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THE COMBINED EFFECT OF ORGANIC FERTILIZER AND SUPPLEMENTARY FEED ON THE GROWTH PERFORMANCE OF COMMON CARP(*Cyprinus carpio)* FINGERLINGS IN RICE FIELDS.

BY

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ABSTRACT

A 105-day experimental period was conducted in rice fields with common carp, *Cyprinus carpio,* (2.8g). Four diets were formulated through combining 100, 75, 50 and 25% duck droppings with 0, 25, 50 and 75% supplementary feed, respectively. The fifth one was the control. Each treatment was performed in duplicate. All replicates were stocked with 1800 fish/feddan. The growth performance, feed utilization, chemical composition of the whole body of common carp and economic efficiency at the end of the experiment were studied. Fish fed 25% duck droppings + 75% supplementary feed (T4), recorded a higher significant ($P< 0.05$) individual body weight and body length after 105 days than fish fed other diets. Fish fed diets with 100% duck droppings (T1) or 75% duck droppings + 25% supplementary feed (25% CP) (T2) had a higher significant ($P < 0.05$) condition factors and survival rate. The inclusion different levels of duck droppings with supplementary feed increased dry matter, protein and fat contents in the whole fish than the control treatment, while the reverse was true for the ash content.

The highest net return of fish was achieved with T1 group followed in a descending order by T2, T3, T5 and T4. Results of this work support the use of duck droppings at a ratios up to 50% combined with supplementary feed for common carp in rice fields in order to achieved the best growth performance and the highest net return that attracts farmers.

INTRODUCTION

Fish culture as an integrated and concurrent activity with rice culture in the same field is important for rational utilization of limited land resources, as well as a sustainable source of fish protein, additional income and employment generation (Jamu and Costa-Pierce 1995).

Rice-fish integration system, has been practiced mainly to improve the income of the farmers and to permit an essential item in the diet of rural people in areas where rice and farm fish are the staple food. (Mohanty *et al.*, 2004).

The practice of collecting wild, naturally accruing fish for food from rice fields is probably as old as rice culture itself. Rice fish culture consists of stocking rice fields with fish fingerlings of a selected size and species to obtain a fish crop in addition to the main crop of rice. This is practiced in several south east Asian countries. The techniques is very dependent on climatic and other local conditions. (Rao and Ram Singh, 1998).

The production of fish must be increased due to the increase of human demand of animal protein. The integrated rice-fish culture is one of the important systems of fish production. However, it seems to have good prospects for the future because the reduction in pesticide applications and the use of less toxic compounds results in an increased rice field biodiversity which is not only important for the balance of pests and their natural enemies but also in nutritional context for forming communities relying heavily on carps, frogs or snails from their rice fields (Shehadeh, 1998).

In aquaculture, feed is the most expensive item of cost, commonly contributing between 40 and 70% of the total variable costs of the diet. Consequently, protein cost is usually given the first priority in formulating fish feed. (Hanley, 2000).

Abdel-Hakim *et al.*, (1999) working on tilapia and common carp found that duck manure alone was superior in producing fish of heavier weights compared to buffalo manure alone and the final weights increased with supplementary feeds. due to the study of Abou-Seif (1997) working on the effect of level of duck manure on common carp who proved that, the differences in body weight among fish groups due to levels of duck manure were significant ($P < 0.001$).

Sadek and Abdel-Hakim (1986) found that when common carp fingerlings are stocked at 714/ha. fish yield ranged from 91.2 to 104 kg/ha within a growing period of 153 days, moreover the rice in the integrated system was improved by 11.4% compared to rice non-stocked wit carp.

El-Bolock and Labib (1967) used common carp with 20-56 g in rice fields at a rate of 750-1250 fingerlings/ha for 2-3 months, and found that the fish yield was about 200kg/ha with 5-7% increase in rice yields. Also, Jensen (1983) cultured mirror carp (52g) in paddies in the Nile delta for 47 days at a stocking rate of 1600 carp/ha and observed that the fish yield reached 158kg/ha, with an average individual daily gain of 1.1g and survival rate of 75%.

