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EFFECT OF COMMERCIAL DIETS, MANURE AND SOME AGRICULTURE BY-PRODUCTS ON PERFORMANCE OF COMMON CARP IN POLYCULTURE SYSTEM

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SUMMARY

The effect of using some commercial diets, manure and some agriculture by-products on performance of common carp, Cyprinus carpio, in polyculture system with tilapia, Oreochromis niloticus, has been investigated.

The water quality measurements seemed to be within the normal range of tolerance and well being of tilapia and common cap fishes.

The performance results of common carp in terms of live body weight (LBW), body weight gain (BWG), specific growth rate (SGR), and condition factor (K) showed that the commercial diets exhibited superior performance rather those either treated with manure or agriculture by-products compost.

Fish fed on the pelleted diet (25%CP) exhibited superior growth response rather than those fed on the mash diet containing (25%CP).

The cow manure and chicken manure treatments gave significantly ($P<0.05$) higher growth performance than that of agriculture by-products (bagasse and rice straw compost).

From these results, it could be recommend to use diet for feeding common carp fish in earthen ponds as pelleted not as mash form and it is potential to use manure and agriculture by-product to fed common carp fish.

INTRODUCTION

Fish as a source of dietary protein for human consumption is esstial to help considerably in correcting the state of malnutrition especially in Egypt. Fish production from masses is not sufficient to

protein requirements for all people.

The intensive culture of fish such as is practiced in Egypt, requires the inputs of considerable quantities of protein and other nutrients, beside that available to fish from plankton and benthos, to sustain maximum growth of fish. The shortage and the increased prices of traditional foodstuffs used in formulating the commercial fish feed have led researchers to investigate alternative sources of feed that might suffice totally or in part as a substitute for traditional protein sources.

The polyculture of several fish species with different feeding habits, which feed on different natural food is an important management to efficiency utilize the different pond productivity (Lin, 1982 and Milstein, 1992). The same author added that synergitic interaction among different, non-competive fish species are manifested by higher growth and yield in polyculture than monoculture systems.

The objective of this study was to find out new cheap feed sources for fish to minimize production cost of common carp, reduce competition of using conventional feed stuffs in feeding fish and farm animal by using manure and agriculture by-products and evaluate the effect of commercial diets compared with manure, bagasse and rice straw on peformance of common carp fish in polyculture system with tilapia fish.

MATERIALS AND METHODS

This study was conducted in Central Laboratory for Fish Resources, Abbassa, Abou-Hammad, Sharkia Governorate, Agricultural Research Center. Eighteen earthen ponds of 1000 m2 area/each were used in this study. All the ponds were filled with fresh water from a local canal to 1 m depth. The ponds were randomly assigned the following six treatments each with 3 replicates.

Treatment 1. a pelleted diet containing 25% CP.
Treatment 2. a mash diet containing 25% CP.
Treatment 3. fermented cow manure.
Treatment 4. fermented chicken manure.
Treatment 5. sugarcan bagasse compost.
Treatment 6. rice straw compost.

The feed was offered twice a day at a rate of 3% of fish biomass, while the other fertilizers were added at a rate of 50 kg/pond/week.

Nile tilapia, Oreochromis niloticus, and Common carp, Cyprinus carpio, fry at a ratio of 1800 and 200 per pond were used in this study with initial body weight of 5.1-5.4 g and 7.0-7.4 g, respectively. Twenty fish were taken at random from each species and each treatment at the beginning of the experiment and then every 15 days. All fish samples were returned back to their ponds after recording the measurements of individual body weight to the nearest 0.1g and body length to the nearest 0.1cm.

The agriculture by-products were set in layers of 10-15 cm thickness in alternative with layers of fresh cow manure. Thereafter, water was sprayed over the compost. A plastic sheet totally and tightly covered the whole compost for 15 days (anaerobic condition). Then, the plastic sheet was removed for another 30 days (aerobic conditrion). After fermintation and putrefaction of the mixture (45 days), it is even used in the ponds. The amount applied depends on the water quality and pond fertility. On the other hand, cow manure and chicken manure were set in heap form and water was added over manure and mixture. After 3 days fermintation, the manures were mixed with water in plastic bucket, then spread over water surface of the ponds. The manures or compost were added as a fertilizer according to Green et al. (1990). Tables (1) and (2) show the chemical composition of the diet, manures and compost

The measurements used in this experiment were estimates as follows:

Live body weights (LBW) and body length (BL).

