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PERFORMANCE OF SILVER CARP GROWTH AS AFFECTED BY LEVEL OF DUCK MANURING

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Abstract

This experiment was conducted from July to October 1993 at Abbassa farm, Abou-Hammad, Sharkia Governorate. The farm belongs to the Central Laboratory for Aquaculture, Agricultural Research Centre. Three-rectangle one hectare each (about 2.5 feddan) fresh water earthen ponds were used in this experiment. The amount of natural food in the ponds was established by applying duck manure. Three treatments, 500, 750 and 1000kg per growing period were applied to the ponds. Frequency of applications were normally done every two weeks. Fish used were silver carp, *Hypophthalmichthys molitrix*,. Number of fry stocked used in each pond was 10,000 fry per pond. Results showed that, growth performance of silver carp under the three rates of duck manuring was highest at the low level (500 kg/ha), followed by the high level (1000 kg/ha) in a decreasing order. It could be concluded that duck manure treatments at both low and high levels promote growth perfomance of silver carp in both body weight and length. The differences were found to be significant.

INTRODUCTION

The utilization of organic manure as the principal nutrient to the ponds is a traditional management practice in Asian aquaculture. The manure can be used in direct or indirect integration of fish and livestock. In the direct integration systems, fresh manure is continuously added to the ponds, while, in the indirect integration, the manure is transported to the ponds and used in fresh or treated forms in different mauring regimes (Pekar 1994).

The readily decomposable organic matter of the manure provides dissolved and particulate substances for bacteria, and the bacterial laden particles supply food to the filter-feeding and detritus-consuming animals, while, the mineralized fraction of the manure stimulates phytoplankton productivity similar to the action of inorganic fertilizers (Schroeder and Hepher 1979, Hepher and Pruginin 1981, and Olah 1986).

Direct consumption, autotrophic production utilizing the mineral fraction, and heterotrophic production based on the organic matter content of the manure as possible modes of conversion were defined qualitatively (Tang 1970, Schroeder 1978 and Wohlfarth and Schroeder 1979), however, these processes have not been confirmed quantitatively.

Integrated agriculture-aquaculture systems probably originated in China (Edwards 1980) and involved the recycling of farming waste, such as manure and crop residues, and human excreta, for fish culture. A large percentage of Worlds's farmed fish is produced in fish ponds fertilized with organic matter (Colman and Edwards 1987). Fish culture in an integrated farming system, acts as a subsystem for the production of food that utilizes polluting wastes from another subsystems. These widespread integrated systems include livestock-fish, fowl-fish and rice-fish culture. The use of integrated fish farming ponds seems to be very efficient and well-balanced method of fish culture (Braaten 1991). These ponds can be regarded as semi-intensive systems, because, a significant part of the fish nutrient is derived from internally produced natural feed that is internally dependent on fertilization (Pekar 1994).

Ducks have been kept on fish ponds for centuries in Central Europe and China, although not on a commercial scale. It has only been since World War that commercial fish-cum-duck culture has developed in Europe (Woynarovich 1979). According to Woynarovich (1979), each duck produced about 6 kg of droppings in 30-40 days, or about 70 kg of manure per year. Schroeder (1974) reported that the amount of manure that can be added depends on three main factors: the biochemical oxygen demand (BOD) of the manure, the temperature, and the available oxygen supply. The same author added that BOD is highly correlated with the amount of dry matter presented in the manure. He also found that 120-150 kg of dry matter per hectare can be applied safely at any one application when manure is applied periodically, and frequently constant populations of the entire food chain are established. He added that peak levels of bacteria rise after routine application, since the protozoa and other organisms already present in large numbers, graze heavily on the bacteria and limit their increase. Protozoa are also upon by zooplankton and do not reach excessive levels, large amounts of organic matter can be applied and ingested without greatly affecting oxygen level, while, at the same time producing large amounts of natural food.

The most commonly stocked phytoplankton feeder is the silver carp, *Hypophthalmichthys molitrix*. The aim of the present study was to examine the influence of duck manure levels on growth performance of silver carp in earthen ponds.

