

Fish Culture and Physico-chemical Characteristics of Madikoppa Pond, Dharwad Tq/Dist, Karnatak

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Abstract

Monthly changes in water quality parameters (Physico-chemical) in Madikoppa pond were investigated from Feb 2012 to Jan 2013, to assess the suitability of this pond for pisciculture. The different Physico-chemical parameters like P^H , temperature, turbidity, dissolved oxygen, carbon dioxide alkalinity, chloride, total hardness, BOD, COD, Phosphates, and nitrates were carried out. The values are within the range prescribed by "Guidelines for water quality management for fish culture in Tripura", ICAR Research complex for NEH Region Tripura Centre, Lambucherra-799210 Tripura (West), publication No. 29, Year 2007.

Keywords: Physico-chemical parameters; Madikoppa pond; Pisciculture; Water quality management

Introduction

A pond is referred to as a man-made or natural water body. Water quality means the component of water which must be present for optimum growth of aquatic organisms. The source of water supply to the pond may be from river or from spring or from rain. A pond must be manageable for controlled farming; Life in aquatic environment is largely governed by physico-chemical characteristics and their stability. Various changes that organisms bring about in the water are essential for their own existence. Rearing of fishes in localized water is known as Pisciculture. The determinant of good fish growth in water body includes dissolved oxygen, total hardness, alkalinity, temperature, etc. Conversely other parameters like BOD, COD indicates pollution level of a given water body. Concentrations of physico-chemical parameters increase due to human activities and also by lack of environmental regulations.

Materials and Methods

Physico-chemical characteristics of water of Madikoppa pond were studied at monthly intervals from Feb 2012 to Jan 2013, (Table 1) by choosing fixed spot by composite sampling method using labeled plastic container of five liter capacity.

The method adopted for different physico-chemical parameters were followed according to the procedure described in the APHA, AWWA and WPCF 1998 [1].

The Physico-Chemical parameters were analyzed by

1. pH by Digital pH meter
2. Temp: by Thermometers
3. Turbidity: by Nephello Turbid Meter
4. DO: Using standard Winkler method by titration
5. CO_2 : By titration method
6. Alkalinity: By titration method
7. Cl: By titration method
8. Total hardness: by using EDTA complexometric by titration
9. BOD: By titration

10. COD: Open condensation and digestion by titration

11. PO_4 : By Spectrophotometer

12. NO_3 : By Spectrophotometer

Results and Discussions

The study area Madikoppa pond is located between $15^{\circ} 31' 18''$ N and $74^{\circ} 51' 08''$ E at an altitude of 655 MSL covering an area about 5.2 acres. The above said pond is in Dharwad taluk of Dharwad District. This is one of the biggest tank coming under minor irrigation project of Dharwad District. It is approximately 15-20 years old pond artificially built for irrigation and domestic use. Since there is no research work has been carried out on this pond, an attempt has been made to assess the suitability of the physico-chemical characteristics of this pond water for pisciculture.

pH

pH is an important limiting factor in fish culture. It indicates the acid base balance of the water. The survival and growth of fish is also depending on pH of the water. The ideal pH for the growth of fishes is between 7.5 to 8.5, above and below this is stressful to the fishes (According to the Guidelines for water Quality Management for fish culture is Tripura). In present study pH ranged between 7.0 to 8.1. This agrees with both [2] and also with Guidelines for Water Quality Management for fish culture in Tripura. Similar range was also obtained by [3] who reported a range of 7.3-8.3.

Temperature

A prior knowledge of maximum and minimum water temperature of the water body is essential for fish culture. Ideal temperature $24^{\circ}C$ to

