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EFFECT OF USE FERTILIZER AND ARTIFICIAL FEEDS ON PERFORMANCE OF COMMON CARP (*Cyprinus carpio L.*) REARED IN EARTHEN PONDS.

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SUMMARY

This study was carried out at Abbassa fish farm. Seven earthen ponds were used in this work. Area of each pond was one feddan (4200 m^2) with 100cm water depth. Common carp, *Cyprinus carpio*, fingerlings were used. Experimental period was 22 weeks. The ponds were randomly assigned to seven treatments [poultry manure (PM), PM+ duck manure (DM), PM+ artificial feed (F), PM+DM+F, DM, DM+F and artificial feed (F).

Averages of body weight gain, relative growth rate and specific growth rate were found to be highest for PM+DM+F groups and followed in descending order by DM+F, PM+F, F, DM, PM and PM+DM groups, respectively. Analysis of variance of the results indicated that the PM+DM+F group had significantly ($P<0.05$) heavier weight and length. These results may indicate that the best growth of common carp can achieved through the system of combined organic fertilizer i.e. PM, DM with addition artificial feeding. The results showed that PM+DM+F group had the highest phytoplankton and zooplankton concentration (number of organisms/l pond water).

In conclusion, pond fertilizer with poultry manure + duck manure with artificial feed was the optimum in terms of growth performance and total production, but the group of duck manure only was best in term net revenue.

Key words: *Common carp, pond fertilization, artificial feeds, fish growth, plankton count.*

INTRODUCTION

Carps as group, given the greatest production of fish by weight from fish culture in the world which represents about 4.5 million metric tons. The technologies of reproduction and larval rearing are now established, and growth is practiced in the different production systems. The common carp, *Cyprinus carpio*, once abundant by Chinese was successfully cultivated, domesticated and selected by other countries. Carp was transferred from the Danube River to Greece and Italy during the Roman Empire, and later spread throughout Europe and other countries. It was introduced to Egypt in order to use it in artificial hatcheries for aquaculture fish production. Common carp is omnivorous, eating both animal and plant materials. Common carp tolerate a wide range of temperature and dissolved oxygen *(Lovell et al., 1978).* They showed that, the most suitable forms for commercial use are those, which either have a wide natural range of feeding habits and therefore, take up feed offered from the bottom and floating pellets, or those

which possess a high enough capacity for learning to adapt quickly to the conditions of feeding capacity. Abdel-Hakim et al., (1999) found that ponds fertilized with duck manure plus fish feeds produced the highest total fish yield followed in a significant decreasing order by pond fertilized with buffalo manure with fish feeds, ponds with duck manure only and ponds with buffalo manure only, respectively.

This study was conducted to evaluate the effect of duck manure, chicken manure and artificial feed with different combination between these different inputs on growth performance of common carp fish, chemical composition of fish as well as economic evaluation.

MATERIALS AND METHODS

The study was carried out at Abbassa fish farm. The farm belongs to Central Laboratory for Aquaculture Research, Agriculture Research Center. Seven earthen ponds were used in this study. The area of each pond was one feddan (4200 m^2) and water depth was 100 cm. The experiment was conducted during the period of 22 weeks, from April to September. The ponds were randomly assigned to seven treatments as follows:

-T.1. Poultry manure (PM).
-T.2. PM+DM (duck manure).
-T.3. PM+F (artificial feed).
-T.4. PM+DM+F.
-T.5. DM.
-T.6. DM+F.
-T.7. F.

Commercial pelleted fish feed (25% crude protein) was administrated to ponds (receiving fish feeds T3, T4, T6 and T7) 6 days a week at a rate of 3% of fresh fish body weight two times a day. Fertilization broadcast over the pond surface at a rate of 150 kg/pond every week. Water samples were collected from ponds every month after three days of fertilizer applications. The water samples were taken from each corner of the ponds using sampler bottle and mixed together to be ready for analysis. Water temperature and oxygen content were measured daily by oxygen meter model YSI 57. The pH was measured weekly by electrode pH meter. Total alkalinity was measured weekly according to Boyd (1979). Total phosphorus, NH3 and salinity were analyzed by the methods described by Boyd (1979). Water depth and water fertility were determined weekly by secchi disk. The phytoplankton and zooplankton organisms were quantitatively counted according to Boyd (1979).

Common carp, *Cyprinus carpio*, fingerlings were obtained from Abbassa hatchery. Average body weight was 2 g. All ponds were stocked with the same number of fingerlings, being 6000 fish/feddan. Random samples of fish (50 fish from each pond) were taken every month during the whole experimental period 22 weeks. Individual body weight (g) and body length (cm) were recorded for each fish, there after the fish were returned to their ponds. At the end of the experimental period, ponds were drained from water and all fish were harvested by seining nets. Total yield was recorded for each pond. Five fish from each pond were collected for chemical analysis. The proximate analysis of whole fish bodies of initial and final samples were carried out according to AOAC (1984) methods.

Results of the chemical analysis of poultry manure, duck manure and artificial diet calculated on dry matter basis are shown in (Table 1). Data of this study were statistically analyzed according to SAS Computer program (1991). Duncan's Multiple range test (1955) was used for testing differences between means.

Table (1) : Chemical composition of poultry manure, duck manure and artificial diet, (% DM Basis).

