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Evaluation Study For The Impact Of Poultry Drops, Silkworm Wastes And Fresh Rumen Contents In Nile Tilapia Culture

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ABSTRACT

A field study was conducted in 8 earthen ponds (1 m depth of water column, 1000 m^2 area) and represented four treatments (two replicates for each) to evaluate the growth performance of mixed Nile tilapia (*Oreochromis niloticus*) through a period of 4 months. The treatments included: first treatment (the control) where the ponds received artificial feed pellets. Second, third and fourth treatments, the ponds received poultry droppings (60PD/feed), silkworm wastes (60SW/feed) and fresh rumen contents (60FRC/feed) at the rate of 50 g/m^3/week for first 60 days of the study, respectively, then applying the same artificial feed pellets till the end of the study. The 60PD/feed and 60SW/feed treatments had the high level of the positive effect on the water quality productivity; they produced a considerable quantity of phytoplankton biomass of 35,230 & 29,205 org./ml and 75 & 63 org./ml of zooplankton, respectively. The 60PD/feed treatment had the highest values of fish body weights with significant differences ($P<0.05$), while, the control treatment had the least one along the study period when compared with the other treatments. This was reflected a higher growth performance parameters (general mean of final body weight 148.39 & 127.96 g/fish, average daily weight gain 1.22 & 1.05 g/fish/day, general mean of specific growth rate 4.16 & 4.03 %/day and finally survival rate 94 & 96 % for both 60PD/feed and 60SW/feed treatment, respectively) with significant difference ($P<0.05$) than the other treatment. Choosing one of them (poultry droppings, silkworm wastes and fresh rumen contents) in aquaculture ponds fertilizing will depend primary on the price for poultry droppings, silkworm wastes and fresh rumen contents, abundant quantities and finally on their inclusion level of infectious diseases causatives.

INTRODUCTION

In 2008, the world's output from tilapia culture has reached about 2.8 million ton. It was estimated that in 2010, the global production of tilapia will exceed 3 million ton. Thus, tilapia has become a fish of the 21 century

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(Li, 2010). The largest markets of tilapia in Africa are situated in the main producing countries, namely, Egypt and Uganda. In 2007, Egypt produced 265.862 tones of farmed tilapia representing 83% of total farmed tilapia production in Africa (Norman-López & Bjørndal, 2010). In Egypt, local demand for tilapia has increased over last few years due to the increase in population, the rise in household income and the devaluation of the Egyptian pound, which led to a decrease in fish imports and stimulated the local fish industry, in particular tilapia aquaculture (Norman-López & Bjørndal, 2010).

Although, different types of rumen contents (fresh; treated with house fly maggot and efficient microorganisms) were tested as organic fertilizers in male Nile tilapia (*Oreochromis niloticus*) fingerlings' production from cement ponds (Abd El-Mageed et al., 2009), little information exist on its use in fish earthen ponds fertilizing. Close integration in mulberry cultivation, sericulture and fish farming is one models of integrated fish farming to fully exploit the production potentials of the ecosystem (Francis et al., 2004). Depending on the study of Sayed and Mahmoud (1999), Kamal et al. (2010) stated that it can produce about 596-628 ton of fish in Egypt if the silkworm wastes will be use. Although, the silkworm wastes (pupae, feces and mulberry leaves) have been used around the world in fish feeding of tilapia (Hossain et al., 1992), carp (Nandeesha et al., 1989), ornamental fish (Furukawa et al., 1953) and as organic manure in carp ponds (Nandeesha et al., 1989), rare studies are known on its use in fish ponds in Egypt (Kamal et al., 2010). Substitution of organic manure for pelleted feed in tilapia production is economically preferred, especially during the first 60 days of culture (Abd El-Mageed, 1997 & Green, 1992).

Zhang (2010) dreamed to provide green and safe tilapia for the world people. So, this field study aimed to compare the impacts of poultry droppings, silkworm wastes and fresh rumen contents as organic fertilizers on the growth performance of mixed Nile tilapia (*O. niloticus)* reared in earthen ponds, in order to decrease the production costs.

MATERIALS AND METHODS

Experimental fish

Mixed Nile tilapia (*O. niloticus)* fry (with an average individual weight 2.03±0.02 g/fry) were brought from Bayad El-Arab hatchery, the General Authority for Fish Resources Development, Bayad El-Arab Village, Beni-Suif governorate, Egypt. These fish were stocked at a rate of 5 fry/m^3; 5000 fry/pond), reared for 4 months (3 April to 3 Aug. 2010) and sampled monthly to record growth performance data.

