

ASSESSMENT OF LIMNOLOGICAL PARAMETERS OF THE FISH REARING POND WATER IN RELATION TO GROWTH PERFORMANCE OF ENDANGERED MAHSEER, *TOR PUTITORA* AT HOSHANGABAD, MADHYA PRADESH, INDIA

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ABSTRACT

The present investigation was carried out to determine the monthly changes of physico-chemical parameters of pond water and fish growth. The parameters monitored included water temperature, water colour, transparency, turbidity, dissolved oxygen, pH, free carbon dioxide, alkalinity, hardness, dissolved oxygen, BOD etc. The growth of mahseer fish was examined by fabric scale. The results of the present study revealed that all the parameters were in the permissible limits and although their growth rate was very slow, the rearing of fish is possible in culture pond which supports mahseer fishery and would be helpful for the protection and conservation of endangered fish.

KEY WORDS: Biochemical oxygen demand (BOD), endangered Fish, Mahseer, Physico-chemical parameters.

INTRODUCTION

Mahseer is an iconic species having excellent sporty fish and important food fish qualities belongs to cyprinids group occurring in Asia which are widely distributed from Himalyan region to Peninsular India (Jayaram, 1999) living in both river and lakes prefer cold, clear and flowing water with rocky bottom for breeding and intermittent deep pools (Dinesh *et. al.* 2008). Mahseer of genus *Tor* are group of large fishes and golden mahseer is one of the largest freshwater fish (Bhatta *et. al.*, 2000). Mahseer are known for big scaled fish on their body (Hamilton 1822; Desai 2003). Langer *et. al.* (2001) stated that group of Mahseers as ‘King of the Indian aquatic system’. Mahseers are also called as ‘king’, ‘lion’, ‘tiger’, ‘the great fighter’ etc.

However, the population of mahseers is declining rapidly in different parts of 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. (Nautiyal *et. al.*, 1989; Menon *et. al.*, 2000; Ogale 2002a; Vinod *et. al.* 2007) and making them as a ‘threatened group’ (Oliver, 2007).

In recent years most of the conservationist put an effort to improve conservation strategy and aquaculture potential by increasing the research in this field. The present study was conducted to determine the physico- chemical qualities of water and growth performance of *Tor putitora* for the purpose of conservation.

MATERIALS AND METHODS

The experimental site Shri Ganeshan fish farm is located in Nitaya village of Hoshangabad Tehsil of Hoshangabad district in Madhya Pradesh, India. The study area is located between 22.6873° N and 77.7710° E covers an area of about 12 acre. Commercial production of major carp fishes has been cultured from last 25 to 27 years in this fish farm. Yet no research has been conducted on *Tor putitora*, an efforts being made to assess the water quality parameters and growth of fish for enhancing the rearing of endangered species.

A.

Pond water samples were collected in monthly basis during study period from April 2016 to June 2016 at Shri Ganeshan fish farm of village Nitaya in Hoshangabad. Water samples for physico-chemical analysis were collected in five litre of labeled plastic container from the littoral zone of the site from 09:00 a.m. to 10:00 a.m.

The selected physico-chemical parameters were analyzed as per standard method APHA 20th edition (1998) and Workbook on Limnology by A.D. Adoni (1985).

Instruments and methods used for evaluating physico-chemical parameters are given below:

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 titration

B. Growth Parameters

The experiment was conducted from October 2015 to June 2016. One Thousand individuals were introduced in the pond. Individuals were sampled and weighed individually and released back into the pond water. Growth in terms of length, weight, SGR was estimated. Samples were weighed by weighing balance whereas body length was carefully measured by fabric ruler and SGR is calculated according to Brown (1957).

RESULTS AND DISCUSSIONS

A. The results of physico-chemical parameters have been represented in Table 1 and length-weight of fish have been represented in Table 2.

Temperature

Temperature plays an important role for every aquatic organism which effects the biochemical reaction in water (Boyd, 1982). As fish is a cold blooded animal, physiology of fish is affected by the change in temperature and thereby production is also decreased. During present investigation temperature ranges from 28°C to 30°C which agrees with guidelines of water quality management for fish culture in Tripura.

pH

It is the negative logarithm of hydrogen ion concentration. pH is an important parameter which determines acidity or alkalinity of water. In the present study pH value varied from 8.2 to 8.5. Similar range of pH was also reported Bisht *et al.* (2013). They are also within the international standards; FEPA and WHO.

Transparency

It is determined by Sechhi disc and it measures the depth of the water body where light penetrates which directly influence the primary productivity of pond. In the present work, transparency value ranged between 6.3 to 6.6 cm. High transparency values in winter and low in summer season were obtained by Indu *et al.* (2017).

Turbidity

It is ability of water to restrict light penetration and reduces photosynthesis (Bhatnagar and Devi, 2013). Turbidity of water is due to suspended particles like clay particles, silt, phytoplanktons, zooplanktons, particulate organic matters etc. In this present work the turbidity obtained ranged from 94 to 97 NTU. The values was slightly more than desirable range of Bhatnagar and Devi (2013).

