PRODUCTIVE PERFORMANCE OF *OREOCHROMIS NILOTICUS* UNDER DIFFERNET NUTRITIONAL AND AQUACULTURE SYSTEMS

MOHAMED F. OSMAN[1], HAMDY M. KHATTAB[1], HOSAM A.M. MOUNES[2] AND FATAMA A. HAFEZ[2]

1) *Department of Animal Production, Faculty of Agriculture, Ain Shams University, Shoubra El-Kheima, Cairo, Egypt.*
2) *Central Laboratory for Aquaculture Research, Agriculture Research Center, Abbassa, Sharkia, Egypt.*

Abstract

This work was conducted in the region of Baallwa, Waadi El-Mollak, Ismailia, Egypt, to investigate the effect of organic plus inorganic fertilizers and artificial diets on the productive performance of *Oreochromis niloticus* under Egyptian conditions. *Oreochromis niloticus* fingerlings were stocked at a rate of two fish/m^3 in ten earthen ponds ($60m^3$ total area/ each). Five treatments with two replicates were applied as follow: The 1st treatment was fed only pelleted feed (25% protein) where the daily allowances of the fish was calculated as 4.5% of fish biomass/day at (3 to 10 g/fish), 3.5% of fish biomass / day at (10 to 50 g/fish). 2.9% of fish biomass/day at (50 to 100 g/fish), 2.5% of fish biomass at (100 to 250 g/fish), 2.2% of fish biomass at (> 250 g /fish). The pond of the 2nd treatment was treated by poultry manure and urea plus super phosphate at a rate of (1.5 kg poultry manure + 200 g urea + 400g triple super phosphate /pond/2weeks) till the end of the experimental period (17 weeks) without artificial feeds. The 3rd treatment was fertilized by the same regime in the 2nd treatment for only the first month of the experimental period, followed by pelleted diet regime similar to that of the 1st treatment. The 4th treatment was treated for only two months by fertilizers followed by two months artificial feed. The 5th treatment was treated by poultry manure and urea plus super phosphate during the first 90 days of the experimental period, followed by pelleted feed till the end of the experimental period. Averages of final body weight for the above 5 mentioned treatments were 308.8- 178.8- 292.4- 234.1 and 202.3 g/fish, respectively. Differences among final body weights were significant ($P<0.01$). Averages of total yield for the same treatments were 36.12, 21.44, 34.44, 28.09 and 24.28 kg/pond, respectively. The highest feed conversion value (the worst) was recorded by treatment 1 (1.23 g feed/ g gain) while the lowest value (the best) was in treatment 5 (0.62 g feed/ g gain) and differences between treatments were significant ($P<0.01$). The highest protein efficiency ratio was obtained by treatment 5, while the lowest value was obtained by treatment 1. The highest protein productive value was in treatment 5 while the lowest was regarded in treatment 1. The statistical analysis of the results showed that the differences between the treatments were significant ($P<0.01$). The economical study showed that treatment 1 gave the highest total income and net return followed in descending order by treatments (3, 4, 5 and 2), respectively.

Keywords: Organic and inorganic fertilizers regime, Artificial feed, Tilapia

INTRODUCTION

Animal manures have been used as fertilizers in fish production throughout the world, especially in tropical and subtropical regions (Lovshin *et al* 1974; Miller, 1975; Wohlfarth and Schroeder, 1979). Manures stimulate both primary and secondary productivity (Rappaport *et al* 1977; Schroeder, 1978; Noriega-Curtis, 1979). Chicken litter has been used successfully as an organic fertilizer for tilapia production in many parts of the world (Miller, 1975; Lovshin, 1977; Rappaport and Sarig, 1978 and Green *et al* 1989). Nitrogen and phosphorus applied to ponds are assimilated directly by phytoplankton, increasing primary productivity (Hepher, 1962 and Boyd, 1976), which tilapia utilize efficiently for growth (Boyd, 1976 and Almazan and Boyd, 1978). Animal manures, besides containing nitrogen and phosphorus, stimulate heterotrophic production, thus increasing tilapia production in ponds (Schroeder, 1974, 1978, 1980; Wohlfarth and Schroeder, 1979). Green *et al* (1989), reported that the final weight of fish was significantly greater on chicken litter than on the dairy cow manure and chemical fertilizer treatments.

The objective of this study was to investigate the effect of different combinations between organic, inorganic fertilizers and artificial diets on the growth performance, feed efficiency and production cost of *Oreochromis niloticus* reared in earthen ponds.

MATERIALS AND METHODS

This work was conducted in the region of Baallwa- Wadi EL-Mollak- Ismailia-Egypt to investigate the effect of organic plus inorganic fertilizers and artificial feeding on growth performance of *Oreochromis niloticus* under Egyptian conditions. Ten earthen rectangular ponds (20x3x1m) as length, width and depth, respectively, were used. The experimental ponds were supplied with freshwater from Ismailia canal. The water exchange rate was 15% of the total pond area/day. *Oreochromis niloticus* fingerlings used in this experiment were of an average initial weight of 4 g. All experimental earthen ponds used in this study were stocked by 120 of Nile tilapia fingerlings/pond.

The experimental period lasted 4 months from 1st of July to the 4th of November 2004. Five treatments (two replicates /each) were designed as follow:

Treatment1 (artificial diet only).

