EFFECT OF USING DIFFERENT LEVELS OF COW MANURE AND SUPPLEMENTARY FEEDING ON WATER QUALITY, GROWTH PERFORMANCE AND TOTAL YIELD OF COMMON CARP (*CYPRINUS CARPIO*) IN RICE FIELDS

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Abstract

Cow manure improved the water quality and promoted the growth rate of common carp *(Cyprinus carpio)* (20.40gm /fish) in rice fields. The present study was designed to evaluate the effect of cow manure level and rate of artificial feeding on water parameters, the nutritive value, growth performance, fish productivity and economical efficiency reared in rice-fields. Therefore, two experiments were conducted, in the first experiment cow manure, at the rate of 150, 300 and 600 kg /fed/ month for period of 90 day enhanced the growth of common carp fingerlings of 20.49gm to 157.0 , 166.0 and 177.0 gm, respectively. In the second experiment another application of 600 kg /fed/ month of cow manure along with different rates of supplementary feeding (0.5, 1.5 and 3.0 % 0f body weight). Pelleted diet contained 25% crude protein. Feed was offered twice/day for five days/week further enhanced the growth of common carp fingerlings from 20.49g to196.0, 226.0 and 239.0 gm, respectively.

Results of the first experiment showed that; applying cow manure, fish body weight, body length, net gain, daily gain, specific growth rate, relative growth rate, condition factor and total yield. Also, cow manure level had significant effect on the chemical composition of the whole fish body and economic return.

Results of the second experiment showed that when 600 kg /fed /month of cow manure was applied along with different rates of supplementary feeding significant effect on the growth performance and total yield of common carp and the same trend

was also observed for flesh, moister, protein, fat and ash contents in fish bodies and economic return. Also concentration of dissolved oxygen, nitrite, nitrate, ammonia, total phosphorus, orthophosphate as well as phytoplankton and zooplankton were affected significantly in the first and second experiment. The feed conversion value , manure conversion ratio (S value) and water quality indicated that economical return that, feeding beyond 1.5% of the body along with the cow manure (600 kg /fed / month) was wasteful and lead to accumulation of the feed wastes and causes deterioration in water quality.

Key words: Cow manure, Fertilizer, Artificial feeding, Rice field, Common carp, Growth performance, Water quality, Plankton, Proximate analysis and Economic evaluation.

INTRODUCTION

There is a great need for increasing food production to meet the growing world population, especially in the developing countries. Aquaculture, on a rational basis, can contribute to cover a sizable part of this demand. Moreover, fish has high protein content ranks the top among all protein sources either from plants or animals. Fish flesh has highly nutritive value and is considered easily digestible.

The economic of fish culture in rice fields cannot be separated from the economics of rice growth and production .With the recently observed decline in the rice yield frontier there is a need to explore the complementarily between rice and fish .It is argued that ecological as well as economic farces provide scope for reintegration of fish culture in rice –based fish farming systems Hassan (2004).

The concurrent cultures of rice and fish have many benefits over rice monoculture. One of these benefits is the increase in rice yield per unit of cultivated area. Salama (2003), found that average body weight of Nile tilapia cultured in rice fields and fed supplementary feeding has been increased from 30.12 to 120. 7g /fish and the rice yield increased by 5.7 % where fish production was 115.87 kg fish /feddan in 3-months season at different stocking densities. [The on average, the rice yield increased

between + 0.6 to + 28.6 %]. Moreover, Abdel-Hakim *et al*. (2000a) found that the average body weight of Nile tilapia, *Oreochromis niloticus* cultured in rice fields has been increased from 4.05 to 81.97g/fish and the rice yield increased by 148 kg/feddan, beside 77.0 kg fish/fedden. In Egypt, fish-rice system culture is promising for the development of rural areas. However, the total fish production in rice fields increased year by year and reached about 29223 tons (GAFRD, 2010).

The main sources of fertilizers used in semi-intensive aquaculture systems are the manures, human sewage and chmical fertilizer. Animal manure is superior to other inorganic fertilizer for prompting the growth of plankton and benthic food organisms in fresh and brackish water ponds. (Abdel-Hakim *et al*. 2000b) concluded that the increase in fish productivity in fertilized ponds has been attributed to an increase in primary production accordingly. Increase in phytoplankton productivity with application of organic and/or inorganic fertilizers have been demonstrated (Abdel-Tawwab *et al*. 2002).The present study was aimed to determine the economic utilization of farmard manure and rate of artificial feeding on water quality, growth performance and total production of common carp in rice fields.