MATERIALS AND METHODS

This experiment was conducted from July to October 1993 at Abbassa farm, Abou-Hammad, Sharkia governorate. The farm belongs to the Central Laboratory for Aquaculture Research, Agricultural Research Centre. Three-rectangle one hectare (about 2.5 feddan) fresh water eathen ponds were used for this experiment. The amount of natural food in the ponds was established by applying duck manure. Three treatments 500, 750, and 1000 kg per growing period were applied to the ponds. Application of manure was frequently done every two weeks. Fish used in this experiment were silver carp, *Hypophthalmichthys molitrix*). Number of fry stocked in each pond was 10,000 fry per pond. Averages body weight and body length at the start of the experiment are presented in Table 1. Random samples (100-140 fish) from each pond were taken every month starting from July till the end of the growing season (October). Fish were kept in fiber glass tanks filled with water from the same pond to avoid fish stress. All fish from samples were returned to their ponds after recording the measures of individual body weight and body length.

Statistical Analysis

The statistical analysis of the fish data of the present experiment was carried out by applying the computer programme described by Harvey (1987). Data of body weight and length of the fish at different growth stages of the study were analyzed by adopting the fixed model:

Yij = M + Si + eij

where:

Yij = observation on the ij fish;

M = overall mean, common element to all observations;

Si = fixed effect of ith duck manure rate;

eij = a random deviation of kth fish, this item assumed to be independently randomly distributed. (O, Oe2)

RESULTS AND DISCUSSION

Results presented in Tables 1 and 2 show that means of initial and final body weight and body length of silver carp fish reared in earthen ponds fertilized with duck manure gained an average 29.7g and 8.2 cm from July till October, respectively. The statistical evaluation of the results indicates that the differences in body weight and body length between different manuring rates were highly significant ($P<0.001$) (Tables 3 and 4).

Table 1. Least-square means for factors affecting body weight of silver carp.

Independent variable	N	July wt. mean ± SE	August wt. mean ± SE	September wt. mean ± SE	October wt. mean ± SE
			+		
Treat.1 (500 kg/ha)	99	2.5±0.1 a	20.7±0.6 a	30.2±1.0 a	35.9±0.9 a
Treat.2 (750 kg/ha)	99	2.7±0.1 b	23.8±0.8 b	29.7±1.0 b	26.5±0.9 b
Treat.3 (1000 kg/ha)	99	2.7±0.1 b	18.9±0.6 b	28.2±1.0 c	34.6±0.9 c

+ Duncan's multiple range test, means have the same letter are not significant other wise they do.

Table 2. Least-square means for factors affecting body length of silver carp.

Independent variable	N	July wt. mean ± SE	August wt. mean ± SE	September wt. mean ± SE	October wt. mean ± SE
			+		
Treat.1 (500 kg/ha)	99	6.6±0.1 a	12.5±0.1 a	14.1±0.2 a	15.2±0.2 a
Treat.2 (750 kg/ha)	99	6.8±0.1 b	13.4±0.1 b	14.1±0.2 a	13.8±0.2 b
Treat.3 (1000 kg/ha)	99	6.7±0.1 b	12.1±0.1 c	13.9±0.2 b	15.6±0.2 c

+ Duncan's multiple range test, means have the same letter are not significant.

Table 3. Least-square analysis of variance for factors affecting body weight of silver carp.

Source of variation	DF	July F.ratio	August F.ratio	September F.ratio	October F.ratio
		ns	***	***	***
Treatments	2	1.9	14.9	21.9	29.0
Remainder DF	294				
Remainder MS		0.7	39.7	2.3	89.2

*** P<0.001, ** P<0.01, * P<0.05, ns P>0.05

Table 4. Least-square analysis of variance for factors affecting body length of silver carp.