An attempt has been made to evaluate the effects of adding different ratios of duck droppings combined with supplementary feed (25% CP) to find out new cheaper food sources for fish to minimize production cost of common carp in rice field and reduce competition of using conventional feed stuffs in fish feeding specially in the rural area (to improve the rice-fish integration system) where the limited financial farmers.

MATERIALS AND METHODS

Location:

The present study was carried out in rice fields at Al-Dahria village, Behera Governorate to represent five treatments with two replicates for each. The individual rice-field area was 2100 m^2, each area was prepared by digging canals inside the rice field, (60 cm width and 75 cm depth) which can be used by fish during low water level with long land without any dicks. Two screens (80 x 100 cm) were fixed at beginning and the end of the canals to prevent fish escape and the entrance of wild fish into rice fields.

Facilities and fish:

Common carp (*Cyprinus carpio*) fingerlings (2.8 g/fish) were obtained from Saft-khaled fish Hatchery (General authority for fish resources development Ministry of Agriculture. *Cyprinus carpio* fry were stocked at a rate of 1800 fish / feddan during the experimental period (105 days)

Treatments:

The rice fields were assigned to one of the following five treatments being: 100% duck droppings, (DD), 75% duck droppings + 25% supplementary feed (25% CP), 50% duck droppings + 50% supplementary feed, 25% duck droppings + 75% supplementary feed and the last one was without adding either duck droppings or supplementary feed which serves as a control one. Fish were fed daily on a mixture of the usual substances at a rate of 5% of the total biomass (three times/day). Rice was cultivated in the permanent rice fields. After 5 days of rice transplantation, all fields were stocked with fish.

Crop performance, fish growth parameters, survival rate, condition factor and apparent feed conversion ratio were estimated using standard methods (Mohanty, 1999) to compare the effect of treatments on yield of fish. All water quality parameters were within the permissible levels for normal fish growth and survival.

The tested diets and fish from each treatment were chemically analyzed according to the standard methods of AOAC (1990).
Statistical Analysis:

Table (1): Chemical analysis of duck dropping and supplementary feed (commercial) used (on dry matter basis %)

Items	CP %	EE %	Ash %	Crude fiber %	N.F.E
Duck droppings	13.54	4.53	50.72	2.95	28.26
Supplementary feed (25%CP)	24.95	11.15	9.59	4.89	49.42

One way least-squares analysis of variance (ANOVA) was carried out for the collected data. Differences among treatments means in all possible combinations were tested for significance according to Duncan's multiple range test (Duncan, 1955). All statistics were run using the computer program SAS (2000).

RESULTS AND DISCUSSION

Growth performance:

Table (2) showed that live body weight increased significantly ($P < 0.001$) with the decrease of the ratio of duck droppings (D.D.) to supplementary feed (25% CP) Long and Micha (2002) found that fish fed pellets with 25% CP was significantly higher in yield ($P < 0.05$) than with 18% CP level. Also, they indicated that pellet feeding gave higher fish yield than feeding fish fresh farm by- products (823.4 kg/ ha). Also, Abdel-Hakim *et al.*, (2000) indicated that the average body weight of common carp increased from 11.7 $\pm$ 2.39g at stoking to 154.5 $\pm$ 2.7g at harvest.The total fish yield of common carp was 200 kg / feddan. As presented in table 2 after 105 days from stocking time, average of body length slightly decreased with increasing the addition of duck droppings and the longest body was recorded by fish of T4 (25% duck droppings + 75% supplementary feed) followed in descending order by those of T3 (50% duck droppings + 50% supplementary feed), T2 (75% duck droppings + 25% supplementary feed), T1 (100% duck droppings) and T5 (the control treatment). On the other hand, Abdel-Hakim *et al.*, (1999) working with tilapia and common carp found that duck manure alone was superior in producing fish of heavier weights compared to buffalo manure alone and the final weight increased with supplementary feeds .(Abou-Seif, 1997) working on the effect of level of duck manure on common carp proved that, the differences due to duck manure levels in body weight among fish groups of the five treatments were significant ($P < 0.001$).