Item	CP	CF	NFE	EE%	Ash	Dry matter	Moisture
PM	26.50	15.90	25.40	2.20	30.00	84.70	13.30
DM	16.80	27.80	33.90	1.20	20.30	91.50	8.50
F	25.90	20.73	36.53	6.12	10.72	80.30	19.70

RESULTS AND DISCUSSION

Effect of manuring common carp ponds with artificial feed on growth performance: As presented in Table (2) averages body weight at the start of the experiment had ranged from 2.04 to 2.66 g and differences among the experimental groups (PM, PM+DM, PM+F, PM+DM+F, DM, DM+F and F at this period were insignificant indicating that groups were homogenous. Results presented in Table 2 show that PM+DM+F and F groups have significant (P<0.05) higher body weight after 4 weeks of the start as compared with the other treatment groups. The lowest body weight at this period were obtained by the PM and PM+DM groups (Table 2). The statistical evaluation of the results after eight weeks indicated that the differences of body weight among the experimental groups were significant (P<0.05). The higher body weight were obtained by the PM+DM+F group followed in a decreasing order by the F, DM+F, DM, PM+F, PM+DM and PM groups, respectively (Table 2).

Results presented in the same Table show at 12 weeks after the experimental start the (F) group showed significantly P<0.05) higher body weight followed by the PM+DM+F, DM+F, DM, PM+F, PM and PM+DM groups, respectively. At 16 weeks averages body weight for PM, PM+DM, PM+F, PM+DM+F, DM, DM+F and F were 67.08, 75.01, 79.24, 97.30, 80.02, 80.26 and 95.82 g, respectively. Higher averages body weight were obtained by the PM+DM+F and F groups. At this period, PM group showed significantly (P<0.05) lower body weights as compared with the F and PM+DM+F groups.

After 20 weeks averages of body weight for the experimental groups were found insignificant for F and PM+DM+F, while they showed significant (P<0.05) higher body weight compared to the other groups. Also, averages body weight of DM+F group were significantly (P<0.05) higher than DM, PM, PM+F and PM+DM groups (Table 2). Analysis of variance of the results indicated that the PM+DM+F group had significantly (P<0.05) heavier weights at the end of the experimental period compared to all other treatment groups. On the other hand groups DM+F, F and PM groups showed significantly (P<0.05) higher body weights compared to PM+F, PM and PM+DM groups (Table 2).

These results may indicate that the best growth performance of common carp can be achieved through the system of combined organic manure i.e. (PM+DM) with additional feeding. This system may enhance the growth of live food and the needs of fish could be compensated by the artificial diet containing 25% crude protein and fed at level of 3% of biomass. These results are in agreement with those reported by

Table (2) : Effect of source of manure with or without artificial feeding on body weight (gm) of common carp.

Treatment	Start Mean±S.E	4W Mean±S.E	8W Mean±S.E	12W Mean±S.E	16W Mean±S.E	20W Mean±S.E	22W Mean±S.E
	a	d	d	d	b	de	c
PM	2.04±0.09	10.02±0.64	22.02±1.04	34.40±1.96	67.08±5.16	122.02±6.01	142.58±6.82
	a	cd	d	d	ab	e	c
PM+DM	2.66±0.09	11.26±1.19	20.06±0.82	30.74±1.51	75.01±9.95	107.36±6.34	142.41±6.34
	a	bc	c	c	ab	ed	b
PM + F	2.05±0.09	14.34±0.58	27.77±1.22	40.26±1.37	79.24±8.09	119.10±4.89	195.85±6.26
	a	a	a	a	a	ab	a
PM+DM+F	2.05±0.09	23.03±1.18	46.72±1.86	57.66±1.98	97.30±9.11	159.50±6.32	223.80±5.32
	a	bc	bc	b	ab	cd	b
DM	2.17±0.12	14.67±1.14	31.36±1.94	48.08±1.88	80.02±5.44	128.8±8.58	181.88±7.13
	a	b	b	b	ab	cd	b
DM + F	2.05±0.09	16.52±1.73	35.05±0.93	50.06±2.22	80.26±6.61	146.50±7.23	198.80±7.20
	a	a	a	a	a	a	b
F	2.08±0.09	21.02±2.10	44.56±1.85	61.30±2.25	95.82±7.44	168.86±7.06	192.48±6.73

* Means with the same letter in each column are not significantly different ($P<0.05$).

Dabrowska *et al.*, (1979) who mentioned that commercial production of common carp, *Cyprinus carpio*, larvae relies on the provision of natural or culture live food. They added that live food either alone or in combination with artificial diets consistently enhance growth and survival. These results may lead to recommended the application of poultry manure plus duck manure with supplementary feeding in common carp ponds to attain the best body weight and yield.

Results presented in (Table 2) are in complete with those reported by Prinsboo and Schoonbee (1984) who showed that the production of almost one ton/ha for various carp species and tilapia could be obtained with 98 days or 2.5 ton/ha could be achieved within 128 days by applying fertilization with chicken manure in addition to pelleted fish feed. Resents Mahmoud (1997) reported that increasing manuring rate (duck manure) in ponds of silver carp from 150 to 300 or 450 kg/fed. Weekly increased averages of final weight significantly ($P<0.05$) from 273.1 to 332.3 and 366.0 g, respectively. On the other hand, Abdel-Aal (1996) found that body weight gain values of common carp fed on three commercial pelleted rations were significantly ($P<0.05$) higher than those fed on organic and inorganic fertilizers. He added that organic fertilizer exhibited significantly ($P<0.05$) higher body weight than inorganic fertilizers.

