

Physico-Chemical Analyses of Water at Hiran Minar Sheikhupura (Pakistan)

MUDASSARA JABEEN

Department of Zoology, Government Degree College for Women, Sheikhupura, Pakistan

ABSTRACT

Physico-chemical Analysis of water of storage tank at Hiran Minar, Sheikhupura was conducted for a period of one year. The correlation among chemical factors such as light penetration and total hardness, water temperature and nitrates, dissolved oxygen and calcium chloride, and total hardness, chlorides and nitrates were positively significant. The "Forward Selection Method of stepwise Regression Equation" revealed that seven parameters of Physico-Chemical factors (water temperature pH, electrical conductivity, dissolved oxygen, total alkalinity, total hardness, calcium) towards dry weight of planktonic biomass was 86.64%. The remaining parameters contributed minor effect.

Key Words: Physico-chemical analyses; Water; Pakistan

INTRODUCTION

A suitable environment is necessary for any organism, since life depends upon the continuance of a proper exchange of essential substances and energies between the organism and its surroundings (Welch, 1952). The study on the physico-chemical analysis of water is of great significance in removing the constraints which impede the production of inland fish. Fish production is closely correlated with the biological production which in turn depends upon the ecological and physico-chemical conditions of water body. Research studies on limnological aspects are of great significance in developing fresh water fisheries (Love, 1974). In view of great importance of physio-chemical analyses and biological aspects of fish-culture, the present study was conducted.

MATERIALS AND METHODS

This study of Hiran Minar Water Tank of Sheikhupura was carried out. The tank was some what rectangular in shape with the length of 890 and 750 ft at north south and east west sides, respectively. The tank was about 8 ft deep and supplied with canal water on six month basis. The samples were taken at fortnightly intervals for a period of one year from four stations viz, A,B,C,D which were 600 ft apart from each other. These stations were situated at North, South, East, and West sides, respectively.

The temperature of water and that of the air (atmosphere) was recorded with the help of an alcohol thermometer. The light penetration was determined with the help of "Secchis Disc". pH and conductivity of water were measured with Toaphameter (modal Hm-5b Japan)

and conducting meters. The chemical analysis of the parameters viz., dissolved oxygen and free carbon dioxide was measured as described by A.P.H.A. (1971). The parameters such as carbonates, bicarbonates chlorides total alkalinity, total hardness calcium and magnesium were analysed by using the techniques given by united states salinity laboratory staff (U.S.S.L.S., 1954). The analysis of the remaining parameters like nitrates and phosphates was carried out using the methods given by WAPDA Directorate Lahore (1979).

RESULTS AND DISCUSSION

Physical factors. The overall range of air and water temperature throughout the year was 16.0–36.0 and 12.0–32.0°C, respectively. The highest temperature of air (36°C) water (32°C) was recorded during first fortnight of June and the lowest (16°C) of air and 12°C of water during 2nd fortnight of January. The most obvious familiar property of water is its transparency. The over all range of light transparency as interpreted from "Secchis Disc" was 30–52 CMS. The highest transparency value 52 CMS was recorded during 1st fortnight of June and the lowest 30 CMS during 2nd fortnight of January. The annual highest EC +10.0 m mhos/cm was recorded during the first fortnight of April then 400.0 m mhos/cm during the 2nd fortnight of September. The pH value 5.5 was recorded during the 1st fortnight of June and the highest 8.4 during the 1st fortnight of January. The seasonal changes on pH are associated with the effect of photosynthesis. The fluctuations in pH values were mainly due to photosynthetic activity of phytoplankton and other higher aquatic plants (Khan & Siddiqui, 1978). Annual oxygen concentration varied from 3.5 to 8.4 mg/L at surface. The minimum value of oxygen was 3.5 mg/L

was recorded during 1st fortnight of June to maximum (8.4 mg/L during the 2nd fortnight of January. Diffusion of oxygen in the natural water is a slow process. Most of the oxygen is derived from photosynthesis by aquatic plants. Factors controlling the rate of photosynthesis and the amount of oxygen evolved include temperature light and density of vegetation etc. The concentration of dissolved oxygen fluctuated throughout the year. No measurable amount of CO₂ was present in the samples water of tank.

