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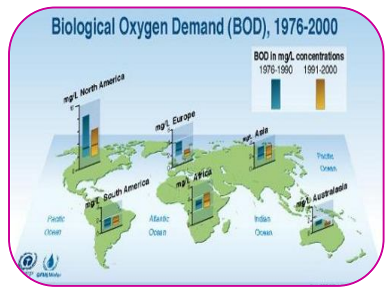
REVIEW OF RESEARCH

STUDIES OF SEASONAL VARIATION OF BOD AND ITS PHYSICO-CHEMICAL CONDITIONS OF A POND OF HAJIPUR DISTRICT

Pooja
University Department of Botany , J.P. University, Chapra, Bihar.

ABSTRACT

Biochemical oxygen demand is the amount of dissolved needed by aerobic biological organisms to break down organic material present in a given water sample at certain temperature over a specific time period. The present study was carried out from October 2014 to september 2015 Pollution is a man-made phenomenon. Some pollutants which discharged which discharged directly to the environment could create serious pollution problems. Untreated waste water will cause contamination and even pollution on the water body. Biological Oxygen Demand (BOD) is the amount of oxygen required for the oxidation by bacteria. The higher the BOD concentration, the greater the organic matter would be.Temperature electrical conductance, biochemical oxygen demand, nitrate-nitrogen, phosphate – phosphorus chloride, alkalinity and chemical oxygen demand is pond to increase and PH and dissolve oxygen content decreased.



KEYWORDS : *Biochemical oxygen , aerobic biological organisms.*

INTRODUCTION

The biological oxygen demand of water plays a vital role in the productivity of waste water fish ponds the present study was to find out the optimum biological oxygen demand level for fish culture in the sewage-fed ponds in a tropical environment, to obtain maximum production.

Biochemical oxygen demand is the amount of dissolved needed by aerobic biological organisms to break down organic material present in a given water sample at certain temperature over a specific time period. The Biological oxygen demand value is most commonly expressed in milligrams of oxygen consumed per litre of sample during 5 days of incubation at 20^0C and is often used as surrogate of the degree of organic pollution of water. Biochemical oxygen demand reduction is used as a gauge of the effectiveness of waste water treatment plants. Biochemical oxygen demand of waste water effluents is used to indicate the short term impact on the oxygen levels of the receiving water.

Water chemistry has received attention as are the most fundamental environmental factor affecting the occurrence of aquatic macrophytes. Several of works dealing with this aspect have been published from various regions of the world (Lohamne, 1938. Iverson and Olsen, 1943. Moyle, 1945 etc.) Furch (1984) studied the water chemistry of Amazon basin and distribution of chemical elements among fresh water.

MATERIAL AND METHODS

Water samples were collected in triplicate in plastic container at the surface water by hand of the pond. Precautions and instructions were followed in the collection of water samples as given in IBP Hand book No. 8 by Golgerman *et al.* (1969) Water samples were preserved by the addition of 2.5 ml of chloroform in 500 ml of water. Temperature and transparency were measured, and dissolved oxygen was fixed at the site. Physico-chemical analyses of water were done by standard methods as prescribed by American Public Health Association (Apha, 1976, 1985).

PHYSICAL CHARACTERISTICS

Temperature was measured with the help of a Celcius thermometer. Transparency was measured using Secchi disc (20 cm in diameter) painted alternatively black and white. Digital portable kit (Century C.K. 704) was used to measure pH and electrical conductance (EC).

CHEMICAL CHARACTERISTICS

All chemical analyses were done following Apha (1985).Winkler's modified iodide-azide method was used for the estimation of dissolved oxygen (DO). The sample was fixed at the collection site with the help of mangnous sulfate and alkaline iodide azide. In the laboratory the precipitate was dissolved with the help of conc. H_2SO_4 and then titrated with sodium-thio sulphate using starch as indicator.

Samples were taken in sets of two BOD bottles, one was fixed immediately and the other was incubated at 20^0C in dark for 5 days for estimation of Biochemical oxygen demand (BOD). The difference of dissolved oxygen in initial bottle and incubated BOD bottles gave biochemical oxygen demand.

Phenol-di-sulphonic acid method was applied for the analysis of nitrate-nitrogen (NO_3-N). The steam dried water samples were dissolved in phenol-di-sulphonic acid. The alkaline medium was made by adding ammonium hydroxide. The development of yellow colour denoted presence of NO_3-N. The colour intensity was proportional to the amount of NO_3-N and was measured with the help of a colorimeter at 410 nm in terms of optical density.

Stannous-chloride method was adopted for the analysis of phosphate-phosphorus (PO_4-P) in water samples. Ammonium molybdate solution and stannous chloride solution in glycerol were added to the water sample. The development of blue-colour indicated the presence of PO_4-P. The colour intensity was proportional to the amount of phosphorus present, and was measured in terms of optical density with the help of spectrocolorimeter at 690 nm.