Daily gain: As concerned with daily gain in live body weight (Table 3) revealed that group of PM+DM+F showed significantly ($P<0.05$) higher averages daily gain during the periods 4 and 8 weeks after the experiment started. At the third period (12 weeks) this trend shifted to DM and F groups, this showed significantly ($P<0.05$) higher better daily gain compared to the other treatment groups. On the other hand, the group of PM+DM showed the highest daily gain at 16 weeks compared to the other groups and the DM+F group showed the lowest daily gain. At 20 weeks daily gain averages obtained by the F group was significantly ($P<0.05$) higher than the other groups (Table 3). Averages of daily gain at the end of the experiment (from 0 to 22 weeks) for the PM, PM+DM, PM+F, PM+DM+F, DM, DM+F, and F groups were 0.96, 1.04, 1.61, 1.70, 1.37, 1.47 and 1.32 g, respectively (Table 3). Analysis of variance indicated that PM+DM+F group had significantly ($P<0.05$) higher daily gain in live weight followed in a decreasing order by DM+F, F, DM, PM and PM+DM groups, respectively.

Results of daily gain followed almost the same pattern as the body weight. These results are in partial agreement with results obtained by Green (1992) who reported that the addition of feed to ponds of common was necessary to maintain fast growth in addition to organic fertilization. In this respect, Chang (1989) reported that fertilization was commonly used to enrich pond water in order to increase natural food production and to provide additional organic matter as fish food. The same author reported also that fish growth rate was found to be directly related to the amount of enrichment when ponds were low in nutrients. Mahmoud (1997) showed that increasing the manuring level lead to a significant ($P<0.05$) increase in daily gain.

Relative growth rate: As presented in (Table 4) averages of relative growth rates calculated on the base of initial weight during the whole experimental period were found to be 68.9, 52.5, 94.53, 108.2, 82.81, 95.21 and 91.53 for the experimental groups PM, PM+DM, PM+F, PM+DM+F, DM, DM+F and F, respectively. These results indicated that the highest relative growth rate were

Table (3) : Effect of source of manure with or without artificial feeding on daily gain (gm/ fish) of common carp.

Treatment	4W Mean±S.E	8W Mean±S.E	12W Mean±S.E	16W Mean±S.E	20W Mean±S.E	22W Mean±S.E	0-22W Mean±S.E
PM	0.29±0.005 f	0.43±0.035 e	0.44±0.075 e	1.18±0.021 e	1.96±0.091 e	1.47±0.055 e	0.91±0.035 e
PM+DM	0.31±0.013 e	0.31±0.045 f	0.38±0.038 d	1.58±0.073 a	1.16±0.067 f	2.50±0.085 d	0.91±0.003 e
PM + F	0.44±0.012 d	0.48±0.067 d	0.45±0.023 c	1.39±0.093 c	1.42±0.024 d	5.48±0.044 a	1.26±0.007 d
PM+DM+F	0.75±0.017 a	0.85±0.026 a	0.39±0.071 d	1.42±0.054 b	2.22±0.088 b	4.59±0.074 b	1.44±0.006 a
DM	0.45±0.037 a	0.60±0.091 e	0.60±0.091 a	1.14±0.084 ef	3.70±0.016 e	128.8±8.58 c	1.17±0.002 b
DM + F	0.52±0.057 e	0.66±0.098 b	0.54±0.048 b	1.09±0.036 ef	2.37±0.038 b	3.74±0.018 c	1.28±0.017 b
F	0.68±0.087 b	0.84±0.057 a	0.60±0.031 a	1.23±0.037 d	2.61±0.077 a	1.69±0.053 e	1.24±0.001 b

* Means with the same letter in each column are not significantly different (P<0.05).

Table (4) : Effect of source of manure with or without artificial feeding on relative growth rate of common carp.

Treatment	4W	8W	12W	16W	20W	22W	0-22W
	Mean±S.E	Mean±S.E	Mean±S.E	Mean±S.E	Mean±S.E	Mean±S.E	Mean±S.E
	g	ab	a	b	a	d	d
PM	3.91±5.77	1.20±0.45	0.55±0.12	0.95±0.26	0.82±0.43	0.17±0.71	68.90±0.43
	f	d	a	a	d	e	e
PM+DM	4.47±4.32	0.78±0.48	0.53±0.13	1.44±0.032	0.43±0.75	0.33±0.49	52.54±0.75
	d	cd	a	b	cd	a	b
PM + F	5.97±3.76	0.94±0.81	0.45±0.39	0.97±0.29	0.50±0.56	0.64±0.83	94.53±0.56
	a	bc	b	cd	abc	b	a
PM+DM+F	10.23±6.73	1.03±0.23	0.23±0.27	0.69±0.22	0.64±0.27	0.40±0.81	108.20±0.27
	e	a	a	d	bcd	b	c
DM	5.48±4.93	1.23±0.31	0.53±0.34	0.66±0.63	0.61±0.37	0.41±0.48	82.81±0.37
	e	abc	a	bc	abc	c	b
DM + F	7.06±5.94	1.12±0.01	0.43±0.31	0.76±0.13	0.66±0.38	0.36±0.57	95.21±0.38
	b	abc	ab	d	ab	d	b
F	9.11±5.86	1.12±0.55	0.38±0.35	0.56±0.18	0.77±0.27	0.14±0.38	91.53±0.27

* Means with the same letter in each column are not significantly different (P<0.05).

obtained by groups PM+DM+F and followed in a descending order by DM+F, PM+F, DM, F, DM, PM and PM+DM, respectively. These results are in agreement with findings of Barash and Schroeder (1984) who reported that growth of common carp in manure ponds ceased because of food limitation, in which the addition of sorghum pellet (as-an energy source) significantly ($P<0.05$) increased carp growth. The common carp growth rate was accelerated by this addition energy source. Abdel-Aal (1996) noted that relative growth rate of common carp fed on 26% crude protein (CP) at 120 day experimental period was significantly ($P<0.05$) superior to those recorded for medium protein diet 20% CP, 15% CP diet and fertilizers.