Also, the present results indicated that differences between body length of fish fed the different diets were significant ($P < 0.05$). These results are in partial agreement with Abou-Seif (1997) who found that fish varied significantly ($P < 0.001$) in their body length with duck manure level.

Values of condition factor (k) ranged between 1.51 to 1.68 at start of the experiment and between 1.15 to 1.66 at its end with insignificant differences between the different treatments(T1,T2, T3 and T4). At the end of the experiment condition factor of fish of control treatment showed the least value as compared to the other four treatments. The results indicated that the difference between condition factor for fish in the control treatment and each of the other treatments was significant ($P < 0.05$). These results are in partial accordance with those reported by Abou-Seif (1997) who found that condition factor of common carp varied significantly with manuring level during 105 days post stocking while non-significant during the last stages to 180 days post stocking.

Averages of daily gain in weight (DWG) during the whole experimental period were 0.58, 0.64, 0.69, 0.78 and 0.36 g for the T1. T2, T3, T4 and T5 (control), respectively and the differences between these values where significant

(P<0.001). These results gave evidence that the increased level of duck droppings significantly decreased DWG of common carp fish. Also, the same trend was observed for the relative growth rate (R.G.R.) during the different stages of the whole period of the experiment.

Specific growth rate (SGR) values during the whole experimental period i.e. (0-105 days) were 2.97, 3.06, 3.14, 3.25 and 2.56% g/day for T1, T2, T3, T4 and T5, respectively with significant (P < 0.001) differences between these values. SGR decreased with increasing in the duck droppings to supplementary feed ratio. These results are in agreement with Abdel-Hakim *et al.*, (1999) working with Nile tilapia and common carp found that duck manure increased SGR more than buffalo waste and the increase was more prononnuced by supplying fish with supplementary feeds. Also, Abou-Seif (1997) studied common carp and found that SGR of the fish in ponds with the highest manuring rate 1250 kg duck manure pond showed the highest SGR.

The increas in live body weight, weight gain, SGR and DWG for T4 and T3, T2 and T1 groups may be due to the release of N and P from duck droppings which resulted in improvement of the biological conditions of ditch water and consequently the abundance of phytoplankton as natural feed for the zooplankton and fish as well as the presence of organic mater of duck droppings which can be used as food source (Schroder, 1980).

Food utilization:

Feed conversion ratio (FCR) during the whole experimental period (0-105 days) were 1.74, 1.79, 1.86 and 1.91 for T1, T2, T3 and T4, respectively (Table 3). The best value (1.74) was obtained by T1, while the worst FCR (2.91) was observed for T4. Although the FCR of T4 was numerically worse than that of T1, with significant difference ($P \leq 0.05$) there were insignificant differences ($P \geq 0.05$) between FCR of T1 and T2, between FCR of T2 and T3 and between FCR of T2 and that of T4.

Bowen (1982) found that common carp usually utilize feeds on a wide variety of natural food organisms in organically fertilized ponds.

Protein efficiency ratio (PER):

During the whole experimental period, protein efficiency ratios (PER) were 4.25, 3.41, 2.79 and 2.49 for T1, T2, T3 and T4 groups, respectively. In this concern Abdel-Hakim *et al.*, (2000) observed that animal manure is superior to other inorganic fertilizer for promoting the growth of plankton and benthic food organisms in fresh and brackish water ponds.

Supplementing the water column with chicken droppings usually results in two main sources of feed being organic matter of the droppings, in addition to the production of phytoplankton and zooplankton. Similarly, supplementing with duck droppings is expected to exhibit similar findings. Thus, the first four treatments of the present study may have caused the improvement of the PER compared with the control (Table 3).

Table (2): Effect of different combination of duck droppings and supplementary feeding on growth performance parameters (mean ± SE) of common carp *C. Carpio* in rice fields during experimental periods.

