

Physico-chemical analysis of some major tanks in relation to fish production of district Hanamkonda, Telangana

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Abstract

Present study was aimed to explore the physico-chemical characteristics of two major tanks of district Hanamkonda. The most of the ponds have been devastated due to anthropogenic activities. The ponds which are selected for the study are three from Waddepally City tank and one from Hasanparthy village tank in Hanamkonda region. The two tanks are selected. The physico-chemical parameters are water transparency, temperature, dissolved oxygen, ph., Free CO₂, alkalinity and total solids etc. The study was conducted during the month of February 2020 to March 2021. It was noted to have alkaline water throughout the year. The biodiversity and the production of fish depend upon the physico-chemical characteristics of the tanks.

Keywords: Physico-chemical; Hanakonda; CO₂

1. Introduction

The importance of lakes, in maintaining healthy as well as prosperous nations in a healthy environment is amply understood from the very existence of the civilization on the globe. Lakes constitutes, need for the development of an area. While all developmental activities like, urbanization, industrialization, mining, construction and agricultural are dependent upon water, they at the same time contribute, towards the gross degradation of water quality directly or indirectly by promoting silting and accumulation of nutrients, organic matter and other pollutants.

Inland fish production has been carried out through ponds and tanks in different regions of district Hanamkonda. The water resources of the district are canals, lakes, ponds and tanks. The major sources of irrigation are canals and tube wells. The ponds and tanks are the major resources of inland fish production. There were about 2400 ponds found in the government record of district. The areas of the most of the ponds are now reduced and they are occupied by the residents of there. Farming is also taken in most of the ponds. Most of the ponds and tanks in the district reflect their attitude for inland fish production. About 95% of unorganised labour is dwelling in fishing sector. Fish farmers are inefficient in the application of resources. The imperfect condition of input markets and low output prices hampered efficient utilisation of production inputs. (Inoni OE, 2007). Fishes are dependent on physico-chemical parameters. Any change of parameters may affect the growth, development and maturity of the fish (Jhingran, 1985). Phytoplankton and zooplankton together constitutes the natural fish food. High plankton counts indicate high fish production potential (ICAR 2011). The demand of fish is increasing day by day in Hanamkonda district. It motivates producers to produce more from their impounded land resources. As per FAO report around 90 percent of fish production is expected to be destined for human consumption. This would happen because of rising income and urbanisation linked with the expansion of fish production and improved distribution channels. World food fish consumption in 2030 is projected to be 20 percent higher than in 2016.

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2. Material and methods

The present study was carried out on some selected tanks of Hanamkonda district. The water samples were collected from two tanks. The samples were collected in clean and dried bottles and in all the three seasons—summer (March to June), monsoon (July to October) and winter (November to February) during 2020-21. Two tanks Waddepally City and Hasanparthy are selected for littoral and limnetic sites. (Fig.1&2). The samples collected from different tanks are brought to laboratory for examination. A standard method suggested by American public health association (APHA 2006) was used for water analysis (Table-1).



Figure 1 Collection of Water Samples at Waddepally tank



Figure 2 Collection of Water Samples at Hasanparthy tank

Table 1 Names, depth range and site types

Name of Tanks	Depth range (meters)	Site types
Waddepally	1.0-1.5	Littoral
Hasanparthy	1.5-2.5	Limnetic

Table 2 Meteorological data of Hanamkonda district for 2020-21

S.no.	Month	Min. tempC ⁰ . C ⁰	Max. tempC ⁰	Rainfall (mm.)	Min. Humidity %	Max. humidity %
1	February	15.0	30.0	12.5	32	80
2	March	17.5	34.0	0	28	75
3	April	21.5	39.5	15.6	35	70
4	May	25.0	42.8	70.3	36	72
5	June	24.8	40.0	74.0	60	70
6	July	18.0	32.0	63.0	65	80
7	August	23.0	32.8	25.0	62	85
8	September	20.2	29.0	0	60	88
9	October	18.6	30.0	0	65	90
10	November	10	20.0	14.6	55	92
11	December	8.0	22.0	0	46	80
12	January	5.0	18.0	44.0	4280	82

3. Results and discussion

The temperature has an important role in deciding the environmental conditions of the area. It has a key role in deciding the biotic features of the water body. The temperature varied from 4.6oC- 40.8oC. The highest temperature was noted in June and lowest in January during 2020-21 in district Hanamkonda. Rainfall is very important because most of the farmers are dependent on the rain to fill their ponds. The rainfall ranges from 14.5mm-65.6mm in 2020-21. The humidity ranges from 25% - 84%. The minimum humidity was noticed in April and maximum in October month. The physico-chemical characteristics of water depend on the metrological conditions of the area. The temperature and turbidity play an important role in the pond productivity. Dissolved minerals, gases and pH decide the quality of the pond water. It was found that no significant differences in the variability of physico-chemical factors between surface and bottom water. The transparency of water ranges from 18.5 cm to 30.5 cm. Its high value in summer and low in monsoon was noted. The high transparency in summer was due to low depth of water, high intensity of sunlight and precipitation of turbidity. The transparency influences the photosynthesis, growth and primary productivity of the pond (Table-3). The mean values of water temperatures varied from 20⁰C-28.5⁰C. The water temperature have shown variation with seasons and sites. The temperature has an important tool in deciding the biotic features of the water body. The higher temperature in tropical waters is considered to be beneficial for higher productivity.