Chloride was determined by Mohr's Method. The water sample was titrated with silver nitrate using potassium chromate as indicator for estimating chloride. Chloride content was calculated as follows:

$$\text{Cl/mg/l} = \frac{(a-b)xNx35.46}{\text{ml sample}} \text{ x } 1000$$

Where,

a = Volume of $AgNO_3$ used for the sample

b = Volume of $AgNO_3$ used for the blank

N = Normality of $AgNO_3$ (0.0141 N)

Potentiometeric titration method was used for the estimation of bicarbonate alkalinity of water. The bicarbonate alkalinity was calculated using the following formula:

$$\text{Alkalinity mg/l } CaCO_3 \quad \frac{VxNx50{,}000}{\text{ml sample}}$$

Where,

V = Volume of titrant, N = Normality of titrant

Chemical oxygen demand (COD) is the amount of dissolved oxygen required for the oxidation of organic and inorganic substances in the water. The dichromate reflux method was used to determine the chemical oxygen demand. The known volume of sample water was refluxed with known volume of potassium dichromate and conc. H_2SO_4 for two hours. The remaining amount of potassium dichromate after completing reflux was titrated with ferrous ammonium sulphate using ferroin as indicator. The chemical oxygen demand was calculated using the following formula:

$$\text{COD mg/l} \quad \frac{(a-b) \times N \times 8{,}000}{\text{ml sample}}$$

Where,
a = ml of ferrous ammonium sulphate used for the blank
b = ml of forrous ammonium sulphate used for the sample water
N = Normality of ferrous ammonium sulphate

RESULTS

Physical Characteristics

Temperature

Surface maximum temperature of pond water was measured 31.5^{0}C in July. Minimum temperature of water sample of the pond was observed in January, 18.5^{0}C (Fig. 3.1).

Transparency

Seasonal variation of Secchi disc depth (SDD) was quite obvious. Lowest transparency or lowest Secchi disc depth was found in rainy season followed by winter and maximum in summer. Maximum SDD of 35 cm was observed in the month of July, whereas lowest values i.e., 19 cm was observed in August (Fig. 3.2)

pH (Hydrogen ion concentration)

Water of the pond was slightly alkaline to more alkaline in nature. Surface pH of the pond ranged from 7.3 during February to 8.7 during May (Fig. 3.3).

Electrical Conductivity

Electrical conductance of water is a measure of concentration of ions present and to the temperature at which the measurement is made. In July, maximum conductance were observed i.e., 695 µ mhos. The rainy season showed minimum ionic concentration or conductance followed by winter and early summer. Minimum values, i.e., 325 µ mhos were observed in August of the pond (Fig. 3.4).

CHEMICAL CHARACTERISTICS

Dissolved Oxygen (DO)

The oxygen concentration is a much more critical factor in the aquatic than in the aerial environment. Maximum dissolved oxygen, i.e., 11.8 mg/l was observed during March and minimum 4.6 mg/l in August (Fig.1).

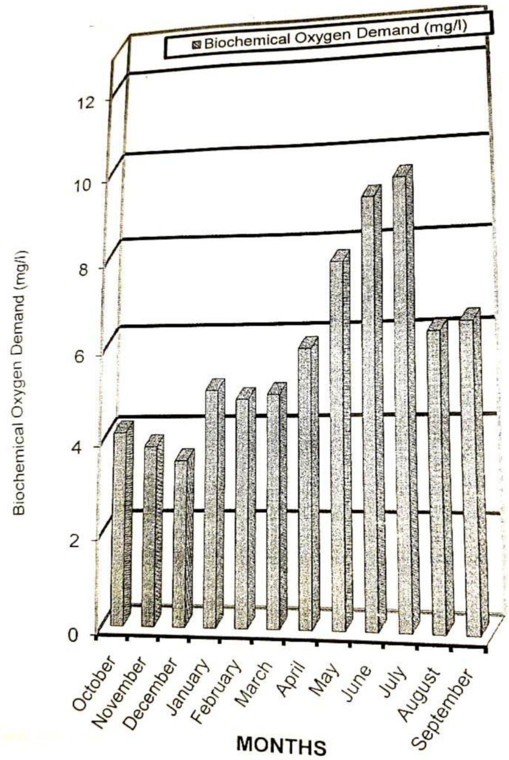


Fig. 1 : Monthly variation in Biochemical Oyxgen Demands of the pond water (2014-2015)

CONCLUSION

Biochemical oxygen demand / biological oxygen demand is an important water quality paramatter because it provides an index to assess the effect discharge waste water will have on the receiving environment. The higher BOD value, the greater the amount of organic matter or food available for oxygen consuming bacteria.

Temperature electrical conductance, biochemical oxygen demand, nitrate-nitrogen, phosphate – phosphorus chloride, alkalinity and chemical oxygen demand is pond to increase and PH and dissolve oxygen content decreased.

It represents the quality of oxygen which is consumed in the course of aerobic processes of decomposition of organic materials, caushed by microorganisms. The BoD therefore provides information on the biologically convertible proportion of the organic content of a sample of water.

