EVALUATION OF PHYSICO-CHEMICAL PARAMETERS OF FISH CULTURE POND WATER IN SHRI GANESHAN FISH FARM AT HOSHANGABAD, MADHYA PRADESH, INDIA

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ABSTRACT
Mahseer is a commercially important group of fresh water cyprinids and have high value food fish as well as sport fish, but they are endemic to Asia. The growth of Mahseer depends on the physico-chemical qualities of water. Hence for successful culture of Mahseer in a pond requires analysis of water parameters. Water quality is determined by various parameters such as temperature, transparency, turbidity, water colour, pH, free carbon dioxide, alkalinity, hardness, dissolved oxygen, BOD etc. In this   paper analysis of water parameters have been reviewed to make aware the fish culturist about important water quality parameters for enhancement of fish production and to conserve the fish.

KEY WORDS: Cyprinids, Fish production, Mahseer, Parameters, Physico-chemical qualities.

INTRODUCTION

Mahseer are regarded as a food fish and an excellent sport fish. Mahseer refers to a group of fresh water cyprinid having larger having larger size of scales on their body (Hamilton, 1822; Desai, 2003). Mahseer have been variously called as the 'king', 'lion', 'tiger', 'the great fighter'etc. The population of mahseer has been declining rapidly in India due to the degradation of ecological condition of aquatic system, indiscriminate fishing of brood fish and juveniles, river valley projects, industrial and anthropogenic intervention etc. (Ogale, 2002a). The major issue of drastic decline of mahseer population is the fry and fingerlings fishing by fishermen (Vinod, 2007). In recent years, conservationists have expressed views over declining population of mahseer. So, Mahseer has been declared as 'the state fish of M.P'.

Good water quality plays an important role in the growth and survival of a fish. Fish growth depends on water quality characteristics in order to increase its production. Water quality is determined by physico-chemical parameters which are directly or indirectly affect the biotic components of an aquatic environment.

MATERIALS AND METHODS

In the present study water samples were collected from earthen pond of Shri Ganeshan fish farm of village Nitaya at Hoshangabad. Physico-chemical characteristics of water of the pond were studied in the three periodic months from Jan 2016 to March 2016 (Table 1). Water samples were collected in five litre of labeled plastic container from the littoral zone of the site from 09:00 a.m. to 05:00 p.m. The various physico-chemical parameters were analyzed as per standard method APHA 20th edition (1998) and Workbook on Limnology by Adoni (1985).

The Physico-Chemical parameters were analyzed by
1. Temp: by Thermometer
2. pH: by Digital pH meter
3. Transparency: by sechhi disc
4. Turbidity: by Nephello Turbid Meter
5. Total dissolved solids: by TDS meter
6. DO: Using standard Winkler method by titration
7. BOD: By titration
8. Alkalinity: By titration method
9. Cl: By titration method
10. Total hardness: using EDTA complexometric by titration
11. PO_4: By Spectrophotometer
12. NO_3: By Spectrophotometer

RESULTS AND DISCUSSIONS

The study area shri ganeshan fish farm is located in Nitaya village between 22.6873^0 N and 77.7710 ^{0} E. This fish farm is approximately 20-25 years old pond and covers an area of about 12 acre. The above said pond is located in Nitaya village of Hoshangabad Tehsil of Hoshangabad district in Madhya Pradesh, India. This is the one and only the largest fish farm in the village where different species of fishes is to be cultured. These ponds are built for commercial production of fishes. Although it is also a research station but no research work has been carried out on mahseer in this fish farm, an attempt has been made to evaluate the physico-chemical characteristics of this pond water which is suitable for culture of Mahseer .
The results are shown in Table 1

Temperature

It is one of the most important basic environmental factors for all aquatic organisms which effects chemical and biological reaction in water (Boyd, 1982). The change in temperature affects the metabolism and physiology of fishes and its productivity is also affected. Ideal water temperature for the growth of fish was between 24°C to 28°C (Kulkarni and Ogale, 1991) and it holds good for fish culture in pond. In the present study temperature is obtained in the range of 19°C to 24°C which are come under the standards.((FEPA,1991and WHO, 2009).

pH

It is a measure of hydrogen ion concentration and it indicates the acid base balance of the water. In present study, the pH values varied from 7.0 to 8.2 which show the favorable conditions of productivity of fishes. The pH value also agrees with the results of Bisht *et al.* (2013). They are also within the international standards; FEPA and WHO.

Table 1 - Comparision of results with other standards values

Parameters	Jan	Feb	March	WHO	FEPA	Acceptable range BD
Temperature (^{o}C)	19	22	24	<35	27	15 – 35
pH	7	8.1	8.2	6.5 – 8.5	6 – 9	7 – 9.5
Transparency (cm)	8.4	8.1	5.8	-	-	-
Turbidity (NTU)	66	70	105	10	<7	-
Total Dissolved Solids (TDS)	224	228	203	500	500	-
Dissolved oxygen (DO) (mg/l)	5.7	5.6	6.2	6	8 – 10	3 – 5
Biochemical Oxygen Demand (mg/l)	4	4.1	3.8	6	10	3 – 6
Alkalinity (mg/l)	241	254	186	600	-	50 – 200
Chloride (**mg/l**)	30	31	21	250		0 -100
Total Hardness (mg/l)	97	99	102	600	-	>20
Phosphate (mg/l)	0.22	0.21	0.25	-	-	0.03 – 2
Nitrate (**mg/l**)	0.65	0.71	0.53	50	20	0 – 100

WHO – World Health Organization (2009), FEPA – Federal Environmental Protection Agency (1991), BD – Bhatnagar and Devi (2013)

Transparency

Secchi disk transparency is essentially determines the depth of the water body where light penetratres which influences the primary productivity of a pond. Transparency reduces with the suspended particles and plankton in water. In the present work, transparency value ranged between 5.8 to 8.4 cm. High transparency values in winter and low in summer season were obtained by Indu *et al*.(2017).