***Specific growth rate (SGR)*:** Results of specific growth rate as affected by different treatment through the experimental period (start to 22 weeks) are presented in (Table 5). These results revealed that PM+DM+F and F groups showed significantly ($P<0.05$) the highest SGR recorded comparing with the other treatment groups at four weeks after the experiment start. At 8 weeks averages of SGR were found to be 2.81, 2.06, 2.36, 2.53, 2.71, 2.69 and 2.68 g for groups PM, PM+DM, PM+F, PM+DM+F, DM, DM+F and F, respectively. During this period PM and DM showed the higher SGR values while the lowest value was obtained by PM+DM groups (Table 5). After 12 weeks of the experiment start groups PM+DM and DM showed significantly ($P<0.05$) higher SGR values compared to the other groups. At 22 weeks after the experiment start groups of DM and PM+DM+F showed the highest value followed by DM+F, PM+F, PM+DM, PM and F in descending order. During the whole experimental period, averages of SGR values were found to be 2.76, 2.58, 2.83, 3.05, 2.87, 2.96 and 2.94 for PM, PM+DM, PM+F, PM+DM+F, DM, DM+F and F groups, respectively (Table 5). These results indicated that manuring of common carp ponds with mixture of poultry and duck manure results in a significantly ($P<0.05$) higher SGR recorded followed by the group receiving the same mixture with artificial feed (group PM+|DM+F). In this respect, Abdel-Aal (1996) found that the 26% CP diet and 20% CP diet gave significantly ($P<0.05$) higher SGR values than that of low protein diet 15% CP. He added that organic fertilizer (rabbit manure) tended to increase the SGR values than those recorded for inorganic fertilizers (super phosphate and urea).

Body length: As presented in Table 6 averages of body length at the start of the experiment ranged between 4.91 cm and 5.12 cm and differences among treatment groups were non-significant. Four weeks after start the averages body length ranged between 8.71 and 11.00 cm and the differences among the experimental groups were non-significant. After 8 weeks the experimental groups PM, PM+DM+F and F showed significantly ($P<0.05$) longer bodies (from 13.43 to 14.28 cm), while group PM+DM showed the lowest body length. After 12 weeks, averages body length for PM, PM+DM, PM+F, PM+DM+F, DM, DM+F and F groups were 12.74, 12.85, 13.76, 15.93, 16.08, 15.09 and 15.79 cm, respectively (Table 6).

Analysis of variance for the results at this period indicated that DM, PM+DM+F,F and DM+F groups showed significantly ($P<0.05$) longer body length than that recorded for PM, PM+DM and PM+F groups. At periods 16 and 20 weeks differences of body length among the experimental groups were found to be significant ($P<0.05$) for the favor of PM+DM+F and F groups. At the end of the experimental period (22weeks) averages body length were found 20.40, 22.59, 25.69, 26.78, 24.89, 25.23 and

Table (5) : Effect of source of manure with or without artificial feeding on specific growth rate of common carp.

Treatment	4W Mean±S.E	8W Mean±S.E	12W Mean±S.E	16W Mean±S.E	20W Mean±S.E	22W Mean±S.E	0-22W Mean±S.E
	d	a	a	b	a	d	bc
PM	5.86±0.06	2.81±0.05	1.59±0.03	2.39±0.32	2.14±0.03	1.11±0.03	2.76±0.05
	d	d	a	a	e	e	e
PM+DM	5.15±0.32	2.06±0.12	1.52±0.012	3.19±0.33	1.28±0.12	2.02±0.19	2.58±0.13
	c	cd	b	b	e	bc	b
PM + F	6.95±0.05	2.36±0.57	1.33±0.57	2.42±0.57	1.46±0.57	2.10±0.35	2.83±0.35
	a	bc	cd	cd	b	a	a
PM+DM+F	8.64±0.01	2.53±0.05	0.75±0.15	1.87±0.24	1.77±0.55	2.42±0.05	3.05±0.03
	e	a	a	cd	b	a	b
DM	6.38±0.04	2.71±0.09	1.53±0.17	1.82±0.36	1.70±0.53	2.43±0.35	2.87±0.04
	b	ab	b	cd	a	b	b
DM + F	7.45±0.02	2.69±0.08	1.27±0.24	1.69±0.03	2.15±0.17	2.18±0.43	2.96±0.05
	a	ab	bc	cd	a	d	b
F	8.26±0.07	2.68±0.03	1.14±0.18	1.60±0.26	2.02±0.19	0.93±0.34	2.94±0.85

* Means with the same letter in each column are not significantly different (P<0.05).

Table (6) : Effect of source of manure with or without artificial feeding on body length (cm) of common carp.