MATERIALS AND METHODS

Location, facilities and fish:

The experiment was carried out in rice fields in AL-Salahat village, Bani-Ebied, Dakahlia Governorate, Egypt. Two experiments were conducted to determine the economic utilization of cow manure, and the rate of artificial feeding on growth and production of fish in rice fields fish culture .The first experiment was carried out in nine rice fields representing three treatments with three replicates , each, and were applied with three different levels of cow manure, 150, 300 and 600 kg / feddan / month .No artificial feeding or other fertilizer were added during

the experiments. The second experiment, was extended to a other nine rice fields by applying cow manure at rate of 600 kg / fed / month along with the supplementary pelleted diet at a rate of 0.5, 1.5 and 3.0% of the total body weight of the fish .The pelleted diet contained 25% crude protein and was offered twice/daily for five days a week. Feeding rate of artificial diet was recalculated and adjusted biweekly according to the change in fish biomes.The individual rice field area was 0.25 feddan (34 x 30 m^2). Each area from all rice fields are prepared with an irrigation cannel (zarouk) with diameters of 50-60 cm width and 0.75×0.60 cm depth longitudinal one side of the field, where irrigation and drainage of this rice field was done. Giza rice 104 was used in this study. After 15 days from spender of the rice and the up water, all fields were stocked with common carp *(Cyprinus carpio)* at a rate of 2500 fingerlings/fed with an average weight of 20.40 gm/fish. The experiment period lasted 90 days. The first experiment was fertilized with cow manure every month at the prescribed rate each feddan throughout the experimental period to stimulate the natural food. Cow manure remained next to the fields for a long time before the start of the experiment until it was completely dried by the heat of the sun before being used in fertilization. The chemical analyses of cow manure and supplementary feed used are summarized in Table (1).

Table (1): Showed chemical analysis of cow manure and supplementary feed on dry matter basis.

Item	Cow manure	Supplementary feed
Dry matter (DM%)	91.1	90
Organic matter (OM%)	81.66	89.5
Crud protein (CP%)	14.2	25
Ether, extract (EE%)	1.20	6
Crud fiber (CF%)	9.17	7
Nitrogen free extract (N'FE%)	57.09	50.93
Ash %	18.34	11.07

Calculated gross energy (GE = 416 K cal / 100g), according to what and to which

Growth performance parameters:

Fish body weight and length of random sample of 30 fish from each treatment were taken at start and every two weeks, where the fish were netted from water and weighted to the nearest gram. Standard length was measured at beginning and at the end of the experimental period then the fish were returned immediately to the zarouk. Growth parameters and yield were calculated as follows:

Weight gain=final mean weight (g) – initial mean weight (g); Daily weigth gain (DG) = (Wt_2 - Wt_1)/ T; Specific growth rate (SGR) = (Ln Wt_2 – Wt_1) x 100/ T; where Wt_1 is the initial weight in grams, Wt_2 is the second weight in grams, and T is the period in days; Condition factor (K) = body weight (g) / total length^3 (cm) x 100 ; Yield of fish/ feddan = harvested fish weight (kg)/unit area (feddan); Net yield/feddan (kg). = (harvested fish weight (kg) - initial fish weight (kg) /unit area (fed); Survival rate (%) = (number of fish harvested/ initial number) 100.

Water quality monitoring:

Quality of pond water was checked once per month to determine temperature (°C), dissolved oxygen (DO), Secchi disk visibility (SD), pH, free ammonia (NH_3), nitrite-nitrogen ($N0_2$-N), nitrate-nitrogen ($N0_3$-N), total alkalinity (T.alk), total phosphorus (TP), orthophosphate (OP) , chlorophyll 'a' (Ch!-a), phytoplankton and zooplankton account. Temperature and dissolved oxygen was measured using thermo-oxygen meter (YSI model 57). All other measurements were carried out according to the standard methods of American Public Health Association (APHA, 2000).

Proximate analysis:

Proximate chemical analysis (moisture, protein, fat and ash) of whole fish body and diets was determined according to the methods described by A.O.A.C. (1990).

Economical efficiency:

Economic analysis was done by the end of the experimental period. Total return (value of fish harvested), total cost (value of fingerlings, feed pellets, Cow manure, labor, irrigation water, and net return [total return - total cost] were calculated according to Green, (1992) and Hassan and Mahmoud (2012).

Statistical analysis:

The collected data were statistically analyzed by SAS program (SAS, 2000) and the differences among means were tested for significance according to Duncan's multiple rang tests as described by Duncan (1955).

RESULTS AND DISCUSSION

First experiment:

1 .Growth performance:

Fish production and growth performance parameters are illustrated in Table (2) and Fig (1). The average final weight of common carp was 157.0, 166.0 and 177.0g for low, medium and high cow manure, respectively. These results clearly demonstrate positive correlation between fish weights and level of applied cow manure to the rice fields of common carp. The average total fish production for all treatments low, medium and high cow manure were, 339.32, 370.18 and 435.42 g, respectively. Analysis of variance, showed that final body weight and total fish production increased significantly ($p<0.05$) with each increase in the level of applying cow manure to the rice field of common carp .These results are in partial agreement with the findings of Hassan (2004) who reported that, increasing the rate of application of poultry manure enhanced the growth rate and total yield of Nile tilapia. Results presented in Table (2) are also in accordance with those obtained by Shaker (2008) who reported that the organic manure and mineral fertilizer had higher

