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EFFECT OF POULTRY DRY MANURE (PDM) LEVELS ON SILVER CARP (*HYPOPHTHALMICHTHYS MOLITRIX*) PERFORMANCE

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Abstract

This study was carried out to investigate the effect of level of poultry manure and stocking density on growth performance of silver carp (*Hypophthalmichthys molitrix*). Six recangle earthen ponds, each of a total area of about 0.25 feddan (50 x 20 m) representing six treatmens (3 levels of poultry manure 150, 300 and 450 kg/feddan/week within each two stocking densities 3200 and 4800 fish/feddan), were used in this study. The experiment expanded 20 weeks.

Results obtained showed that average body weight and body length of silver carp fish during the experiment increased with increasing poultry manure levels and the increase was more pronounced at lower stocking density (3200 fish/feddan). Analysis of variance showed that the differences between average body weight and body length were significant (P<0.05). Other growth performance parameters are also discussed. In general, results indicated that body weight of silver carp increased within each manuring level as the stocking density decreased the increase in this trait was more pronounced at higher manuring levels. The same trend was observed for body length. Body weight gain increased with increasing manuring level. The results indicated that fish grow better at lower stoking density (3200 fish/fed). The results indicated that increasing manuring level results in an improvement in SGR. Increasing stocking density led to decrease SGR. Generally, the results indicated that level of manuring and stocking density seemed to have no influence on condition factors.

INTRODUCTION

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

Tang (1970) classified silver carp as phytoplankton and micro-zooplankon feeders. Bardach *et al.* (1972) reporteed that silver carp feed on phytoplankton in mid water, and are the most commonly stocked phytoplankton feeders. Cremer and Smitherman (1980) found that the silver carp growth was similar in both fertilized ponds and ponds receiving feed. Schroeder (1978) reported that rate of growth and stocking density were correlated with fish yield.

The main sources of fertilizers used in semi-intensive aquaculture systems are the manures from livestock manure, human sewage and chemical fertilizer. Animal manure is considered to be better than inorganic ferilizer for promoting the growth of plankton and benthic food orgaisms in fresh and brackish water ponds.

Animal manures have been used as ferttilizers in fish production throughout the world, especially in tropical and subtropical regions (Lovshin *et al.*, 194, Miller, 195, and Wohlfarth and Schroeder, 1979). These widespread inttegrated systems include livestock-fish, fowl fish, and rice fish cultures. The use of integrated fish farming ponds seems to be very effective and well-balanced methods of fish cultture (Braaten, 1991). These ponds can be regarded as semi-intensive systems because significant fish nurients are derived in ponds from internal produced natural feed which is dependent on ferilization (Pekar, 1994).

Poultry manure provides an inexpensive source of organic matter, which can stimulae all trophic levels. However, aquaculture species that grow and survive best in high-nutrientt environments are of a low trophic level and are able to consume directly animal wastes, and can withstand suboptimal water quality conditions (Buck *et al.*, 196).

This study was conducted to investigate the effect of increasing levels of poultry manure on growth performance of silver carp, at different stocking densities.

MATERIALS AND METHODS

This study was conducted at the Central Laboratory for Aquaculture Research (CLAR), Agricultural Research Centre. It was carried out in order to investigate the effect of applying poultry dry manure (PDM) at different levels, as well as, stocking density on growth performance of silver carp, *Hypophthalmichthys molitrix*. Six rectangle earthen ponds each of a total area of about 0.25 Feddan (Fed) (50x20 m), representing six treatments [3 levels of poultry manure (M) within each of two stocking densities, (SD] were used in this study. The three levels of manuring were 150, 300 and 450 kg/fed (40, 80 and 120 kg/pond) weekly. Within each level of manuring two socking densities of silver carp were tested i.e. 3200 fish/fed and 4800 fish/fed (800 and 1200 fish/pond). The water depth of the experimental ponds was kept almost at 100 cm. The experiment started on the 15th May and ended on the 15th October 1994. Average weight of silver carp was 5.36 g at the experimental start.

Random samples of fish (50 fish each reatment) were taken once every two weeks during the whole experimental period. Individual body weight to the nearest gramme and fish length to nearest cm were recorded for each sample. There thereafter the fish were returned to their experimental ponds. Based on data of body weight and body length, the following parameters were estimated:

Daily gain = W2-W1/T, where W1=initial weight, W2=final weight, T=period in days.

Specific growth rate (SGR) = Ln W2-LnW1/TT, where Ln=antilog, W1=initial weight, W2=final weight (Jauncey and Rose, 1982).

Condition Factor (K) = W/L3x100, where W=body length. (Largler, 1959).