Total Dissolved Solids (TDS)

It comprises both inorganic salts and organic matter in water bodies. The values obtained from this present ranged from 183 to 196 mg/l. The values agree within the range of WHO and FEPA values.

Dissolved oxygen (DO)

Dissolved oxygen is the most crucial environmental factor in the growth and survival of fish. It is defined as the amount of gaseous oxygen in aquatic bodies which is responsible for growth, survival and physiology of aquatic animals (Solis, 1988). The concentration of DO is decreased as the temperature increases. The optimum concentration of DO in pond waters is 6 to 9 mg/L (Boyd, 1982). In present study DO content was in the range of 7.3 to 8 mg/l. Similar findings were obtained by Bisht *et al.* (2013).

Biochemical Oxygen Demand (BOD)

It is defined as the amount of oxygen taken up by micro-organism due to the decomposition of organic waste matter in water (Bhatnagar and Devi, 2013). The BOD value below 5mg/l showed that the water is not polluted (Clerk, 1986). In present study the value of BOD ranged between 2 to 2.5 mg/l. The BOD level less than 10 mg/L can be

considered for fish culture (Santhosh and Singh, 2007). The values obtained are within the range of WHO and FEPA values.

Alkalinity

Alkalinity is the amount of bases present in water comprising carbonates, bicarbonates, hydroxides, phosphate, magnesium and calcium salts etc. The value of alkalinity for fish productivity is between 50 to 200 mg/L reported by Bhatnagar and Devi (2013). Similar findings of alkalinity ranged from 174 to 186 mg/l in the present work.

Chloride

Chloride is one of the common inorganic anion in aquatic ecosystem and is helpful in maintaining the osmotic balance of the fishes. In present study chloride obtained was in the range of 24 to 27 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 a measure of calcium and magnesium concentration in water bodies which are present in the combination of carbonates and bicarbonates which causes temporary hardness. They are essential for bone and scale formation in fishes (Bhatnagar and Devi 2013). The hardness in the present study ranged between 109 to 116 mg/l. The values obtained are within the range of WHO values.

B. The results of growth parameters are as follows -

1. Average weight (in gms) – It is obtained by dividing the biomass (in gm) by the total number of fish present. It was taken during the introduction of fish in the rearing pond. The average weight of the fry is 0.021 gm.
2. Average growth (in gms) – It is obtained by increase in the average weight over a given period. It is difference between average weight at the beginning and end of a period. The average growth of fish obtained is 49.979 gm.
3. Specific growth rate – It is calculated as the percentage increase in body weight per day over given time interval.

$$\text{SGR (\% / day)} = \frac{\text{Log } W_2 - \text{Log } W_1}{T_2 - T_1} \times 100$$

Whereas W1 = Initial body weight (5gm) at time T1 (90 days), W2 = Final body weight (50gm) at time T2 (180 days) SGR obtained is 1.11% which was higher than the findings of Chatta *et. al.*(2015).

4.Length and Weight of fish – The length of fish fry size was 1cm and weight is 0.021gm at the stocking and grows slower from October 2015 to February 2016 but it showed higher growth from March to June and finally the length of the fish becomes 15.2 cm and weight is 50gm.

Table 1 - Comparison of results with other standards values

Parameters	April 2015	May 2015	June 2015	WHO	FEPA	Acceptable range BD
Temperature (°C)	28	29	30	<35	27	15 – 35
pH (units)	8.3	8.5	8.2	6.5 – 8.5	6 – 9	7 – 9.5
Transparency (cm)	6.3	6.6	6.6	-	-	-
Turbidity (NTU)	97	94	94	10	<7	-
Total Dissolved Solids (TDS)	196	187	183	500	500	-
Dissolved oxygen (DO) (mg/l)	7.3	7.4	8	6	8 – 10	3 – 5
Biochemical Oxygen Demand (mg/l)	2.5	2.4	2	6	10	3 – 6
Alkalinity (mg/l)	180	186	174	600	-	50 – 200
Chloride (mg/l)	24	25	27	250	-	0 -100
Total Hardness (mg/l)	109	117	116	600	-	>20

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

Table 2 showing length and weight of *Tor Putitora* from October 2015 to June 2016

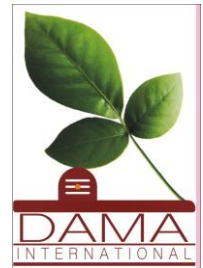
Period	Stages of fish	Length (cm)	Weight (gm)
At stocking time	Fry	1.5	0.021
90 days	Fingerlings	6.5	5
180 days	Growing	15.2	50

CONCLUSION

In the present investigation it has been concluded that the values of various limnological parameters are in the range of standard value as well as other researcher works. However the growth of fish was very slow but it can be reared in pond water under controlled conditions. The regular monitoring of physico-chemical qualities of pond water will surely help the aquaculturist and to conserve the endangered species *Tor putitora* in M.P.

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