	**52.9**	**32.7**	**45.6**	**37.8**	**BDL**	**0.01**	**0.2**	**4.8**	**4.7**	**2.2**	**4.9**	**13.2**	**BDL**
Sample 5	**28.9**	**6.2**	**89.4**	**94.5**	**77.8**	**22.7**	**12.5**	**0.01**	**0.03**	**0.2**	**5.7**	**9.8**	**5.1**	**9.8**	**3.4**	**BDL**

All values except Temperature, pH and Electrical Conductivity are expressed as mg/l, Temperature as ^{0}C, pH as pH unit andElectrical Conductivity (EC) as µS/cm at 25 ^{0}C. BDL – Below Detectable Level.

Table 7- Physico- chemical Characteristics of Water Samples (summer)

Sample code	Temp.	pH	EC	TDS	TA	TH	- Cl	- Br	- I	- F	2- SO 4	+ Na	+K	2+ Ca	2+ Mg	2+ Fe
Sample 1	34.8	6.4	221.7	165.2	101.1	58.6	62.3	0.09	0.008	0.3	23.7	17.7	2.8	11.5	21.8	0.02
Sample 2	36.7	6.1	184.6	161.6	144.7	94.7	67.7	0.18	0.009	0.7	19.6	38.9	2.7	52.2	27.8	0.01
Sample 3	39.5	5.9	177.6	142.4	178.8	39.3	43.7	0.19	0.006	0.1	12.1	31.8	1.3	38.9	18.9	0.01
Sample 4	34.7	5.7	157.8	169.6	188.9	99.8	79.4	0.34	0.008	0.1	9.4	45.8	4.0	41.7	23.7	0.01
Sample 5	32.5	5.4	252.7	192.8	169.5	87.9	66.7	0.12	0.005	0.3	16.6	31.2	9.7	31.7	29.8	0.01

All values except Temperature, pH and Electrical Conductivity are expressed as mg/l, Temperature as ^{0}C, pH as pH unit andElectrical Conductivity (EC) as µS/cm at 25 ^{0}C. BDL – Below Detectable Level.

Correlation of pesticides concentration and its possible effect on Labeo rohita organs

To evaluate the effect of pes**tic**ides on fish (Labeo rohita), histological examinations are carried out. Diverse literature is available for histological analysis of fishes e.g., Bernet (1999), Sultana et al. (2016), Stoskopf (1993), Genten et al. (2009), and Allen (1992). The gill, liver, and intestine of L. rohita were microscopely examined to explore the change in tissue characteristics after exposure to selected pesticides.

The function of fish organs

Table 8.

S.no	Fish organ	Function	References
1	Gill	Gills facilitate the excretion of nitrogenous waste, osmoregulation, pH regulation, and respiration in fish.	Bernet (1999) Sultana et al. (2016) Stoskopf (1993) Genten et al. (2009) Allen (1992)
2	Liver	Livers play an important role in metabolic functions, excretion, and xenobiotic metabolism in fish.	
3	Intestine	The intestine helps in the digestion and absorption of feedstuffs, maintains electrolyte balance, facilitates endocrine regulation, participates in metabolism, and contributes in certain immunological functions.	

Impact of Pesticides on fishes - Fish is high in omega-3 and protein, lipids that the human body needs to stay healthy. However, potentially dangerous pesticides are absorbed in the body tissues of fish.Physical reaction of fish to lethal concentrations of pesticides were examined along with control group.The control group showed normal behavior. No immediate change inswimming pattern and opercula movements was noted.

5. CONCLUSION

The overall results of physico-chemical characteristics reveal that there are distinguishable seasonal variations in the water quality. It was concluded that during the pre- monsoon period, about 41% of the observed sample are within the permissible limit for drinking purpose as per BIS. The quality of water for fish production is determined by various physicochemical and biological factor. Water quality is direct and indirect necessary for the survival and development of fish. In the present investigation, acute toxicity due to pesticides and the physical behaviors of fish and its opercula movements response to pesticides.

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