Pak. j. sci. ind. res., vol. 34, no. 6, June 1991

INFLUENCE OF COWDUNG COMPOST ON SURVIVAL AND GROWTH OF TILAPIA *(OREOCHROMIS MOSSAMBICUS)*

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(Received August 5, 1989; revised June 26, 1991)

Growth of *Oreochromis mossambicus* was determined over a period of 180 days in concrete ponds. Ponds in treatment group A were treated with cattle dung compost, treatment group B received compost plus a feed supplement, while control pond received neither compost nor supplementry feed. Analysis of covarience showed significant differences between the three treatments. In this study none of the values recorded for water chemistry was beyond the normal range of tolerence of fish. It is concluded that treating pond with bio waste can improve growth rates in tilapia culture and reduces runing costs.

Key words: Tilapia, Growth, Cowdung compost.

Introduction

A primary objective in fish culture is to increase production per unit culture space. Supplementry feeding with artificial diets is an effective measure for increasing fish production which may need 60-70% cost of the total budget. For favourable economical production various techniques are used in intensive fish culture. The manuring of fish ponds have recently become the subject of interest among the aquaculture researchers in many parts of the world [1].

The objective of manuring is to supply essential nutrients such as nitrogen, phosphorous and pottasium which boost the production of pond plankton. A variety of agricultural wastes, dung of various farm animals (cow, buffalow, horse, sheep, poultry and duck) and also domestic sewage can be used as organic manure for fish ponds as a substitute for costly feed or fertilizer [2]. The major advantage of such manure is that the nutrients are released slowly and are available for a longer period than inorganic fertilizer. The efficacy of applying organic fertilizer have been examined in the form of cattle and poultry waste to fish ponds [3]. Of all the organic manures raw cattle dung is easily available in large quantities and has been widely applied in south east Asia [3,4]. No such study has so far been undertaken in Pakistan on the utilization of waste obtained from the farm animals. Keeping in view the potential role of cow dung in fish pond fertilization, its efficacy has been determined in tilapia *O. mossambicus* culture, as this fish has the ability to tolerate extreme conditions in water and feeds almost on phytoplanktons [5, 6]. Studies were therefore, undertaken and reported here on survival, growth, maturity and chemical composition of the fish. The present paper deals the results on growth.

Materials and Methods

In the present series of experiments the compost was prepared by the following method. Non draining fermentation pits were dug. In the pits green grass and cow dung were placed in alternate layers. Lime solution (1 part of lime to 100 parts of total grass and cow dung) was added on the top of each grass layer and finally enough lime solution to cover all the compost. The pits were sealed with mud and left for six months for biodegradation (composting).

For calculating the suitable quantity of compost and application techniques preliminary experiments were conducted with five different quantities of 6, 9, 12, 15 and 18 Kg ha-1 day-1 of the fermented compost in small cemented ponds of 1 cu-m. Fingerlings of the experimental fish were stocked at 120000.0 ha^1. To find out the optimum manuring level, studies on the survival of fish and physicochemical parameters of the water, such as temperature, dissolved oxygen determined for four weeks. The maximum survival rate of fish and optimum water quality conditions were observed in ponds treated with 12.00 kg ha^1 day^{-1} of compost. Hence this quantity was selected for conducting the studies. The application techniques are as follows:

Fermented compost was placed into the water than sprinkled evenly over the pond. The residue was placed in the corner of the pond so that further biodegradation could take place in order to release further nutrients. Experiments were conducted from 4th April, 1987 to 30th September, 1987 (180 days of culture). Six cemented ponds each with an area of 0.0025 ha $25m^3$ were used to run each of the three treatments in dublicate. The treatments used are given below:

1. Control (pond 1 and 2) no compost.
2. Treatment A (pond 3 and 4) manuring at 12.0 Kg ha^{-1} day^{-1}.
3. Treatment B (pond 5 and 6) manuring and supplementry feeding of fish with rice bran and mustard oil cake (2:1) in the morning once daily at 2% of the total fish body weight.

Each pond was stocked with fingerlings of *O. mossambicus* five days after first application of the compost. Then after the manurial level is 20 kg day^{-1}. The stocking density was 1,200,000 fingerlings per hactare. The average weight per fish at the time of stocking was 4,455,4.26 and 4.415 gm in control, treatment 'A' and treatment 'B' respectively.