Treatment	4W Mean±S.E	8W Mean±S.E	12W Mean±S.E	16W Mean±S.E	20W Mean±S.E	22W Mean±S.E	0-22W Mean±S.E
	a	a	abc	d	b	c	d
PM	5.02±0.10	9.31±1.32	13.43±0.29	12.74±0.32	15.59±0.43	20.04±0.48	20.40±0.39
	a	a	d	d	ab	c	c
PM+DM	5.12±0.12	8.71±0.31	11.37±0.35	12.85±0.22	16.31±0.75	20.09±0.74	22.59±0.67
	a	a	c	c	ab	bc	b
PM + F	4.97±0.10	8.80±0.17	12.91±0.23	13.76±0.22	16.48±0.56	20.48±0.39	25.69±0.24
	a	a	a	a	a	a	a
PM+DM+F	5.02±0.10	10.92±0.34	14.28±0.22	15.93±0.81	16.76±0.50	23.45±0.44	26.78±0.27
	a	a	bc	a	a	c	b
DM	4.91±0.13	11.08±1.54	13.18±0.63	16.08±1.20	17.39±0.48	20.07±0.55	24.89±0.28
	a	a	c	ab	a	ab	b
DM + F	5.02±0.10	9.53±0.27	12.96±0.13	15.09±0.26	17.76±0.48	21.79±0.45	25.23±0.27
	a	a	ab	a	ab	a	b
F	5.03±0.10	10.84±0.39	14.03±0.18	15.79±0.81	16.55±0.57	23.75±0.38	25.05±0.28

* Means with the same letter in each column are not significantly different (P<0.05).

25.05 cm for PM, PM+DM, PM+F, PM+DM+F, DM, DM+F and F groups, respectively (Table 6). Analysis of variance indicated that groups PM+DM+F, PM+F showed significantly (P<0.0.5). These results are in accordance with those reported by Mahmoud (1997) who found that body length of silver carp increased significantly (P<0.05) with increasing level of duck manure application. He added that manuring silver carp ponds with duck manure at higher rates increased significantly (P<0.05) growth performance in general and body length was more markedly at higher level of duck manure application.

Condition factor (K): Averages of K condition factor value at the start of the experiment and after 4, 8, 12, 16, 20 and 22 weeks are presented in Table 7. Four weeks after the experiment start PM+F group showed highest significant (P<0.05) value followed in a decreasing order by DM+F, PM+DM+F, PM+DM, F, PM and DM, respectively. After 8 weeks group F had significantly (P<0.05) higher K value compared to the other groups. At 16 weeks F and PM+DM+F groups showed significantly (P<0.05) higher K values compared with the other groups studied. At the end of the experiment i.e. 22 weeks, averages K values for PM, PM+DM, PM+F, PM+DM+F, DM, DM+F and F groups were 1.68, 1.24, 1.15, 1.17, 1.16, 1.24 and 1.25, respectively (Table 7). Analysis of variance for K values at this period indicated that PM group showed significantly (P<0.05) the highest K value. The PM+F group showed significantly (P<0.05) the lowest K value. These results indicated that PM group grew more in weight than in length, while other groups such as PM+F and DM grew more in length than in weight thus they showed the lowest K values at the end of the experiment. Abdel-Aal (1996) found that K values of carp fed on low protein 15.28% was highest, while that of inorganic fertilizer was low during the successive periods of the experiment. The same author suggested that the low condition factor of inorganic fertilizer could mainly be due to be the inadequate feeding.

Fish yield: Averages of initial and final fish weight and length. The total fish weight per feddan as well as the total gain in fish per feddan are presented in (Table 8). The results indicated that the total biomass per feddan at the beginning of the experiment at the start was almost similar and differences among treatment groups were very slight. At the end of the experiment averages of total fish weight per fed for the experimental groups PM, PM+DM, PM+F, PM+DM+F, DM, DM+F and F were found to be 855, 854, 1175, 1342, 1091, 1192 and 1154 kg, respectively.

Averages of total weight gain per fed calculated as percentage of total gain for the group PM+DM+F (100%) were found to be 63.28, 63.35, 81.11, 85.85, 87.43, and 88.65% for the experimental groups PM, PM+F, PM+DM+F, DM, DM+F and F, respectively (Table 8 and 7). These results indicated that manuring common carp ponds with both poultry and duck manure combined with applying artificial feeds. It seems that duck manure alone or plus artificial feed tended to increase the total gain in fish yield indicating that duck manure is better utilized in common carp ponds as fertilizer or fish feed compared by poultry manure. These results are in agreement with those reported by Nayak and Mandal (1990) who found that increasing the rate of cow manure from 1.2 to 3 ton/ha in ponds of common carp. Zhu *et al.*, (1990) showed that total yield of ponds cultured with silver carp and big head carp increased and the increase in yield was proportional to the amount of

Table (7) : Effect of source of manure with or without artificial feeding on condition factor of common carp.

Treatment	4W Mean±S.E	8W Mean±S.E	12W Mean±S.E	16W Mean±S.E	20W Mean±S.E	22W Mean±S.E	0-22W Mean±S.E
	b	d	e	a	b	a	a
PM	1.61±0.05	1.24±0.08	0.91±0.03	1.66±0.21	1.77±0.51	1.52±0.07	1.68±0.03
	a	bc	bc	abc	b	bc	b
PM+DM	1.98±0.04	1.70±0.09	1.36±0.16	1.45±0.31	1.73±0.03	1.32±0.15	1.24±0.15
	ab	a	bc	ab	b	b	c
PM + F	1.67±0.02	2.1±0.11	1.29±0.18	1.55±0.23	1.77±0.01	1.39±0.05	1.15±0.19
	b	c	b	bc	a	bc	c
PM+DM+F	1.62±0.07	1.77±0.12	1.60±0.05	1.43±0.27	2.07±0.15	1.24±0.07	1.17±0.18
	a	d	bc	c	c	a	c
DM	1.83±0.03	1.08±0.04	1.37±0.08	1.16±0.18	1.52±0.14	1.59±0.21	1.16±0.21
	b	ab	b	abc	c	b	b
DM + F	1.62±0.01	1.91±0.03	1.61±0.13	1.43±0.17	1.42±0.17	1.42±0.12	1.24±0.08
	b	c	a	ab	a	bc	B
F	1.63±0.06	1.65±0.02	2.05±0.26	1.56±0.02	2.11±0.18	1.26±0.07	1.25±0.17

* Means with the same letter in each column are not significantly different (P<0.05).

