

Physico-Chemical Characteristics and Sustainable Diversity of Fishes of Taj Baj Ka Pokhra of Hajipur in North Bihar (India)

Sushma Kumari¹, Sujeet Kumar²

¹Associate Professor, Deptt of Zoology, R.N College Hajipur (Bihar) India

²Research Scholar, Deptt of Zoology, R.N College Hajipur (Bihar) India

Abstract: *In the present project, a comprehensive study was done on physiochemical characteristics and sustainable diversity of fish in a pond called as Taj baj ka pokhra. The pond is situated in the heart of the town and is of utmost importance on account of its historical aspect. Different variety of fishes are cultured in this pond. Especially carp culture is common. Study of different physiochemical parameters like temperature, pH, turbidity, total hardness, total alkalinity, BOD, COD, etc were carried out throughout the year i.e January to December 2015. The study was carried out season wise also viz Summer season, Rainy season and Winter season. The result shows that the water of the pond is not much suitable for rearing of carps.*

Keywords: Alkalinity, BOD, P_H, Fish culture, season, turbidity. Etc

1. Introduction

For successful rearing of fishes in a pond, study of physicochemical characteristics is an imperative need. With the rapid pace of urbanization and industrialization the aquatic ecosystem has severely been destroyed affecting the living beings of water bodies. Fresh water has become heavily polluted due to over exploitation and influx of different pollutants in it, Gupta and Shukla 2006, Patil and Tijare 2001, Singh and Mathur 2005. The Taj Baj ka pokhra is a perennial pond situated amidst the town of Hajipur. Hajipur is the headquarter of Vaishali district of north Bihar in India. Vaishali district is situated in the Gandak Kamla interfluvial region and lies approximately between 25.29 to 26.1 North and 85°4 to 85°3 E longitude and latitude respectively. The pond is surrounded by unplanned residential and commercial construction too. The water of pond get polluted mainly due to discharge of water waste, sewage effluents, solid wastes, detergents, insecticides etc. Bhuiyan, J. R & Gupta S.A 2006. The present pond also receive good amount of household discharge, detergents solid waste etc. Which also impose a direct or indirect threat to the physicochemical of pond which ultimately influence the culture of carp in this pond. The fish productivity in this pond adopted a decreasing trend in last few years. Therefore it is need of hour to study the physico-chemical characteristics of the pond in details so that fish productivity can be enhanced at the desired trophic level.

2. Material & Methods

An intensive observation was made in every month of a calendar year starting from January to December 2015. Sampling and analysing of the pond water was carried out in every month of a year. Sampling was done on 5th of each month. Water was collected in plastic bottle using composite sampling method. Collected water was analyzed in a laboratory using ISSO certified methods.

Table 1

Physico-chemical parameters of water	Method employed
Ph	pH meter
Turbidity	Secchi disc
Total hardness	Titration method
Alkalinity	By titration method
Total dissolved solids	By TDS meter
Chloride	Titration method
Fluoride	Titration method
Sulphate	Titration method
Calcium	Titration method
BOD	Titration method
COD	Titration method

3. Result & Discussion

3.1 PH

PH of water is an important factor influencing the sustainable diversity of fishes in a pond. The pH of pond was alkaline throughout the year. The range of pH was 7.2 to 7.6 respectively. The maximum pH was observed in the month of June and August and the minimum 7.2 was recorded in December. Seasonal fluctuation was also observed in its average value. Average value of 7.5 was noticed in summer and rainy season. Winter season recorded a decrease in pH value. According to Goel et al 1986 seasonal fluctuation are considered good for buffering capacity. Nandan and Patel were of the view that higher pH is responsible for the algal bloom and higher photosynthetic activity which in turn increase the O₂ supply to the fauna of the pond.

3.2 Turbidity

Suspended dirt and particle in water inhibit the penetration of light across the pond water thereby reducing photosynthetic process. Hence it is considered as a limited factor for pisciculture in natural waterbodies. In the present

study the turbidity ranged between 0.2 to 0.5 N.T.U. Season wise highest turbidity was recorded in rainy season. Summer season come next to rainy season and winter season was on the lowest position.

3.3 Total dissolved solids

Being a good solvent water dissolves a number of mineral salt electrolyte of metals as well as impurities also. Total dissolved solids comprise inorganic salt sand some small amount of organic matter. In the present project the maximum TDS was 668mg/lit in November and minimum was 650mg/lit in February. On an average rainy season recorded highest average 669mg/lit. According to Verma et al 2012 and Priyanka et al 2013 high value of TDS during rainy season may be due to higher addition of domestic waste, garbage, and sewage etc. Increased TDS increase

nutrient status of water body due to eutrophication (Swarnlata and Narsingh Rao 1998). (Singh and Mathur 2005).