For evaluating growth rate random samples of twelve fish from each experimental pond were taken at 30 day interval. In the laboratory, individual standard weight were obtained to the nearest 0.01gm. Survival was determined by counting the live fish at the end of the experiment. No mortality occured in any pond.

Temperature, dissolved oxygen, pH and total ammonia were determined twice a week [7]. Temperature was measured with the mercury filled celsius thermometer. For the measurement of pH values fisher Model 230 pH/Ion meter was used. Total ammonia content was determined by Nesselerization method. The dissolved oxygen was estimated by the azide modification method. Statistical analysis performed were of Tesch [8] and Zar [9].

Results and Discussion

There was no significant difference in the average weights of experimental fish between the three experimental conditions at the inception of the study. The mean increase in total length was 9.589, 10.66 and 12.105 cm in control and the treated group A and B respectively (Table 2). This was 215.15%, 250.23% and 274.17% increase over the mean initial length at the time of stocking. Similarly the average increase in weight per fish at the end of the culture period was 36.501, 57.28 and 90.13gm in control, treated group A and B respectively (Table 1). This was 2504.17% 4465.08% and 5563.58% increase over the mean initial weight at the time of initiation of the experiments.

The length weight relationship was determined according to the equation: $W=al^b$ (Tesch). Where W=weight, L=length, a=constant (the intercept of the length weight regression lines), b=an exponent (the slope of the length weight relationship.

TABLE 1. COMPARISON OF GROWTH RATE (WEIGHT) AND SURVIVAL RATES OF CONTROL AND TREATED GROUPS OF *O. MOSSAMBICUS* AFTER 180 DAYS OF CULTURE.

Culture period	Control	Treatment-A	Treatment-B
0	1.46 ± 0.0079	1.283 ± 0.0058	1.62 ± 0.016
30	8.361 ± 0.182	10.128 ± 0.079	19.15 ± 0.187
60	17.69 ± 0.181	21.493 ± 0.260	39.75 ± 0.341
90	24.95 ± 0.124	36.440 ± 0.289	55.54 ± 0.311
120	29.606 ± 0.412	44.198 ± 0.298	66.43 ± 0.291
150	35.136 ± 0.347	50.84 ± 0.359	79.12 ± 0.378
180	38.18 ± 0.273	58.57 ± 0.314	91.75 ± 0.525

A.-Compost, B-Compost +Feed.

TABLE 2. COMPARISON OF GROWTH RATE (LENGTH) AND SURVIVAL RATES OF CONTROL AND TREATED GROUPS OF *O. MOSSAMBICUS* AFTER 180 DAYS OF CULTURE.

Culture period	Control	Treatment-A	Treatment-B
0	4.455 ± 0.112	4.26 ± 0.058	4.415 ± 0.082
30	7.181 ± 0.065	7.18 ± 0.125	9.895 ± 0.050
60	9.411 ± 0.133	9.27 ± 0.153	12.215 ± 0.049
90	10.629 ± 0.121	11.76 ± 0.099	13.965 ± 0.094
120	11.801 ± 0.1511	12.34 ± 0.090	15.180 ± 0.043
150	13.055 ± 0.172	13.61 ± 0.064	15.830 ± 0.029
180	14.04 ± 0.135	14.92 ± 0.016	16.520 ± 0.081
Mean	$\bar{X}$ = 10.171	$\bar{X}$ = 10.471	$\bar{X}$ = 12.574

A.-Compost, B-Compost + Feed.

The parameters of the equation were determined for the three treatments at 30 days interval time are as follows.

Control $W = 0.0245\ L^{2.87}$

Treatment A $W = 0.0203\ L^{3.04}$

Treatment B $W = 0.01795\ L^{3.044}$

Linear relationship was found to exist between the weight and length (Figs. 3-5). The growth is allometric.

Growth was not significantly different among replicates, hence the data for the replicates was pooled for further analysis. Growth in length and weight with respect to time period (30 days interval was expressed by the linear equation as follows.

$Wi = a + bti$ (Fig. 2)

$Li = a + bti$ (Fig. 1)

Where wi/Li = weight or length at time ti, b=growth rate (regression co-efficient), t = time period O-180 (30 days interval).

Comparison of regression lines (F = 456.88) being significant, the slopes of the regression lines of the three treatments show differences therefore, three different regression lines for the three treatments are justified.