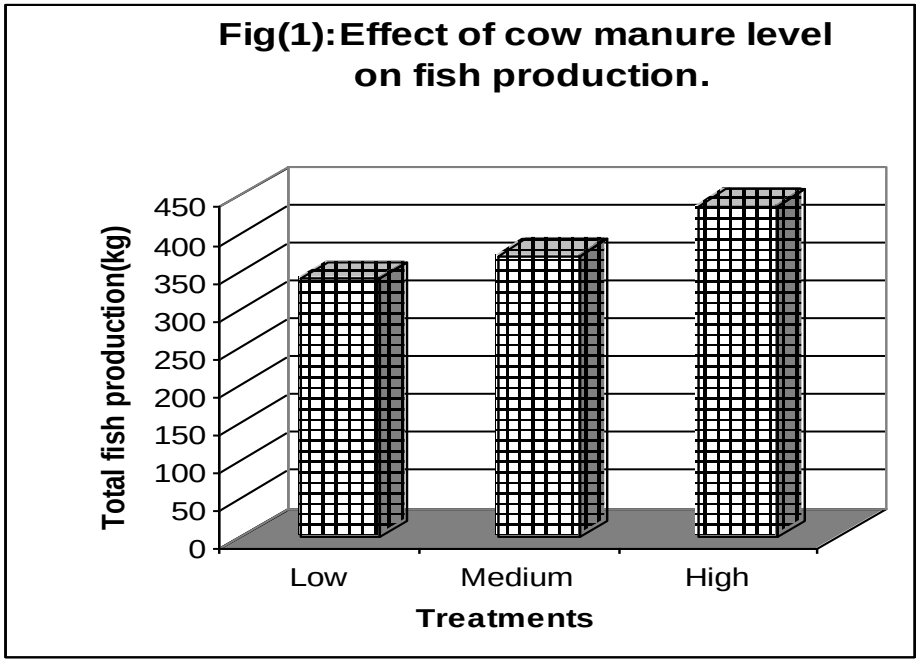
rate of nutrient (NPK), nitrogen, phosphorus and occasionally potassium are the limiting nutrients for phytoplankton production in natural waters and also in fish ponds. In this concern Salama (2003) reported that under the integrated rice fish system, body weight of Nile tilapia increased from 30.12 to 78. 13g during go rice fish culture period. Final averages of body length were found to be 20.5, 21.0 and 21.6 cm in low, medium and high manure, respectively (Table 2). A significant increase in body length was obtained by high manure compared to low and medium manure. These results are in agreement with those obtained by (Hassan 2004 and Hassan *et al.* 2005) who found significant correlation between body weight and body length of fish.

From the data presented in Table (2), it is also clear that highest daily gain was obtained by the highest manuring , followed in a decreasing order by those received medium and low manure in rice fields . These results indicated that the daily gain was positive correlated with the rate of manure applied. Moreover, the same trend was observed in the specific growth rate (SGR). These results are in agreement with those obtained by Hassan (2004).The condition factor did vary among all treatment ($p<0.05$), which indicated the suitability of environment to fish growth and survival %, (Hassan and mahmoud 2011).

Table (2): Showed effect of cow manure levels on growth performance Common carp (*Cyprinus carpio*) in rice fields.

Parameter	Cow manure level (kg / fed / month)		
	Low (150)	**Medium (300)**	**High (600)**
Initial body weight(g/fish)	20.4±o.7 6 ^{NS}	20.4±0.76 ^{NS}	20.4±0.76 ^{NS}
Final body weigh(g/fish)	157.0±0.80^{c}	166.0±0.94^{b}	177.0±1.08^{a}
Initial body length (cm)	8.80±0.11^{NS}	8.80±0.11^{d}	8.80±0.11^{NS}
Final body length (cm	20.5±0.58^{c}	21.0±0.63^{b}	21.6±0.63^{a}
Daily weight gain(g/fish	1.52±0.35^{c}	1.62±0.07^{b}	1.74±0.01^{a}
Net weight gain (g/fish)	136.6±0.37^{c}	145.6±0.53^{b}	156.6±0.22^{a}
Net weight gain (kg/fed)	303.93±1.78^{c}	324.69±2.78^{b}	385.24±4.35^{a}
Fish survival (%)	89.0±0.07^{b}	89.20±0.18^{b}	98.40±21^{a}
Total yield (kg/fed)	339.32±9.67^{c}	370.2 ±10.8 ^{d}	435.42±11.4^{a}
Specific growth rate (%)	2.27±0.21^{c}	2.33±0.21^{b}	2.40±0.22^{a}
Relative growth rate (%)	669.61±0.27^{c}	713.72±0.81^{b}	767.65±0.43^{a}
Condition factor (%)	1.82±0.17^{a}	1.79±0.07^{a}	1.76±0.03^{a}
Manure conversion ratio(S value)	1.48±0.020^{c}	2.77±0.20^{b}	4.67±0.20^{a}

Mean in same row having the same superscript letters are not significantly different ($p<0.05$).
S value = total amount of cow manure applied (kg)/ net production (kg).