Turbidity

It consists of suspended particles in water such as clay particles, phytoplanktons, zooplanktons, particulate organic matters etc. it is defined as the measure of the ability of water to transmit the light that restricts light penetration, limit photosynthesis (Bhatnagar and Devi, 2013) and production of undesirable macrophytes in ponds (Boyd, 1979). In this present work the turbidity ranged from 66 - 105 NTU. According to **Bhavimani and Puttaiah (2014)** turbidity was in

the range of 20-72 NTU. 20-30 NTU is suitable for fish culture by Zweigh (1989). But in present study we observed more turbidity comparatively with Zweigh findings.

Total Dissolved Solids (TDS)
It is direct measure of all the dissolved both organic and inorganic substances in water bodies. In this present study TDS values obtained ranged from 203 to 228 mg/l. The values which we obtained are within the range of WHO and FEPA values.

Dissolved oxygen (DO)
Dissolved oxygen is the most important environmental factor in fish culture. It is a measure of amount of dissolved oxygen in aquatic ecosystem. It plays a vital role in the growth, survival, behaviour and physiology of aquatic organisms (Solis, 1988). Dissolved oxygen is low in winter season due to richness of organic matter, which consumes large amount of dissolved oxygen in the process of decomposition. The optimum concentration of DO in pond waters is 6 to 9 mg/L (Boyd, 1982). In present study DO obtained are in the range of 5.6 to 6.2 mg/l. and its value agree with those of WHO.

Biochemical Oxygen Demand (BOD)
It is the amount of oxygen taken up by micro-organism for the decomposition organic waste matter in water (Bhatnagar and Devi, 2013). The BOD value above 5mg/l indicates the water pollution (Clerk, 1986). In present study the value of BOD ranged between 3.8 to 4.1 mg/l. The BOD level between 3.0 to 6.0 mg/L has been reported as optimal for normal activities for fishes (Bhatnagar *et al*., 2004). The values which we obtained are within the range of WHO and FEPA values.

Alkalinity
Alkalinity is a measure of buffering capacity of water and is important for aquatic life. It equilibrates the pH changes that occur naturally as result of photosynthetic activity of phytoplankton. The ideal value of alkalinity for fish culture is 50- 300 mg/l (According to Guidelines for Water Quality Management for fish culture in Tripura). Optimum alkalinity for fish productivity is between 50 to 200 mg/L reported by Bhatnagar and Devi (2013). The values obtained were in the range of 186 to 254 mg/l and is suitable for fish farming in pond.

Chloride
Chloride is one of the major inorganic anion and is a common constituent of all natural water but are generally non harmful (Nduka et. al., 2008). In present study chloride obtained was in the range of 21 to 31 mg/l. According to Bhavimani and Puttaiah (2014) value of chloride was in the range of 15 to 40 mg/l.

Total Hardness
Total hardness is defined as the sum of calcium and magnesium concentration in aquatic bodies which are present in the combination of carbonates and bicarbonates which causes temporary hardness. Calcium and Magnesium are essential for bone and scale Formation in fishes (Bhatnagar and Devi 2013). The hardness in the present study ranged between 97 to 102 mg/l. The values obtained are within the range of WHO and FEPA values.

Phosphate
It is an essential nutrient for the growth of algae and it forms the food for fishes.
The phosphate values obtained from this present study ranged between 0.21 to 0.25 mg/l. These values also agree within the acceptable range of 0.03 to 2.00 mg/L obtained by Bhatnagar and Devi (2013).

Nitrate
It is essential nutrient for photosysnthetic autotrophs and its presence in any aquatic ecosystem depends on the activity of nitrifying bacteria. Nitrate is relatively non toxic to fish except at exceedingly high level (above 90 mg/l) reported by stone and thomforde (2004) but it is important to control the level of nitrate in a pond to avoid eutrophication. In present study nitrates value obtained in the range of 0.53 to 0.71 mg/l. These values also agree within the acceptable range obtained by Bhatnagar and Devi (2013). Our findings were similar to values of Santhosh and Singh (2007).
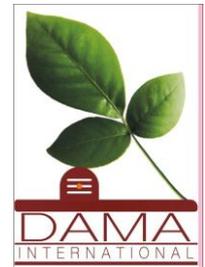
CONCLUSION

In this present study we find the values of different parameters are in the range of standard value as well as other researcher works. Turbidity value is more in present work which has been corrected. A better fish production can be obtained if we monitor the fish pond water at regular intervals. Hence, Mahseer culture is possible in M.P. and is economically advantageous to aquaculturist.

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