A number of twenty fish were taken randomly from each species in each treatment every 15 days to determine individual body weight and body length.

Body weight gain (BWG).

Biweekly weight gain was determined as the different between the initial and final weight up to the end of the experimental period.

Specific growth rate (SGR).

Specific growth rate was calculated according to **Jauncey and Rose (1982)**.

SGR = 100 (Lnw2 - Lnw1)/ (t2 - t1)

Where:

W1 = the weight at t1

W2 = the weight at t2

Ln = the natural log

T = the time in days

Condition factor (K).

The condition factor was estimated according to Lagler (1959).

$$K = \frac{100\ W}{L^3}$$

Where: W = body weight in gram. L^3 = Length in centimeters cubic.

Data were analyzed using analysis of variance among the six treatments (SAS, 1985). Differences between means were tested by Duncan multiple range test (Duncan, 1955).

RESULTS AND DISCUSSION

Effect of the experimental treatments on some

water quality parameters.

Table (3) shows some water quality parameters of the experimental ponds. The results showed that temperature ranged from 27 to 30°C being adequate for growth of common carp fish. Jhingram and Pullin (1985) reported that the optimum growth temperature ranged from 22 to 25oC for common carp.

The measured dissolved oxygen during the experimental period was ranged from 7.9 to 9 mg/l. These values agree with those of NACA (1989) required for growth and survival of fish.

Average values of pH ranged from 6.95 to 7.6 in the different treatments, indicating that the pond water was suitable for well being of fish. Boyd and Lichkoppler (1979) demonstrated that water with pH value of about 6.5 to 9 ppm daybreak are considered best for fish production. The acid and alkaline death points of ranged between pH 4 and 11.

Electric conductivity (E.C.) values ranged from 0.8 to 1.4 ppm. Among the six treatments, water in the cow manure pond revealed lower EC value, where salinity was low. Because the direct relationship between EC and salinity. On the other hand the diet and sugarcan bagasse treatments showed high EC values, where sailinity was high in the same treatments.

Total alkalinity(Alk.) ranged from 250 ppm in cow manure treatment to 368 ppm in mash diet treatment. The lowest hardness value was 195 ppm in the chicken manure treatment. In this respect, Boyd (1981) reported that as long as the hardness values of pond water are over 200 ppm, then no deleterious effects will be seen. Boyd (1984) reported that calcium and magnesium (total hardness) are generally associated with carbonate salts, which are the principal sources of alkalinity in water.

Total phosphorus (T.P.) ranged from 0.032 to 0.32 mg/l in the experimental ponds. These values are suitable for growth of tilapia and common carp fish due to that both fish feed and pond water serve as a source of minerals.

Effect of commercial diets, manure and agriculture by-product on growth performance.

Live body weight of common carp.

Results in Table (4) show that the live body weight of common carp fed on different sources of feed during the experimental period. The live body weight values of common carp fed on the pelleted diet was significantly ($P<0.05$) higher than that of the other treatments. Among the two commercial diets, when the diet was offered as

pelleted, it increased the body weight rather than mash form. No significant differences were noticed between cow manure and chicken manure treatments. Also, no significant differences were observed between baggasse and rice straw compost treatments.

It could be concluded that pelleted diet is an excellent supplementary food supporting common carp fish with nutrient requirement growth. The previous results are in agreement with the finding of Barash and Schroeder (1984) who reported that growth retardation of common carp in manured ponds was mainly due to the food limitation and addition of sorghum grains (to supply common carp with energy) the ponds showed significant ($P<0.05$) improved growth performance of common carp fish.

Body weight gain (BWG).