2. Water quality:

Results of water parameters were summarized in Table (3). Water temperature at 7:00 A.M. ranged from 28.55 to 28.80 °C in all treatments during the study period. **IT** is being adequate for fish growth and suitable for all chemical, physical **AND** biological processes. **BOYD** (1990) reported that warm water species, which were native **TO** temperate climates **AND** best semitropical, grow at temperature ranged between 20 and 28 °C. Also, all parameters of water quality are suitable to grow up fish. Increasing rate of organic manure causes the depletion of oxygen content in the water of the rice fields. Further more there was a substantial increase in pH, nitrite, nitrate, and total alkalinity, in water with higher rate of manuring. No noticeable trend was observed in the total phosphorus, orthophosphate Table (3). Biological parameter plankton is comprised of all the macroscopic organism whish are suspended in water and include phytoplankton and zooplankton. However, phytoplankton uses inorganic minerals, carbon dioxide

available in water and sunlight to produce its own food zooplankton fish feeds on living or dead plankton, and other particles of organic matter found in the water. As in Table (4), the highest count of phytoplankton and zooplankton was found at treatments of high cow manure followed by medium and low manure. These results agree with those obtained by Shaker (2008) who reported that the organic manure and mineral fertilizer had higher rate of nutrient (NPK), nitrogen, phosphorus and occasionally carbon are the limiting nutrients for phytoplankton production in natural waters and also in fish ponds. Also, Boyd (1990) reported that the organic fertilizer might serve as a direct source of food for interprets food organisms and fish. The quadratic equation derived from the growth responses of fish and increasing rate of application of cow manure allow the application of 600 kg /fed /month, but higher rates of manuring may cause the depletion of water quality and the production of fish may not increase at the same rate as expected

Table (3): Showed effect of cow manure levels on average of some physico-chemical parameters in rice fields under the experimental period of Common carp *Cyprinus carpio*.

Items	Cow manure level (kg / feddan / month)		
	Low (150)	Medium (300)	High (600)
Temp. °C	28.55	28.8	28.65
DO mg/l	9.93	8.97	7.73
SD Cm	16.5	14.75	13.40
pH	8.04	8.03	8.50
Total alkalinity mg/l	260.83	329.33	399.33
NH_3 mg/l	0.12	0.17	0.25
NO_2 mg/l	0.02	0.03	0.03
NO_3 mg/l	0.10	0.13	0.16
Total phosphorus mg/l	0.69	0.97	1.20
Orthophosphate mg/l	0.28	0.33	0.43
Chlorophyll a µg/l	116.10	127.6	150.5

Table (4): Showed effect of cow manure levels of phytoplankton (organism/l) during the experimental period under cow manure levels.

Plankton	Division	Cow manure level (kg / feddan / month)		
		Low (150)	Medium (300)	High (600)
phytoplankton (organism /L)	Green alage	117	156	158
	Blue green alage	92	107	122
	Euglena	8	21	24
	Diatoms	6	7	8
	Total	223	291	312
Zooplankton (organism/L)	Copepoda	102	183	216
	Rotifera	20	30	36
	Cladocera	8	20	24
	Ostracoda	5	11	13
	Total	135	244	289

3. Chemical composition of the whole fish:

Averages of crude protein (CP), total fat (EE), ash, dry matter and moisture in the whole fish body for different treatments at the end of the experimental are illustrated Table (5). These results may indicate that high manuring rate which showed higher dry mater and protein contents , but it caused lower fat and moisture content. Thus, it could be stated that there is a negative correlation between dry matter or protein content and fat or moisture content. Ash percent in whole fish did not affect significantly ($p<0.05$). In this respect, Hafez *et al*. (2000) observed that manuring level of silver carp influenced the whole fish contents of crude protein. Also Hamed *et al*., (2011) indicated that total body fat content of the common carp was 20%, 15% and 6%, when fed with high protein pellets, grain pellets or reared on liquid cow manure, respectively.

Table (5): Showed chemical composition of the whole fish body of Coomon carp *Cyprinus carpio* at the end of the experimental period (on dry matter basis under cow manure levels.

Items	Cow manure level (kg / fed / month)		
	Low (150)	**Medium (300)**	**High (600)**
Moisture %	70.74±0.29a	69.02±0.37b	68.81±0.49bc
Dry matter %	29.26±0.59a	30.98±0.37a	31.19±0.49a
Protein %	57.28±1.39bc	58.76±1.96b	62.27±1.42a
Fat %	17.79±2.06a	16.36±1.41b	10.22±1.32c
Ash %	24.93±1.90a	24.88±1.68a	27.21±1.54a

Mean in same row having the sam superscript letters are not significantly different.