Fish in this treatment were fed pelleted diet allover the experimental period (25% CP), the fish diet was offered at a rate of 4.5% of tilapia biomass at weight (5 to 10 g/fish), 3.5% at weight (10 to 50 g/ fish), 2.9% at weight (50 to 100 g/fish), 2.5% at weight

(100 to 250 g/fish), 2.2% at weight (> 250/fish) in each pond to the end of the experiment.

Treatment 2 (fertilization only)

Poultry manure plus triple super phosphate and urea were added at a rate of (1.5 kg poultry manure + 400g triple super phosphate + 200 g urea/ pond/ biweekly) for the whole period.

Treatment 3 (1month fertilization + 3 months artificial diet)

Poultry manure plus triple super phosphate and urea were added at a rate of (1.5 kg poultry manure + 400g triple super phosphate + 200 g urea/ pond / biweekly) for the first 30 days followed by artificial diet with the same rates used in treatment 1.

Treatment 4 (2months fertilization + 2 months artificial diet)

Poultry manure plus triple super phosphate and urea were added at a rate of (1.5 kg poultry manure + 400g triple super phosphate + 200 g urea/ pond / biweekly) for the first 2 months then added artificial diets for the last 2 months.

Treatment 5 (3 months fertilization + 1 month artificial diet)

Poultry manure plus triple super phosphate and urea were added at a rate of (1.5 kg poultry manure + 400g triple super phosphate + 200 g urea/ pond / biweekly) for the first 3 months then artificial diets were added in the last month of the experiment. The quantities of applied organic and inorganic fertilizers during the whole experimental period are shown in Table 1.

Table 1. Quantities of organic and inorganic fertilizers used during the experimental period:

Treatments	Organic fertilization (Kg/ponds)	Inorganic fertilization (g/ponds)	
		Super phosphate	Urea
Treatment2	12	3200	1600
Treatment3	9	2400	1200
Treatment4	6	1600	800
Treatment5	3	800	400

Also amount of artificial feeds for each treatment group are presented in Table (2), wile the proximate analysis of poultry manure and the diet are given in Table (3).

Random samples of fish (20 fish/ treatment) were weighed every two weeks during the whole experimental period. Individual body weight and length of fish were recorded for each sample, thereafter the fish were returned to their experimental ponds.

According to the data of body weight and length, the following parameters were estimated:

Specific growth rate (SGR)

Specific growth rate was calculated according to Jauncey and Rose (1982).

$SGR = (Ln\ wt_2 - Ln\ wt_1)\ x100/t.$

Where:

wt_1 = first fish weight in grams.

wt_2 = following fish weight in grams.

t = period in day.

$Ln = (\log l0x)^{3.303}$

Average daily gain (ADG)

Daily gain was estimated according to the following formula:

$ADG = (Wt_2 - wt_1)/t$

Condition factor (K)

The condition factor value was calculated according to Lagler (1959).

$K = [weight\ (g) / length^3\ (cm)]\ xl00$

Table 2. Quantities of artificial feed used during the experimental period.

Treatments	2nd week	4th week	6th week	8th week	10th week	12th week	14th week	17th week
	kg/pond	kg/pond	kg/pond	kg/pond	kg/pond	kg/pond	kg/pond	kg/pond
Treatment 1	0.324	0.763	2.117	3.303	5.049	7.832	9.907	15.768
Treatment 3	--	--	1.796	2.662	4.627	7.197	9.254	10.733
Treatment 4	--	--	--	--	3.409	4.694	6.746	8.082
Treatment 5	--	--	--	--	--	--	6.737	8.087

Table 3. Chemical analysis of poultry manure and artificial feeds on dry matter basis

Item	Poultry manure	Artificial feeds
Dry matter (DM%)	85.98	91.41
Organic matter (OM%)	61.36	80.26
Crud protein (CP%)	25.00	27.45
Ether extract (EE%)	1.74	4.10
Crud fiber (CF%)	16.36	6.78
Nitrogen free extract (NFE%)	18.26	41.93
Ash%	38.64	19.74

Feed conversion ratio

$$F.C.R = \frac{Total\ \ feed\ \ consumption\ (g)}{Final\ \ body\ \ weight\ (g) - initial\ \ body\ \ weight\ (g)}$$

Protein efficiency ratio

$$P.E.R = \frac{Final\ body\ weight(g) - Initial\ body\ weight(g)}{Protein\ intake(g)}$$

Protein productive value

$$P.P.V = \frac{Protein\ retained\ intissue\ (g)}{Protein\ intake\ (g)} x100$$

Economical study

At the end of the experiment an economical study has been conducted to determine the cost of feed to produce one kg fish wet weight.

Water quality

Water pH was measured by using pH meter (model 68 Engineered System and Designs). Water dissolved oxygen and temperature were measured daily at 6.00 o'clock a.m. by oxygen meter (WPA 20 Scientific Instrument). Also water samples were taken weekly for analysis of ammonia, nitrate and nitrite. Analytical methods were carried out according to the American Public Health Association (ADHA, 1992).

Statistical analysis

The statistical analysis was applied according to Steel and Torrie (1980) on the collected data using a SAS program (1998). Differences between means were tested for significance according to Duncan's multiple rang test (Duncan, 1955). The following model was used to analyze the obtained data:

$$Yi\,j = u + Ti + eij$$

Where:

Yij =observation.

U = the overall mean.

Ti= the effect of treatment.

eij= random error.