Stages	Treatments					
	T1	T2	T3	T4	T5 Plank	Test of significance
Initial body weight/fish(g)	2.8 ± 0.56	2.8 ± 0.56	2.8 ± 0.56	2.8 ± 0.56	2.8 ± 0.56	NS
Initial body length/fish(cm)	5.5 ± 0.91^{a}	5.5 ± 0.91^{a}	5.7 ± 0.85^{a}	5.7 ± 0.90^{a}	5.7 ± 0.85^{a}	*
15-day post stocking stages	4.9 ± 0.54^{b}	4.9 ± 0.77^{b}	5.9 ± 0.73^{b}	6.7 ± 0.56^{a}	4.1 ± 0.51^{b}	*
30-day post stocking stages	8.6 ± 0.81^{b}	8.9 ± 0.78^{b}	9.8 ± 0.81^{ab}	10.51 ± 0.91^{a}	7.5 ± 0.72^{b}	**
45-day post stocking stages	15.31 ± 1.32^{b}	16.15 ± 1.41^{b}	18.51 ± 1.61^{ab}	19.8 ± 1.8^{a}	12.50 ± 1.31^{c}	***
60-day post stocking stages	23.92 ± 1.74^{cd}	28.81 ± 1.95^{c}	31.53 ± 2.05^{b}	38.31 ± 2.53^{a}	20.5 ± 2.31^{d}	***
75-day post stocking stages	34.31 ± 2.51^{d}	41.35 ± 2.81^{c}	49.92 ± 3.11^{b}	53.32 ± 3.01^{a}	28.5 ± 3.09^{e}	***
90-day post stocking stages	50.51 ± 3.01^{d}	56.32 ± 2.91^{c}	61.83 ± 3.06^{b}	68.11 ± 3.11^{a}	33.13 ± 3.11^{e}	***
105-day post stocking stages	63.31 ± 3.91^{d}	69.53 ± 3.11^{c}	75.31 ± 3.81^{b}	85.13 ± 4.81^{a}	41.11 ± 3.09^{e}	*
Final body length/fish(cm)	15.61 ± 1.81^{b}	16.11 ± 1.72^{a} b	16.91 ± 2.11^{a}	17.35 ± 2.31^{a}	15.31 ± 2.31^{bc}	***
Daily weight gain(g/day/fish)	0.58 ± 0.06^{c}	0.64 ± 0.05^{b}	0.69 ± 0.07^{ab}	0.78 ± 0.07^{a}	0.36 ± 0.06^{d}	***
S.G.R.	2.97 ± 0.13^{b}	3.06 ± 0.13^{ab}	3.14 ± 0.15^{ab}	3.25 ± 0.15^{a}	2.56 ± 0.13^{c}	***
R.G.R	21.61 ± 0.13^{c}	23.83 ± 0.13^{b}	25.90 ± 0.15^{ab}	29.40 ± 0.15^{a}	13.68 ± 0.13^{d}	***
Initial condition factor	1.68 ± 0.001^{a}	1.68 ± 0.001^{a}	1.51 ± 0.005^{a}	1.51 ± 0.005^{a}	1.51 ± 0.001^{a}	*
Final condition factor	1.66 ± 0.09^{a}	1.66 ± 0.011^{a}	1.56 ± 0.15^{a}	1.63 ± 0.14^{a}	1.15 ± 0.09^{b}	*
Survival rate %	85 ± 0.09^{a}	85 ± 0.08^{a}	87 ± 0.08^{a}	88 ± 0.09^{a}	81 ± 0.07^{b}	*

a,b,c,d means within each raw having different letters were significantly different at ($p < 0.05$) otherwise were not.

T1 = 100% duck droppings , T2 = 75% duck droppings + 25% supplementary feed (25% cp), T3 = 50% duck droppings + 50% supplementary feed (25% cp), T4 = 25% duck droppings + 75% supplementary feed (25% cp) and T5 = Plank treatment (without adding either duck droppings or supplementary feed).

NS= non significance, * = $P < 0.05$, ** = $p < 0.01$, *** = $P < 0.001$

Table (3): Effect of different treatments on the growth performance and feed efficiency of common carp *C. Carpio* in rice fields (mean ± SE).