Relative growth rate (RGR) = W2-W1/W1, where W1=initial weight, W2=final weight.

At the end of the experimental period (5 months), ponds were drained from water and all fish in ponds were harvested by seining.

Quality of pond water was checked once a week to determine temperature, pH, Secchi disk reading, dissolved oxygen, ammonia, salinity, total alkalinity, total hardness, total phosphorus, ortho phosphorus, phytoplankton and zooplankton according to Boyd (1979). Secchi disk visibility was used to determine availability of natural food in ponds.

The two ways analysis of variance was applied on the collected data according to Harvey (1990) and differences between means were tested for significance according to Duncan's multiple range tests as described by Duncan (1955).

RESULTS AND DISCUSSION

Effect of level of poultry manure and stocking density on performance of silver carp

1. Body weight

Average of body weight of silver carp fish reattment M1SD1 (150 kg poultry manure and 3200 fish/fed), M1SD2 (150 kg manure and 4800 fish/fed, M2SD1 (300 kg poultry manure and 3200 fish/fed)), M2SD2 (300 kg poultry manure and 4800 fish/fed), M3SD1 (450 kg manure and 3200 fish/fed), and M3SD2 (450 kg manure and 4800 fish/fed) are presened in Table 1. Analysis of variance showed that differences in body weight two weeks after the experimental start, were insignificant. The same trend was observed at 4 weeks after experimental start. Six weeks after experimental start, averages body weight for the experimental groups were 107.72, 97.18, 126.38, 115.90, 159.22 and 136.86g for M1SD1, M1SD2, M2SD2, M2SD1, M2SD2, M3SD1 and M3SD2, respectively. Analysis of variance for body weight at this period revealed that differences among the treatments were significant (P<0.05) for the favour of higher manuring levels at lower stocking densities (M3SD1).

After 10 weeks of the experimental start, averages of body weight for the same groups cited before were 170.70, 142.28, 211.90, 185.96, 302.02 and 249.0 g, respectively. The statistical evaluation of the results showed that differences in body weight among the experimental groups were significant (P<0.05). At this period the group M3SD1 gave the highest body weight, and the lowest was obtained also by M1SD2.

Analysis of variance showed that groups M3SD1 and M3SD2 had significant (P<0.05) heavier body weight at 12 weeks after the experimental start as compared to all other groups. Results showed also that M1SD2 group had significantly (P<0.05) the lowest body weight as compared with the other treatments after 12 weeks of the experimenttal start, however, differences among groups M1SD1, M2SD1, M2SD2 and M3SD2 were significant (P<0.05).

In general, results of body weight after 12 weeks of the experimental start indicated that body weight increased as the stocking density decreased within each manuring level. Also, these results showed that body weight increased with each increase in manuring level.

At 14 weeks after the experimenal start, the statistical analysis of the results showed that M3SD1 group had significantly (P<0.05) heavier body weight as compared to the other treatment groups, followed in a decreasing order by M_2SD^1, M2SD2, M1SD1 and M1SD2, respectively. These results indicated that increasing the manuring level from 150 to 450 kd/fed increased significantly (P<0.05) average body weight when applied at lower stocking density. The same trend was observed at 16 and 18 weeks after the experimental start.

At the end of the experimental period, i.e. 20 weeks after start, averages final body weight for the same groups cited before were found to be 322.50, 269.30, 398.94, 350.98, 586.00 and 506.06 g, respectively, (Table 1). The statistical analysis of the results showed that the group M3SD1 had significantly (P<0.05) the highest final body weight. These results indicated that, final weight of silver carp increased within each manuring level as the stocking density decreased, and the increase in this trait was pronounced at higher manuring levels.

Regardless of stocking density, averages of body weight as affeced by manuring level during all intervals increased significantly (P<0.05) with each increase in the level of manuring from 150, 300 to 450 kg of poultry manure per fed (Table 2).

Averages of the final weights (20 weeks after experimental start) were 295.90, 374.96 and 546.17 g for manuring levels 150, 300 and 450 kg poultry manure/fed, respectively, (Table 2). Analysis of variance for final body weight as affected with manuring level, regardless of stocking density, showed that, final body weight increased significantly (P<0.05) with each increase in the level of applying poultry manure to the ponds of silver carp.