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Date	Parameters											
	pH	Temp	Tur	DO	CO ₂	Alk	Cl	TH	BOD	COD	PO ₄	NO ₃
Feb, 2012	7.2	25.8	28.0	7.8	3.0	82.0	22.0	100.0	3.0	10.0	0.3	1.2
March, 2012	7.0	26.2	20.0	7.9	4.0	85.0	15.0	106.0	2.0	12.0	0.3	1.0
April, 2012	7.7	26.4	22.0	7.3	3.0	94.0	25.0	108.0	3.0	18.0	0.2	1.8
May, 2012	7.8	26.3	30.0	7.5	2.0	92.0	30.0	105.0	5.0	20.0	0.2	1.3
June, 2012	7.9	26.1	38.0	7.9	Nil	90.0	32.0	108.0	4.0	16.0	0.3	0.9
July, 2012	8.1	25.9	44.0	7.7	3.0	92.0	33.0	104.0	3.0	12.0	0.3	0.8
Aug, 2012	7.9	25.7	60.0	7.8	2.0	80.0	28.0	100.0	4.0	8.0	0.2	0.4
Sept., 2012	7.7	25.5	70.0	7.9	3.0	95.0	30.0	106.0	5.0	6.0	0.3	0.3
Oct., 2012	7.2	25.3	64.0	7.6	1.0	84.0	32.0	110.0	4.0	8.0	0.3	0.6
Nov., 2012	7.8	25.2	72.0	7.4	2.0	88.0	35.0	96.0	3.0	10.0	0.2	0.7
Dec., 2012	8.0	25.4	56.0	7.5	1.0	89.0	40.0	106.0	2.0	8.0	0.3	1.0
Jan., 2013	7.6	25.8	42.0	7.7	2.0	70.0	32.0	80.0	3.0	6.0	0.2	1.2

Table 1: Physico-Chemical parameter analysis of Madikoppa pond.

30°C (According to the Guidelines for water Quality Management for fish culture in Tripura) holds good for fish culture in pond. In present study temperature ranged between 25.2°C to 26.4°C which falls under guidelines given by Water Quality Management for fish culture in Tripura.

Turbidity

Turbidity refers to the decreased ability of water to transmit light caused by suspended particulate matter and phytoplankton. The range of turbidity obtained in the present study was 20 to 72 NTU. According to Zweigh [4] 20-30 NTU is suitable for fish culture. But in present study we observed little more turbidity comparatively with Zweigh findings.

Dissolved oxygen

Dissolved oxygen is a measure of amount of gaseous oxygen dissolved in an aqueous solution that plays a vital role in the biology of cultured organisms [5]. Of all the dissolved gases in water, oxygen is the most important for the survival of organism under aquaculture. In present study DO obtained in the range of 7.3 to 7.9 mg/l. According to Guidelines given by Water Quality Management for fish culture in Tripura, the minimum concentration of DO is 4 mg/l should be maintained in fish ponds at all times. Present study DO values agree with those of [6], pointed out that the minimum DO should be 5 mg/l for tropical fish.

Carbon dioxide

Free Carbon dioxide in water is the byproduct of metabolism. More than a particulate level, carbon dioxide in water is toxic to the life in water. In present study the value of CO₂ is ranged between Nil to 4 mg/l, but according to the guidelines for Water quality Management for fish culture in Tripura, the water supporting good fish population should contain 5 mg/l free carbon dioxide. According to this, the CO₂ which we obtained in our findings coincides with above value.

Alkalinity

Alkalinity is the sum of negative ions reacting to neutralize hydrogen ions when an acid is added to water. Concentration of alkalinity will be taken care by proper liming. The ideal value for fish culture is 50-300 mg/l (According to Guidelines for Water Quality Management for fish culture in Tripura). In present study the alkalinity value we got is ranged between 70 to 95 mg/l. The value falls under the Guidelines for water Quality Management for fish culture in Tripura.

Chloride

In present study chloride obtained was in the range of 15 to 40 mg/l. But according to [7] reported chloride value ranged between 10-25 mg/l in his findings good for fish culture but according to above value, the values which we got in our findings are little more.

Total hardness

Hardness of water depends on the dissolved solids and pH. Hardness gives a measure of the total concentration of the divalent metallic cations like Calcium, Magnesium and Strontium. Proper liming can rectify the hardness. The ideal value of hardness for fish culture is 30-180 mg/ltr (According to Guidelines for Water Quality Management for fish culture in Tripura). The hardness in the present study ranged between 80 to 110 mg/ltr. This result supports guidelines given by Water Quality Management for fish culture in Tripura. But [8] reported hardness ranged between 25-100 mg/l for good fish culture. The value which we got in our findings are little more but harmony with above findings of [8].