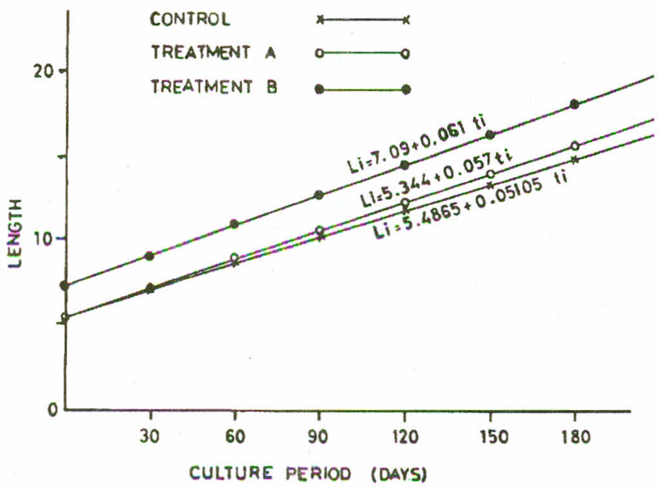

Fig. 1. Relationship between length gain versus time for *O. mossambicus* during cultur period of 180 days. Straight line present regression line.

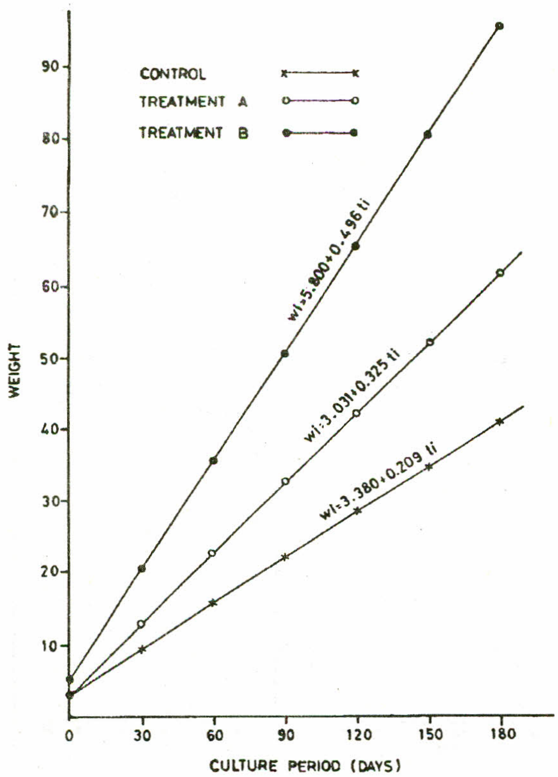

Fig. 2. Relationship between weight gain versus time for *O. mossambicus* during culture period of 180 days. Straight line present regression line.

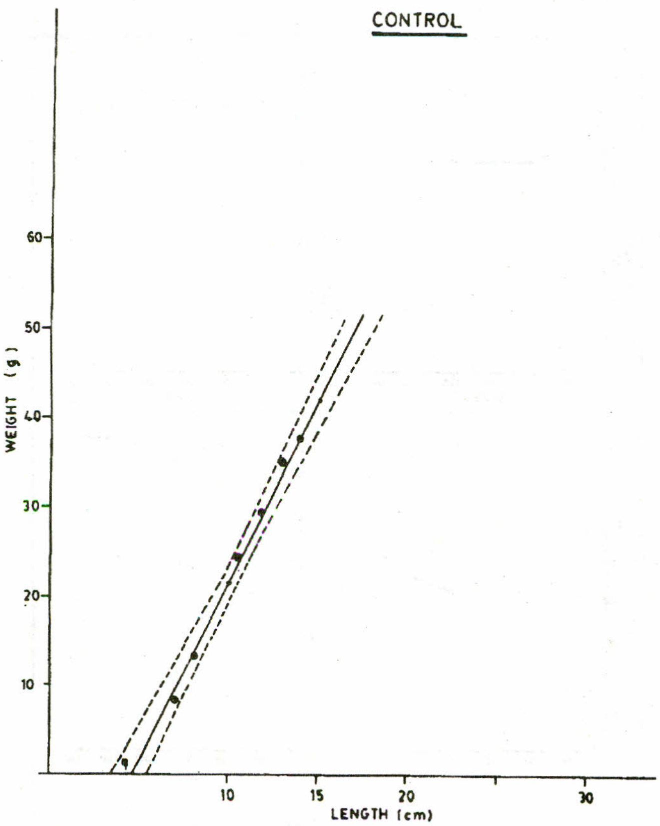

Fig. 3. Relationship between the length and weight for the control, dotted lines indicate 95% confidence interval.