These results may lead us to recommend applying the poultry manure in silver carp ponds at a level of 450 kg/fed every week in order to improve the growth performance of this fish species. These results are in partial agreement with the finding of Hickling (1962), who reported that, increasing the rate of application of organic fertilizer (cow dung) enhanced the growth rate of fish. The same author added that, better growth of fish was observed with higher rate of manure application. Results presented in Tables 1 and 2 are also in accordance with those obtained by Pullin and Shehadeh (1980) who repored that, application of poultry manure to common carp ponds cultured in monoculture system increased the fish production. In this connection, Batterson *et al.* (1988) reported that, yield of Nile Tilpia at the final harvest increased linearly with increasing the level of application of chicken manure from 12.5, 25.0, 50.5, to

100.0g/m3/week in earthen ponds.

Results presented in Table 3 showed that, regardless to the level of manuring, averages of body weight of silver carp decreased significantly (P<0.05) with increasing stocking density at all experiments. Averages of final weights after 20 weeks of the experimenal start were 435.91 and 375.45 g for stocking density 3200 and 4800 fish/fed, respectively. Analysis of variance showed that, fish kept at lower density had significantly (P<0.05) higher final weights as compared with those stocked at higher densitry, regardless of level of manuring. These results are in agreement with the findings of Rappaport and Sarig (1979) who showed that, reduction of stocking density of carp from 40000 to 20000 fish/ha resulted in increased individual daily growth rate of up to 55% and a drop of 17-33% in feed conversion ratio. The same authors reported also, that the density of 4000 fish/ha in comparsion with the higher density of 2000 resulted in 6% drop in daily growth increment per unit area. The same trend was also observed by Kwang and Williams (1992) who reported that, growth of Nile Tilapia decreased with increased stocking density. They showed also, that, the optimal density for better harvesting weights and fish size is 2 fish/m3. Results presented in Table 3 are also in accordance with finding of Suresh and Kewilin (1992) who showed that, increasing the stocking density of red Tilapia reared in recirulared water system from 50, 100, and 200 fish/m3 resulted in linear decrease in daily weight gain

2. Body length

As presented in Table 4, average of body length (cm) at the experimental start was 19.28 cm for all groups indicating the complete homogeneity of the experimental groups at the start. Differences among the experimental groups were not significant (P>0.0 till 8 weeks after the start of the experiment. Averages of body length after ten weeks after of the experimental start for groups M1SD1, M1SD2, M2SD1, M2SD2, M3SD1 and M3SD2 were 24.88, 23.80, 26.70, 26.70, 30.38 and 28.40 cm, respectively. The analysis of variance of the results this period indicated that, the M3SD1 groups had significantly (P<0.05) superior body length compared to the other groups, followed by the M3SD2 group.

The same trend was observed during the following periods indicating that higher manuring level at lower stocking density leads to significant improvement in body length development.

Regardless of stocking density, averages of body length, as affected by manuring level differ insignificantly among manuring levels at the start and two weeks thereafter. As presented in Table 5, averages of body length at the periods 6-20 weeks after the experimental start, as affected by level of manuring increased significantly (P<0.05) with each increase in the level of poultry manre application. After 10 weeks of the start, averages of body length for manuring levels 150, 300 and 450 kg/fed were found to be 24.30, 26.55 and 29.31 cm, respectively. At the end of the experimental period, they were 30.39, 33.30 and 40.20 cm, respectively. Analysis of variance for body length at the end of the experimental period revealed that, body length of silver carp increased significantly (P<0.05) with each increase in the level of manuring, regardless of stocking density. These results may lead to the conclusion that, manuring the silver carp ponds with poultry manure at higher rates increased significantly (P<0.05) the growth performance in gerneral and specifically body length; and the increase in body length was more pronounced at higher level of poultry manure application.

Regardless of level of manuring, averages of body length, as affected with stocking density showed insignificant effect on body length, although silver carp stocked at lower density showed longer bodies as compared to those stocked at higher density. During the following periods, fish stocked at lower density (3200 fish/fed) showed significantly (P<0.05) longer body length compared to those stocked at higher density (4800 fish/fed), regardless of manuring level (Table 6).

Results of body length as affected with stocking density behaved parallel to those of body weight, regardless, of manuring level. In this connection, Swingle (1966) noted that the rate of stocking of fish is an extremely important factor at all levels of fish production. He added that, if few fish were stocked, the results were large fish with low yield, however, at very high stocking densities the results may be high yield of fish with small undesirable size.

Results presented in Table 6 are in agreement with the finding of Snow (1983) who reported that, increasing the stocking density from 17800 to 141000 fish/ha resulted in a decrease in body length from 9.4 cm to 6.8 cm, respecively.

Daily weight gain (DWG)

At all the periods, the M3SD1 group was superior in daily gain in weight as compared with the other groups (Table 7). These results indicatted that daily gain of silver carp increased with each increae in the level of manuring, and the increase was more pronounced at lower density. Regardless of stocking density, daily gains of silver carp as affected with the level of manuring during all experimental periods were the highest for the group of the highest manuring rate (450 kg/fed), followed in a decreasing order by those received 300 and 150 kg/fed, respectively (Table 8).