4. Economical Efficiency:

In this study, total return (the sale of harvested fish) for manuring levels low , medium and high were found to be 1357.28 , 1480.72 and 1741.68 LE/fed, respectively (Table 6) . These results indicated that increasing the manuring level from150, 300 and 600 kg /fed /month, caused an increase in total return. Total costs were found to be 363.50, 396.0 and 506.0 LE/fed, for the manuring levels low , medium and high.Net return of common carp as effected with the level of manuring was the highest at manuring (600kg/fed/month), followed in a decreasing order by those received 300 and 600 kg /fed/month, respectively Table (6) .The results sho that the level high manuring 600 kg /fed/ month is the best from the point of view of economic efficiency with Hassan and Mahmoud (2012).

Table (6): The economical values per feddan of fish production in L.E under cow manure levels.

Item	Unit	Price L.E	Cow manure level (kg / fed / month)					
			Low (150)		Medium (300)		High (600)	
			Quant	Value L.E	Quant	Value L.E	Quant	Value L.E
1st class	**K.g**	6.0	-	-	-	-	-	-
2nd class	**K.g**	5.0	-	-	-	-	-	-
3rd class	**K.g**	4.0	339.3	1357.28	370.18	1480.72	435.42	1741.68
Total return	**-**	-	-	**1357.28**	-	**1480.72**	-	**1741.7**
Costs feddan								
Fingerlings	**1000**	50.0	2.50	125.0	2.50	125.0	2.50	125.0
Cow manure	**M 3**	25.0	1.50	37.50	3.0	75.0	6.0	150.0
Labor	**Hr.**	3.0	15.0	45.0	20.0	60	25.0	75.0
Irrigation water	**Hr.**	3.0	12.0	36.0	12.0	36.0	12.0	36.0
Ditch Dig	**M2**	1.0	100.0	100.0	100.0	100.0	100.0	100.0
Screen	**Unit**	10.0	2.0	20.0	2.0	20.0	2.0	20.0
Total costs	**-**	-	-	363.50	-	396.0	-	506.0
Net return	**-**	-	-	993.78	-	1084.72	-	1235.68
E . E. %	**-**	-	-	**373.40**	-	**401.28**	-	**344.2**

Economical efficiency. (E. E) = Net return per fed / total costs fed × 100

Second experiment:

1. Growth performance:

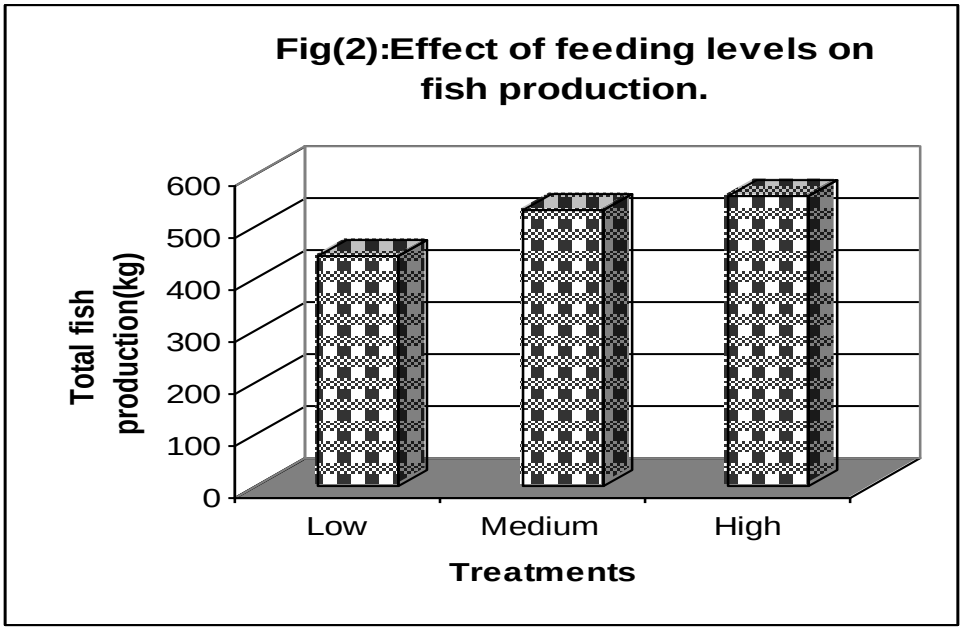
In the second experiment, constant application of 600 kg/ fed / month of cow manure along with different rate of supplementary feed was maintained. The results of the fish production variables are presented in Table (7). The average final weight of common carp was 196, 226 and 239 gm for low, medium and high supplementary feed, respectively. These results clearly demonstrate the positive correlation between fish production and the feeding rate to the rice fields of common carp. An increasing trend in growth of fish and fish yields with the increasing feeding rate was recorded. The pond conversion value for manure along with supplementary feeding were 4.85, 4.47 and 4.89 for 0.5%, 1.5% 3% feeding treatment, respectively. The present study are in agreement with those reported by Sayed *et al*. (2004), found that, the growth of fry. Nile tilapia increase with increasing feeding level. In