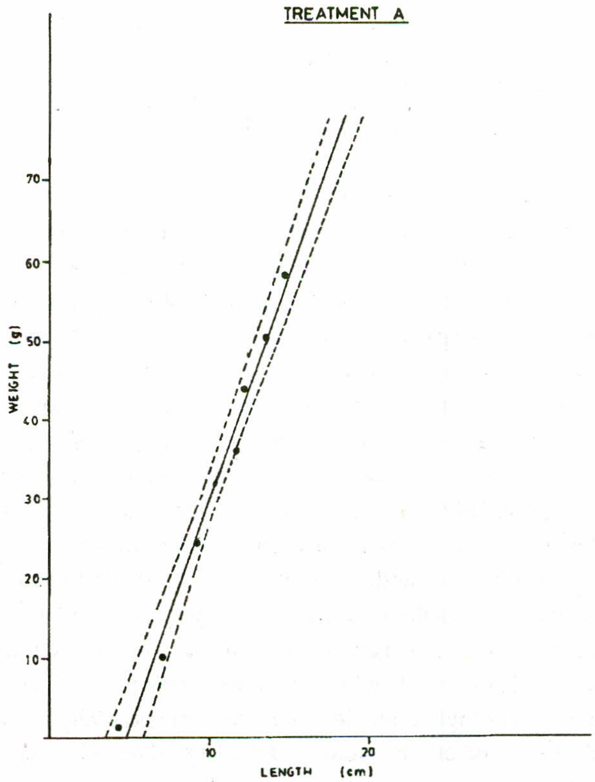

Fig. 4. Relationship between the length and weight for the treatment group A, dotted lines indicate 95% confidence interval.

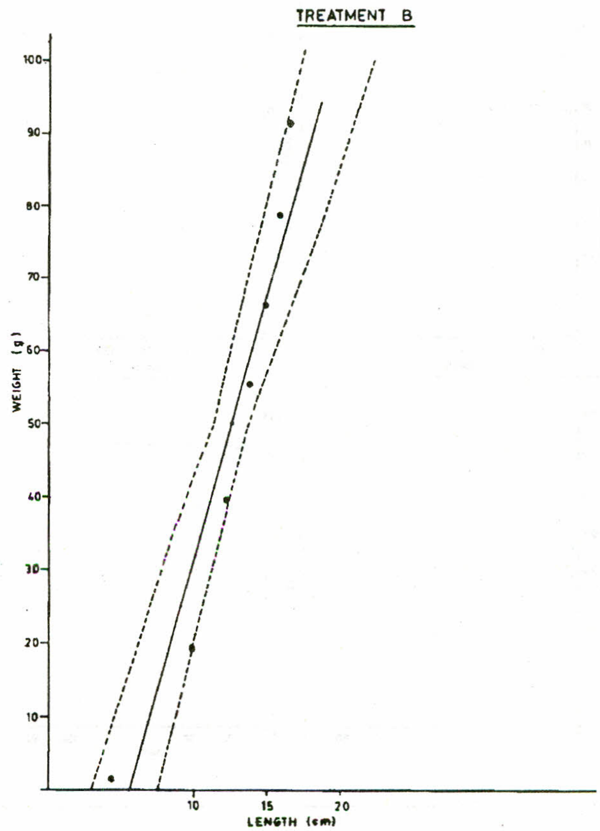

Fig. 5. Relationship between the length and weight for the treatment group B, dotted lines indicate 95% confidence interval.

Temperature was consistent among the ponds within the range 26.75 - 36.3°. The dissolved Oxygen Levels varied from 6.75 - 8.55 mg/1 pH ranged from 7-8.81 and the ammonia levels were low through out the study ranged from 0-.53mg/1 (Figs. 6-8).