Results in Table (5) showed that after 15 days of age, fishes recived the commercial diet (pelleted and mash) treatments were significantly ($P<0.05$) higher in body weight gain than those of the other treatments. However, no significant differences

Table (2): The chemical composition of agricultural by-products

Agricultural by-products	DM	OM	Crude protein	Crude fiber	Ether extract	Ash	NFE	Nitrogen	potssium	phosphorus
Cow manure	91.11	81.66	81.66	81.66	81.66	81.66	81.66	81.66	81.66	81.66
Chicken manure	92.37	67.5	67.5	67.5	67.5	67.5	67.5	67.5	67.5	67.5
Bagasse (Material)	79	88.25	88.25	88.25	88.25	88.25	88.25	88.25	88.25	88.25
Bagsse (compost)	39	69.51	69.51	69.51	69.51	69.51	69.51	69.51	69.51	69.51
Rice straw (Material)	94.27	83.89	83.89	83.89	83.89	83.89	83.89	83.89	83.89	83.89
Rice straw (compost)	38	71.17	71.17	71.17	71.17	71.17	71.17	71.17	71.17	71.17

* DM = Dry matter
OM = Organic matter
NFE = Nitrogen free extract

were observed between fishes recived cow manure and chicken manure, bagasse and rice straw treatments. After 30 days, pelleted diet exhibited significant ($P<0.05$) higher body weight gain than the other treatments. On the other hand, there are no significant different between bagasse and rice traw treatments. Similar trend was detected from 60 to 75 days. The results at 90 and 105 days indicated the superiority of pelleted diet treatments (75.3g) followed by mash diet (63.3g), manure (33.0 and 51.3g), then the agriculture by products bagasse and rice straw (40.0 and 40.7g), respectively.

The previous results indicated that when diet was offered in pelleted form, it increased the body weight gain rather than the mash form.

The results at the end of the experiment indicated the superiority of commercial diets treatments followed by cow manure, chicken manure and agriculture by-products. Schroeder (1983) reported that even in the presence of a full ration of supplied feed pellets, approximately 50% of the common carp groth is based on natural foods. Also, Clark et al., (1990) showed that, a dietary protein level of 20% supported growth of red tilapia from 10.2 g to 440 g.

Table (3): Average water quality of the experimental ponds.

Treatments	Temp. °C	Secchi desk cm	DO* Mg/L O_2	pH	EC* ppm	Salinity ppm	Alkalinity ppm	Hardness mg/L	T. P.* mg/L
Pelleted diet	27	10	7.9	7.5	1.4	0.7	360	218	0.083
Mash diet	27	10	8	7.6	1.3	0.65	368	260	0.084
Cow manure	30	16.5	8.8	7.2	0.8	0.25	250	200	0.0325
Chicken manure	30	17.5	8.5	7.2	1.0	0.35	275	195	0.321
Bagasse compost	30	11.5	8.9	7.17	1.4	0.62	325	260	0.147
Rice straw compost	29	12	9	6.95	1.3	0.57	293	215	0.278

* DM = Dry matter
OM = Organic matter
NFE = Nitrogen free extract

Specific growth rate for common carp.

Results of specific growth rate (SGR) for common carp during the successive fortnight periods of the experiment were shown inTable (6). Averages SGR during the successive fortnight periods of the experiment clearly showed significantly ($P<0.05$) differences between all treatments for all periods from 15 to 105 days except at 75 and 105 days of age. These results at 75 and 105 days may be due to that the weight of fish has been taken as a total when determined at the fornight periods not as an individual. So, there are a lot of different weights in the same pond between fishes.

Condition facto (K) of common carp:

Generally, the condition factor of common carp fish Table (7) showed that the pelleted diet and mash diet treatments gave the highest values for some periods from 15 to 105 days, while no significant differences ($P<0.05$) were observed among bagasse and rice straw compost. However, at the end of the experimental periods, there are no significant differences ($P<0.05$) between all treatments.

The previous results of growth performance agree with that obtained by Viola and Arieli (1982 and 1983) and Rappaport and Sarig (1978) who recommended the level of 25% dietary CP for fish, while Omer and Gunther (1987) recommended the level of 35%. The poor growth observed in ponds receiving manure and agricultural by-products compared with those in ponds receiving pelleted and mash diets might be due to the food limitation and subsequently the energy limitation.

Condition factor is usually used to compare the condition, fatness or well being of fish, and is based on the hypothesis that the heavier fish at a given length is in a better condition of growth.

It could be recommended for feeding fish in aquaculture earthen ponds to use feed as pelleted not as mash and potential to use manure and agriculture by-products as compost form. In these respect FAO, (1987) reported that compost feeding of fiaponds is also successful with the carp family (Cyprinidae).

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