Regardless of level of manuring, the averages daily gain in weight as affected by stocking density during all experimental period were 2.40 and 2.00 for stocking 3200 and 4800 fish/fed, respectively, (Table 9). These results indicated that fish grow better at lower density as compared with the higher one. These results are in agreement with those reported by Wyban *et al.* (1987) who showed that the average individual growth rates were negatively correlated with stocking density.

Specific growth rate (SGR)

Average of specific growth during the experimental periods for the experimental groups are presented in Table 10. The averages of SGR during the whole experimental period for the groups were 0.97, 0.85, 1.11,1.03,1.37 and 1.27 for M^1SD1,. M^1SD2,. M^2SD1, M^2SD2,. M^3SD1,. and M^3SD2, respectively. These results indicated that, SGR in general, increased linearly with each increase in level of manuring, however, the increase was more pronounced at lower stocking densities.

The averages of SGR during the whole experimental period as affectted with level of manuring, regardless of stocking density, were 0.91, 1.07 and 1.32 for manuring levels 150, 300 and 450kg/fed, respectively. These results indicated that, increasing manuring level resulted in an improvement in SGR (Table11).

Averages of specific growth rate as affected with stocking density, regardless of level of manuring during the whole experiment were 1.15 and 1.05 for stocking densities 3200 and 4800 fish/fed, respectively, (Table 12).

These results indicated that, increasing stocking density of carp resulted in decreased specific growth rate at almost all periods studied except at 12,14,16, and 18 weeks after experimental start. These results are in accordance with those reported by Wallace and Kolbeinshavn (1988), who found that the changes in the SGR during their experiment indicated that, the increase in denities and size influenced the fish growth, and, consequently, growth parameters like SGR.

Relative growth rate (RGR)

Average of RGR for the experimental groups during all experimental period are given in Table 13. Results presented in this Table indicated that, highest RGR values for almost all-experimental groups were those of M3SD1 obtained during the period from the 30 th of May to 15 th of August, i.e 2 to 12 weeks.

Table 1. Effect of levels of poultry manure and stocking density on body weight development of silver carp.

Treatment	Start Mean±S.E	2/w Mean±S.E	4/w Mean±S.E	6/w Mean±S.E	8/w Mean±S.E	10/w Mean±S.E	12/w Mean±S.E	14/w Mean±S.E	16/w Mean±S.E	18/w Mean±S.E	20/w Mean±S.E
MISDI	75.36±0.82 ^{a}	81.10±0.82 ^{e}	93.12±0.88 ^{e}	107.72±0.96 ^{e}	133.18±0.95 ^{e}	170.70±1.01 ^{e}	206.50 ±1.08 ^{e}	244.68±1.57 ^{e}	272.84±1.27 ^{e}	301.08±1.7 ^{e}	322.5±1.59 ^{e}
MISD2	75.36±0.82 ^{a}	78.72±0.82 ^{ef}	85.82±0.88 ^{f}	97.18±0.96 ^{f}	118.08±0.95 ^{f}	142.28±1.01 ^{f}	172.20±1.08 ^{f}	205.72±1.57 ^{f}	233.76±1.27 ^{f}	254.6±1.7 ^{f}	269.3±1.59 ^{f}
M2SDI	75.36±0.82 ^{a}	85.7±0.82 ^{efc}	103.84±0.88 ^{ec}	128.38±0.96 ^{c}	164.02±0.95 ^{c}	211.90±1.01 ^{c}	157.56±1.08 ^{c}	300.12±1.57 ^{c}	337.08±1.27 ^{c}	369.64±1.7 ^{c}	398.94±1.59 ^{c}
M2SD2	75.36±0.82 ^{a}	83.1±0.82 ^{efcd}	98.10±0.88 ^{ecd}	115.90±0.96 ^{d}	146.6±0.95 ^{d}	185.96±1.01 ^{d}	224.90±1.08 ^{d}	262.48±1.57 ^{d}	293.96±1.27 ^{d}	323.92±1.7 ^{d}	350.98±1.59 ^{d}
M3SKI	75.36±0.82 ^{a}	93.06±0.82 ^{a}	117.18±0.88 ^{a}	159.22±0.96 ^{a}	226.44±0.95 ^{a}	302.02±1.01 ^{a}	372.32±1.08 ^{a}	438.98±1.57 ^{a}	493.24±1.27 ^{a}	539.48±1.7 ^{a}	586±1.59 ^{a}
M3SD2	75.36±0.82 ^{a}	88378±0.82 ^{b}	108.34±0.88 ^{b}	136.86±0.96 ^{b}	184.86±0.95 ^{b}	249.70±1.01 ^{b}	314.22±1.08 ^{b}	375.7±1.57 ^{b}	424.7±1.27 ^{b}	468.62±1.7 ^{b}	50606±1.59 ^{b}

Values in the same column having the same suerscript letters are not significantly differnt ($P<0.05$)

Table 2. Effect of manuring levels on body weight of silver carp regardless of stocking density.