Experimental design

A private farm includes eight earthen ponds (1 m depth of water column and 1000 m^2 area) in Badyni Village, Menya governorate, Egypt, was used to conduct this experiment. These ponds were randomly distributed to four treatments (2 replicates x 4 treatments). The ponds received about 400 kg of poultry manure/pond as an activating dose for the plankton productivity. These treatments were: first (the control) ponds received artificial feed pellets from the start till the end of the study (25% crude protein at a daily rate of 3% of fish biomass, at two portions/day). The ponds of second, third and fourth treatments, received poultry droppings (60PD/feed); silkworm wastes (60SW/feed) and fresh rumen contents (60FRC/feed) at a rate of 50 g dried weight/m^3/week for 60 days, respectively. Artificial feed pellets (25% crude protein at a daily rate of 3% of fish biomass, at two portions/day) were applied during the rest of the study period (100 days). All these organic wastes were analyzed according to the **AOAC (1990).** Table (1) shows the chemical composition of different organic materials used as organic fertilizers in this study. All following growth performance parameters were calculated:

Daily weight gain (g/day/fish) = [(final body weight-initial body weight)/period in days]

Specific growth rate (%/day) = {[Ln (final body weight-initial body weight)]/ period in days}*100

Survival rate (%) =[(initial no. of fish-final no. of fish)/ initial no. of fish]

Water quality parameters

Water temperature (^oC) and dissolved oxygen were measured by using the Oxygen meter (YSI Co. Model 57, USA). The pH was measured by using pH meter (Thermo-Orion, Model 420, UK). Total ammonia (NH_4+NH_3) concentration was measured at the field by using HACH Comparison. At 10:00 h, both Secchi disk (cm) and water samples for plankton assessments were measured and collected, respectively. Qualitative and quantitative estimates of phytoplankton and zooplankton were, also, recorded according to Boyd and Tucker (1992).

Table (1): Chemical composition (% dry matter basis) of different organic materials (poultry droppings, silkworm wastes and fresh rumen contents) used as organic fertilizers in Nile tilapia (*O. niloticus*) earthen ponds for 60 days.

Item	Poultry droppings	Silkworm wastes	Fresh rumen contents
Moisture	.	6.08	80.23
Dry matter	.	93.92	19.77
Ash	32.01	24.67	13.49
Ether extract	2.11	1.9	7.86
Crude protein	19.25	18.74	11.79
Crude fiber	11.37	13.84	33.22
NFE	35.26	.	33.64

Statistical analysis

One-way ANOVA was used to evaluate the significant difference of different items studied with respect to treatment. Means, standard errors and Duncan's multiple ranges were also estimated (Duncan, 1955). All statistics were run on the computer, using the SAS program software (SAS, 1996).

RESULTS AND DISCUSSION

Water quality

Table (2) shows that water temperature (^{o}C) had no significant differences (P> 0.05) for different treatments. It was ranged from 28.05 (at 60PD/feed treatment) to 29.25 ^{o}C (at 60FRC/feed treatment) with an optimal general mean 28.68 ^{o}C for all treatments. El-Syed and Kawana (2008) mentioned that optimum range of tilapia tolerance was founded to be 24-32 ^{o}C. The 60PD/feed treatment had the lowest concentration of dissolved oxygen (5.65 mg/l) compared with other treatments, while the control treatment had the highest value (7.05 mg/l). This may be due to that 60PD/feed treatment had a higher organic load than the other treatments. The general means of dissolved oxygen (6.48 mg/l) suitable for plankton and fish growth. These results agree with those of Davies et al. (2006), who recorded levels of dissolved oxygen ranged from 3 to 5.9 mg/l which obtained after fertilization of different organic and inorganic fertilizers. Also, these data agree with that of recorded levels of dissolved oxygen ranged from 3.11 to 5.9 mg/l at ponds fertilized with different types of silkworm wastes. The 60SW/feed treatment had the highest significant ($P<0.05$) general mean of pH (8.25), while the 60FRC/feed treatment had the lowest significant general mean of pH (7.5). All pH values of treatments (7.50-8.25) lay within the optimum range for fish growth as mentioned by Boyd (1998). The Secchi disk depth (SD; cm), also, had no significant differences ($P> 0.05$), and fluctuated between 12.5 (at 60PD/feed treatment) and 17.25 cm (at control treatment) with acceptable general mean of 14.56 cm for all treatments. This may be due to that the control treatment did not received any organic fertilizer, on the other hand, the 60PD/feed recorded the lowest SD readings and this may be reflected to the addition of rich organic fertilizer (poultry droppings) during the first 60 days, which pushed the plankton growth. Both control and 60FRC/feed treatments had the lowest general mean of total ammonia (NH_4+NH_3) concentrations (0.20 and 0.23 mg/l, respectively). On the other hand, the 60PD/feed treatment had the highest concentration ($P<0.05$) of total ammonia (NH_4+NH_3) (0.36 mg/l) with significant difference than other treatments. This increase may be due to the high content of organic matter and total nitrogen in poultry droppings. Although, total ammonia had significant differences ($P<0.05$) among treatments, it was lesser than the lethal levels (Boyd, 1990). These values of ammonia were lower than those obtained by Kamal et al. (2010). In general, both water temperature and Sicchi disk depth had no significant differences ($P> 0.05$), among treatments. The other water quality parameters (dissolved oxygen and pH) had significant differences ($P<0.05$) among treatments.

