

## Seasonal Variations in Physico-Chemical Parameters of Bharawas Pond, Rewari, Haryana



**Kavita Sahni and Sheela Yadav**

Department of Zoology Vedic Kanya P.G.

Mahavidyalaya, Raja Park, Jaipur

e-mail : drksahni@yahoo.co.in

**ABSTRACT** : The present paper deals with the seasonal variations in some important Physico-chemical parameters of Bharawas pond, district Rewari. A total of 17 parameters were recorded during the study period. Most of the parameters viz. temperature, transparency, EC, Free CO<sub>2</sub>, DO, Chloride, Carbonate, Bicarbonate, T.alkalinity, T.hardness, Calcium, Magnesium, Salinity, TDS and phosphate were badly affected while only pH and nitrate were found within range. It was also observed that the pollutant receiving water body appears as an aquatic desert which is most unsuitable for aquatic biota and for aquaculture.

**Key words:** Bharawas pond, pollution, aquaculture.

### Introduction :

Limnological investigations on water bodies were aimed to assess the deterioration of water quality due to pollution. The role of water in nature is unique not only from the point of human consideration; even the numerous organisms make aquatic medium their abode. Understanding such aquatic life requires a sound knowledge not just for organisms themselves but also of those of external influences of the medium that affect them. The physical and chemical properties of fresh water bodies are characterized by the climatic, geochemical, geomorphological and pollution conditions. The quality of aquatic life depends on the water quality. In order to utilize fresh water bodies successfully for fish production, it is very important to study the physico-chemical factors which influence the biological productivity of the water body.

In the recent year, a remarkable contribution is made in this field. Several studies have been made on the limnology of fresh water bodies in India (Naganandini and Hosmani, 1998; Pandey *et. al.*, 2000; Patil and Tijare, 2001 and Gupta and Shukla, 2006).

Not much information is available on Physico-chemical parameters and aspects pertaining to village water bodies used for culture of Indian major and exotic carps around Rewari. Hence, the present account is an attempt to study detailed information on some important physico-chemical parameters of Bharawas pond in district Rewari, Haryana.

### Material And Methods

The pond is situated in Bharawas village and about 10 Km away from Rewari Bus Stand. The pond is

about 0.4 hectare in area with an average depth of about 2 metres during post-monsoon period. The fish cum cattle rearing without any fertilizer is carried out at this pond. Uncontrolled dairy effluents/biogass slurry discharge into the pond have resulted in eutrophication of pond as evidenced by substantial algal bloom, dissolved oxygen (DO) depletion in the subsurface water. Water samples were collected during morning hours in between 8.30 a.m. to 11.30 a.m. in one litre glass stopper sterile bottles and immediately transferred to the laboratories for analysis. Some of the parameters such as transparency and temperature were however, analysed on the spot itself whereas the others were recorded in the laboratory following the standard methods of Trivedi and Goel (1986) and APHA (2005) Welzed & Likeo (2000) and compared with standard values of aquaculture pond water (Boyd, 1998).

### Result and Discussion

Physico-chemical parameters of three seasons (post-monsoon, winter and summer) from October 2009 to May 2010 are given in Table-1.

Water temperature directly as well as indirectly influences many abiotic and biotic components of aquatic ecosystem. It also reflects to the dynamics of the living organisms such as metabolic and physiological behavior of aquatic ecosystem. In the present study temperature was found ranging between 16.12 to 36.75°C of which maximum value (36.75°C) was noticed in summer season and the minimum value (16.12°C) in winter season. Many workers observed similar trends while working on different water bodies (Dwivedi and Pandey, 2002 and Singh and Mathur, 2005).

**Table 1 :** Seasonal variation in Physico-Chemical parameters of Bharawas Pond during 2009-2010

Parameters	Post-monsoon season	Winter Season	Summer season	Aquaculture pond water standards as per Boyd (1998)
Temperature(0°C)	22.60	16.12	36.75	25-32
Transparency(cms)	13.30	15.12	12.12	35-40
pH	8.75	8.54	8.92	7-9
EC( umhos/cm)	4149.00	3858.00	4681.25	2000
Free CO <sub>2</sub> (mg/L)	18.26	13.42	19.35	1-10
DO(mg/L)	5.24	5.34	4.73	5-15
Chloride(mg/L)	1402.96	1107.95	1735.24	1-100
Carbonate (mg/L)	--	--	--	0-20
Bicarbonate(mg/L)	611.00	412.00	1081.00	50-300
T.Alka. (mg/L)	611.00	412.00	1081.00	50-300
T.Hardness(mg/L)	1203.60	968.60	1172.10	50-200
Calcium(mg/L)	89.37	75.71	118.80	5-100
Magnesium(mg/L)	239.22	190.20	213.60	5-100
Salinity(ppt)	6.00	5.25	6.75	<5
TDS (mg/L)	3803.20	2908.70	4373.00	500
Nitrate(mg/L)	1.25	1.02	1.51	0.2-10
Phosphate (mg/L)	2.41	2.15	2.80	.005-0.2

Transparency in the present study ranged between 12.12 to 15.12cms of which higher value (15.12 cm) was reported in winter season while the lower value (12.12 cm) in summer season. Lower value of transparency during summer season may be due to low level of water and influx of dairy effluents. Similar conclusion was reported by Kamal *et. al.*, (2007).

pH is considered as one of the most important chemical parameter of water since most of the aquatic organisms are adapted to an average pH. The pH values during the post-monsoon, winter and summer seasons were 8.75, 8.54 and 8.92 respectively. Higher value of pH in summer season may be due to influx of dairy effluents and low level of water. pH also influences other factors like conductivity, bicarbonates, chloride, salinity, phosphate, hardness and magnesium (Sheeja, 2005).