RESULTS AND DISCUSSION

Fish growth and feed utilization performance

Fish groups fed the artificial diet only (treatment 1) showed the highest significant finale body weights ($P<0.01$) followed in descending order by treatments 3, 4, 5 and 2 (308.8, 292.4, 234.1, 202.3 and 178.8 g), respectively (Table 4). It seems that with decreasing artificial feed in the feeding regime the growth performance of tilapia fish was affected negatively. Ramdan *et al* (2001) reported that fish reared on artificial ration gave higher harvest weight than those reared in ponds with inorganic treatments. Green (1992) concluded that the chicken manure can replace 100% of pelleted supplemental feed without significant effects on the growth of tilapia during the first 60 days of the culture. This is in agreement with the results obtained in the present study.

Average fish final length at the end of the experimental period were found to follow the same order ($P<0.01$) of finale body weight and being 23.5, 23.0, 21.8, 21.0 and 19.7cm, respectively. These results are in accordance with those obtained by Hafez (1991), who found a strong correlation between body weight and body length for tilapia, mullet and carp fish. Oren (1981) revealed that fluctuations in ponds for fish growth (length and weight) are affected by different factors such as feeding regime, population density and environmental conditions.

As it is clear from Table (4) the highest averages daily gain and SGR were recorded by treatment 1 (2.54 and 3.62%/ day, respectively) followed by treatments 3,4 and 5, while the lowest values (1.46 and 3.16%/day, respectively) were found in the group fed no artificial feed (treatment 2). Abdel- Rahman *et al* (2003) reported that SGR for *O. niloticus* during the fortnight periods of the experiment were significantly higher for pelleted and mash treatments rather than chicken manure and cow manure treatments.

According to Schroeder (1974, 1978, and 1980) and Wholfarth and Schroeder (1979) the increases in daily gain, body weight and fish yield in the chicken litter treatment are due to: 1- releasing N and P from chicken litter, 2- improvement of the biological conditions of the pond's water, 3- abundance of phytoplankton as important feed for the zooplankton and fish, and 4- chicken litter contained organic matter that used as a food source, all these factors improve the daily gain, average body weight, survival rate and fish yield. The organic nutrients sources were more productively than inorganic sources (Schroeder, 1975 a and b). Noriega-Curtis, 1979).

Growth in the fish can be readily monitored by measuring the increase of fish weight and length. Other parameters which may be used as an index of growth is the condition factor, which provide a measure of "fatness" of fish and food conversion efficiency (Power, 1990). Condition factor also measures the "plumpness" or "robustness" of fish, and are easily calculated from routinely collected length-weight data. Condition factor is frequently assumed to reflect not only characteristics of fish such as health, reproductive state and growth, but also characteristics of the environment such as water quality and prey availability (Liao *et al* 1995). Condition factor of fish is essentially a measure of relative bone growth. The growth responses of these tissues to the dietary treatments may be reflected by changes in condition factor (Ostrowski and Garling, 1988).

Table 4. Average of growth and feed utilization parameters at the end of the experimental period

Parameters	Treatments					
	Treatment 1	Treatment 2	Treatment 3	Treatment 4	Treatment 5	± SD
Initial body weight (g/fish)	3.99	4.02	4.1	3.99	4.01	0.102
Final body weight (g/fish)	308.8[a]	178.8[e]	292.4[b]	234.1[c]	202.3[d]	1.053
Average daily gain (g/day)	2.54[a]	1.46[e]	2.41[b]	1.91[c]	1.65[d]	0.060
Specific growth rate (%/day)	3.62[a]	3.16[e]	3.56[b]	3.39[c]	3.27[d]	0.027
Final body length (cm/fish)	23.5[a]	19.7[c]	23.0[a]	21.8[b]	21.0[c]	0.172
Condition factor	2.38[a]	2.34[a]	2.4[a]	2.26[b]	2.18[c]	0.0004
Total yield (kg/pond)	36.12[a]	21.44[e]	34.44[b]	28.09[c]	24.28[d]	0.025
Total yield (kg/Fadden)	2528.4[a]	1500.8[e]	2410.8[b]	1966.3[c]	1699.6[d]	0.05
Feed conversion ratio (g feed/ gain)	1.23[a]	-	1.05[b]	0.83[c]	0.62[d]	0.009
Protein efficiency ratio	3.54[b]	-	4.16[a]	5.25[a]	7.0[c]	0.026
Protein Productive value (%)	44.81[d]	-	60.88[c]	88.91[b]	121.21[a]	0.151

Averages of condition factor values for the experimental treatments during the experiment are presented in Table (4). At the end of the experiment the average of condition factor values for treatments (1, 2, 3, 4 and 5) were 2.38, 2.34, 2.4, 2.26 and 2.18, respectively. The statistical analysis of the results showed that the treatment 3 had significantly ($p<0.01$) the highest K value followed by treatments (1, 2, 4 and 5), respectively. Stickney *et al* (1979), reported that growth of tilapia was rapid in ponds had a history of high manuring rate.

