Pak J Sci Ind Res 2001 44 (5) 294-296

Studies on the Efficiency of Cowdung Compost as Food Producer in Carp (*Cyprinus carpio*) Culture

Khalid Jamil[a]*, Razia Sultana[a], Abbas Shah[a] and Lin Hong[b]

[a]*Applied Biology and Marine Resources, PCSIR Laboratories Complex, Karachi 75280, Pakistan*

[b]*Department of Fisheries, Ocean University, Qingdao, P R China*

(Received 19 October 1999; accepted 8 January 2001)

Studies were undertaken to determine the efficiency of composted bio waste in carp *(Cyprinus carpio)* culture for a period of 180 days. Growth of fish was measured in terms of weight. The main increase in weight per fish at the end of the culture period was recorded in control, treated group A (compost) and treated group B (compost and feed) respectively. Statistically significant differences were found between the weight of experimental fish under control, treatment A and B groups. In this experiment none of the values recorded for water chemistry was beyond the tolerance of fish. It is concluded that with bio waste favourable change could be achieved in fish culture, which would help to reduce the running cost of the fish culture.

Key words: *Cyprinus carpio,* Cow dung, Compost, Fish culture.

Introduction

The significant goal in fish cultures is to maximize the production per unit of culture space. One effective method used for increasing fish production is the supplementary feeding of artificial diets. Yet this method requires 60-70% of the total cost of budget. Nevertheless there remains various types of techniques used for efficient results in intensive fish culture. One of this techniques is the manuring of fish ponds which has recently become the subject of interest among aqua culture researchers in many parts of the world today (Han and Ding 1986; Mishra *et al* 1988; Msuku and Roger 1994). The objective of manuring is to extract nutrients such as (nitrogen, phosphorus and potassium) from the manure, which will result in the production of pond planktons. Various agricultural waste products, excretion of farm animals (cow, buffalo, horse, sheep, poultry and ducks) as well as domestic sewage may be used as organic fertilizer for fish pond as a substitute for expensive feed for fertilizer. The advantage of this type of fertilizer is that the nutrients are constantly being released at a slow pace and are more readily available than that of inorganic fertilizers (Hulata *et al* 1982). Cow dung is the easiest organic manure to obtain large quantities, is widely used in South East Asia (Govind *et al* 1978). So far there has been no study in Pakistan on the utilization of composted farm animal waste.

The carp *(Cyprinus carpio)* would seem to be an especially appropriate fish species to use in studying cow dung compost manuring of fish ponds, since this fish has the ability to tolerate extreme water temperature conditions and is able to feed on phytoplanktons. The studies were undertaken to evaluate the effect of cow during manuring on water quality parameters in fish ponds and growth and survival of this fish (*Cyprinus carpio*).

*Author for correspondence

Materials and Methods

The compost was prepared by the following method. Non draining fermentation pits were digged. In the pit green grass and cow dung were placed in alternate layers and 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 up all the compost. The pits were sealed with mud and left for six months for composting.

To establish the optimum manuring level and application techniques, studies on survival of fish and the physico-chemical characters of the water (temperature dissolved O_2, pH & total ammonia) were determined for 6 weeks with five different quantities (6, 9, 15, 18 kg ha^{-1} d^{-1}) of fermented compost. The maximum survival rate of fish and the optimum water quality conditions were observed in ponds treated with 9 kg ha^{-1} $day^{-1}$of the compost. Hence this quantity was selected for conducting the studies.

The suitable application technique is as follows:

Fermented compost was placed in sieves, washed into the water and sprinkled with the water evenly over the pond. The residue was placed in a corner of the pond so that further

fermentation and decomposition could take place. Experiments were conducted for 180 days of culture period. Six cemented ponds each with an area of 0.0025 ha (5x5m) were used to run each of the three treatments in duplicate. The treatments used are as follow:

1. Control (pond 1 and 2). No compost.
2. Treatment A (pond 3 and 4). Manuring at 9 kg ha^{-1} day^{-1}.
3. Treatment B (pond 5 and 6). Manuring and supplementary.

