

EFFECT OF ENVIRONMENTAL FACTORS ON FISH GROWTH

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ABSTRACT

Primary fish production in ponds is affected by the influence of environmental factors and management practices. Seasonal variations in the environmental factors have to be matched with effective management practices for optimum fish production. For this it is necessary to collect data about the seasonal variations in environmental factors like temperature, pH, dissolved oxygen levels and nutrient levels. In the present study we have collected data on these factors from local ponds and have tried to correlate this with fish productivity. Our study will help in increasing the fish productivity under local geo-climatic conditions of Chhattisgarh.

KEYWORDS: Fish Production, Temperature, pH, Dissolved Oxygen, Chhattisgarh

Chhattisgarh is rich in fresh water resources which can be utilized for fish culture. About 59,887 hectares of water bodies is readily available for fish culture (Govind 1988). These include rivers, fresh water ponds and seasonal ponds, however natural and man made ponds are a major source of fish culture. Due to tropical location there is a considerable variation in environmental factors like temperature, precipitation, duration of photoperiod etc. which also physically affect the water bodies. Primary production of fresh water bodies is influenced by physical factors like temperature, pH, transparency and chemical factors like dissolved Oxygen and Carbon dioxide levels, and levels of inorganic nutrients (Ruttner, 1963).

For optimum fish production it is necessary to know about the variations in environmental factors under local conditions, which can be matched with managerial practices for maximizing fish production.

To this end we have collected data on seasonal variation of water temperature, pH, dissolved oxygen levels etc. From a local pond and have also studied the seasonal variation in growth of common carp in this pond.

MATERIALS AND METHODS

Site of Study

Adbandha pond located in Bhilai was selected for this study. This pond is spread in an area of 16 hectares and fed from local run off water from agricultural fields and seasonal rainfall. It has been used for fish production since 1983.

Sample Collection

Water from the pond was collected along with fish samples every month over a period of 12 months from July to June and physiochemical parameters were recorded. Fish samples were taken for measurement of monthly growth rate during this period to assess the influence of environmental factors on fish growth.

Measurement of the temperature

Temperature of the water sample was measured on site with the help of Mercury thermometer.

Measurement of the pH

pH of the water sample was measured on site with the help of a handheld digital pH meter.

Dissolved oxygen level

To calculate dissolved oxygen levels water samples was collected in BOD bottles and transported to the laboratory. DO values was calculated using modified Winkler method.

Water transparency

Water transparency was measured by Sacchi disc method.

Measurement of Fish growth:

Growth of fish was studied in terms of weight gain (GBW %) calculated as follows:

$$GWB = ((W_2 - W_1) / (t \times W_1)) \times 100$$

Where W₂ is the average fish weight (in gms.) in the given time period, W₁ is average fish

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weight (in gms.) in the previous time period, and t is the time period (in days) between the two measurements.

RESULT

Fish growth

The annual variation in monthly growth from July to June is represented graphically as in Figure.1. It can be clearly seen that rate of growth shows a regular increase and maximum growth occurring in the month of June.