Table (8) : Effect of different manures system with or within artificial feeding on body weight gain and total yield of common carp.

Treatment	Initial fish number	Average fish weight the start (gm)	Initial total weight (kg / f)	Average final fish weight (gm)	Average initial fish length (cm)	Average final fish length (cm)	Average gain weight (gm)	Total fish yield at harvesting (kg)	Average given in weight fish (kg)	% of total gain bond on that of treatment
PM	6000	2.04	12.2	142.58	5.05	20.40	140.54	855	842	63.35
PM+DM	6000	2.06	12.3	142.41	5.12	22.59	140.35	854	841	63.28
PM+F	6000	2.05	12.3	195.85	4.97	25.69	193.8	1175	1162	87.43
PM+DM+F	6000	2.05	12.3	233.80	5.02	26.78	221.75	1342	1329	100
DM	6000	2.17	12.0	181.88	4.91	24.89	179.71	1091	1078	81.11
DM+F	6000	2.05	12.3	198.80	5.02	25.23	196.75	1192	1177	88.65
F	6000	2.08	12.4	192.48	5.03	23.05	190.40	1154	1141	85.85

Table (9) : Effect of source of manure with or without artificial feeding on water quality of ponds which cultured stocked with common carp.

Treatment	Temperature °C	DO mg / l	pH	SD cm	Sal. ppt	Total alk mg / l	NH_3 Mg / l	PO_4 Mg / l
PM	29	5.1	8.68	17.1	1..2	343	0.22	0.18
PM+DM	29	4.9	8.34	16.5	1.3	364	0.31	0.26
PM+F	29	4.6	8.12	15.3	1.13	366	0.41	0.21
PM+DM+F	29.4	4.3	8.01	14.7	1.3	416	0.42	0.32
DM	29.1	5.2	8.59	16.9	1.25	343	0.21	0.13
DM+F	29.2	4.6	8.13	15.1	1.24	350	0.26	0.15
F	29.2	4.2	8.02	21.8	1.23	315	0.39	0.12

manure applied over the range 0-48 kg dry weight manure/ha/day.

Chemical composition: As presented in (Table 9) average of moisture content in the whole fish body at start of the experiment was found to be 79.15%. At the end of the experiment averages of moisture content for the groups PM, PM+DM, PM+F, PM+DM+F, DM, DM+F and F were 79.09, 79.84, 79.92, 79.72, 81.56, 79.46 and 78.32%, respectively. Results of moisture content in the whole fish body revealed that DM group showed that the highest value. Dry matter content in the whole fish body showed the reverse trend compared to the moisture. F group showed significantly ($P<0.05$) higher content 21.67% and DM group showed the lowest value (18.44%). In this connection, Abdel-Aal (1996) showed that the highest value for dry matter was found of medium protein diet (19.72% CP), while the lowest was recorded by the organic fertilizer group (rabbit manure). Mahmoud (1997) reported that neither manuring level nor stocking density seemed to have a significant ($P<0.05$) on dry matter.

Results of protein content in the whole body weight revealed that DM+F group showed significantly ($P<0.05$) higher protein content, while group PM+F showed the lowest value (Table 9). This results are in partial agreement with the results obtained by Abdel-Aal (1996) who reported that the crude protein in the dry matter of common carp bodies decreased with advanced age. Mahmoud (1997) found that regardless of stocking density, averages of crude protein content in the whole fish body as affected by level of manuring were increased significantly ($P<0.05$) with each increase in manuring level.

Averages of fat content in whole fish body at the end of the experiment were highest in the group F followed in a decreasing order by the DM, PM+DM+F, PM+F, DM+F, PM and PM+DM groups, respectively (Table 9). Analysis of variance for fat content in the whole body indicated that differences among the experimental groups were significant ($P<0.5$). Averages of ash content of PM+DM group showed significantly ($P<0.05$) higher body ash, while groups DM and F had the lowest values (Table 9). Mahmoud (1997) showed silver carp grew in ponds manured with 300 kg/fed had significantly ($P<0.05$) higher ash content in their whole body compared to other manuring.

Water quality parameters: Obser-vations on physio-chemical characters of water quality of water are shown in Table 10. The results indicated that there is a slight increase in water temperature with group PM+DM+F due to the activation of biological process in water containing different sources of manure and artificial feed. Temperature considerably influences the vital activities of fish notably their feeding growth and reproduction. This is due to the fact that fish body temperature varies according to the change in the temperature of environment, which being almost the same as that of their environment (Huet, 1972). Average water temperature was 29.10 ± 2 and this is beneficial to fish growth and production. This results agrees with those reported by Jhingran and Pullin (1985) who found that the optimum growth temperature was 23.3 °C for common carp and 30-31°C for silver carp. They reported that silver and grass carp grew poorly at temperature below 20°C and show poor appetite and stopped feeding at 10 to 15°C, respectively.

The dissolved oxygen varied between 5.2 ppm in group DM and 4.2 ppm for group F (Table 10).This range is beneficial to fish cultivation and agrees with finding of Lagler (1959) who showed that water containing 4 to 5 ppm

Table (10) : Effect of source of manure with or without artificial feeding on water quality of ponds which cultured stocked with common carp.