Feeding of fish with rice bran and mustard oil cake and fishmeal (2:1:0.5) in the morning once daily at 3% of total body weight. Each pond was stocked with fingerlings of *Cyprinus carpio* five days after first application of the compost. The stocking density was 120,000 fingerling per hectare. The average initial weight per fish at the time of stocking was 0.3g in control, treatment A and B respectively.

The growth of experimental fish was measured in terms of total weight. For evaluating growth random samples of fish from each experimental pond were taken at 30 days interval. In the laboratory individual standard weight were obtained to the nearest 0.01g. The fish after weighing were returned to the ponds unharmed. Survival was determined by counting the live fish at the end of the experiment. Growth in weight with respect to time period (30 days) intervals was expressed by regression equation.

$W = a + bt$

where

W = weight at time t
a = intercept
b = growth rate (regression coefficient)
t = time period 0-180 days (30 days interval).

Temperature, dissolved O_2, pH and total ammonia were determined twice a week in the morning (APHA 1981). Temperature was measured with the Celsius Thermometer. For measurement of pH values fisher model 230/PH ion meter was used. Total ammonia contents was determined by nesselerization method (APHA 1981). Dissolved oxygen was determined by azide modification methods (APHA 1981). Statistical analysis performed were of Zar (1974).

Results and Discussion

The main initial and final weights of experimental fish *Cyprinus carpio* in control and treated groups appear in Table 1. The highest weight gain was obtained with the treated group A and B. Control was markedly inferior than those from any of the two treated groups. The main increase in weight was 216.52, 360.85 and 377.03 gm in control, group A and group B, over the main initial weight at the time of initiation of the experiment.

Growth was not significantly different among replicates, hence the data for replicates was pooled for further analysis. The growth of the fish in the manured (treatment A) and manured plus feed (treatment B) were both significantly greater ($P>0.01$) than the control fish from day 90 until the end of the experimental period. (Table 1). The feed supplement (treatment B) resulted in no additional growth compared with the manure alone (treatment A). The calculated equation of regression line (Fig. 1) of control and treated groups are as follows:

Control = -17.92 + 1.264t
Treatment A = -32.95 + 2.02t
Treatment B = -36.33 + 2.10t

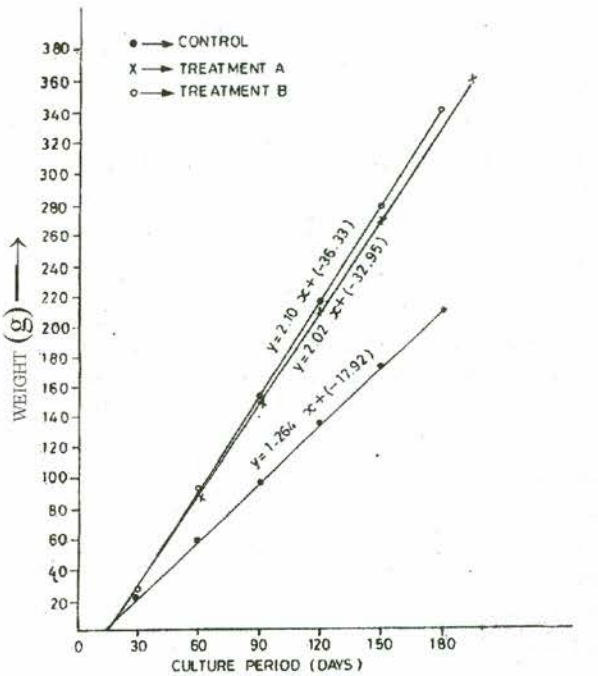

Fig 1. Relation between weight gain versus time for *Cyprinus carpio* during culture period 180 days; straight line represent regression line.