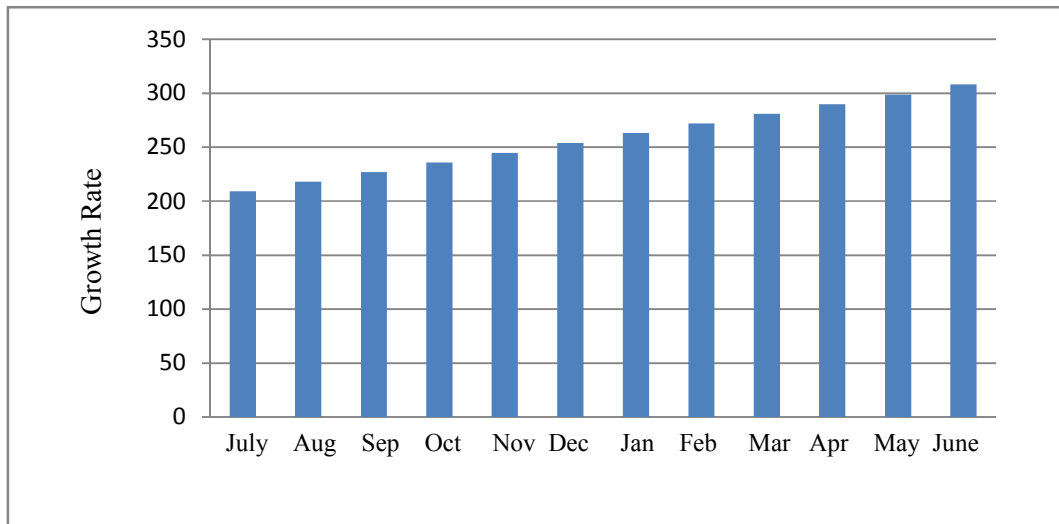


Figure 1: Represents the average monthly growth rate from July to June

Variation of Monthly Temperature

Water temperature was calculated by averaging the monthly surface and bottom

temperature of the pond. The water temperature varied from 21°C in December to 31°C in June.

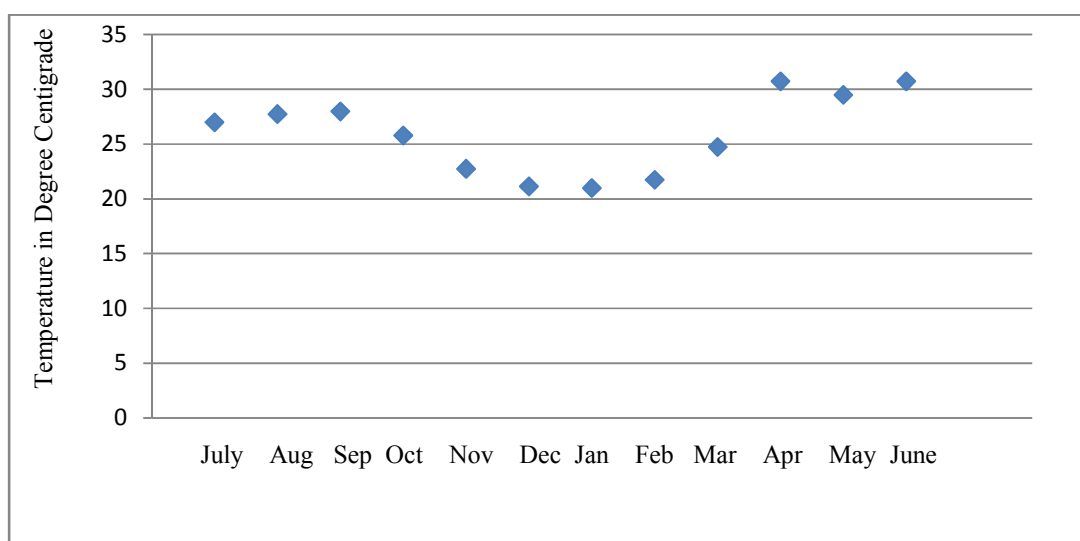


Figure 2: Represents the monthly water temperatures

Variation of Water pH

Water pH was calculated by measuring the surface and bottom pH and taking the average of

these values. Water pH was towards the alkaline range, with maximum pH in the month of July and minimum during February.