In the present experiment the survival of *O. mossambicus* was 100% as compared to 75-85% survival in ponds manured with waste from finishing hogs reported earlier [10]. This higher survival rate was largely because of better quality of manure consisting of cow dung compost. However, the results indicate that the compost can be used as growth substrate in fish ponds as feed replacement. Correlation was found between total length and weight of the experimental fish (Figs. 3-5). In terms of weight the growth was phenomenal during the initial culture period of 60,90 and 60 days in control, treated group A and B, after which growth was slower comparatively gradual, but the increase in length was quite small. It may be concluded that under favourable conditions tilapia put on more in weight and concomitant increase in length is not so conspicous. It was observed that in ponds with or without feeding the growth of fish was very high at the begining and comparatively slower towards the end of the culture period of 180 days. This slower growth is in agreement with the generalization made by Brett

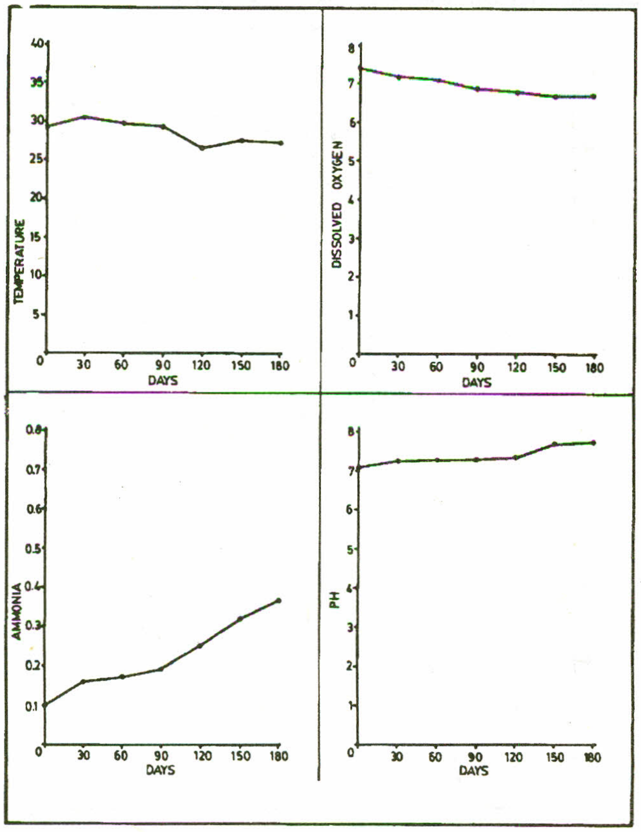

Fig. 6. Comparison of water quality characteristics of control (pond) against time.

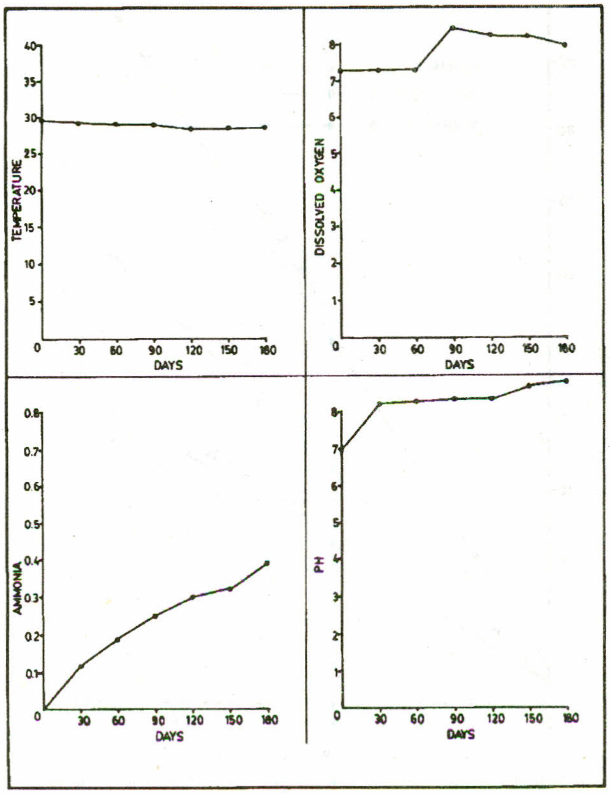

Fig. 7. Comparison of water quality characteristics of treatment (A) pond against time.

