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SEASONAL WATER PARAMETERS OF ACTIVE AND RESTING NURSERY PONDS ON WILDLIFE AND FISHERIES MANAGEMENT DEPARTMENT'S FARM, UNIVERSITY OF IBADAN

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SUMMARY

Water quality parameters from active and resting nursery ponds were taken in both dry and wet seasons at the model fish farms, University of Ibadan. Temperature, turbidity, dissolved oxygen (D.O.), free carbon dioxide, pH, total alkalinity, total hardness and nitrite were examined to determine the suitable conditions of the ponds and seasons for optimum fish production. The physico-chemical parameters of all the ponds sampled for the two seasons (dry and wet) were interrelated with slight differences in their concentrations, levels and readings. From the data generated all the parameters were within the desirable standard for fish culture in all the ponds within the seasons. However, the quality of water in the active nursery pond was significantly better ($p<0.005$) than the resting nursery pond in both wet and fry seasons.

INTRODUCTION

Water quality parameters include all physico-chemical and biological characteristics of water that affects survival, growth and reproduction in fish since the water-body provides suitable habitat for survival and reproduction of desirable fish, shellfish, and other aquatic organisms (Boyd and Lichtkoppler, 1979). Viveen *et al.* (1985) and Van Eer *et al.* (2000) observed that water quality is important in order to optimise fish production per unity area of pond as well as the production of healthy fish since it also determines the quantity and active nursery ponds are those that are kept in operation, i. e. in which fingerlings are being nursed, while resting ponds are those not in use. The performance of fingerlings in these ponds is always a prerequisite to their subsequent performances in the production pond.

Our findings from studying water quality parameters, such as temperature, D. O., turbidity, carbon dioxide (CO_2), pH, total alkalinity, total hardness and nitrite in active and resting water ponds during the two seasons (dry and wet) will therefore provide physico-chemical and biological information that will be useful in designing management strategies for improved performance of fish from the nursery stage.

MATERIALS AND METHODS

This study was carried out at the model fish farm of the Department of Wildlife

and Fisheries Management, sited along El-Kanem road, University of Ibadan, Ibadan.

The farm takes its water from the stream that runs through the farm whose source is the Awba dam also within the University. There were twenty nursery ponds altogether on the farm, out of which two were stocked. Four ponds were therefore put to use: the two active (stocked) ponds (A1 and A2) and two of the adjacent resting (un-stocked) ponds (B1 and B2).

The water analyses were carried out both on the field and in the laboratory. Temperature, pH (Hydrogen ion), turbidity, dissolved oxygen (D. O.), free carbon dioxide, total alkalinity (as $CaCO_3$ mg/l), Total Hardness (as $CaCO_3$ mg/l), and nitrite concentration were determined as described in APHA (1995). The ponds were sampled around 8.00 am daily for two weeks in February and July for the dry and wet seasons respectively. The mean value for each parameter under consideration was then calculated. Statistical analyses of variance were used in testing the significance of each of these variables in all the ponds sampled during the two seasons.

RESULTS

The mean value of the different parameters considered during the two seasons (dry and wet) in the two types of ponds (active and resting) considered is presented as Table I.

There were little variations in the temperature of the nursery ponds sampled on the departmental fish farm during the sampling periods, ranging from 26.2-27.5°C (Table 1). The difference in the turbidity of the two types of ponds were significant ($p<0.05$) during the two seasons, however the highest mean turbidity was recorded in the wet season for both types of ponds.

The highest mean dissolved oxygen (D. O.) was recorded in the resting nursery ponds BI during the dry season (8.53 mg/l) while the lowest (7.11mg/l) was recorded in the active ponds AI and A2 in the wet and dry seasons respectively. The highest mean carbon dioxide (CO_2) concentration was 6.0mg/l in resting pond BI in both wet and dry seasons while the active pond AI had the lowest (4.0mg/g) during the wet season. The highest mean pH reading (7.2) was recorded in the resting ponds BI and B2 during the wet season while the active pond AI recorded the lowest pH of 6.6 during the dry season.

The lowest mean alkalinity (as $CaCO_3$ mg/l) occurred during the dry season in active pond AI and the highest during wet season in resting pond BI with 75 and 95 $CaCO_3$ mg/l) was in pond AI during the dry season and the highest during wet season in resting pond BI with 75 and 95 $CaCO_3$ mg/l respectively while the highest mean total hardness (as $CaCO_3$ mg/l) was in pond AI during the dry season and the lowest in pond BI during the wet at 45 and 48 $CaCO_3$ mg/l respectively. Nitrite concentration level was generally low with the highest mean concentration being 1.515×10^{-1} in pond AI during the dry season and lowest in pond BI also during the dry season.