Table 1
Comparison of growth (fish weights) of control and treated groups of *Cyprinus carpio* after 180 days of culture

Culture period	Control weight (g)	Treatment A weight (g)	Treatment B weight (g)
0	0.31+(0.04)	0.305+(0.05)	0.30+(0.02)
30	12.43+(1.65)	22.15+(0.99)	18.98+(2.70)
60	45.31+(2.56)	66.16+(3.59)	62.33+(6.55)
90	99.13+(2.34)	140.16+(13.61)	149.66+(18.95)
120	123.38+(1.86)	180.16+(12.34)	188.33+(9.48)
150	179.53+(3.48)	273.18+(8.70)	271.33+(7.12)
180	216.83+(6.42)	361.16+(2.26)	378.33+(19.05)

Standard deviation values are in parenthesis.

Table 2
Water chemistry of control and treated ponds stocked with *Cyprinus carpio* for 180 days of culture

Cultured period	Temperature (°C)			Dissolved oxygen (mg l^{-1})			Total ammonia (mg l^{-1})			pH		
(days)	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	7.17	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	7.33	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	8.23
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
150	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.

Temperature was constant among the ponds within the range of 26.75 - 30.31°C. The dissolved oxygen level varied from 6.70 - 8.55 mg l^{-1}. pH ranged from 7 - 8.81 and the ammonia levels were low ranging from 0 - 0.53 mg l^{-1} (Table 2).

Through out the course of 180 days of experimental period the mortality of the fish was 3-5% as compared to 15-25% mortality in ponds manured with waste from finishing hogs reported earlier (Han and Ding 1986). This higher survival rate was largely because of better quality of manure consisting of cow dung since compost contained 3.2% nitrogen as against 1.35% in raw cow dung (Radia *et al* 1987). Our observations that cow dung compost has a better manurial quality than cow dung is strengthened by the comparison of the growth in ponds treated with or without compost. In comparison with 1.65 and 1.75 times increase in weight of this experimental fish in ponds treated with compost than control indicates that the compost has highest value in terms of weight gain mainly due to the enhancement of natural productivity in ponds (Qadri and Khalid 1991). It has to be pointed out that natural diets are more likely to contain the inorganic nutrients and essential factors necessary for good growth than production diets.

It, therefore, may be concluded that this experimental fish grows well in manured pond but marked additional increase in weight was not observed in ponds manured with compost and supplementary feeding. In the present study, it was also evident that none of the values recorded for water chemistry was beyond the normal tolerance range of the fish (*C. carpio*). Temperature was consistent among the ponds with the mean being ideal for growth of this fish. In the case of dissolved O_2 no supersaturation or severe depletion was noted. The pH did not rise or fall in any pond to levels deleterious to fish. Ammonia levels were low throughout the study (Table 2).

However, the results of this experiment indicate that the compost can be used as growth substrate in fishponds as feed supplement.

In conclusion the present study indicates that with bio-waste favorable change could be achieved in fish culture which will help to reduce the running cost of the fish culture in terms of expenditure incurred on food increments. Utilization of bio-waste in terms of compost reduces environmental pollution.

References

APHA 1981 *Standard Methods for the Treatment of Water and Waste Water.* American Public Health Association, Washington, D.C.

Govind B V, Gopal K V, Singh S S 1978 *J Inland Fish Soc Ind* **10** 101.

Han G Y, Diny J Y 1986 Naga Working paper 86/32, 6P, Bangkok, Thailand.

Hulata G R, Moavg, Wolhforth 1982 Effect of cowdung and availability of food on growth rate of fry in European & Chinese races of common carp. *J Fish Biol* **20**(3) 323-327.

Mishra B K, Sahu A K, Pari K C 1988 Effect of different manures of fish farming. *Aquaculture* **68**(1) 59-64.

Msuku B S, Roger J F 1994 Utilization of cowdung in processing Nile perch in Lake Victoria. *Tropical Science* **34**(4) 387-390.

Qadri N N, Khalid J 1991 Influence of cowdung compost on survival and growth of *Tilapia. Pak J Sci Ind Res* **34**(1) 253-257.

Radia K, Usmani N, Shahid S 1987 Studies on Bioconversion, I. Effect of urea on improving biogas yield. *Pak J Sci Ind Res* **30**(7) 553-562.

Zar J H 1974 *Biostatistical Analysis.* Prentice Hall International, London.