Treatment	Start Mean±S.E	2/W Mean±S.E	4/W Mean±S.E	6/W Mean±S.E	8/W Mean±S.E	10/W Mean±S.E	12/W Mean±S.E	14/W Mean±S.E	16/W Mean±S.E	18/W Mean±S.E	20/W Mean±S.E
M1	75.36 ± 0.82^{a}	79.91 ± 0.58^{c}	89.19 ± 0.63^{c}	102.45 ± 0.68^{c}	125.63 ± 0.67^{c}	156.49 ± 0.72^{c}	189.35 ± 0.76^{c}	225.20 ± 1.11^{c}	253.3 ± 0.9^{c}	277.89 ± 1.2^{c}	295.9 ± 1.13^{c}
M2	75.36 ± 0.82^{a}	84.40 ± 0.58^{b}	100.97 ± 0.63^{b}	121.14 ± 0.68^{b}	155.21 ± 0.67^{b}	198.93 ± 0.72^{b}	241.23 ± 0.76^{c}	281.13 ± 1.11^{b}	315.52 ± 0.9^{b}	346.78 ± 1.2^{b}	374.96 ± 1.13^{b}
M3	75.36 ± 0.82^{a}	90.92 ± 0.58^{a}	112.76 ± 0.63^{a}	148.04 ± 0.68^{a}	205 ± 0.67^{a}	296.86 ± 0.72^{a}	343.27 ± 0.76^{a}	407.34 ± 1.11^{a}	458.97 ± 0.9^{a}	504.05 ± 1.2^{a}	546.17 ± 1.13^{a}

Values in the same column having the same suerscript letters are not significantly differnt ($P<0.05$)

Table 3. Effect of stocking density on average body weight of silver carp regardless of levels manuring.

Treatment	Start Mean±S.E	2/W Mean±S.E	4/W Mean±S.E	6/W Mean±S.E	8/W Mean±S.E	10/W Mean±S.E	12/W Mean±S.E	14/W Mean±S.E	16/W Mean±S.E	18/W Mean±S.E	20/W Mean±S.E
SD 1	a 75.36 ±0.82	a 86.62 ±0.82	a 104.72 ±0.51	a 131.11 ±0.55	a 174.71 ±0.55	a 192.65 ±0.58	a 278.79 ±0.62	a 327.93 ±0.91	a 367.72 ±0.73	a 403.4 ±1.0	a 435.91 ±0.92
SD 2	a 75.36 ±0.82	b 83.53 ±0.48	b 97.23 ±0.51	b 161.65 ±0.55	b 149.78 ±0.55	b 228.78 ±0.58	b 237.11 ±0.62	b 281.30 ±0.91	b 317.47 ±0.73	b 349.05 ±1.0	b 375.45 ±0.92

Values in the same column having the same superscript letters are not significantly different ($P<0.05$).

Table 4. Effect of levels of poultry manure and stocking density on body lengthdevelopment of silver carp.