Treatment	Temp. °C	DO Mg/l	pH	SD cm	Sal. ppt	Total alk mg/l	NH_3 mg/l	PO_4 mg/l
PM	29	5.1	8.68	17.1	1.2	343	0.22	0.18
PM+DM	29	4.9	8.34	16.5	1.3	364	0.31	0.26
PM+F	29	4.6	8.12	15.3	1.13	366	0.41	0.21
PM+MD+F	29.4	4.3	8.01	14.7	1.3	416	0.42	0.32
DM	29.1	5.2	8.59	16.9	1.25	343	0.21	0.13
DM+F	29.2	4.6	8.13	15.1	1.24	350	0.26	0.15
F	29.2	4.2	8.02	21.8	1.23	315	0.39	0.12

of oxygen was suitable for fish farming. On the other hand, Batterson *et al.*,(1988) reported that increasing in the level of chicken manure from 12.5 to 25.50 and 100 g/m2/week in tilapia ponds resulted in a decreased in D.O. contents in the top, middle and bottom of water and this decrease in D.O. was related to the level of manure.

As presented in (Table 10) averages of pH values as affected with manuring type and artificial feed indicate that increasing poultry manure or duck manure caused a slight increase in pH values of the ponds. This results are in partitial agreement with the finding of Mahmoud (1997) who found a linear increase in the water pH with each increase in manuring levels.

The highest value of total alkalinity (416 mg $CaCo_3$/L) was of treatment by PM+DM+F, while the lowest (315 mg $CaCo_3$/L) was for F group. Stickney *et al.,* (1979) and Mahmoud (1997) reported that the increasing of total water alkalinity with each increase in the level of manuring.

As presented in (Table 10) averages of secchi disk depth for PM, PM+DM, PM+F, PM+DM+F, DM, DM+F and F were found to be 17.1, 16.5, 15.3, 14.7, 16.9, 15.1 and 21.8, respectively. These results indicated that type of fertilzer (poultry manure or duck manure) had no influence on secchi disk depth. In this connection, Bok and Jongblodd (1984) reported that increasing poultry manure from 30 to 428 kg dry manure/ha/day as well as the stocking density decreased the secchi disk visibility; this due to the high algae growth un the rich fertilized ponds.

Table 10 showed that there were no influence on water salinity at using neither poultry manure and duck manure fertilizers nor artificial feed. Mahmoud (1997) reported that the higher manuring levels caused a slight increase of water salinity.

Averages of ammonia concentration (NH_3) as affected with poultry, duck manure and artificial feeding were 0.22, 0.31, 0.41, 0.42, 0.21, 0.26 and 0.39 for groups PM, PM+DM, PM+F, PM+DM+F, DM, DM+F and F, respectively. These results indicated that there was a slight increase in the trait of poultry manure + duck manure + artificial feed (0.42 mg/l). Robinette (1976) concluded that the toxic levels for unionized ammonia for short term exposure usually lie between 0.6 to 2 mg/l for pond fish; and sub-lethal effect occur at o.1 to 0.3 mg/l. Also, Sims (1986) found that ammonia is the common form of inorganic nitrogen in chicken manure with NH_3-H comprising approximately 30% by weight of the total nitrogen present.

As presented in (Table 10) average of available phosphorus (PO_4) for groups PM, PM+DM, PM+DM+F, DM, DM+F and F were 0.18, 0.26, 0.21, 0.32, 0.13, 0.15 and 0.12, respectively. These results show that both group PM+DM and PM+DM+F increased PO_4 than the other treatments. Results of Fortes *et al.,* (1986) showed that the available phosphorus was significantly ($P<0.01$) highest in chicken manure feed combination. They added that there are indications that phosphorus content of chicken manure increased in the soil, although total phosphorus in the soil contributed only about 0.8% of that in water.

Plankton concentration (organisms/ liter): Averages of phytoplankton count (cell/ml) during April , May, June, July, August and September for all experimental ponds are presented in (Table 11). The highest count of phytoplankton during April was obtained by the PM+DM+F followed in a decreasing order by PM+DM, DM+F, PM+F, PM, DM and F. During May high count of phytoplankton was also obtained

Table (11) : Effect of source of manure with or without artificial feeding on phytoplankton density (organisms / L) of common carp ponds.

Treatment	April	May	June	July	August	Sept.
PM	692	742	1112	2692	2788	2690
PM+DM	688	712	1211	2776	2802	2662
PM+F	763	873	1478	2882	3806	2702
PM+DM+F	102	1112	2662	3886	3966	3766
DM	632	724	1102	2599	2707	2688
DM+F	783	802	1309	2852	3814	3656
F	682	612	719	884	816	722

Table (12) : Effect of source of manure with or without artificial feeding on zooplankton density (organisms / L) of common carp ponds.

Treatment	April	May	June	July	August	Sept.
PM	18	24	53	96	102	191
PM+DM	21	28	92	118	136	112
PM+F	19	26	58	101	112	106
PM+DM+F	28	56	112	158	162	121
DM	18	28	38	131	113	117
DM+F	20	36	82	153	189	210
F	10	14	18	50	66	54

Table (13) : Effect of source of manure with or without artificial feeding on economical efficiency for common carp.