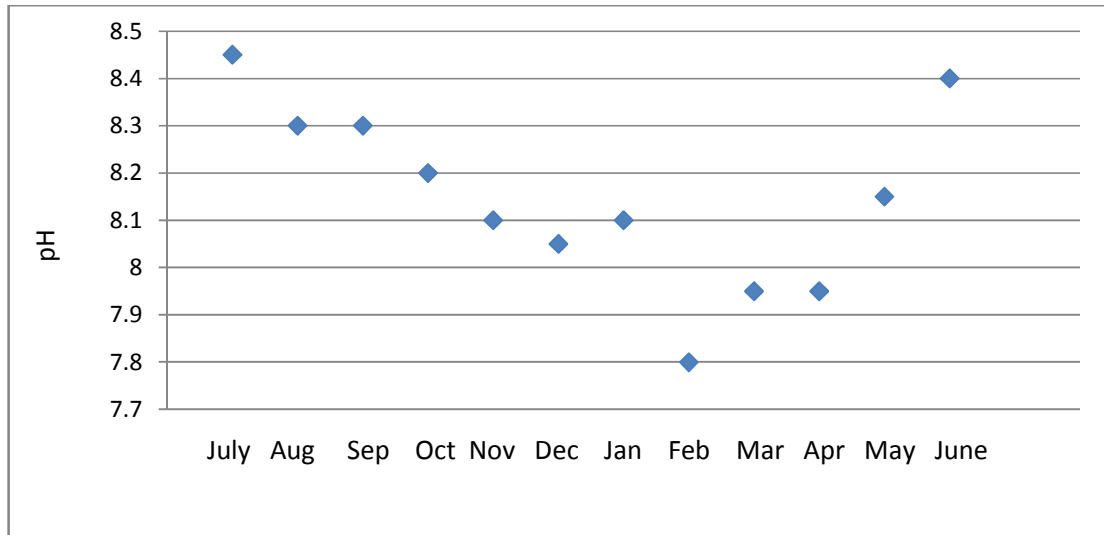


Figure 3: Represents the monthly variation in water pH values

Dissolved Oxygen concentration

Dissolved oxygen (DO) levels showed seasonal variations, maximum dissolved oxygen

levels were recorded in the month of March and April.

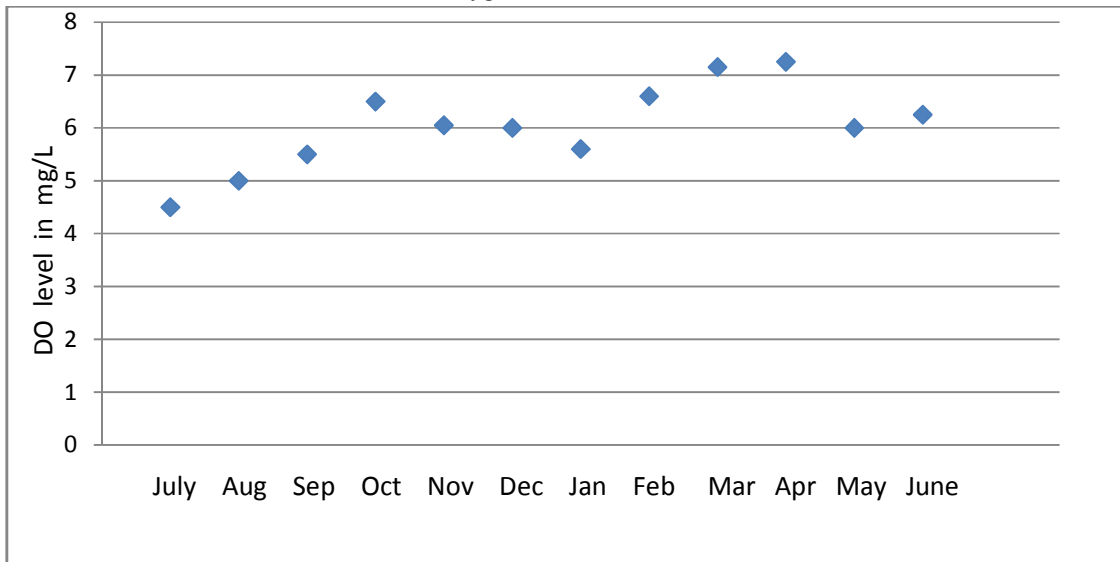


Figure 4: Represents the levels of Dissolved oxygen in water

Water Transparency

Water transparency showed a maximum during the months of December and January, and there after it declined.