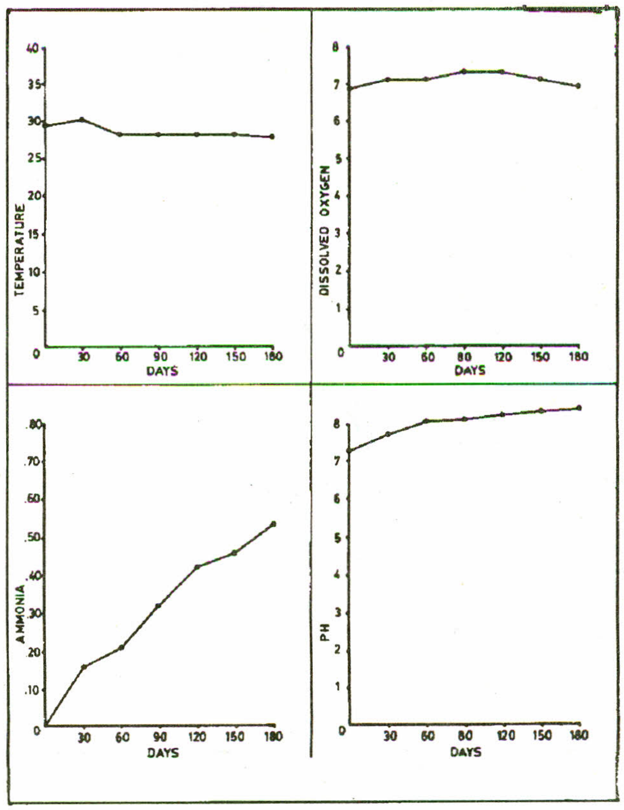

Fig. 8. Comparison of water quality characteristics of treatment (B) pond against time.

TABLE 3. WATER CHEMISTRY OF CONTROL AND TREATED PONDS STOCKED WITH *S. MOSSAMBICUS* FOR 180 DAYS OF CULTURE.

Culture period (days)	Temperature (°C)			Dissolved oxygen mg/l			Total ammonia mg/l			pH		
	C	A	B	C	A	B	C	A	B	C	A	B
0	29.12	29.14	29.15	7.4	7.35	6.99	0.00	0.00	0.00	7.19	7.00	7.21
30	30.31	29.29	30.31	7.2	7.39	7.12	0.16	0.12	0.16	7.31	8.24	7.73
60	28.67	28.31	28.52	7.12	7.45	7.10	0.17	0.19	0.21	7.32	8.27	8.00
90	28.02	28.34	28.51	6.85	8.55	7.35	0.19	0.25	0.32	7.32	8.32	8.15
120	27.57	27.54	28.31	6.80	8.33	7.31	0.25	0.30	0.42	7.34	8.39	9.23
150	27.65	27.63	28.23	6.72	8.28	7.10	0.32	0.32	0.46	7.66	8.70	8.25
180	27.21	26.75	28.20	6.70	8.00	6.98	0.37	0.39	0.53	7.73	8.81	8.34

Each value is Geometric mean of 52 Observations, C = Control, A = Treatment A, B = Treatment B.

[11] who observed that as the size increase the metabolic rate declines. Significantly higher increase in weight of tilapia in treated group A and B than control was mainly due to the enhancement of natural productivity (phyto and zooplankton) in the pond [12]. Our observation that cowdung compost has a better manurial quality than cowdung is strengthened by the comparison of growth rates in ponds treated with or without cow dung compost. In comparison with 4.137 times higher growth (by weigh)t of tilapia in pond treated with compost than in control indicated that the compost had highest value in terms of weight of the fish. Compost contained 3.2% nitrogen as against 1.35% in raw cowdung [13]. It may therefore, concluded that tilapia grows well in manured ponds but shows even better growth when supplementary feed containing protein, carbohydrate and fat are added [14]. This finding is supported by the significantly higher growth rate of tilapia observed in ponds manured with compost and fed with rice bran and mustard oil cake as supplementary feed than in those manured with only compost.

In the present study it was also evident that none of the values recorded for water chemistry was beyond the normal tolerance range of tilapia. Temperature was consistent among the ponds with the mean being ideal for the growth of tilapia. In the case of dissolved oxygen no supersaturation or sever depletion was noted. The pH did not rise or fall in any pond to levels considered to be deleterious for the survival of the tilapia. Ammonia levels were low throughout the study (Figs. 6-8).

In conclusion the present study indicates that with biowaste favourable change could be achieved in tilapia culture which will help to reduce the running cost of the fish culture in terms of expenditure incurred on food increments. Utilization of cowdung in the form of compost reduces the environmental pollution.

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