Table (4) showed that averages of total fish yield at the end of the experimental period for treatments (1, 2, 3, 4 and 5), were found to be 36.12, 21.44, 34.44, 28.09 and 24.28 kg/ pond, respectively. The statistical evaluation of the results showed that the differences in total yield among the experimental treatments were significant ($p<0.01$). These results are relatively in agreement with those obtained by Green (1992), who concluded that layer chicken litter can replace 27 to 58% of the pelleted supplemental feed without any significant effects on tilapia yield and the total substitution can be occurred for the first 60 days of culture. Green *et al* (1989), found also that net fish production was the greatest in the chicken litter treatment (1759 kg/ha/150 days), and production was different when dairy cow manure (1295 kg/ha/150 days), or chemical fertilizer (1194 k/ha/150 days) were used. This probably, resulted from increased heterotrophic production (Schroeder, 1975 b, 1978) or direct consumption of manure (Popma, 1982).

The final data given in (Table 4) showed that the highest value (the worst) of (FCR) was recorded with treatment 1 (1.23 g feed/ g gain) while the lowest value (the best) was recorded with treatment 5 (0.62 g feed/ g gain). The statistical analysis of the results showed that the differences between the best value (treatment 5) and the worst (treatment 1) were significant ($P<0.01$). Kerns and Roelofs (1977), reported that, growth rate and feed conversion efficiency of common carp *Cyprinus carpio* were found to be inversely related to the level of poultry waste in the diet, and this does not appear to be promising means of reducing the amount of animal protein required in fish diet.

There is an inverse correlation between the level of feeding on one side and the efficiency of feed utilization in the other side. This was reported by different fish species, i.e. Santiago *et al* (1987); El–Dahhar (1993); Pouomogne and Mbonglang (1993); Eid *et al* (1995) and Khalil *et al* (2000) for tilapia. Henken *et al* (1985), indicated that there is a negative correlation between the level of feeding and the digestibility of protein and dry matter. Dawah *et al* (2002) found that the feed conversion ratio and fish growth were better when the fish were maintained on artificial diets with 10 and 20% dried algae. Zoccarato *et al* (1996), showed that (FCR) and protein efficiency ratio were significantly ($P<0.05$) decreased with increasing level of poultry manure in the diet of rainbow trout *Oncorhynchus mykiss.* The data given in Table (4) showed that the highest value of (PER) was in treatment 5 while the lowest regarded in treatment 1 where only artificial feed was used. The statistical analysis of the results showed that there were significant differences between the treatments ($P<0.01$). Results of protein productive values in Table (4) showed that the efficiency of net feed protein utilization could be very high when restricted feeding system was used with natural food (treatments 3, 4 and 5). The highest PPV% was in treatment 5 (121%) while the lowest was regarded in treatment 1 (44.81%), the statistical analysis of the results showed that there were significant differences between treatments ($P<0.01$). These results are in agreement with the results obtained by Hassanen (1997) who revealed that although the protein efficiency ratio was not-significantly ($P<0.05$) affected by increasing the level of poultry manure in the diet of sea bass *Dicentrachus labrax,* however, the protein productive value obtained was significantly different. Shaker *et al* (2000); Ibrahim (2001); Abu Zead (2001) and Dawah *et al* (2002), Who found that the protein efficiency ratio ranged from 1.1 to 1.7 for Nile tilapia and Common carp fed on diets containing aquatic plant and algae.

Whole body composition of tilapia fish as affected by feeding treatments

Table (5) presents the chemical composition of tilapia fish treated with different feeding regimes. Moisture content of tilapia fish in treatment 2 (only organic and inorganic fertilizers) decreased significantly ($P<0.01$) compared with the other treatments. Also body protein and fat contents in the same treatment (treatment 2) were less significantly ($P<0.01$) than those in the other treatments. To the same results came Barash and Schroeder (1984) that tilapia fat content was higher in fish fed pelleted feed when compared by those raised with fermented manure. Brown and Murphy (1991) concluded that larger size fish class (as treatment 1 in the present experiment) usually had lower ash and higher fat content than those smaller size (treatment 2). It is obvious to notice that the rest in fish body composition was high in groups treated with fertilizers, this my due to the increase of natural food in fish gut.

Effect of the experimental treatments on some water quality parameters.

Water qualities of the experimental ponds are presented in Table (6). The results showed that temperature ranged between 27.8 to 27.9 °C, this temperature is suitable for all chemical, physical, and biological processes in pond's water as cited by Boyd (1979).

Table 5. Chemical composition of the whole fish body at the beginning and the end of the experimental period

Parameters	DM %				
	Moisture	Crude protein	Ether extract	Ash	Rest
Initial body composition	78.79[a]	48.79[c]	6.75[f]	12.67[c]	31.79[a]
Final body composition					
Treatment 1	76.25[a]	53.23[a]	19.66[a]	13.36[b]	13.75[d]
Treatment 2	61.14[d]	47.85[c]	9.68[e]	13.61[a]	28.86[a]
Treatment 3	72.18[b]	52.40[a]	16.04[b]	13.74[a]	17.82[c]
Treatment 4	67.36[c]	51.52[b]	13.50[c]	12.34[c]	22.64[b]
Treatment 5	66.19[c]	50.81[b]	12.50[d]	12.88[bc]	23.81[b]

Dissolved oxygen (DO) readings during the experimental period ranged from 7.92 to 9.95 mg/l. Average values of pH ranged from 8.47 to 8.72 in the different treatments, water with pH values ranged from about 6.5 to 9 at dawn are most suitable for fish production (Ellis, 1973). Boyd (1984) reported that the level of DO should be above 4 ppm which is considered limiting level. At DO lower than 4 ppm fish may live but can not feed or grow well. Total alkalinity, NH_3, NO_2, NO3, total phosphorus and soluble phosphate were suitable for growth of tilapia fish (Boyd, 1979).