Plankton

As shown in Table (3), green algae formed the major group of phytoplankton at all treatments, where its percent ranged from 84.59 % at the 60FRC/feed treatment to 86.32 % at the control with a general mean of 85.37 %. Contrary, euglena were represented the minor component of the phytoplankton. These results agree with those of Jensen et al. (1994), Kamal et al. (2008; 2009 and 2010) and Abd El-Mageed et al. (2009). Kamal et al. (2010) reported that green algae group was the dominating group (its percentages ranged from 58% to 68 %) followed by blue green algae group at cement ponds treated with different types of silkworm wastes. In general,

Table (2): ***Some water quality parameters (Mean ±SE) of earthen ponds (1000 m^2) stocked with mixed Nile tilapia (O. niloticus; 5000 fry/pond) under different treatments of feeding and organic fertilizers (poultry drops, silkworm wastes and fresh rumen contents) for 4 months*.**

Item	Control (AF)	(60PD/feed)	(60SW/feed)	(60FRC/feed)	General mean
Temp. (^{o}C)	28.90 a ± 0.40	28.05 a ± 0.05	28.50 a ± 0.50	29.25 a ± 0.25	28.68 ± 0.21
Dissolved oxygen (mg/l)	7.05 a ± 0.05	5.65 b ± 0.15	6.80 a ± 0.30	6.40 a ± 0.10	6.48 ± 0.21
PH	8.00 ab ± 0.00	7.75 ab ± 0.25	8.25 a ± 0.25	7.50 b ± 0.00	7.88 ± 0.13
Sicchi disk (cm)	17.25 a ± 0.25	12.50 a ± 2.50	14.50 a ± 0.50	14.00 a ± 1.00	14.56 ± 0.83
NH_3 conc. (mg/l)	0.20 b ± 0.00	0.36 a ± 0.04	0.27 ab ± 0.04	0.23 b ± 0.01	0.26 ± 0.02

Note: AF = artificial feed pellets 25% crude protein at a daily rate of 3% of fish biomass,
60PD/feed = 60 days fertilizing with poultry droppings then artificial feed pellets,
60SW/feed = 60 days fertilizing with silkworm wastes then artificial feed pellets,
60FRC/feed = 60 days fertilizing with fresh rumen contents then artificial feed pellets,
a-b: means in row with the same letter had no significant difference (P>0.05).

the highest phytoplankton abundant was found at the 60PD/feed treatment (35,230 org./ml) but the least phytoplankton abundant was found at the control treatment (23,170 organism/ml), with a general mean of 28,698 org./ml for all treatments. The 60SW/feed treatment had the second order for the abundant of phytoplankton (29,205 org./ml).