The growth of carps was found optimum in the temperature range of 25⁰C- 30⁰C. The dissolved oxygen is the most important and critical parameter requiring continuous monitoring in aquaculture production system APHA (1985) has considered this parameter as the key test to understand water pollution and degree of eutrophication. This is due to the fact that fish aerobic metabolism requires dissolved oxygen (Timmons et al. 2001). The dissolved oxygen content ranged from 5.0 to 6.8 mg/l in 2020- 21. Dissolve oxygen was higher during summer months and lower during winter months. Bhowmic (1968), Jana (1973) and Chakraborty (1980) had recorded fluctuations of content in their experimental ponds at West Bengal. The pH value of different ponds varied between 7.0 to 8.0. It was shown that ponds had alkaline water throughout study period. Nees 1946 and Banerjia (1967) observed the variation in water pH from 7.1 to 8.0 as optimum for fish production. The high PH in summer and low PH in winter are recorded during the study period. The free CO₂ content varied from 5.4 to 6.4 mg/l. The highest was noted in summer and lowest in winter. Sometimes the free CO₂ is

absent in the ponds. It was due to its utilisation by algae during photosynthesis or presence of carbonates in water (Manjare et al.2010). The total dissolved solids was recorded a moderate to high range during the study period. TDS consists of nutrients and minerals like magnesium, calcium, nitrogen, sulphate and phosphate etc. It was recorded with a wide range of 200 to 260 during the study period. The highest value was recorded in winter and lowest in summer. The total alkalinity of ponds varied from 100-160 mg/l it was minimum during winter and maximum during summer season. The range of alkalinity was found due to greater dissociation of carbonic acid at high temperature however low alkalinity indicates scarcity of carbonates. The total alkalinity was maintained by liming and fertilisers by fish farmers it was because the climatic factors such as temperature and rainfall do not fulfil the need. The alkalinity less than 100mg/l is not suitable for fish culture (Scroeder1980, Banerjea 1967).

The chemical oxygen demand (COD) measures amount of organic compounds in water. It determines organic pollutants of water in ponds. The COD was found minimum in monsoon and maximum in summer. It was varied from 24.0 to 25.5mg/l during the study period (Table-3).The quality of pond depends on the physical, chemical and biological characteristics of water(Latha N, R Mohan 2010 and S.E. Sinde 2011). Biochemical oxygen demand (BOD) was varied from 15.0 to 20.2 mg/l in the pond water. It was minimum in winter and maximum in summer (Table-3).The quality of an ecosystem depends on the physico-chemical characteristics and biological diversity of the system (Tiwari and Chauhan 2006). The high values of transparency, temperature and pH were the most valuable parameters that have affected phytoplanktons and zooplanktons quantitatively and qualitatively. These factors usually govern the seasonal growth and distribution of biotic communities in ponds. Species composition of zooplanktons and phytoplanktons were comparatively higher during summer as compared to rainy and winter seasons at all sampling sites of ponds.

Table 3 Mean seasonal values of physico-chemical parameters during 2020-21

S.no	Parameters	Summer season	Monsoon Season	Winter season
1	Transparency (cm)	30.5	18.5	26.5
2	Temperature C ^o	26.5	22.0	18.0
3	D/O (mg/l)	5.5	5.0	4.0
4	Ph	7.2	6.5	6.8
5	Co ₂ (mg/l)	6.0	6.0	5.0
6	Total Solids (mg/l)	240.0	320.0	300.0
7	Total alkalinity (mg/l)	90.0	80.2	80.0
8	COD (mg/l)	23.5	21.0	22.0
9	BOD (mg/l)	18.0	16.0	12.0

Fishes being the highest consumer had been taken as the measure for secondary production in the present study. The fishes which were caught from the ponds are Catla catla, Labeo rohita (Rohu), Cyprinus carpeo (common carp), Hypothalmichthys molitrix (silver carp), Ctenopharyngodon idella (grass carp) and some local large and small fishes. The local fishes are singhi, padhan, kaalbasu etc. The average fish productivity was found to be 28 quintal per hectare during 2020-21. The maximum catch was found in the month of October and November and minimum in the month of March and April. The fishes are mainly caught two times in a year, one in the month of July-August and the other in March-April. In the summer months, when the temperature increases the production of fishes also increases. This shows that temperature affects the growth of fishes. In the winter season the fish catch was decreased due to low temperature. Therefore, the ponds showed the moderate to high range of fish productivity. It indicates that the limnology of present water body is still quite suitable for extension of aquaculture and fisheries based on fresh water systems. (Table 3).

4. Conclusion

The study of physico-chemical factors of four ponds of Hanamkonda, Telangana. Has confirmed that there were no significant differences between surface and bottom water. The high values of transparency, temperature and pH have affected the seasonal growth of phytoplanktons, zooplanktons and other biotic communities. The climatic conditions, physico-chemical factors and quality of soil decide the productivity of the ponds. The findings of the ponds indicate that the water quality have very good potential for fish culture. The study has shown that the small tanks of villages have

greater power of high yield if they are scientifically managed. The study has noticed the need to protect and conserve these small water bodies at the rural level. Hence the policy makers, fish biologists and planners need to take immediate action and to help fish farmers to make strategies for fish culture enhancement programs.

Compliance with ethical standards

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