Table 6. Average of water quality parameters throughout experimental period

Parameters	Treatments				
	Treatment 1	Treatment 2	Treatment 3	Treatment 4	Treatment 5
Temperature	27.90	27.80	27.90	27.90	27.90
Dissolved oxygen	7.92	9.95	9.02	9.15	8.92
Secchi disk	27.60	27.37	25.97	25.75	26.02
pH	8.47	8.57	8.67	8.67	8.72
Total alkalinity	848.75	851.25	838.75	838.50	837.50
NH_3	0.23	0.03	0.40	0.36	0.38
NO_2	0.02	0.02	0.03	0.03	0.02
NO_3	0.10	0.20	0.20	0.20	0.17
Total phosphate	0.26	0.29	0.30	0.36	0.36
Soluble phosphate	0.05	0.09	0.12	0.09	0.10

Economical parameters

In this study, total returns (the sale of harvested fish) for the treatments (1, 2, 3, 4 and 5) were 575.15, 243.25, 537.84, 376.58 and 336.47 L.E/ treatment respectively. These results indicated that the highest value of total income was in treatment 1 (575.15 L.E) and the lowest with treatment 2 (243.25 L.E).

Net return was the highest by treatment1 and treatment 3 while the lowest net return by treatment 2. Tilapia is marketed according to size class. Market price of fish was calculated according to the percentage of fish class's production. Total costs (TC) were found to be 211.45, 41.68, 178.89, 128.16 and 98.35 L.E for the treatments (1, 2, 3, 4 and 5), respectively. These results indicated that the highest value of (TC) was obtained by treatment 1 (211.45 L.E) while the lowest with treatment 2 (41.68 L.E).

The results are in good agreement with those obtained by (Teichert-Coddington *et al* 1991), They found that the low-cost of chicken litter applied weekly at 220Kg/ha was profitably substituted for high cost feeds during the first 8 to 9 weeks of grow-out.

Green (1992), observed that the production costs/ kg of tilapia were less when chicken litter was added to the feed. The observed net returns to land, labor and management were greater when manure was substituted for feed.

Table 7. Economical study of the present experiment (calculated as a sum of the two ponds/ treatment)

Item	Unit	Price (LE/ unit)	Treatments									
			Treatment 1 (two ponds)		Treatment 2 (two ponds)		Treatment 3 (Two ponds)		Treatment 4 (two ponds)		Treatment 5 (two ponds)	
			Qua. (kg)	Value (L.E)	Qua. (kg)	Value (L.E)	Qua. (kg)	Value (L.E)	Qua. (kg)	Value (L.E)	Qua. (kg)	Value (L.E)
Super Class	Kg	8	66.84	534.72	-	-	52.58	420.64	3.41	27.28	0.93	7.44
1st class	Kg	7.5	5.39	40.425	-	-	12.65	94.875	36.93	276.975	29.81	233.575
2nd class	Kg	6	-	-	36.46	218.76	2.41	14.46	6.12	36.72	13.95	83.7
3rd class	Kg	4.5	-	-	4.23	19.035	1.13	5.085	5.7	25.65	1.05	4.725
4th class	Kg	2.5	-	-	2.18	5.45	1.11	2.775	3.98	9.95	2.81	7.025
Total return			72.23	575.145	42.87	243.245	69.88	537.835	56.14	376.575	48.55	336.465
Fingerlings	1000	80	240	19.2	240	19.2	240	19.2	240	19.2	240	19.2
Artificial Feed	Kg	2	90.142	180.284	-	-	72.533	145.066	45.859	91.718	29.646	59.292
Poultry manure	Kg	0.3	-	-	12	3.6	3	0.9	6	1.8	9	2.7
Tri.sup.phosphate	Kg	1.6	-	-	3.2	5.12	0.8	1.28	1.6	2.56	2.4	3.84
Urea	Kg	1.1	-	-	1.6	1.76	0.4	0.44	0.8	0.88	1.2	1.32
Water exchange cost	Liter	0.6	20	12	20	12	20	12	20	12	20	12
Total cost				211.448		41.68		178.886		128.158		98.352
Net return				363.697		201.565		358.949		248.417		238.118

CONCLUSION

From the present experiment we can concluded that, chicken manure and inorganic fertilizers can replace 100% of pelleted feed in the first 30 days of culture without adverse effects on growth of tilapia during the first 30 days of culture. Also it is recommended from the economical side of view to start tilapia rearing for the first 30 days on natural food by fertilizing fish ponds with both organic and inorganic fertilizers which improve the efficiency of feed utilization.