Traits	Treatments				
	T1	T2	T3	T4	T5 Plank
Initial body weight/fish(g)	2.8 ± 0.56	2.8 ± 0.56	2.8 ± 0.56	2.8 ± 0.56	2.8 ± 0.56
Final body weight/fish(g)	63.31 ± 3.91^{d}	69.53 ± 3.11^{c}	75.31 ± 3.81^{b}	85.13 ± 4.81^{a}	41.11 ± 3.09^{e}
body weight gain(net increment)	60.51 ± 2.98^{cd}	66.73 ± 2.89^{c}	72.51 ± 3.51^{b}	82.33 ± 2.83^{a}	38.31 ± 2.89^{e}
Total feed intake(g)/fish	105.26 ± 2.31^{b}	119.42 ± 0.073^{ab}	135.22 ± 1.00^{a}	149.66 ± 0.00^{a}	---------
Feed conversion ratio	1.74 ± 0.05^{b}	1.79 ± 0.05^{ab}	1.86 ± 0.06^{a}	1.91 ± 0.06^{a}	----------
Protein efficiency ratio	4.25 ± 0.35^{a}	3.41 ± 0.35^{b}	2.79 ± 0.31^{c}	2.49 ± 0.25^{c}	-----------

a,b,c,d means within each raw having different letters were significantly different at ($p < 0.05$) otherwise were not

T1 = 100% duck droppings ,

T2 = 75% duck droppings + 25% supplementary feed (25% cp),

T3 = 50% duck droppings + 50% supplementary feed (25% cp),

T4 = 25% duck droppings + 75% supplementary feed (25% cp) and

T5 = Plank treatment (without adding either duck droppings or supplementary feed).

Proximate analysis of fish:

The proximate analysis of the fish allows assessment of fish health, determination of efficiency and transfer nutrients from the feed to the fish and make it possible to predictably modify carcass composition (Shearer, 1994). Results listed in Table 4 indicated that averages of dry matter content of whole fish were 18.81, 19.01, 19.05, 20.12 and 18.53 % for fish of T1, T2, T3, T4 and T5, respectively. The differences between these averages were not significance. The higher protein percentage (64.68%) was obtained by fish of T4 (25% duck droppings + 75% supplementary feed) and the increasing level of duck droppings up to 50% in tested groups did not significantly affect the protein content of whole fish, but when the levels of duck droppings reached to 75% or 100%, protein content of whole fish decreased significantly ($P < 0.001$) to 62.91 and 62.58 for 100% duck droppings and 75% duck droppings, respectively. Also, Hafez *et al*., (2000) with silver carp observed that manuring level influenced the whole fish contents from crude protein.

The inclusion levels of duck droppings or duck droppings combined with supplementary feed increased dry matter content, protein content and fat content in the whole fish than the control treatment, while the reverse was true for the ash content.

The higher fat content (21.85%) was obtained by fish fed the diet of T2 (75% duck droppings + 75% supplementary feed) and the inclusion of duck droppings at 50% or 25% in the diet did not significantly affect the fat content in the whole fish, but when the levels of duck droppings reached to 100%, fat content of whole fish decreased significantly ($P < 0.001$) to 20.81%. The lowest value of fat content in whole fish was recorded by fish of the control treatment (20.21%). In this respect, Abou-Seif (1997) found that the effect of manuring level was significant ($P< 0.01$) on fat content of the whole common carp fish after 90 days post stocking and on all chemical composition traits (dry matter, protein, fat, ash and moisture contents) at 180 days (harvesting).

The higher ash content (19.05%) was estimated recorded in T5 (control) and the lowest value (13.59%) was observed for fish fed the diet of T4 (25% DD). Fish fed the diets of T1 and T2 had a significant ($P< 0.001$) lower body ash content than fish fed the diets of T3 and T4. These results indicated that, ash content of the whole fish increased as the level of duck droppings level increased. (Table 4).

Economic Efficiency:

As shown in table 5 results of economic evaluation including the costs returns for treatments applied in kg/ feddan and income in (L.E.) per 105 days. Total costs were 102.42, 178.8, 274.8, 387.17 and 74 L.E./feddan for T1, T2, T3, T3, T4 and T5, respectively. These results indicated that the highest total cost (387.17 L.E per faddan) through T4 (due to the increase of the supplementary feed) followed in a descending order by T3, (274.8 L.E.), T2 (178.8 L.E.) and T1 (102.42 L.E.). The lowest total cost (47 L.E.per faddan) recorded through T5 group due to the absence of input costs. Net returns in L.E./ feddan were 139.73, 87.15, 79.02, 17.37 and 45.88 L.E for T1, T2, T3, T4 and T5 groups respectively.