REFERENCES

1. Anderson, R.R. (1969). Temperature & rooted aquatic plants. *Chesapeake Sci.,* 10: 157-164.
2. APHA (1995). Standard methods for the examination of water and waste water. 19th Edition, American Public Health Association, Washington, D.C. 2005.
3. Auclair, A.N.D. (1979). Factors affecting tissue nutrient concentration Bagnall, L.O., Baldwin, J.A. and Hentges, J.F. (1974). Processing and storage of water hyacinth silage. *Hyacinth control. J.,* 12: 73-79.
4. Barko, J.W. (1982a). Influence of potassium source (sediment or open water) and sediment composition on the growth and nutrition of a submerged freshwater macrophyte *(Hydrilla verticillata)* (L.f.) Royle. *Aquatic Botany,* 12: 157-172.
5. Barko, J.W. and Smart, R.M. (1981a). Comparative influences of light and temperature on the growth and metabolism of selected submerged freshwater macrophytes. *Ecological Monographs,* 51(2): 219-

235.
6. Barko, J.W. and Smart, R.M. (1981b). Sediment based nutrition of submerged macrophytes. Aquatic Botany, 10: 339-352.
7. Barko, J.W. and smart, R.M. (1986). Sediment-related mechanisms of growth limitation in submerged macrophytes. *Ecology,* 67: 1328-1340.
8. Barko, J.W., Adams, M.S. and Clesceri, N.L. (1986). Environmental factors and their consideration in the management of submerged aquatic vegetation. A review: *J. Aquat. Plant Manage.,* 24: 1-10.
9. Barko, J.W., Hardin, D.G. and Mathews, M.S. (1982). Growth and morphology of submerged freshwater macrophytes in relation to light and temperature. *Canadian Journal of Botany,* 60(6): 877-887.
10. Bayly, I.L. and O'Neill, T.A. (1972). Seasonal ionic fluctuations in a *Typha glauca* community. *Ecology,* 53: 714-719.
11. Bellamy, D.J. (1967). Succession and depth time scale in ephemeral swamp ecosystems. *Tropical Ecology,* 8(1-2): 67-72.
12. Best, M.D. and Mantai, K.E. (1978). Growth of *Myriophyllum spicatum:* sediment or lake water as a source of nitrogen and phosphorus *Ecology,* 59: 1075-1080.
13. Bhargava, D.S. (1985). "Varations in quality in the Ganges". *effluents water Treatment J.,* 25(2).
14. Bhowmick, B.N. and Singh, A.S. (1985). Effects of sewage on physico-chemical characteristics and bacterial population on river Ganga at Patna. *Ind. J. Ecol.* (Ed.), 12(1): 141-146.
15. Bilby, R. (1977). Effects of a spate of the macrophyte vegetations of a stream pool. *Hydrobiologia,* 56: 109-112.
16. Billore, D.K., Sankhla, S.K. and Vyas, L.N. (1982). Mineral composition of some important macrophytes in two lakes around Udaipur (Rajasthan). Paper presented in 69th Science Congress, Mysore, India.
17. Billore, D.K., Sankhla, S.K. and Vyas, L.N. (1983). Mineral composition some important macrophytes in two lakes around Udaipur (Rajasthan). *Acta Ecol.,* 5(2): 39-48.
18. Bliss, L.C. (1962). Calorific and lipid content in Alpine tundra plants. *Ecology,* 43: 753-757.
19. Bole, J.B. and Allan, J.R. (1978). Uptake of phosphorus from sediment by aquatic plants, *Myriophyllum spicatum* and *Hydrilla verticillata.* Wat. Res., 10: 353-358.
20. Bosserman, R.W. (1981). Elemental composition of aquatic plants from Okefenokee Swamp. *J. Freshwater Ecology,* 1(3): 307-319.
21. Bouldin, D.R., Johnson, R.L., Burda, C. and Chun-Weikao, 1974. Losses of inorganic nitrogen from aquatic systems. *Journal of environmental Quality,* 3: 107-114.
22. Boyd, C.E. (1969). Production, mineral nutrient absorption and biochemical assimilation by *Justicia americana* and *Alternanthera philoxeroides. Arch. Hydrobiol.,* 66: 139-160.
23. Boyd, C.E. (1970). Losses of mineral nutrients during decomposition of *Typha latifolia, Arch. Hydrobiol.,* 66: 511-517.
24. Boyd, C.E. (1970a). Vascular aquatic plants for mineral nutrients removal from polluted waters. *Econ. Bot.,* 24: 95-103.
25. Boyd, C.E. (1971). The dynamics of dry matter and chemical substances in a *Juncus effusus* population. *Amer. Midl. Nat.,* 86.
26. Boyd, C.E. (1976). Accumulation of dry matter, nitrogen and phosphorus by cultivated water hyacinth. *Econ. Bot.,* 30: 51-56.
27. Boyd, C.E. (1978). Chemical composition of wetland plants. In: R.E. Good, D.F. Whigham and R.L. Simpson (Editors), *Freshwater Wetland.* Academic Press, pp. 155-167.