REFERENCES

1. Abdel-Rahman, A. A., M. M. Abdel- Aal, Fatma A. Hafez; Sohair A. Arafa and G. M. Abdel- Aziz. 2003. Effect of commercial diets, manure and some agriculture by-products on performance of *Orechromis niloticus* in polyculture system. *Egyptian Soc Anim. Reprod. Fert. Fifteenth Annual Congr. 26–30, January, 2003, pp. 195-208.*
2. Abu-Zead, M. Y. 2001. Studies on some plants used for fish nutrition. *Ph. D.* thesis. Faculty of Agriculture, Al- Azhar University, Egypt, pp.55-68.
3. ADHA 1992. American Public Health Association Standard Methods for examination of water and waste water. *19th Ed. pp.33-45.* Washington, D.C. Aquaculture.
4. Almazan, G. and C. E. Boyd. 1978. An evaluation of Secchi visibility for estimating plankton density in fish pond. *Hydrobiologia, 61:205-208.*
5. Anderson, J., A. J. Jackson and B. S. Capper. 1984. Effects of carbohydrate and fiber on *Oreochromis niloticus* (Linn). *Aquaculture, 37:303-314.*
6. Barash, J. E. and G. L. Schroeder. 1984. Use of fermented cow manure as substrate for fish polyculture in stagnate water ponds. *Aquaculture, 36: 127-140.*
7. Boyd, C. E. 1976. Nitrogen fertilizer effects on production of Tilapia in ponds fertilized with phosphorus and potassium. *Aquaculture, 7:385-390.*
8. Boyd, C. E. 1979. Water quality in warmwater fishponds. *Auburn University Agriculture Experiment Station. Auburn, Alabama, pp 359-374.*
9. Boyd, C. E. 1984. Water quality management in warm water fish ponds. *Auburn University, Agriculture Experiment Station. Auburn, Alabama, pp285-307.*
10. Brown, M. L. and B. R. Murphy. 1991. Relationship of relative weight (Wr) to proximate composition of juvenile striped bass and hybrid striped bass. *Trans. Am. Fish. Soc., 120: 509-518.*
11. Dawah, A. M., A. M. Khater, I .M. A. Shaker and N. A. Ibrahim 2002. Production of *Scenedesmus bijuga* (chlorophyceae) in large scale in out door tanks and its use in feeding mono sex *O. niloticus* fry. J. Egypt. Acad. Soc. Enviro. Develop. (B. Aquaculture) 2 (1): 113-125.

12. Duncan, D. B. 1955. Multiple range and multiple F-tests. *Biomet. 11.1.*
13. El- Dahhar, A. A. 1993. Maintenance and maximum growth rate for fry and fingerlings of Nile tilapia *O. niloticus* fed at varying feeding regimes. *Alex. Res., 38 (3): 179-197.*
14. Eid, A. E., M. A. Danasoury, F. Z. Swidan and K. A. EL Sayed. 1995. Evaluation of twelve practical diets for fingerlings Nile tilapia *O. niloticus*. *Proc. 5th Sci. conf. on Animal Nutrition. 12-13, Dec. Suez Canal University, Ismailia, Egypt. pp.115-127.*
15. Ellis, M. M. 1973. Detection and measurement of stream pollution. *U. S. Bureau offish. Bull. 22: 267-437.*
16. Green. B. W., R. Phelps and H. Alvarenga. 1989. The effect of manures and chemical fertilizers on the production of (*Oreochromus niloticus*) in earthen ponds. *Aquaculture, 76:37-42.*
17. Green, B. W. 1992. Substitution of organic manure for pelleted feed in tilapia production. *Aquaculture, 101:213-222.*
18. Hafez, A. F. 1991. Studies on some Productive Traits in Fish. pp.63-85. Ph.D. Thesis, Faculty of Agriculture at Moshtohor. Zagazig University, Egypt.
19. Hassanen, G. D. I. 1997. Nutritional value of some unconventional proteins in practical diets for sea bass *Dicentrachus labrax* fingerlings. *Proc. of the 6 th Conference on Animal Nutrition. El- Minia, 17-19 November, pp. 335-348.*
20. Henken, A. M., D. W. Kleingeld, and P. A. T. Tijssen. 1985. The effect of feeding level on apparent digestability of dry matter, crude protein and gross energy in the African cat fish *Clarios gariepinus*. *Aquaculture, 51:1-11.*
21. Hepher, B. 1962. Primary production in fish ponds and its application to fertilization expermints. *Limnol. Oceanogr., 7:131-136.*
22. Jauncey, K. and B. Rose 1982. A Guide to Tilapia Feeds and Feeding, *Institute of Aquaculture, University of Sterling, Scotland. Pp.125-149.*
23. Kerns, C. L. and E. W. Roelofs. 1977. Poultry wastes in the diet of Israeli carp. *Bamedgeh. 29 (4): 125-135.*
24. Khalil, F. F., A. M. Abdelhamid, A. A. A. EL- Shebly and A. A. EL- Kerdawy. 2000. Effect of feeding regimes on water quality and fish production under semi-intensive system. *Proc. 5th Vet- Med. Zag. Conf., 12-14 Sep. Sharm El- Sheikh, Egypt. pp. 65-88.*
25. Ibrahim. N. A. 2001. Effect of Phytoplankton *(Chlorella vulgaris) and Scenedesmus spp.* Inoculation on Water Quality for Tilapia Culture by Urea and Super Phosphate. pp. 77-99. Ph. D. thesis. Faculty of Agriculture, Cairo University.
26. Lagler. K. F. 1959. Fresh Fisheries Biology. *2nd (ed.), Publ. by Dubauque. Iowa, U.S.A. pp.66-85.*