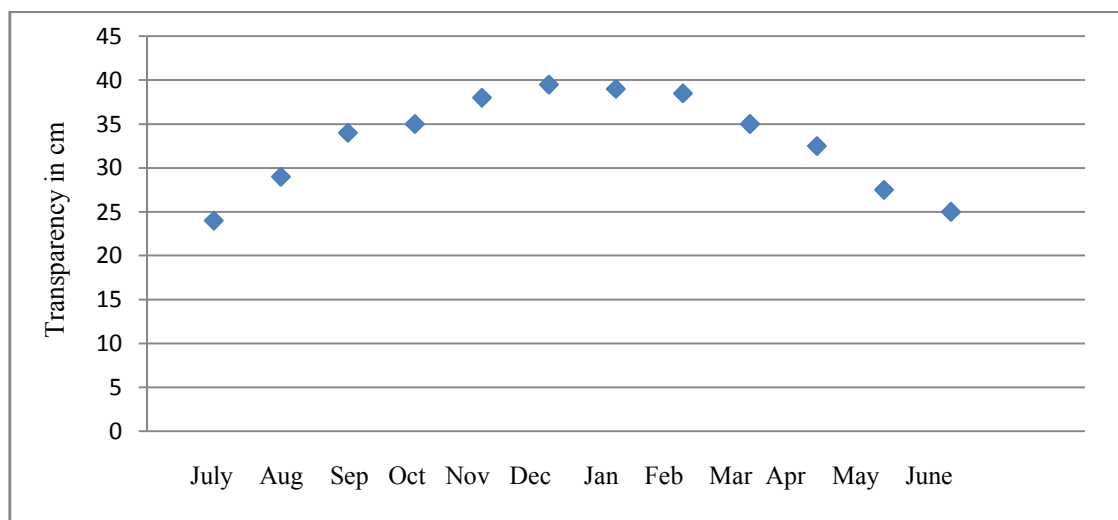


Figure 5: Represents the water transparency levels

DISCUSSION

In the present study an attempt is made to correlate the monthly growth rate of common carp with the existing physical and chemical conditions like water temperature, pH, dissolved oxygen and transparency of the pond water. Water temperature depends on the atmospheric temperature which shows considerable variation during annual seasonal cycle. In the present study average water temperature varied from 20°C in December to 31°C in June, a considerable increase in monthly growth rate was also observed from December to June. Dwivedi et al. (1986) have also reported that increase in water temperature results in increase in fish production.

pH is an indicator of general chemical composition of water and hence quality of water. In this study pH varied considerably from 7.8 in February to 8.4 in June. Overall the pH variation was in the optimum range as reported in earlier studies by Munawar (1970) and Mathew (1990).

The dissolved oxygen (DO) is an extremely important factor for aquatic life because organisms like fish solely depend on the dissolved oxygen for respiration. Dissolved oxygen levels showed variation in the range of 4.5 mg/L in July to 7.25 mg/L in April. The rate of fish growth also showed a parallel increase from July to April. Several previous studies by Olah (1978), Khuhawar (2009) and Jha (1979) have also reported the optimum DO levels

in the range of 3-8 ppm indicating that higher DO levels favor increase in fish growth.

Light is an important factor in regulating aquatic life. It affects the rate of photosynthesis by aquatic plants, which indirectly influences the fish fauna in the water body. Depth of light penetration is influenced by seasonal factors and transparency of the water. In the present study transparency varied from 24-40 cm depth. Variation in transparency may be influenced both by the availability of light influx which is reduced during cloudy conditions in rainy season and increased turbidity due to evaporation during summer months. However from the present study it appears that transparency level may not directly affect the rate of fish growth as we saw maximum growth during the months of May and June when water transparency was towards the lower range.

CONCLUSION

In the present study we saw a clear influence of physiochemical parameters on rate of fish growth, however future studies will be needed to understand the influence of physiological and biotic factors on fish growth.

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