Treatment	Start Mean±S.E	2/W Mean±S.E	4/W Mean±S.E	6/W Mean±S.E	8/W Mean±S.E	10/W Mean±S.E	12/W Mean±S.E	14/W Mean±S.E	16/W Mean±S.E	18/W Mean±S.E	20/W Mean±S.E
M1SD1	19.28^{a} ±0.1	19.88^{a} ±0.09	20.36^{a} ±0.13	23.36^{a} ±0.60	25.46^{a} ±0.53	24.88^{a} ±0.18	26.98^{c} ±0.6	29.08^{e} ±0.14	29.76^{e} ±0.16	30.92^{e} ±0.18	31.66^{e} ±0.28
M1SD2	19.28^{a} ±0.1	19.75^{a} ±0.09	19.78^{a} ±0.13	20.62^{a} ±0.60	22.88^{a} ±0.53	23.8^{b} ±0.18	25.25^{e} ±0.6	26.70^{f} ±0.14	26.7^{f} ±0.16	28.82^{f} ±0.18	29.02^{f} ±0.28
M2SD1	19.28^{a} ±0.1	19.86^{a} ±0.09	20.62^{a} ±0.13	23.92^{a} ±0.60	24.88^{a} ±0.53	26.7^{a} ±0.18	28.84^{c} ±0.6	24.88^{c} ±0.14	33.86^{c} ±0.16	34.85^{c} ±0.18	36.12^{c} ±0.28
M2SD2	19.28^{a} ±0.1	19.79^{a} ±0.09	20.94^{a} ±0.13	22.86^{a} ±060	25.52^{a} ±0.53	26.7^{a} ±0.18	27.47^{d} ±0.6	28.24^{d} ±0.14	24.74^{d} ±0.16	32.96^{d} ±0.18	33.98^{d} ±0.28
M3SD1	19.28^{a} ±0.1	20.5^{a} ±0.09	20.28^{a} ±0.13	24.34^{a} ±060	26.82^{a} ±0.53	30.38^{a} ±0.18	32.23^{a} ±0.6	34.46^{a} ±0.16	38.46^{a} ±0.16	39.46^{a} ±0.18	41.56^{a} ±0.28
M2SD2	19.28^{a} ±0.1	20.28^{a} ±0.09	20.82^{a} ±0.13	24.8^{a} ±0.60	26.8^{a} ±0.53	26.8^{a} ±0.53	30.08^{b} ±0.6	31.76^{a} ±0.14	36.54^{b} ±0.14	36.6^{b} ±0.18	38.96^{b} ±0.28

Values in the same column the same superscript letters are not significantly different ($P<0.05$).

Table 5. Effect of manuring levels on bodylength of silver carp regardless of stocking density.

Treatment	Start Mean±S.E	2/W Mean±S.E	4/W Mean±S.E	6/W Mean±S.E	8/W Mean±S.E	10/W Mean±S.E	12/W Mean±S.E	14/W Mean±S.E	16/W Mean±S.E	18/W Mean±S.E	20/W Mean±S.E
M 1	a 19.28 ±0.07	a 19.18 ±0.06	b 20.7 ±0.09	c 21.99 ±0.43	c 24.17 ±0.37	c 24.3 ±0.13	c 26.1 ±0.42	c 27.89 ±0.10	c 28.23 ±0.12	c 29.87 ±0.13	c 30.39 ±0.2
M 2	a 19.28 ±0.7	a 19.83 ±0.6	b 20.78 ±0.09	b 23.39 ±0.39	b 25.20 ±0.37	b 26.55 ±0.13	c 28.15 ±0.42	b 29.61 ±0.42	b 28.8 ±0.12	b 33.90 ±0.13	b 33.3 ±0.2
M 3	a 19.28 ±0.07	a 20.39 ±0.06	a 22.75 ±0.09	a 24.82 ±0.43	a 26.81 ±0.37	a 29.31 ±0.13	a 31.17 ±0.42	a 32.95 ±0.1	a 37.0 ±0.12	a 38.01 ±0.13	a 40.2 ±0.2

Values in the same column having the same superscript letters are not significantly different ($P<0.05$).

Table 6. Effect of stocking density on average body length of silver carp regardless of levels manuring.

Treatment	Start Mean±S.E	2/W Mean±S.E	4/W Mean±S.E	6/W Mean±S.E	8/W Mean±S.E	10/W Mean±S.E	12/W Mean±S.E	14/W Mean±S.E	16/W Mean±S.E	18/W Mean±S.E	20/W Mean±S.E
SD 1	a 19.28 ±0.06	a 20.08 ±0.05	a 21.98 ±0.08	a 22.14 ±0.35	a 25.72 ±0.31	a 27.32 ±0.1	a 29.36 ±0.35	a 31.4 ±0.08	a 34.03 ±0.09	a 35.07 ±0.11	a 36.61 ±0.16
SD 2	a 19.28 ±0.6	a 19.94 ±0.05	a 20.98 ±0.08	a 22.66 ±0.35	a 25.07 ±0.31	b 26.46 ±0.1	b 27.6 ±0.35	b 28.9 ±0.08	b 31.33 ±0.09	b 32.76 ±0.11	b 33.98 ±0.16

Values in the same column having the same superscript letters are not significantly different ($P<0.05$).

Table 7. Effect of levels of poultry manure and stocking dennsity on daily gain of silver carp.