27. Liao. H.; C. L. Pierce, D. H. Wahl, J. B. Rasmussen and W. C. Leggett. 1995. Relative weight (wr) as a field assessment tool: Relationships with growth, prey biomass, and environmental conditions. *Trans. Amer. Fish .Soc., 124: 387-400.*
28. Lovshin, L. L., A. B. DaSilva and J. A. Fernandes. 1974. The intensive culture of all male hybrid of *Tilapia hornorum* (male) x *Tilapia nilotica* (female) in northeast Brazil. Paper CARPAS/G/74/SE22. Presented at the F.A.O. *Aquaculture Conference* for Latin America. Montevideo, Uruguay, 26 November-2 December 1974. 18 pp.
29. Lovshin, L. L. 1977. Progress Report on Fisheries Development in northeast Brazil. Res. Dev. Ser. No. 14, Int. Center Aquacult., Auburn Univ., Auburn AL, 11 pp.
30. Miller, J. W. 1975. Fertilization and feeding practices in warm-water pond fish culture in Africa. Paper CIFA/75/SR4 presented at the F.A.O. /C.I.F.A. *S*ymposium on Aquaculture in Africa, Accra, Ghana, 30 September-6 October 1975, 29 pp.
31. Noriega-Curtis. P. 1979. Primary productivity and related fish yield in intensively manured fish ponds. Aquaculture, 17:344-355.
32. Oren, 0. H. 1981. Aquaculture of grey mullets. International. Biological Programme. Camebridge Univ. London. Pp.45-57.
33. Ostrowski, A. C. and D. L. Garling. 1988. Influences of anabolic hormone treatment and dietary protein: Energy ratio on condition and muscle deposition of rainbow trout. *Prog. Fish-Cult., 50:133-140.*
34. Popma, T. J. 1982. Digestibility of Selected Feed Stuffs and Naturally Occurring Algae by Tilapia. 86 pp. Ph D. Dissertation, Auburn Univ., Auburn, Alabama,
35. Pouomogne, V. and J. Mbongblang. 1993. Effect of feeding rate on the growth of tilapia *O. niloticus* in earthen ponds. Bamidgeh, 45 (4): 147-153.
36. Power, D. M. 1990. The physiology of growth. *Trout News, 10:20-23.*
37. Ramdan A. A., M. A. El- Nady, M. G. Kamar and F. A. Hafez. 2001. Effect of different husbandry methods on water quality and growth of some fresh water fishes. Egyp. J. Aquat. Boil. & Fish. 5 (4):295-318.
38. Rappaport, U., S. Sarig and Y. Bejerano. 1977. Observations on the use of organic fertilizers in intensive fish farming at the Ginosar Station in 1976, *Bamidgeh, 29:57-70.*
39. Rappaport, U. and S. Sarig, .1978. The results of manuring on intensive growth fish farming at the Ginosar Station in 1977, *Bamidgeh, 30(2):27-30.*
40. Santiago, C. B., B. A. Mercedes and S. R. Ofelia 1987. Influence of feeding rate and diet form on growth and survival of Nile tilapia *Oreochromus niloticus* fry. *Aquaculture., 64:227-282.*
41. SAS 1988. SAS/STAT user's guide Release 6.03 Edition SAS Inst. *Inc. Cary NC. USA.*

42. Schroeder, G. L. 1974. Use of fluid cow manure in fish ponds. *Bamidgeh, 26: 84-96.*

43. Schroeder. G. L. 1975a. Some effect of stocking fish in waste treatment ponds. *Water Res., 9: 591-593.*

44. Schroeder, G. L. 1975b. Nighttime material balance for oxygen in fish ponds receiving organic wastes. *Bamidgeh, 27(3): 65- 74.*

45. Schroeder, G. L. 1978. Autotophic and heterotrophic production of micro-organismis intensively-manured fish ponds, and related fish yields. *Aquaculture, 141: 303-325.*

46. Schroeder, G. L. 1979. Micro-organisms as the primary diet in fish farming. World Symposium on Finfish Nutrition and Fish Feed Technology, Hamburg (GFR), 20 June. Pp.401-427.

47. Schroeder, G. L. 1980. Fish Farming in Manure-Loaded Ponds. pp. 73-86. In: R.S.V. Pullin and Z.H. Shehadeh (Eds.) Integrated agriculture aquaculture farming systems, International Center for Living Aquatic Resources. Management, Manila.

48. Shaker, A. M. A., Y. A. Khattab and N. F. Abd- EL Hakim. 2000. Azolla meal as non- traditional feed ingredients for *O. niloticus*. *Egypt. J. Agri. Res, 78 (5):86-95.*

49. Steel, R. G. D. and J. A. Torrie. 1980. *Principles and Procedures of Statistics. 2nd ed., pp. 183–193.* USA McGraw Hill.

50. Stickney, R. R., J. H. Hesby, R. B. McGeachin and W. A. Isbell. 1979. Growth of tilapia nilotica in ponds with differing histories of organic fertilization. *Aquaculture, 17:189-194.*

51. Teichert-Coddington, D. R., W. B. Green and W. R. Parkman. 1991. Substitution of chicken litter for feed production of penaeid shrimp in Honduras. *The Progressive* Fish. Culturist 53: 150- 156.