Treatment	Amount of feed and fertilizer				Costs of pond				Costs of fry	Total costs and other	Total costs	Fish prod / fed.	Price of one kg. fish	Total income	Net. reve-neowe	Net rev. as % of the lowest (L.E)
	PM (m^{-3})	DM (m^3)	Feed (kg)	Tot. (m^3)	PM (m^{-3})	DM (m^3)	Feed (kg)	Tot. (m^3)	(L.E)	(L.E)	(L.E)	(Kg)	(L.E)	(L.E)	(L.E)	
PM	13	-	-	13	520	-	--	520	120	100	740	855	3.75	3206	2466	82.66
PM+DM	6.5	5.5	-	12	260	220	--	480	120	100	700	854	3.75	3202	2502	83.87
PM+F	13	-	964	13	520	-	964	1484	120	125	1729	1175	3.75	4406	2677	89.74
PM+DM+F	6.5	5.5	1324	12	260	229	1324	1804	120	125	2049	1342	3.75	5032	3983	100
DM	-	11	-	11	-	440	--	440	120	100	660	1054	3.75	4091	3651	122.39
DM+F	-	11	1147	11	-	440	1146	1586	120	125	1811	1192	3.75	4470	2639	88.46
F	--	-	1335	-	-	-	1335	1335	120	75	1530	1154	3.75	4328	2798	93.80

by PM+DM+F. The same trend was observed during June and July. During August and September highest count of phytoplankton was observed for DM+F. It could be concluded that phytoplankton concentration increased linearly with increase inputs (manure and feed).

Results presented in (Table 12) showed that zooplankton concentration during all tested periods decreased with decreased inputs. Averages of zooplankton counts in ponds water showed increase from April to September. During April highest zoolplankton concentration was obtained by group PM+DM+F. The same trend was observed during May, June, July, August and September. These results indicated in general that group PM+DM+F showed the highest concentration of zooplankton count during the experimental period.

Economic evaluation: Averages of fertilizer and feed amounts were presented in (Table 13). Results illustrated in this Table indicated that total costs in the form of fertilizer alone, mixed, or with and without artificial feed were found to be 520, 480, 1484, 1804, 440, 1586, 1335 LE for the groups PM, PM+DM, PM+F, PM+DM+F, DM, DM+F, and F, respectively. These results indicated that group PM+DM+F had the highest input costs followed by DM+F, PM+F, PM, PM+DM and DM in a descending order, respectively. These results may indicate that applying the supplementary feeding with or without manure tended to increase the cost drastically. The same results were observed with the total cost including fertilizers, feed, fry and labor costs.

Averages of total income per pond for PM, PM+DM, PM+F, PM+DM+F, DM, DM+F, and F were found 3206, 3202, 4406, 5032, 4091, 4470 and 4328 LE, respectively (Table 13). The results indicated that total income per feddan was the highest of group PM+DM+F followed by DM+F, PM+F, DM and PM+DM groups, respectively. As presented in the same Table, the highest net revenue was obtained by DM group followed by PM+DM+F, F, PM+F, DM+F, PM+DM and PM groups, respectively. In this respect, Abdel-Aal (1996) found that the organic fertilizer (rabbit manure) was the cheapest in cost, and the highest revenue.

In conclusion fertilize pond with poultry manure + duck manure + feed was the optimum in term of growth performance and total production, but the group of duck manure only was the best in term of net revenue.

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اثر استخدام التسميد والتغذية الصناعية على أداء اسماك المبروك العادى

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٢ – المعمل المركزى لبحوث الاسماك بالعباسة – مركز البحوث الزراعية

اجريت هذة الدراسة باحواض التجارب بالمعمل المركزى لبحوث الاسماك بالعباسة. استخدمت ٧ احواض ترابية مساحة الحوض الواحد فدان . عمق المياه فى الاحواض ١متر. استخدمت اصبعيات المبروك العادى فى هذة التجربة التى استمرت ٢٢ اسبوع. اشتملت الدراسة ٧ معاملات كالاتى:

١–التسميد بزرق الدواجن.
٢–التسميد بزرق دواجن + زرق بط.
٣–التسميد بزرق الدواجن + غذاء صناعى.
٤–التسميد بزرق دواجن +زرق البط + غذاء صناعى.
٥–التسميد بزرق البط.
٦–التسميد بزرق البط + غذاء صناعى.
٧–العلف الصناعى.

كان السماد يتم نثره فوق سطح الاحواض مرة واحدة كل اسبوع بمعدل ١٥٠ كجم/فدان/اسبوع والتغذية مرتين فى اليوم بعلف صناعى ٢٥% بروتين خام. اخذت عينات الاسماك كل اربعة اسابيع (٥٠ سمكة من كل معاملة لاخذ قياسات النمو) المتمثلة فى (الوزن والطول لكل سمكة على حدة).

اسفرت النتائج علىان سجلت المجموعة الرابعة المتمثلة فى زرق الدواجن + زرق البط + الغذاء الصناعى اعلى معدل نمو واعلى انتاجية. ومن تحليل البيانات اتضح ان اسماك المجموعة الرابعة اطول المجموعات تلتها المجموعة الثالثة ثم السادسة والسابعة. سجلت المجموعة الرابعة (زرق دواجن + زرق بط + غذاء صناعى) اعلى نسبة فى الغذاء الطبيعى المتمثل فى الفيتوبلانكتون والزوبلانكتون.

يستنتج من هذة الدراسة ان افضل معاملة هى المجموعة الرابعة وذلك من حيث النمو والانتاجية العالية. بينما المعاملةالخامسة (التسميد بزرق البط) كانت افضل من حيث التكاليف ونسبة الارباح.