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LIMNOLOGICAL STUDIES OF A FRESHWATER FISH TANK BIBINAGAR, ANDHRA PRADESH PART I, ABIOTIC FACTORS.

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INTRODUCTION

Extensive work on water chemistry of freshwater bodies of India have been carried out by many workers like Ganapati (1940), Alikunni *et al.* (1955). Das and Srivastava, (1956), George (1961, 1966), Zafar (1964) Munawar (1970) Seennaya (1971), Rao (1972), Patil & Sen (1983), Patil *et al.* (1982-85) and others. The present tank was investigated during Jan. 85-Dec. 85, to obtain basic data on abiotic factors for future ecological study of water bodies of this region and to find out the trophic status of this water body.

DESCRIPTION OF THE TANK

The present tank called as Bibinagar tank is situated (lat. 17°38′ N and long. 78°46′E) 40 kms away from Hyderbad on Warangal road near a small town called Bibinagar. The shoreline is wavy with an earthern embankment on one side. The depth of the water varies from 1 to 5 meters. The water of the tank is used for irrigation purpose. The tank water gets polluted due to human activities of the nearby villages. Cattles are also washed here, consequently considerable amount of cowdung & urine are also added in the tank besides the domestic sewage of the nearby town. The tank is not yet under fish cultivation on large scale.

MATERIAL AND METHODS

Collection of surface water samples were made once in a month. D. O. was estimated as per Winkler's method. pH was determined with the help of pH meter. CO_2, total alkalinity, total hardness, calcium, chloride, total Phosphate, Nitrate, Nitrogen and Sulphate was estimated as per Standard Methods for the Examination of water and Waste Water (APHA, 1971). Plankton samples were also collected and preserved in 4% formalin The average annual abiotic data of water of the tank is given in (Table 1).

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RESULTS AND DISCUSSION

Mean transparency value was low throughout the year indicating enrichment of nutrients (Endmondson *et al*) ; 1956. Hickel (1973) related transparency value to density of plankton. The present study corroborate the view of the above authors. Moitra and Bhattacharya (1965), Jana (1973), related a high pH value to heavy bloom of phytoplankton, while low pH indicate the rise in zooplankton, but in the present study this does not seem to be so for zooplanktons of this region. In the present investigation direct correlation was recorded between pH and phenolophthalein alkalinity (Rao, 1955) Reid (1961) reported direct relationship with P and D. O. and while inverse relationship between pH and CO_2. More or less similar observations were made in the present study.

Table 1: Average annual range of various physico chemical factors.

	Average	Range			Standard Deviation
Transparency cm	62.91	30	to	90	5.7873
Temp. water °C	23.62	19	to	28	0.922
Temp. air °C	33.00	27	to	43	1.40
pH	8.7	8.2	to	9.7	0.128
CO_2mg/1.	7.54	0	to	35	3.5037
Carbonate mg/1.	43.33	34	to	80	9.8307
Bicarbonate mg/1.	257.5	170	to	370	22.9775
D. O. mg/1.	5.78	5.1	to	6.3	0.1222
Calcium mg/1.	92.33	65	to	120	5.2166
Mg. mg/1.	42.41	40	to	50	1.01
Total hardness mg/1.	199.58	190	to	220	4.823
Chloride mg/1.	97.0	64	to	130	6.2216
Total PO_4 mg/1.	0.36	0.32	to	0.45	0.0190
Nitrate Nitrogen mg/1.	0.61	0.58	to	0.65	0.0071
Sulphate mg/1.	8.9	8	to	10	0.2203
Sp. conductivity μ ohm/cm	534	468	to	600	11.7118

Total alkalinity was always above 170 mg/L and it was mainly due to the salts of calcium and magnesium. Moyle (1946) hsa given the natural separation point between soft and hard water as 40mg/L. Thus the water of the present tank can be considered as hardwater.

The total alkalinity was of carbonate and bicarbonate type. Chari (1980) observed direct relation -ship between pH and carbonate. Golterman (1970) stated that increased pH means high carbonate, this is true in the present study. pH of the water was usually above 8.2 and varies from 8.2 to 9.7 and the range being 1.5 thus it may be stated that the pH of water has shown only minor seasonal variations throughout one year (George, 1966, Tucker, 1985, Patil, 1976).

Rice (1938), Rao (1955), and Munawar (1970) have observed that the atmospheric temperature and water temperature more or less move hand in hand in the smaller water bodies. Welch (1952) pointed out that the smaller water bodies quickly reacts with the change in temperature. In the present study a well marked direct relation between atmospheric and water temperature could not be established as the water temperature did not follow closely the change in the air temperature due to the large size of the present tank under invesigation.

CO_2 was not detected throughout the period of study except on certain occassion and the maximum of 35 mg/l was recorded. The absence of CO_2 in water can be explained in two ways that the loss of CO_2 during the process of photosynthesis is more than its gain in the process of decay of organic matter. Liberation of CO_2 in the process of decompsition of bottom deposits is not sufficient to convert the carbonate completely into soluble bicarbonate. Further more, the presence of carbonate in the water throughout the year confirms the above statement for this water body.

The D. O. content of the water was found to be varied a less in the summer months and this may be due to high temperature of water. At high temperature, some of the oxygen might have been lost in atmopphere as it is well known that increase in temperature results in decrease in solubility of oxygen. It may be that at high temperature the oxidation of organic matter increases as some of the oxygen in water is also utilized. Thus it may be concluded that these above two processes might have been responsible for the low content of D. O. in the water during summer months. Such relationship have been also described by Munawar (1970), Patil *et al.* (1985).

Though many workers (Ganapati, 1940, Rao, 1955, and Saha *et al.* 1959) showed more or less inverse relationship between CO_2 and D. O. content in the present study well marked inverse relationship between D. O. and CO_2 could not be established in this tank, since CO_2 was rarely present in the present water body.

Calcium content was higher than magnesium content in the present tank. This is in conformity with Zutshi and Khan (1977) and the ratio was 3 : 2 for Ca and Mg. This is not close to the ratio recorded for other valley lakes by Zutshi and Vass (1973). Generally lake with low transparency develops floating flora dominancy (Zutshi *et al.* 1989). Same holds goods in the present study.

Nutrients in natural water often been considered to be limiting to phytoplankton production (Fogg, 1965, Hutchinson 1967). More or less same hold true in the present investigation and will be discussed elsewhere. Phosphate, Nitrate and Sulphates were found in considerable amount indicating moderate fertility of the waterhody, Vollenweider and Frei (1953) stated related increase in electric conductivity to the state of enrichment. In the present study the conductivity value varies between 465 to 600 μ ohms. Water free from contamination of effluents have smaller amount of phosphours (Welch, 1952, and Ruttner, 1953). The present tank water is polluted due to the activities of the nearby human population as a result the tank has considerable quantity of phosphate and nitrate. Increase in phosphate due to sewage pollution is observed (Hutchinson, 1957). Phosphate values were high in winter and lowest in summer, This is in conformity with Zutshi & Vass (1978).

Thus limnological investigation on abiotic factors reveals the hither trophic lavel of the present water body.

SUMMARY

Seasonal variations in abiotic parameters of a fresh water fish tank Bibinagar, Hyderbad have been studied for a period of one year. pH of water has shown minor seasonal variation. The transparancy value was low, CO_2 was detected only once. Direct relationship was observed between pH and phenolphthalein alkalintity. The phosphate and Nitrate (N_2) values were in considerable range. D. O. content was ranged between 5.1-6.3mg/1. The tank is isothermic with no sign of thermal stratification.

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