52. Wohlfarth, G. W. and G. L. Schroeder. 1979. Use of manure in fish farming. A review. *Agricult. Wastes, 1(4): 279-299.*

53. Zoccarato, I., L. Gasco, B. Sicuro, G. B. Palmegiano, M. Boccignone, M. L. Bianchini and U. Luzzana. 1996. Use of a by- product from poultry slaughtering in rainbow trout *Oncorhynchus mykiss* feeding. *Ital. Acqucolt., 31 (3): 127-134.*

أثراستخدام نظم غذائية مختلفة علي الأداء الإنتاجي للبلطي النيلي تحت نظم الاستزراع المختلفة

محمد فتحي عثمان[1] – حمدي محمد خطاب[1] ، حسام أحمد محمد مؤنس[2]، فاطمة عبدالفتاح حافظ[2]

١- قسم الإنتاج الحيواني –شعبة إنتاج الأسماك- كلية الزراعة - جامعة عين شمس- شبرا الخيمة- القاهرة- مصر
٢- المعمل المركزي لبحوث الثروة السمكية- مركـز البحوث الزراعيـ ـة- العباسـة- الشرقيـة- مصـر

أجريت هذه الدراسة بمنطقة البعالوة الكبري- وادي الملاك محافظة الاسماعيلية- جمهورية مصر العربية ، لدراسة تأثير كلاً من التسميد العضوي + المعدني و التغذية الصناعية علي إنتاجية أسماك البلطي النيلي تحت الظروف المصرية ، بدأت التجربة في الأول من يوليو و انتهت في أول نوفمبر بفترة تجريبية استغرقت أربعة أشهر تقريباً ، حيث خزنت إصبعيات البلطي النيلي بكثافة 8400 إصبعية للفدان.

خصصت عشرة أحواض أرضية تجريبية ، مساحة كل حوض 60 متر مكعب(٢٠×٣ بارتفاع عمود مياه 1 م) ممثلة لخمسة معاملات في كل معاملة مكررين كالآتي :المعاملة الأولي: تم تغذية أسماك هذه المجموعة بغذاء صناعي محبب مصنع بطريقة البثق (Extruder)) (25% بروتين خام) طوال مدة التجربة ، حيث قدرت الاحتياجات اليومية لأسماك البلطي بمعدل 4.5% من وزن الجسم عند وزن(٣ : ١٠ جم /سمكة) ، 3.5% عند وزن (١٠ : ٥٠جم/سمكة) ، و 2.9% عند وزن(٥٠ : ١٠٠جم/سمكة) ، 2.5% عند وزن(١٠٠ : ٢٥٠جم/سمكة) ، 2.2% عند وزن (>250جم/سمكة) ، المعاملة الثانية: التسميد باستخدام سبلة الدواجن + سوبر الفوسفات الثلاثي + اليوريا بمعدل (1.5 كجم سبلة الدواجن + 400 جم سوبر فوسفات الثلاثي + 200جم يوريا/ حوض/ أسبوعين) حتي نهاية فترة التجربة .المعاملة الثالثة :التسميد باستخدام نفس المعاملة السمادية في المعاملة الثانية و ذلك فقط خلال الشهر الأول من فترة التربية ,ثم اتبعت بالتغذية علي العلاف بنفس النسب في المعاملة الأولي حتي نهاية فترة التجربة ، المعاملة الرابعة :التسميد باستخدام نفس المعاملة السمادية في المعاملة الثانية و ذلك خلال أول شهرين من فترة التجربة , ثم اتبعت بالتغذية علي العلاف بنفس النسب في الأعلي ، المعاملة الخامسة : التسميد باستخدام نفس المعاملة السمادية في المعاملة الثانية و ذلك لمدة ثلاثة أشهر من بداية فترة التربية ، ثم اتبعت بالتغذية علي العلاف بنفس النسب في المعاملة الأولي حتي نهاية فترة التجربة.

في نهاية التجربة كان متوسط الوزن النهائي للأسماك في المعاملات ١، ٢، ٣، ٤، ٥ كالآتي (٣٠٨,٧- ١٧٨,٧- ٢٩٢,٤- ٢٣٤,١- ٢٠٢,٣جم/سمكة) علي الترتيب. التحليل الإحصائي للنتائج أوضح أن الاختلافات في وزن الجسم النهائي بين المعاملات التجريبية كانت معنوية (P<0.01) . أفضل قيمة لكفاءة تحويل الغذاء كانت في المعاملة الخامسة (٠,٦٢ جم علاف/جم نمو) بينما سجلت أقل قيمة في المعاملة الأولي (١,٢٣جم علاف /جم نمو) كما كانت أعلي قيمة لكفاءة الاستفادة من البروتين في المعاملة الرابعة بينما سجلت أقل قيمة في المعاملة الخامسة، كما كان متوسط القيمة الإنتاجيـة للبـ ـروتيـ ـن علـي النحو التالي ١٢١,٢ %- ٨٨,٩١ %- ٦٠,٨٨% -٤٤,٨١ % للمعاملات ١، ٣، ٤، ٥ علي الترتيب، وقد أوضح التحليل الإحصائي للنتائج أن الاختلافات بين المعاملات التجريبية كانت معنوية (P<0.01).

متوسطات محصول السمك الكلي للمعاملات في نهاية التجربـة كانت كالآتـي ٣٦,١٢ ، ٢١,٤٤ ، ٣٤,٤٤ ، ٢٨,٠٩ ، ٢٤,٢٨ كجم/حوض للمعاملات ١، ٢، ٣، ٤، ٥ علي الترتيب.

وقد تم عمل تقييم اقتصادي للنتائج في نهاية التجربة عن طريق حساب تكلفة الغذاء لإنتاج كجم نمو ، حيث سجلت المعاملة الأولي أعلي عائد كلي وأعلي عائد صافي وتبعتها بقية المعاملات.