Source of variation	DF	July wt. mean ± SE	August wt. mean ± SE	September wt. mean ± SE	October wt. mean ± SE
		ns	***	***	***
Treatments	2	1.8	21.6	15.0	33.0
Remainder DF	294				
Remainder MS		0.5	2.3	4.0	2.5

*** P<0.001, ** P<0.01, * P<0.05, ns P>0.05

Table 5. Correlation coefficients among body weight and body length of silver carp at the different stages of growth.

Stage	July		August		September		October	
	wt.	length	wt.	length	wt.	length	wt.	length
July wt.								
len.	0.8							
August wt.	0.03	-0.03						
len.	0.02	-0.04	0.9					
September wt.	-0.04	-0.01	0.02	0.03				
len.	-0.06	-0.07	0.03	0.07	0.7			
October wt.	-0.08	-0.06	-0.05	-0.1	0.03			
len.	-0.06	-0.02	-0.07	-0.1	0.01	0.8		

Tables 1 and 2 show that the differences in body weight and body length of silver carp cultured in earthen ponds under three levels of duck manure tended to be pronounced after one month from the time of manure application (July first). In this respect, Pekar (1994) noted that, intensive manuring of fish ponds, daily or weekly introduced, is an effective method to increase all nutrients in the ecosystem.

Table 1 shows that averages body weight of silver carp as affected by duck manure level were found significant ($P<0.05$) during the growing season (Duncan's test). Similar result was observed for body length. Results in Tables 1 and 2 show that, growth performance of silver carp under the three levels of duck manuring (500, 750 and 1000 kg/ha) was the highest at the low level (500 kg/ha), followed by the high level (1000 kg/ha) in a decreasing order. Lower body weight was observed for the second level (750 kg/ha). It could be concluded that duck manure treatment at both low and high levels used in this experiment promote growth performance of silver carp growth in both body weight and body length. The differences were found to be significant in all treatments. In this respect, Hepher and Pruginin (1981) reported that the major limitation on the amount of manure that can be used is its effect on oxygen concentration. They added that the decomposition of organic matter by bacteria uses large amount of oxygen. In extreme cases, this can cause fish kill by anoxia. They also noted that, it is important, therefore, to determine the maximum amount of organic matter that could be added without endangering the fish. In the present experiment, the results showed that there was a significant difference between the three treatments, and the low level gave the highest final weight.

It could be concluded that, duck manure has a pronounced effect on growing silver carp, and low rate of manure nearly gave good growth rate as high level. In this respect, Manadhar (1977) reported that there was no effect on growth rate of silver carp as a result of increasing phytoplankton volumes in ponds.

Table 5 shows that high correlation correlation coefficients (0.7-0.9) were observed between body weight and body length at the successive growth from July till October. Poor correlation coefficient was found between body weight at stocking and successive body weight. Similar results were obtained for body length. It could be concluded that, body weight and body length at stocking have no effect on growth performance. These results could be due to that silver carp growth was affected by different factors more than the initial body weight that interacts with body weight and body length. In this respect, Schroeder (1974) noted that fish growth is affected by genetic and environmental condition.

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أداء أسماك المبروك الفضى بمستويات مختلفة من زرق البط

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أجريت التجربة بمزرعة المعمل المركزى لبحوث الثروة السمكية بالعباسة التابع لمركز البحوث الزراعية على ثلاثة أحواض ترابية مساحة كل منها ١ هيكتار. بدأت التجربة من يوليو واستمرت حتى أكتوبر ١٩٩٣ , كانت معدلات التسميد ٥٠٠، ٧٥٠ ، ١٠٠٠ كجم زرق بط لكل حوض طوال فترة التجربة وتم إضافة الزرق الى الأحواض كل أسبوعين. كثافة زريعة المبروك الفضى بكل حوض ١٠٠٠ أصبعية.

أسفرت النتائج عن وجود اختلافات معنوية بين المعاملات. وجد أن أداء المبروك الفضى مقاسا بالوزن والطول كان متقاربا فى كل من معدلى التسميد المرتفع (١٠٠٠) والمنخفض (٥٠٠)، مما يدل على أن أداء المبروك الفضى تحت مستويات التسميد المرتفع والمنخفض متقارب.