Chemical factors. During the period of investigation no measurable amount of CO₃ was present in the sampled water of tank. The maximum amount 212.0 mg/L was found during the 1st fortnight of March and then was found during the 1st fortnight of June. The minimum amount 110.0 mg/L was detected the 2nd fortnight of July. The minimum amount of hardness 78 mg/L was detected during the 2nd fortnight of February maximum 200 mg/L during the 1st fortnight of September. The highest amount of calcium 52.0 mg/L was recorded during the 1st fortnight of April and then 48 mg/L during the 1st fortnight of April. The magnesium values were negligible during the 1st and 2nd fortnight of September and April; while maximum 25.0 mg/L during the 1st fortnight of June. The annual Cl ranged from 7.0 to 63.0 mg/L. The maximum amount of Cl 63.0 mg/L was recorded during the 1st fortnight of August and minimum 7.0 mg/L during the 2nd fortnight of May. The annual concentration varied from 0.056 to 0.102 mg/L. The minimum concentration of nitrates 0.056 mg/L was recorded during the 2nd fortnight of January and maximum 0.102 mg/L during the 2nd fortnight of June. The concentration of phosphates ranged between 0.0002 and 0.0009 mg/L. The minimum concentration of phosphates was observed to be 0.0002 mg/L during the 1st fortnight of September and maximum 0.0009 mg/L during the 2nd fortnight of August. The minimum concentration of total solids 136 mg/L was recorded during the 2nd fortnight of January and maximum 260 mg/L during the 1st fortnight of June. The concentration of total dissolved solids, ranged from 116.0 to 227.0 mg/L. The minimum concentration of total dissolved solids 116.0 mg/L was recorded during the 2nd fortnight of February and maximum 227.0 mg/L during the 2nd of March. Total alkalinity ranged from 70.0–112.0 mg/L. The annual minimum alkalinity 70.0 mg/L was recorded during the 2nd fortnight of August and then 121.0 mg/L during the 1st fortnight of June.

It is evident from the results that in the months June and August, the temperature was maximum as a result of which the contents of dissolved oxygen and pH values became lowest. Ahmad (1976) reported that the increased temperature resulted decrease in the level of

dissolved oxygen. Minimum temperature was recorded in the month of January. When temperature was maximum during the 1st fortnight of June, the light penetration was also maximum (52.0 CMS). The minimum light penetration was measured during the second fortnight of January when water temperature was also low. It indicated that with rise in temperature, the light penetration increased; while low temperature showed minimum light penetration. The lower values of light penetration were also due to high turbidity of water, which was further confirmed by the high value of total solids.

Electrical conductivity shows the total soluble salt contents in water. Data show that electrical conductivity fluctuated over the whole range of time. The maximum EC 410.0 m mhos/cm was recorded during the first fortnight of April and then 400.0 mhos/cm during the 2nd fortnight of March. EC depends on temperature and there was a positive but non-significant correlation between water temperature and EC. The seasonal changes in pH are associated with the effect of photosynthesis.

Khan and Siddiqui (1978) reported that fluctuation in pH values were mainly due to photosynthetic activity of Phytoplankton and other higher aquatic plants. Results show negative but significant correlation between water temperature of pH. Low concentration of dissolved oxygen during warmer months could be due to high temperature which decreased photosynthetic activity and depleted the oxygen contents, however, the higher concentration in colder months could be due to enhanced photosynthetic activity accomplished with low temperature. According to Chaughtai (1979), there is a direct relationship between chlorinity and total dissolved solids in water. Nitrates play an important role in pond fertility. The increased value of nitrates during June hints to the probability that a considerable amount of nitrogen fixation by the blue green algae. The same results were reported by Allan and Arnon (1955) and Latif (1983). Phosphates showed irregular variations during the whole period of study. The results of the present investigation tally with the findings of Boguslaw (1984). The maximum value of total solids suspended matters was probably due to the abundance of planktonic life.

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