COMPARISON OF PHYSICO-CHEMICAL PARAMETERS BETWEEN 35% CRUDE PROTEIN SUPPLEMENTED ARTIFICIAL FEED AND BUFFALO DUNG TREATED PONDS

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Limnological parameters of the two freshwater fish ponds treated with artificial feed or buffalo dung were studied. There were no significant differences between water temperature, light penetration, pH, electrical conductivity, dissolved oxygen, total hardness, nitrates and planktonic biomass, whereas highly significant differences were found between total alkalinity and phosphates between artificial feed and buffalo dung treated ponds.

INTRODUCTION

Among the problems emerging as a consequence of population explosion, the problem of shortage of food, particularly high quality protein is affecting adversely the health and vitality of the people. Fish culture is considered today as one of the most promising source of animal protein (Hepher, 1978). Research studies on limnological aspects are of great significance in developing fresh water fisheries. The physical and chemical conditions of the water can be improved through the application of organic and inorganic fertilizers (Ali *et al.,* 1977). The present work was planned to study the limnological parameters of the two freshwater fish ponds which were treated with artificial feed (35% crude protein) and buffalo dung.

MATERIALS AND METHODS

Two earthen ponds with dimensions 22.0 x 7.5 x 1.8 m, located at the Fisheries Research Farms, University of Agriculture, Faisalabad were used to conduct the study. Water samples were collected fortnightly from January 15, 1989 to December 26, 1989 in plastic bottles. Air and water temperature was recorded with the help of an alcohol thermometer. Light penetration was determined with the help of "Secchi's disc", while pH and conductivity of water samples were determined in the laboratory. Dissolved oxygen, total alkalinity, total hardness, nitrates, phosphates and planktonic biomass were estimated following A.P.H.A. (1971). The data collected on the desired parameters were subjected to analysis of variance.

RESULTS AND DISCUSSION

Air temperature ranged from 13 to 32°C whereas water temperature ranged from 12 to 30 and 11 to 30°C in ponds under T1 and T2, respectively. Water temperature of both the ponds had a direct relationship with air temperature. Such a relationship was also reported by Nazneen (1980). The overall range of light penetration in T1 and T2 remained between 4-35

and 5-22 cm, respectively. The low transparency values were due to turbidity of suspended matter. The electrical conductivity values varied between 1.3-2.1 and 1.4-1.9 mmoh cm^{-1} in T1 and T2, respectively. The pH values in T1 and T2 remained in the range of 8.0-9.5 and 8.0-8.9, respectively. The seasonal changes in pH values were probably due to variations in the rate of photosynthesis.

total hardness was observed as 134-238 mg l^{-1} in T1 and 110-256 mg l^{-1} in T2. There existed a direct correlation between total alkalinity and total hardness (Latif, 1983). In the present study, concentration of nitrates was found higher during summer and lower during colder months. The maximum value of nitrates was found during those days when the population of blue green algae was at its peak. This hints out the possibility of

Table 1. Analysis of variance of physico-chemical parameters of fish ponds under T1 and T2

Parameters	Treatment means		F-ratio
	T1	T2	
Water temperature (C)	21.66	21.62	0.0003 [NS]
Light penetration (cm)	13.46	11.30	1.0300[NS]
Electrical conductivity (m moh cm^{-1})	1.75	1.70	1.2290[NS]
pH	8.36	8.45	1.1750[NS]
Dissolved oxygen (mg l^{-1})	7.82	7.67	0.1210[NS]
Total alkalinity (mg l^{-1})	348.70	317.04	10.6740[NS]
Total hardness (mg l^{-1})	179.50	185.08	0.3690[NS]
Nitrates (mg l^{-1})	4.80	4.12	0.4080[NS]
Phosphates (mg l^{-1})	0.01	0.04	35.6180[NS]
Planktonic biomass (mg l^{-1})	77.04	109.29	2.5380[NS]

Dissolved oxygen showed an irregular seasonal pattern in both the ponds. This can be attributed to the variations in the photosynthetic rates of phytoplankton. Absence of CO_2 in both the ponds during the whole experimental period was probably due to alkaline nature of water. The year round changes in average total alkalinity values ranged between 288-413 and 258-405 mg l^{-1} in T1 and T2, respectively. An inverse relationship was observed between water temperature and total alkalinity as reported by Bilgrami et al. (1985). The overall range of

nitrogen fixation by the blue green algae as reported by Latif (1983). The phosphate concentration remained low in T1 whereas in T2 it remained somewhat higher due to the decomposition of buffalo dung as reported by Hassan (1989). The maximum value for total solids was recorded in the months of September and August for T1 and T2, respectively, which was probably due to abundance of planktonic life. Cooper and Koch (1984) also reported similar results. The maximum and minimum values of planktonic biomass were recorded in August

Table 2. Correlation coefficients between average dry weight of planktonic biomass and physico-chemical parameters of T1 and T2

	Temp.	L.P.	E.C.	pH	D.O.	T.A.	T.H.	N	P
T1	0.469	-0.647	0.178	0.183	-0.745	-0.098	0.119	0.414	0.069
T2	0.659	-0.677	0.144	0.343	-0.607	0.098	0.202	0.572	0.321

Critical value (1-tail; 0.05) = + Or -0.344

Temp. = Water temperature
L.P. = Light penetration
E.C. = Electrical conductivity
D.O. = Dissolved oxygen.

T.A. = Total alkalinity
T.H. = Total hardness
N = Nitrates
P = Phosphates

and January, respectively in both the ponds. The biomass was inversely correlated with light penetration.

Analysis of variance revealed non-significant differences between water temperature, light penetration, pH, electrical conductivity, dissolved oxygen, total hardness, nitrates and planktonic biomass of T1 and T2, whereas highly significant differences were observed between total alkalinity and phosphates of T1 and T2 (Table 1).

Table 2 shows that planktonic biomass had a positive and significant correlation with water temperature and nitrates while negative and significant with light penetration and dissolved oxygen in both the ponds. Similarly, a positive and non-significant correlation of planktonic biomass with electrical conductivity, pH, total hardness and phosphates was observed both in T1 and T2. The same Table reveals a negative and non-significant correlation between planktonic biomass and total alkalinity in T1 whereas a positive and significant in T2.

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