Treatment	2/W	4/W	6/W	8/W	10/W	12/W	14/W	16/W	18/W	20/W	Average
M1SD1	0.38	0.80	0.97	1.74	2.50	2.39	2.54	1.87	1.88	1.43	1.65
M1SD2	0.22	0.47	0.75	1.39	1.6	1.99	2.23	1.87	1.38	0.98	1.29
M2SD1	0.69	1.21	1.5	2.51	3.19	3.04	2.84	2.46	2.17	1.95	2.16
M2SD2	0.52	1	1.18	2.03	2.64	2.59	2.50	2.09	1.99	1.80	1.84
M3SD1	1.18	1.61	2.80	4.48	5.03	4.69	4.44	3.61	3.10	3.10	3.40
M3SD2	0.89	1.30	1.90	3.2	4.32	4.30	4.09	3.27	2.93	2.50	2.87

Values in the same column the same superscript letters are not significantly different ($P<0.05$).

Table 8. Effect of manuring levels on doily gain regardless of stocking density of silver carp.

Treatment	2/W	4/W	6/W	8/W	10/W	12/W	14/W	16/W	18/W	20/W	Average
M 1	0.30	0.63	0.86	1.56	2.05	2.19	2.38	1.87	1.63	1.20	1.47
M 2	0.60	1.10	1.34	2.27	2.91	2.81	2.67	2.27	2.08	1.87	2.0
M 3	1.03	1.45	2.35	3.84	4.67	4.49	4.26	3.44	3.01	2.80	3.31

Table 9. Effect of stocking density on daily gain regardless of levels of manuring of silver carp.

Treatment	2/W	4/W	6/W	8/W	10/W	12/W	14/W	16/W	18/W	20/w	Average
SD1	0.75	1.21	1.76	2.91	3.57	3.37	3.27	2.62	2.38	2.16	2.40
SD2	0.54	0.92	1.28	2.21	2.86	2.96	2.94	2.41	2.1	1.76	2.0

Table 10. Effect of levels of poultry manure and stocking density on specific growth rate of silver carp.

Treatment	2/W	4/W	6/W	8/W	10/W	12/W	14/W	16/W	18/W	20/W	Average
M1SD1	0.50	0.96	0.97	1.41	1.67	1.27	1.13	0.72	0.65	0.44	0.97
M1SD2	0.27	0.61	0.84	1.27	1.25	1.26	1.18	0.83	0.60	0.37	0.85
M2SD1	0.87	1.28	1.33	1.78	1.77	1.27	1.03	0.80	0.62	0.53	1.11
M2SD2	0.67	1.11	1.15	1.57	1.70	1.30	1.07	0.75	0.67	0.54	1.03
M3SD1	1.42	1.56	2.07	2.35	1.94	1.40	1.10	0.81	0.60	0.55	1.37
M3SD2	1.11	1.30	1.59	2.00	2.00	1.53	1.19	0.81	0.66	0.51	1.27

Values in the same column the same superscript letters are not significantly different ($P<0.05$).

Table 11. Effect of manuring levels on specific growth rate regardless of stocking density of silver carp.

Treatment	2/W	4/W	6/W	8/W	10/W	12/W	14/W	16/W	18/W	20/W	Average
M 1	0.38	0.78	0.90	1.34	1.46	1.26	1.15	0.77	0.62	0.40	0.91
M 2	0.77	1.19	1.24	1.65	1.73	1.28	1.05	0.77	0.64	0.53	1.07
M 3	1.26	1.43	2.17	2.17	1.97	1.46	1.14	0.81	0.63	0.53	1.32

Table 12. Effect of stocking density on specific rate regardless of levels of manuring of silver carp.

Treatment	2/W	4/W	6/W	8/W	10/W	12/W	14/W	16/W	18/W	20/w	Average
SD1	0.93	1.27	1.46	1.83	1.79	1.31	1.09	0.78	0.62	0.51	1.15
SD2	0.68	1.01	1.19	1.61	1.65	1.63	1.15	0.80	0.64	0.47	1.05

Table 13. Effect of levels of poultry manure and stocking density on specific growth rate of silver carp.

Treatment	2/W	4/W	6/W	8/W	10/W	12/W	14/W	16/W	18/W	20/W	Average
M1SD1	2.62	14.82	15.68	23.63	28.17	20.97	18.49	11.51	10.35	7.11	327.94
M1SD2	4.46	9.02	13.24	21.51	20.49	21.03	19.46	8.91	8.91	5.77	257.35
M2SD1	13.72	21.17	21.71	29.31	29.19	21.55	16.52	9.66	9.66	7.93	429.38
M2SD2	10.27	18.05	18.14	26.31	27.02	31.69	7.18	10.19	10.19	8.35	365.44
M3SD1	23.49	25.92	35.88	37.34	33.38	23.28	17.90	9.37	9.37	8.62	677.60
M3SD2	17.81	21.03	26.32	35.07	35.07	25.84	19.56	10.34	10.34	7.92	571.52

Table 14. Effect of manuring levels of relative growth rate regardless of stocking density of silver carp.