addition**,** Shaker and Abdel-Aal (2006). found that, growth rates of red tilapia fingerlings were increased while FCR were impaired with increasing feeding level from 4 to 16%. Meanwhile, feed consumption increased with increasing stocking density and feeding level, as shown in Table (7). The obtained results indicated that the high feeding rate had the highest ($p>0.05$) final body length as compared to other groups followed by medium and low supplementary feed, respectively. The obtained results were agreed with those of Abdel-Wares (1993) who used tilapia stocked from 3000 to 6000 fish /feedan and found an increasing rate in each of body weight, body length and body depth. The average of total gain /fish (g) and total gain per pond (kg) at the end of experimental period showed an increase at the higher feeding rate Sayed *et al*. (2004).

Table (7): Showed effect of cow manure and supplementary feeding levels on growth performance of Common carp *Cyprinus carpio* in rice fields.

Parameter	Supplementary feeding levels		
	Low (0.5 % body wt.)	**Medium (1.5 % body wt.)**	**High (3% body wt.)**
Initial body weight(g/fish)	15.2±0.09 ^{NS}	15.2±0.09 ^{NS}	15.2±0.09 ^{NS}
Final body weigh(g/fish)	196±6.75^{c}	226±6.32^{b}	239±6.73^{a}
Initial body length (cm)	8.20±0.12 ^{NS}	8.20±0.12 ^{NS}	8.20±0.12 ^{NS}
Final body length (cm	21.8±0.27^{c}	22.9±0.44^{b}	24.0±0.39^{a}
Daily weight gain(g/fish)	2.0±0.01^{c}	2.34±0.01^{b}	2.48±0.01^{a}
Net gain weight (g/fish)	180.8±0.30^{c}	210.8±0.51^{b}	223.8±0.05^{a}
Net gain weight (kg/fed)	406.8±6.26^{c}	493.27±6.81^{b}	520.11±7.9^{a}
Fish survival (%)	90.0±0.18^{c}	93.56±0.39^{a}	92.96±0.21^{b}
Total yield (kg/fed)	441.0±9.67^{c}	528.84±10.08^{b}	555.4±11.4^{a}
Specific growth rate (%)	2.83±0.01^{b}	3.0±0.01^{a}	3.06±0.01^{a}
Relative growth rate (%)	1198.6 ±0.2^{c}	1386.84±0.2^{b}	1472.6±0.0^{b}
Condition factor (%)	4.40±07^{a}	4.1±0.07^{a}	2.23±0.07^{a}
Manure +feed conversion ratio	4.85±0.25^{a}	4.47±0.25^{b}	4.89±0.25^{a}

Mean in same row having the same superscript letters are not significantly different ($p>0.05$).



From the data presented in Table (7), it is clear that the daily gain of the highest feeding rate flowed in a decreasing order by those received medium and low feeding rate in rice fields. Moreover, the same trend was observed in the specific growth rate (SGR). In this regard, Gary and Bhatnagar (2000) reported that similar specific growth rate (0.71% /day) in Indian major carp *Cirrhinus nrigalla* of cow dung , triple superphosphate and urea. Table (7) showed average of (k) values for the experimental group during the whole experimental period. The condition factor was vary among all treatments ($p>0.05$), which indicated of the suitability of environment to fish growth (Hassan 2010) In addition**,** Hassan and Agouz 2010).

2. Water quality:

Results of water parameters were summarized in Table (8). Water temperature ranged from 29.3 to 29.86°C in all treatments during the study period. The concentrations of pH nitrite, nitrate and total alkalinity increased, white DO decrease in the water of the treated plots.

Accumulation of unutilized feed in rice fields was evident. No noticeable trend was observed in total phosphorus, orthophosphate and chlorophyll "a" in water with increasing feeding rate. As in Table (9), the highest count of phytoplankton and zooplankton was obtained at treatments of high level (3%)body weight) followed by medium level (1.5% body weight) and low (0.5% body weight).These results agree with those obtained by Hassan *et al*. (2006) who found that , the growth of plankton increase with increasing feeding level . In addition Hassan and mahmoud (2012) who found that, growth rates of phytoplankton and zooplankton were increased with increasing feeding level and poultry manure.