Table (4): The averages of chemical composition of whole fish as affected by different combination of duck droppings and supplementary feed (mean ± SE). (on dry matter basis)

Item	Treatments					
	T1	T2	T3	T4	T5 Plank	Test of significance
Dry matter %	18.81±0.21	19.01±0.21	19.05±0.25	20.12±0.26	18.53±0.21	NS
Protein %	62.91 ± 0.73^{b}	62.58 ± 0.73^{b}	64.51 ± 0.81^{a}	64.68 ± 0.75^{a}	60.81 ± 0.75^{c}	***
Ether extract %	20.81 ± 0.18^{b}	21.91 ± 0.18^{a}	21.61 ± 0.18^{a}	21.85 ± 0.18^{a}	20.21 ± 0.18^{c}	***
Ash %	16.32 ± 0.15^{b}	15.63 ± 0.15^{b}	14.01 ± 0.15^{c}	13.59 ± 0.14^{c}	19.05 ± 0.16^{a}	***

a,b,c means within each raw having different letters were significantly different at ($p < 0.05$) otherwise were not

T1 = 100% duck droppings ,
T2 = 75% duck droppings + 25% supplementary feed (25% cp),
T3 = 50% duck droppings + 50% supplementary feed (25% cp),
T4 = 25% duck droppings + 75% supplementary feed (25% cp) and
T5 = Plank treatment (without adding either duck droppings or supplementary feed).
NS= non significance, *** = $P < 0.001$

Table (5): Economic efficiency (%) for common carp as affected by different treatments (mean ± SE).

Items	Treatments				
	T1	T2	T3	T4	T5 Plank
Stocking rate (No./Fed.)	1800	1800	1800	1800	1800
Average size at stocking (g)	2.8	2.8	2.8	2.8	2.8
Average size at harvest (g)	63.31	69.53	75.31	85.13	41.11
Survival rate (%)	85.00	85.00	87.00	88.00	81.00
Total no. at harvest/fed.	1530	1530	1566	1584	1458
Production kg/fed.	96.86	106.38	117.94	134.85	59.94
A- operating costs Fish fingerlings 30LE/1000 fingerlings	54	54	54	54	54
Food LE	--	80.62	182.54	303.07	--
Duck droppings LE	28.42	24.18	18.26	10.10	--
Screen LE	20.00	20.00	20.00	20.00	20.00
Total costs/Fed. LE	102.42	178.8	274.8	387.17	74.00
B- Total returns/fed.	242.15	265.95	353.82	404.55	119.88
Net returns/fed.	139.73	87.15	79.02	17.37	45.88
C- Net returns to operating cost	136.43	48.74	28.76	4.49	62.00

T1 = 100% duck droppings ,
T2 = 75% duck droppings + 25% supplementary feed (25% cp),
T3 = 50% duck droppings + 50% supplementary feed (25% cp),
T4 = 25% duck droppings + 75% supplementary feed (25% cp) and
T5 = Plank treatment (without adding either duck droppings or supplementary feed).

Percentages of net returns to total costs for different treatments were 136.43, 48.74, 28.7, 4.49 and 62.00% for T1, T2, T3, T4 and T5, respectively. These results indicated that the highest returns were reached by fish of T1, (100% duck droppings) at a rate of 5% from body weight / day followed in a descending order by those of T5 (control), T2 (75% duck droppings + 25% supplementary feed), T3 (50% duck droppings + 50% supplementary feed) and T4 (25% duck droppings + 75% supplementary feed). The lost net return reached by fish of T_4 treatment may be due to the high of the food added to the diet. These results are in accordance with those obtained by Abdel-Hakim *et al.*, (1999) who found that the highest returns were obtained with the group of duck manure only followed in a decreasing order by the group of duck manure + supplementary feeds group with buffalo manure alone and buffalo manure + supplementary feeds.