Electrical Conductivity is another key factor that

determines the quality of water. It is a measure of purity of water. The EC value in the present study ranged between 3858.00 to 4681.25 umhos/cm being maximum (4681.25 umhos/cm) in summer season and minimum (3858.00 umhos/cm) in winter season. The fluctuations in EC are due to fluctuation in total dissolved solids and salinity (Pandey and Pandey, 2003).

Free CO<sub>2</sub> in the present study varied from 13.42 to 19.35mg/L. The lowest value (13.42 mg/L) of free carbon dioxide was recorded in winter season whereas the highest value (19.35mg/L) in summer season. The increase in carbon dioxide level during summer may be due to decay and decomposition of organic matter. This is strengthened by the observations of Joshi *et. al.*, (1995) who have observed the addition of drainage was the main causal factor for increase in carbon dioxide in the water bodies.

Dissolved Oxygen is one of the most important

parameter of the water quality, directly affecting survival and distributing flora and fauna in an ecosystem. In the present study dissolved oxygen values ranged from 4.73 to 5.34 mg/L of which maximum value (5.34 mg/L) was noted in winter season and minimum value (4.73 mg/L) in summer season. The quantity of DO in water is directly or indirectly dependent on water temperature, partial pressure of air etc. Similar results were observed by Chaurasia and Pandey, (2007). Ravindra *et al.*, (2003) recorded low level of DO in Delhi downstream of Yamuna river which may be due to pollution.

Chloride values in the present study were found ranging between 1107.95 to 1735.24 mg/L of which maximum value (1735.24 mg/L) was noticed in summer season and the minimum value (1107.95 mg/L) in winter season. The higher concentration of chloride is considered to be an indicator of higher pollution due to higher organic waste of animal origin. Sahu *et al.*, (2007) observed that the higher concentration of chloride in the summer period may be due to increased temperature, low level of water and sewage mixing.

During the present investigation, the carbonates were found absent.

Bicarbonates and Total Alkalinity values varied from 412.00 to 1081.00 mg/L of which maximum value (1081.00 mg/L) was observed in summer season and minimum value (412.00 mg/L) in winter season. Larger quantities of bicarbonates during summer months may be due to the liberation of free carbon dioxide in the process of decomposition of bottom sediments which probably resulted in conversion of insoluble carbonates to soluble bicarbonates. Raj Narayan *et al.* (2007) also observed similar results in their study on Texi Temple pond of Etawah.

Total Hardness values ranged from 968.60 to 1203.60 mg/L of which higher value (1203.60mg/L) was found in post-monsoon season while the lower value (968.60mg/L) in winter season. This may be due to the presence of high content of calcium and magnesium in addition to sulphate and nitrates. (Angadi *et al.*, 2005). Calcium is found in greater abundance in all natural water and its main source is weathering of rocks from which it leaches out. Calcium was found higher (118.80mg/L) in summer season and lower (75.71 mg/L) in winter season. Magnesium contents varied from 190.20 to 239.22 mg/L being maximum (239.22 mg/L) during post monsoon season and minimum (190.20 mg/l) in winter season. The main source of magnesium is being leaching of rocks in the catchment area. The maximum level of hardness during the summer season may be due to evaporation of water,

addition of calcium and magnesium salts and sewage inflow (Chaurasia and Pandey, 2007).

Salinity refers to total concentration of all ions in water. In the present study the salinity varied from 5.25 to 6.75ppt being maximum (6.75ppt) in summer season and minimum 5.25ppt in winter season. The fluctuation in salinity is probably may be due to fluctuation in total solids in conformity to the distribution of Salam *et al.*, 2000.

Total dissolved solids (TDS) value of water varied from 2908.70 to 4373.00 mg/L of which higher value (4373.00 mg/L) was reported in summer season while the lower value (2908.70mg/L) in winter season. Higher values of TDS in summer season may be due to evaporation of water, contamination of domestic waste water, garbage and fertilizers etc. High concentration of TDS enriches the nutrient status of water body which leads to eutrophication of the aquatic ecosystem. (Swaranlatha and Rao, 1998 and Singh and Mathur, 2005).

Nitrate concentration in the present study varied from 1.02 to 1.51 mg/L of which higher value (1.51 mg/L) was observed in summer season while the lower value (1.02mg/L) in winter season. All organisms require nitrogen for the basic process of life to synthesize protein required for growth and reproduction. The presence of nitrates in the water samples is suggestive of some bacterial action and bacterial growth. These findings support to the observations of Majumder *et al.*, (2006).

Phosphate is an important nutrient for the maintenance of the fertility of water body. During the present investigation the phosphate concentration was reported higher (2.80 mg/L) in summer season and lower (2.15 mg/L) in winter season. Higher concentration of phosphate in dry seasons may be due to low level of water and pollution. Kamal *et al.*, (2007) observed the similar findings in their study on Mouri river.

## **Conclusion**

From the above investigations, it may be concluded that most of the physico-chemical parameters viz. temperature, transparency, EC, free carbon dioxide, DO, chloride, carbonate, bicarbonate, T. alkalinity, T. hardness, calcium, magnesium, salinity, TDS and phosphate were found beyond the permissible limits while pH and nitrate were found within the range. The findings clearly indicate that the pond is highly polluted due to discharge of uncontrolled dairy effluents leading to eutrophication. The all over impact on the pond has resulted in the deterioration of water quality, accumulation of toxic chemicals and

sediment shrinkage of pond area. In order to improve the quality of pond water, continuous monitoring of the pollution level is an urgent need of the day to promote fishery.

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