Treatment	2/W	4/W	6/W	8/W	10/W	12/W	14/W	16/W	18/W	20/W	Average
M 1	6.04	11.92	14.46	22.57	24.33	21.0	18.97	12.57	9.63	6.44	292.64
M 2	11.99	19.61	19.92	28.04	28.10	26.62	11.85	12.15	9.92	8.14	397.56
M 3	20.65	23.74	31.1	38.64	34.22	24.56	18.73	12.7	9.85	8.27	624.56

Table 15. Effect of stocking density on retative growth rate regardless of levels of manuring of silver carp.

Treatment	2/W	4/W	6/W	8/W	10/W	12/W	14/W	16/W	18/W	20/w	Average
SD1	14.94	20.63	24.42	31.88	30.25	21.93	17.64	12.06	9.79	7.89	478.31
SD2	10.85	16.03	19.23	27.63	27.53	26.19	15.4	12.89	9.18	7.35	398.20

Table 16. Effect of levels of poultry manure and stocking density on condition factor of silver carp.

Treatment	0/w	2/w	4/w	6/w	8/w	10/w	12/w	14/w	16/w	20/W	Average
M1SD1	1.05	1.03	1.10	0.84	0.81	1.11	1.05	0.99	1.03	1.02	1.02
M1SD2	1.05	1.02	1.11	1.10	0.98	1.05	1.07	1.08	1.23	1.06	1.10
M2SD1	1.05	1.09	1.18	0.29	1.06	1.11	1.07	1.01	0.86	0.87	0.81
M2SD2	1.05	1.07	1.07	0.97	00.88	0.98	1.08	1.16	0.92	0.90	0.89
M3SD1	1.05	1.08	1.13	1.13	1.17	11.08	1.11	1.10	0.87	0.88	0.82
M3SD2	1.05	1.06	1.20	0.93	0.96	1.09	1.15	1.17	0.95	0.96	0.85

Table 17. Effect of manuring levels on contdition factor of silver carp regardless of stocking density.

Treatment	0/W	2/W	4/W	6/W	8/W	10/W	12/W	14/W	16/W	18/W	20/W
M 1	1.05	1.02	1.10	0.97	0.89	1.08	1.06	1.03	1.13	1.04	1.06
M 2	1.05	1.08	1.12	0.94	0.97	1.04	1.07	1.08	0.89	0.88	0.85
M 3	1.05	1.07	116	1.03	1.06	1.08	1.13	1.13	0.91	0.91	0.83

Table 18. Effect of stocking density on condition factor of silver carp regardless of levels of manuring .

Treatment	0/W	2/W	4/W	6/W	8/W	10/W	12/W	14/W	16/W	18/w	20/w
SD1	1.05	1.07	1.14	0.96	1.01	1.1	1.08	1.03	0.92	0.92	0.88
SD2	1.05	1.05	1.13	1.00	0.94	1.04	1.82	1.14	1.03	0.97	0.94

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تأثير مستويات زرق الدواجن على أداء أسماك المبروك الفضى

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تعتبر المخصبات العضوية من افضل الوسائل لرفع الانتاجية فى احواض المزارع السمكية. اجريت هذة الدراسة بالمعمل المركزي لبحوث الاسماك بالعباسة - مركز البحوث الزراعية وذلك بغرض دراسة أثر مستوى زرق الدواجن وكثافة التربية(عدد الاسماك فى وحدة المساحة) على نمو اسماك المبروك الفضى فى الاحواض الترابية.

وتمت التجربة فى ست احواض ارضية مستطيلة الشكل. مساحة كل حوص على حدة ربع فدان ممثلة فى ستة معاملات (ثلاث مستويات من زرق الدواجن ١٥٠ - ٣٠٠ - ٤٥٠ كجم زرق دواجن /فدان اسبوعيا وكثافتين من الاسماك ٣٢٠٠ و ٤٨٠٠ سمكة/ فدان). امتدت التجربة عشرين أسبوعا من ١٥ / ٥ الى ١٥ / ١٠ / ١٩٩٤.

وتم اخذ العينات لقياس أوزان وأطوال أسماك كل أسبوعين خلال فترة التجربة. أسفرت النتائج عن ألاتى:

-زيادة أوزان وأطوال الاسماك بزيادة معدل التسميد وانخفاض الكثافة . وأوضح التقييم الاحصائى للنتائج أن الاختلافات فى وزن وطول ألاسماك للمعدلات كانت معنوية.