Table (8): Showed effect of cow manure and supplementary feeding levels on average of some physico-chemical parameters in rice fields under the experimental period Common carp of *Cyprinus carpio.*

Items	Supplementary feeding levels		
	Low (0.5 % body wt.)	**Medium (1.5 % body wt.)**	**High (3% body wt.)**
Temp. °C	29.30	29.2	29.06
DO mg/l	7.01	6.25	4.02
SD Cm	13.50	12.20	11.30
pH	8.60	8.80	9.0
Total alkalinity mg/l	416	425	456
NH_3 mg/l	0.29	0.38	0.48
NO_2 mg/l	0.05	0.06	0.06
NO_3 mg/l	0.17	0.19	0.20
Total phosphorus mg/l	1.50	1.79	1.90
Orthophosphate mg/l	0.46	0.58	0.83
Chlorophyll a µg/l	164	196	230

Table (9): Showed effect of cow manure and supplementary feeding levels of phytoplankton (organism/l) during the experimental period under supplementary feeding levels.

Plankton	Division	supplementary feeding levels		
		Low (0.5 % body wt.	Medium (1.5 % body wt.)	High (3% body wt.)
phytoplankton (organism /L)	Green alage	167	222	252
	Blue green alage	151	152	151
	Euglena	30	29	40
	Diatoms	2	9	12
	Total	350	412	455
Zooplankton (organism /L)	Copepoda	262	259	239
	Rotifera	28	42	52
	Cladocera	23	29	36
	Ostracoda	11	16	22
	Total	324	346	349

Chemical composition of the whole fish:

Averages of crude protein (CP), total fat (EE), ash, dry matter and moisture in the whole fish body for different treatments at the end of the experimental are illustrated in Table (10). These results may indicate that high feeding rate (3% body weight) showed higher ash and protein content , but it caused lower fat content. Thus it could be stated that there is negative correlation between ash or protein content and Fat content. Dry matter percent in whole fish did not affect significantly ($p<0.05$). In thisrespect, Yi *et al*. (2002) where the fed different species of phytoplankton to sex reared however they reported higher moisture (83%) and ash (23-26%) content in their study than reported in this experiment. Veverca *et al*., (2001) reported in inorganic fertilized ponds stocked with *O. niloticus* and *C. gariepinus*, reported a decrease in fat content and a slight increase in moisture, protein and ash.

Table (10): Chemical composition of the whole fish body (Men ±SE) of Common carp *Cyprinus carpio* at the end of the experimental period (on dry matter basis) under supplementary feeding levels.

Items	Supplementary feeding levels		
	Low (0.5 % body wt.)	**Medium (1.5 % body wt).**	**High (3% body wt.)**
Moisture %	79.09±0.38[a]	79.72±0.33[a]	78.32±0.05[b]
Dry matter %	20.31±0.38[a]	20.72±0.33[a]	21.67±0.05[a]
Protein %	72.37±0.27[a]	70.81±0.07[b]	69.80±1.12[c]
Fat %	12.09±0.05[a]	15.72±0.53[b]	19.0±0.60[a]
Ash %	15.54±0.35[a]	13.74±0.48[b]	110.19±0.95[c]

Mean in same row having the same superscript letters are not significantly different (p>0.05).

4. Economical Efficiency:

As presented in Table (11), results of total costs including the total costs for treatment found to be 870, 1446 and 2088 LE/fed., for treatments of low, medium and high feeding rate, respectively. The results revealed that the total cost of the field treatment with high feeding rate were the highest due to the low total quantity of fish as kg and cost of feed from low feeding rate. From Table (11), the net returns were 1335, 1727.04 and 1244.64 LE/fed. for 0.5%, 1.5% and 3% feeding treatment, respectively. The results show that the treatment of medium feeding rate is the best from the point of view of economical efficiency. This result is partially agreed with Hassan and mahmoud (2012).

Table (11): The economical values per feddan of fish production in L.E under supplementary feeding levels.

Item	Unit	Price L.E	Supplementary feeding levels					
			Low (0.5 % body wt.)		Medium (1.5 % body wt).		High (3% body wt.)	
			Quant	Value L.E	Quant	Value L.E	Quant	Value L.E
1st class	K.g	6.0	-	-	528.84	3173.04	555.44	3332.6
2nd class	K.g	5.0	441.0	2205.0	-	-	-	-
3rd class	K.g	4.0	-	-	-	-	-	-
Total return	-	-	-	2205.0	-	3173.04	-	3332.6
Costs feddan								
Fingerlings	1000	50.0	2.50	125.0	2.50	125.0	2.50	125.0
Feed	Ton	2800	0.195	390.0	0.433	966.0	0.800	1608.0
Cow manure	M 3	25.0	6.0	150.0	6.0	150.0	6.0	150.0
Labor	Hr.	2.0	20.0	40.0	20.0	40.0	20.0	40.0
Irrigation water	Hr.	3.0	12.0	36.0	12.0	36.0	12.0	36.0
Ditch Dig	M^2	1.0	100.0	100.0	100.0	100.0	100.0	100.0
Screen	Unit	10.0	2.0	20.0	2.0	20.0	2.0	20.0
Total costs	-	-	-	870.0	-	1446.0	-	2088.0
Net return	-	-	-	1335.0	-	1727.04	-	1244.6
E . E. %	-	-	-	253.44	-	183.73	-	159.61

Economical efficiency. (E. E) = Net return per fed / total costs fed × 100

RECOMMENDATION

In general the results of this study may lead to recommend an application of 600kg/fed/month of cow manure along with 1.5% of total body weight of supplementary feeding in rice fields of common carp *(Cyprinus carpio)* this will lead to a higher total fish yield, higher economical return and rice yield increased by 350 kg/ feddan.