BOD

The Biochemical Oxygen Demand is the amount of oxygen taken up by micro-organism that decomposes organic waste matter in water. This is an indication of both sewage and industrial pollution. The optimum BOD level for aquaculture should be less than 10 mg/l. (According to guidelines for Water Quality Management for fish culture in Tripura). In present study the value of BOD is ranged between 2.0 mg/l to 5.0 mg/l which are harmony with the readings given by guidelines of Water Quality Management for fish culture in Tripura. But according to [9] the permissible value of BOD is 4 mg/l. Accumulation of low BOD results in organisms being stressed, suffocated and death may occur [9]. This condition was not observed in the present study.

COD

The Chemical Oxygen Demand of water represents the amount of oxygen required to oxidize all organic matter, biodegradable and non-biodegradable by a strong chemical oxidant. This is an indication of both sewage and industrial pollution. The ideal value of COD should be less than 50 mg/l for fish culture (According to guidelines for Water Quality Management for fish culture in Tripura). In present study the COD value is ranged between 6.0 mg/l to 20.0 mg/l.

Phosphate

Phosphate value obtained in this present study ranged between 0.2

to 0.3 mg/l. Phosphate although present in very small quantity in water is important for the production of phytoplanktons, which forms food for fishes.

Nitrate

Nitrate is not toxic to aquatic animals even in large concentrations. Its favorable range is 0.1 to 4.5 mg/liter, in culture water (According to guidelines of Water Quality Management for fish culture in Tripura). In present study Nitrates value obtained in the range of 0.3 to 1.8 mg/l. This value is harmony with both the range given by guidelines for Water Quality Management for fish culture in Tripura and by [10] as desirable limit is 0 to 2 mg/lit and acceptable limit less than 4 mg/l.

Conclusion

In present study turbidity value is little more so turbidity can be reduced by scattering gypsum on the entire pond water at the rate of 200kg/1000m³ of pond or lime application also will reduced the turbidity level. Other parameters are within the normal range which is suitable for fish culture. There is desirable need to analyze the fish pond water at regular intervals. Liming should be done at regular intervals of time depending on the pH of pond water. Drag-netting operation racking should be done at least once in a month to disturb the pond bottom and to ensure good quality conditions. If pond condition is maintained no doubt a better yield of fishes can be obtained and it is economically advantage to farmers.

References

1. APHA, AWWA, WPCF (1998) Standard methods for the examination of water and waste water 20th Edition. APHA, NY, USA.
2. Stone NM, Thormforde HK (2003) Understanding your fish pond water analysis report. University of Arkansas Co-operative Extension Printing Services 31-42.
3. Kamal D, Khan AN, Raham MA, Ahmed A (2007) Study on physico-chemical properties of water of Mouri River, Khulna, Bangladesh. Pak J Biol Sci 10: 710-717.
4. Zweigh RD (1989) Evolving water quality in a common carp and blue tilapia high production pond. Hydrobiologia 171: 11-21.
5. Dhawan A, Karu S (2002) Pig dung as pond manure: Effect on water quality pond productivity and growth of carps in poly culture system. The International Centres for Living Aquatic Resources Management (ICLARM) quarterly, Manila 25C1: 1-14.
6. Saloom ME, Duncan RS (2005) Low dissolved oxygen levels reduce anti-predator behaviours of the fresh water clam *corbicula fluminea*. Fresh water Biol 50: 1233-1238.
7. Triverty RK, Khataavker SD (1986) Phytoplankton ecology of the river Krishna in Maharastra with reference to bio-indicators of pollution. Asian Environ 31-42.
8. Wurts WA, Durbow RM (1992) Indications of P^h, Carbon dioxide, Alkalinity and hardness in fish ponds. Southern Regional Aquact. Centre Fact Sheet No 464: 1-4.
9. APHA (1992) Standard methods for the examination of water and waste water 18th Edition. American Public Health Association, Washington. D.C. 874.
10. DWAMD (1994) Division of Water Ambient Monitoring Database.