3.4 Total Hardness

In the present study the range of total hardness was 276.5mg/lit in January to 279.5 mg/lit in September. Seasonally also, total hardness was highest 279.2mg/lit in rainy season followed by 278.5 mg/lit in summer and 276.0 mg /lit in winter season. Hulyal and Koliwal (2011) also found higher hardness in summer and lowest in winter season. The highest level of hardness in rainy season is attributed to the highest influx of impurities containing carbonate and sulphate. Kiran (2010) categorised the water according to the degree of hardness. The present pond water was moderately hard.

Table 2

Parameter	March	April	May	Jun	Avg.	July	Aug	Sep	Oct	Avg.	Nov	Dec	Jan	Feb	Avg.
	Summer season					Rainy season					Winter season				
pH	7.4	7.5	7.6	7.5	7.5	7.4	7.6	7.5	7.5	7.5	7.4	7.2	7.3	7.2	7.2
Turbidity	0.2	0.4	0.5	0.5	0.4	0.4	0.5	0.5	0.4	0.4	0.3	0.3	0.2	0.2	0.2
T D S	656	661	660	662	659	665	670	671	672	669	668	665	651	650	658
Total Hardness	277.4	277.5	278.8	278.5	278	278.9	279.2	279.5	279.2	279.2	278.1	278.1	271.5	276.2	275.9
Alkalinity	251.5	251.5	251.8	251.5	251.5	251.8	252.2	252.5	252.5	252.2	251.8	251.5	250.2	250.5	251
Chloride	191.2	190.8	191.2	191.6	191.2	192.1	192.2	192.2	191.8	192	191.5	191.2	191.2	191.5	191.3
Fluoride	0.3	0.4	0.4	0.5	0.4	0.4	0.4	0.4	0.4	0.4	0.3	0.3	0.3	0.3	0.3
Calcium	54.2	55.5	56.9	56.7	55.8	56.3	57.2	57.5	56.8	56.9	57.3	57.2	53.5	53.8	55.4
Iron	0.3	0.4	0.5	0.4	0.4	0.4	0.5	0.4	0.4	0.4	0.4	0.3	0.2	0.3	0.3
Sulphate	56.5	57.2	57.5	57.2	57.1	57.5	57.5	57.9	57.9	57.7	57.5	57.1	56.5	56.3	56.8
BOD	80	86	88	91	86	91	105	110	91	99	80	90	88	82	85
COD	282	285	285	288	285	288	308	315	288	299	280	285	280	285	282

3.5 Alkalinity

Alkalinity is the sum total of bicarbonates and carbonates of calcium, magnesium, potassium and sodium in natural water. In the present study the alkalinity ranged between 250mg/lit to 251.9 mg/lit respectively. The ideal value of alkalinity for pisciculture is 50-300 mg/lit according to the guidelines of water quality management. In the present study the range of alkalinity was on higher side which is not good for rearing of fishes.

3.6 Chloride

The chloride values were ranging from 190.8mg/ lit to 193.6mg/lit. Excess value of chloride was due to pollution created by human and animal in different ways. It was not suitable for culture of major carps like Catla, Rohu, Grass carp etc:

3.7 Fluoride

The range of fluoride was from 0.3mg/lit to 0.5mg/lit respectively. Fluoride ions act as an enzymatic poison inhibiting enzyme activity and ultimately interrupt metabolic process like glycolysis and protein synthesis. Fluoride increases with exposure time and water temperature and decrease with increasing intraspecific body size and water content of calcium and chloride.

3.8 Sulphate

In the present pond, sulphates are discharged mainly from domestic waste. The range of sulphate was from 56.3mg /lit (February) to 57.9 mg/lit in (September and October).

3.9 BOD

Biological oxygen demand is a good indicator of pollution in a water body. It is measured by the amount of O₂ taken by microorganism during the decomposition of organic waste aerobically in water. In the present project the BOD of the pond was higher throughout the months or season of the year. It may be due to pouring of sewage, defecation and washing etc. The higher range of BOD is not ideal for fish especially carps sustainability. Jain and Dhaniya (2000) considered BOD as an important parameter to establish the status of pollution. Prasanna Kumari et al (2003) related that higher BOD during rainy season was due to input of organic wastes and enhanced bacterial activities.