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تأثير أستخدام مستويات مختلفة من سبلة البقر والغذاء الإضافى على جودة المياه، أداء النمو والإنتاج الكلى لسمكة المبروك العادى فى حقول الأرز

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قسم بحوث إنتاج الأسماك ونظم الاستزراع السمكى بالمعمل المركزي لبحوث الثروة السمكية بالعباسة مركز البحوث الزراعية- مصر

الملخص العربـى

سبلة البقر تحسن من جودة المياه وتزيد من معدلات الانتاج لسمكة المبروك العادى المربى فى حقول الأرز واستهدفت هذه الدراسة تقيم تأثير المستويات المختلفة لسبلة البقر ومعدلات التغذية الصناعية المختلفة على قياسات جودة المياه والقيمة الغذائية ومعدلات النمو والانتاجية الكلية والكفأة الاقتصادية لسمكة المبروك العادى فى حقول الأرز ولذلك أقيمت تجربتان ، فى التجربة الأولى أضيفت سبلة البقرالمعالجة بمعدلات ١٥٠ ، ٣٠٠، ٦٠٠ كيلوجرام لكل فدان شهرياً فى مدة ٩٠ يوماً وأدى ذلك إلى زيادة النمو لسمكة المبروك العادى من ٢٠.٤٠ جرام إلى ١٥٧ ، ١٦٦ ، ١٧٧ جرام نسبياً وفى التجربة الثانية أضيفت سبلة البقرالمعالجة بمعدل ٦٠٠ كيلوجرام لكل فدان شهريا مع العلف الصناعى (٢٥%) بروتين بمعدل ٥، % ، ١.٥ % ، ٣% من وزن الجسم على مرتين يوميا لمدة خمسة أيام أسبوعياَ والذى أزاد النمو لسمكة المبروك العادى من ١٥.٢٠ جرام إلى ١٩٦ ، ٢٢٦ ،٢٣٩ جرام نسبياً. سبلة البقر تمت معالجتها بأن تركت بجوار حقول الأرز لفترة طويلة قبل بداية التجربة حتى جفت تماماَ بواسطة حرارة الشمس قبل استخدامها فى التسميد.

أظهرت نتائج التجربة الأولى أن إضافة سبلة البقر المعالجة بمعدلات ١٥٠، ٣٠٠، ٦٠٠ كيلوجرام لكل فدان شهرياً كان له تأثير معنوى على صفات النمو لسمكة المبروك العادى (وزن الجسم . طول الجسم . والعائد الصافى للوزن، العائد اليومى، ومعدل النمو النسبى، ومعدل النمو النوعى ، ومعامل الحالة والمحصول الكلى ومعدل تحويل السبلة)، ايضا مستويات التسميد بسبلة البقر المعالجة كان له تأثير معنوى على التحليل الكيماوى لجسم الأسماك والصفات الكيميائية والبيولوجية للمياه والعائد الاقتصادى.

أظهرت نتائج التجربة الثانية أن إضافة ٦٠٠ كيلوجرام من سبلة البقر المعالجة لكل فدان شهريا مع المعدلات المختلفة للغذاء الإضافى كان له تأثير معنوى على أداء النمو

والمحصول الكلى وأيضا كان له تأثير معنوى على محتوى أجسام الأسماك من الرطوبة والبروتين والدهن والرماد والعائد الاقتصادى.

تركيزات الأوكسجين الذائب والنيتريت والنيترات والفوسفور الكلى والأرثوفوسفات وأيضا الفيتوبلانكتون والزوبلانكتون كان ملحوظاً فى كلا من التجربة الأولى الثانية.

معدل تحويل الغذاء ومعدل تحويل السبلة وقياسات جودة المياه والكفأة الاقتصادية أشارت إلى أن استخدام الغذاء الإضافى بمعدل ١.٥ % من وزن الجسم مع تطبيق سبلة البقر المعالجة بمعدل ٦٠٠ كيلوجرام للفدان شهريا يجنب الإسراف فى استخدام العلف الإضافى وتدهور خواص جودة المياه.

عامة فقد اشارت نتائج هذه الدراسة إلى التوصية بتطبيق سبلة البقر المعالجة بمعدل ٦٠٠ كيلوجرام للفدان شهريا مع الغذاء الإضافى بمعدل ١.٥ % من وزن الجسم لسمكة المبروك العادى فى حقول الارز وهذا يؤدى الى زيادة المحصول السمكى الكلى والعائدالاقتصادى وايضا زيادة محصول الأرز بمعدل ٣٥٠ كجم للفدان.