There was no considerable difference in

the data generated in the active and resting ponds sampled and within the two seasons, statistical analyses however suggest that the quality of water in the active nursery pond was significantly better ($p < 0.05$) than the resting nursery pond in both wet and dry seasons.

DISCUSSION

Van Eer *et al.* (2000) gave a temperature of between 20-30^{0}C as the best range for fresh water fish farming. The temperature readings in all the ponds sampled were within this range and as such will favour the growth and reproduction of warm water fish species especially Tilapia (Balarin, 1979; Balarin and Haller, 1982; FAO, 1997). The active ponds had relatively higher turbidity readings both the dry and wet seasons and this may be attributed to the phytoplankton growth due to early fertilization of the ponds before stocking.

The dissolved oxygen concentration of the ponds (7.11-8.53 mg/l) was far above the desirable minimum value (5mg/l) suggested by Boyd and Lichtkoppller (1979) and Pillay (1996). This suggest that the ponds sampled can support fish respiration, digestion and synthesis of body tissue. Also the low free carbon dioxide (CO_2) range (4-6 mg/l) can be attributed to the fact that CO_2 released by fish in active ponds is effectively utilized in photosynthetic activities and this is desirable because the CO_2 reading fall below the lethal limit of 50-100 mg/l. which can lead to distress and death of fish if prolonged (Balarin, 1979; Murnyak and Murnyak, 1990).

The pH values derived from this study is in agreement with the adequate pH range (6.7-8.6) suggested by Van Eer *et al.* (2000), which is considered to be satisfactory for optimum growth of fish.

Viveen *et al.* (1985) and FAO, (1995) have reported that values above or below this range inhibit good fish growth and production. The total alkalinity and the total hardness values obtained from this work are also in conformity with the suggestion of Van Eer *et al.* (2000) since these three water quality parameters are inter-related and inter-dependent.

The low nitrite concentration of the ponds sampled is an indication that there was almost complete oxidation of ammonia to nitrates due to adequate dissolved oxygen in the ponds and also the intensive activity of bacteria encouraged by relatively high temperature. This result in nitrates releasing nitrogen; an essential ingredient of photosynthisis (Balarin and Haller, 1982).

Arringnon (1988) opined that regular monitoring and maintenance of water quality is necessary in order to achieve a high fish productivity in a pond and also reported that fish will be more susceptible to disease if they are kept in particular stressful environment.

All the parameters considered in the study were within the desirable standards for fish culture in all the ponds and within the seasons although, the quality of water in the active nursery pond was significantly better ($p<0.05$) than the resting nursery ponds in both wet and dry seasons.

It can therefore be concluded from this

study that water quality monitoring is particularly important in nursery ponds as the performance of frys and fingerlings will determine there subsequent performance as adults in production ponds and hence the potential for aquaculture and increase fish production in Nigeria.

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TABLE I: Physico-chemical parameters of active and resting nursery ponds

Parameters	ACTIVE NURSERY PONDS				RESTING NURSERY PONDS			
	A_1		A_2		B_1		B_2	
	Wet season	Dry season	Wet season	Dry season	Wet season	Dry season	Wet season	Dry season
Temperature (°C)	26.9	27.5	26.5	27	26.7	26.5	26.2	26.5
Turbidity (cm)	38.3	36.2	37.6	35.7	32.9	30.1	32.4	29.8
Dissolved Oxygen (mg/l)	7.11	8.01	8.01	7.11	7.72	8.53	7.93	8.33
CO_2 Concentration (mg/l)	4.0	5.0	4.1	5.2	6.0	6.0	5.0	5.5
PH	6.9	6.6	6.8	6.5	7.2	7.1	7.2	7.0
Total Alkalinity ($CaCO_3$ mg/l)	85	75	85	80	95	80	90	90
Total Hardness ($CaCO_3$ mg/l)	41	45	40	40	38	44	39	39
Nitrite Concentration (mg/l)	1.1515×10^{-1}	1.66×10^{-3}	1.45×10^{-1}	1.56×10^{-3}	3.912×10^{-2}	0	1.5×10^{-2}	1.9×10^{-3}