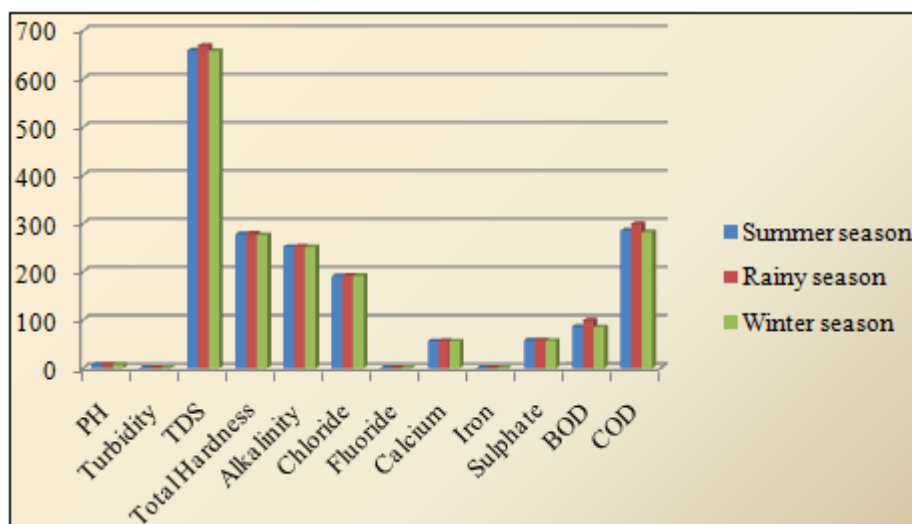
3.10 COD

Chemical oxygen demand COD is a measure of all organic and inorganic material in the water body. It is an indicator of both sewage and industrial pollution. In the present study the COD is quite higher in all the seasons of the year which impact lethally on the production of fishes in the pond.

4. Conclusion

Physio chemical characteristics of a water body keep changing over a period of time by several means including natural and artificial factors. Temperature, pH, TDS, alkalinity, hardness, BOD, and COD of the pond in the present study pose a threat to the survival of the fishes

.consumption of the fishes of this pond ultimately cause several diseases to the local inhabitants of the town. So. It is of utmost importance to take some curative steps to maintain the physio chemical and biological aspect of pond for good quality.



Bar graph of selected parameters during different season of the year

References

- [1] A.K.Dixit, S.K.Pandey, R Mehta ,Niyaz Ahmad ,Gunjan and Jyoti pandey (2015); Study of Physio-chemical parameters of different pond water of BilasPur District, Chattishgarh India. Envi. Skeptics and critics,2015,4 (3):89-95.
- [2] Chaurasia M.and Pandey G.C (2007) Study of Physio-chemical characteristics of some water pond of Ayodhya Faizabad. Indian J of Environmental Protection 27 (11),1019-1023.
- [3] Chowdhary A.H and Mamun A.A (2006) Physio-chemical conditions and plankton population of two fish pond in Khulna. Univ. J. ZOOL .Rajshahi Univ. Vol.25, pp.41-44.
- [4] Dwivedi B.k and Pandey G.C (2002); Physiochemical factors and algal diversity of two ponds in Faizabad India Poll. Res. 21 (3), 361- 370.
- [5] Hulyal S.B and Kaliwal B.B (2011) Seasonal variations in Physio-chemical characteristics of Almatti Reservoir of BijapurDistrict. Karnataka state IJEP vol 1 no1 pp 58-67.
- [6] Jain Y.and Dhanija S.K (2000) Sudies in a polluted centric water body of Jabalpur with special reference to physio-chemical and biological parameters. J .Env ,Bio. Vol 7 pp83-88.
- [7] Jhingran V.G (1982) Fish and fisheries of India. 2nd EDN Hindustan Publishing Corporation India.
- [8] Joshi P.C and Singh .A (2001) Analysis of certain Physio-chemical parameters and plankton of freshwater hillstream at Nanda Devi biosphere reserve. U.P J.ZOOL.21,177-179.
- [9] Kiran B.R (2010) Physiochemical characteristics of fish pond of Bhadra project at Karnataka. RJCABP vol.3 671-676.
- [10] Prasanna Kumari.A.A,Gangadevi T. And Sureshkumar C.P(2003) ;Surface water quality of river Neyyar-Thiruvananthapuram ,Kerala India. Poll Res 22 (4),515-525.
- [11] Singh R.P and Mathur P (2005). Investigation of variation in physiochemical characteristics of a freshwater reservoir of Ajmer city. Rajasthan Ind. J.Environ Science .957-61.
- [12] Swarnlata N.and Narasingrao A. (1998) ;Ecological studies of Banjara lake with reference to water pollution. J.Environ.Biol.19(2), 179-186.
- [13] Verma P.U ,Purohit A.R and Patel N.J (2012); Pollution status of Chandlodia lake located in Ahmedabad Gujrat, IJERA vol 2 pp 1600-1606.
- [14] Young J.O (1975); Seasonal and diurnal changes in the water temperature of a temperate pond (England) and tropical pond (Kenya) Hydrobiol. 47, 513-526.