There existed a percentage of increase in rice yield under rice-fish integration system (7.1– 8.3%) against control, in which the pond was cultivated without integration of fish. This is probably due to the better aeration of water and additional supply of fertilizer in the form of organic fertilizer and supplementary diet in the form of left over feed and fish excreta. Furthermore, these systems help in enhancing soil organic matter/ nutrient status. Control plankton population/ macro- and micro-aquatic insects/bacteria/ organic detritus that compete with rice plants and energy for fish. Hora and Pillay (1962) and Mohanty *et al.*,(2004) reported that stocking fish in rice fields has increased yield of fish and rice. This may be due to better aeration of water, greater tillering effect and additional supply of fertilizer and diets.

RECOMMENDATION

The obtained results showed some variability in the performance of fish of the different treatments applied but do not reject the use of duck droppings as an important addition for cultivated fish in order to reduce the feeding costs. Duck droppings could be used at a ratio up to 50% of supplementary feed for common carp in rice field at a rate 5% for fish biomass daily without adverse effects on growth performance, that attracts farmers in rural area.

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التأثير المشترك للسماد العضوى والتغذية الإضافية على أداء نمو المبروك العادى فى حقول الأرز .

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أجريت تجربة عملية استمرت ١٠٥ يوم في حقول الأرز لاستزراع أسماك المبروك العادى بمتوسط وزن ٢,٨ جم تم توليف أربعة معاملات غذائية تمثلت فى المعاملة الأولى ١٠٠% زرق بط – المعاملة الثانية ٧٥% زرق بط + ٢٥% علف تكميلي (٢٥% بروتين خام) – المعاملة الثالثة ٥٠% زرق بط + ٥٠% علف تكميلي – المعاملة الرابعة ٢٥% زرق بط + ٧٥% علف تكميلي وتمثلت المعاملة الخامسة فى المجموعةالتى لم تتناول أى من زرق البط أو العلف التكميلى. تكونت كل معاملة من مكررتين وتم استزراع مساحات الأرز (٢١٠٠ متر مربع لكل مكررة) بـــ ٩٠٠ من أصبعيات المبروك العادى. أجريت هذه الدراسة لبيان تأثير هذه المعاملات على معدلات النمو ، الاستفادة الغذائية ، التحليل الكيماوى لجسم الأسماك بالإضافة إلى التقييم الاقتصادى . وفى نهاية التجربة وجد أن الأسماك المغذاه على ٢٥% زرق بط + ٧٥% علف تكميلي (المعاملة الرابعة) أعطت أفضل وزن للأسماك فى نهاية التجربة كما سجلت أكبر طول لجسم السمكة عن المعاملات الأخرى بينما الأسماك التى تغذت على ١٠٠% زرق بط (المعاملة الأولى) وكذلك التى تغذت على ٧٥% زرق بط و ٢٥% من العلف التكميلي (المعاملة الثانية) كانت أفضل بالنسبة لمعامل الحالة عن بقية المعاملات. وتبين كذلك أن كلا من زرق البط والعلف التكميلى له تأثير على محتوى الجسم من المادة الجافة ، البروتين والدهن حيث زاد هذا المحتوى في هذه المعاملات بالمقارنة بالمجموعة التى لم تتناول أى من زرق البط أو العلف التكميلى ولوحظ عكس ذلك تماما بالنسبة لمحتوى جسم السمكة من الرماد .

ومن الوجهة الاقتصادية فإن أفضل نتيجة تم التوصل إليها من المعاملة الأولى تلاها الثانية ثم الثالثة ، الخامسة ثم الرابعة . يمكن القول أن هذا البحث يدعم استخدام زرق البط بالاشتراك مع العلف التكميلى (٢٥% بروتين خام) بنسبة قد تصل إلى ٥٠ % وبمعدلات تغذية ٥ % من وزن الجسم يوميا فى حقول الأرز للحصول على أعلى معدلات نمو وربحية اقتصادية تجذب المزارعين وتشجع من الاستزراع السمكى فى حقول الأرز.