It can be observed (Table 3) that the rotifers group was the dominant for all treatments (its percentages ranged from 40% for both the 60PD/feed and 60SW/feed treatments to 44.44% for the control treatment with a general mean of 41.18% for all treatments). This group abundant followed by the copepods group in all treatments. Total zooplankton counts showed fluctuations among treatments; the 60PD/feed treatment had the highest abundant of total zooplankton (75 org./ml) followed by the 60SW/feed treatment (63 org./ml), then the 60FRC/feed treatment and finally the control treatment. These results agree with those of Nandeesha et al. (1984) who found that the green algae (chlorophytes) and rotifers were the dominant plankton groups, when they had applied poultry manure, silkworm wastes and its combination in fish earthen ponds. All these results are in agreement with those of Kamal et al. (2003 and 2008) and Abd El-Mageed et al. (2009). It can be concluded that all treatments had the same trend of abundance for both phytoplankton and zooplankton. The 60PD/feed treatment had the highest abundance of both

Table (3): ***Plankton communities of earthen ponds (1000 m^2) water stocked with mixed Nile tilapia (O. niloticus; 5000 fry/pond) under different treatments of feeding and organic fertilizers (poultry droppings, silkworm wastes and fresh rumen contents) for 4 months.***

Item	Control (AF)	(60PD/feed)	(60SW/feed)	(60FRC/feed)	General mean
Phytoplankton (org/ml):					
Blue green algae	3000	5000	4000	4000	400
Green algae	20000	30000	25000	23000	24500
Green algae (%)	*86.32*	*85.15*	*85.60*	*84.59*	*85.37*
Diatoms	150	200	180	170	175
Euglena	20	30	25	20	23.75
Total	23170	35230	29205	27190	28698.75
Zooplankton (org/ml):					
Copepods	15	25	22	20	20.5
Cladoserans	8	15	13	10	11.5
Rotifers	20	30	25	23	24.5
Rotifers (%)	*44.44*	*40.00*	*40.00*	*42.00*	*41.18*
Ostracods	2	5	3	2	3
Total	45	75	63	55	59.5

Note:
AF = artificial feed pellets 25% crude protein at a daily rate of 3% of fish biomass,
60PD/feed = 60 days fertilizing with poultry droppings then artificial feed pellets,
60SW/feed = 60 days fertilizing with silkworm wastes then artificial feed pellets,
60FRC/feed = 60 days fertilizing with fresh rumen contents then artificial feed pellets,

phytoplankton (35,230 org./ml) and zooplankton (75 org./ml) followed by the 60SW/feed treatment (29,205 and 63 org./ml, respectively), but the control treatment had the lowest abundance of both phytoplankton (23,170 org./ml) and zooplankton (45 org./ml).

Fish growth

Although, homogeneity was observed for initial body fish weights of Nile tilapia (*O. niloticus*) because there were no significant differences (P>0.05) among the treatments, monthly data (Table 4) showed that the 60PD/feed treatment had the highest values of fish body weights with significant differences (P<0.05), while the control treatment had the least one along the study period when compared with the other treatments.

Generally, the 60PD/feed treatment had the highest growth performance development values followed by the 60SW/feed treatment and then by the 60FRC/feed treatment and finally by the control treatment with significant differences (P<0.05). This cleared the importance of applying the organic fertilizers at the first stage (60 days) of the fish growth, where the fish need to the plankton more than the artificial feed pellets. This result agreed with that of Abd El-Mageed (1997). Although, the 60SW/feed treatment had the second order of parameters values of growth performance, with significant differences (P<0.05) after the 60PD/feed treatment, there was no significant differences (P>0.05) between them for the individual final fish weight (127.96 &148.39 g/fish for both 60SW/feed and 60PD/feed treatments, respectively). This mean that the effect of silkworm wastes may be similar to that of poultry droppings on the fish ecosystem and fish growth performance.

Final individual fish body weight mean was differed significantly (P<0.05) among treatments and ranged from 92.79 g/fish for control treatment to 148.39 g/fish for 60PD / feed treatment with a general main 121.76 g/fish.

Table (4): ***Growth performance development (Mean ±SE) of mixed Nile tilapia (O. niloticus; 5000 fry/pond) reared in earthen ponds (1000 m^2) under different treatments of feeding and organic fertilizers (poultry droppings, silkworm wastes and fresh rumen contents) for 4 months.***

Fish weight (g/fish)	Control (AF)	(60PD/feed)	(60SW/feed)	(60FRC/feed)	General mean
Initial	2.06 a ± 0.05	2.01 a ± 0.01	2.05 a ± 0.05	2.00 a ± 0.00	2.03 ± 0.02
After 1 month	9.18 c ± 0.95	26.76 a ± 2.38	19.84 b ± 0.47	18.75 b ± 0.36	18.63 ± 2.42
After 2 months	27.15 c ± 1.78	67.87a ± 2.50	55.06 b ± 4.28	45.01 b ± 0.09	48.77 ± 5.71
After 3 months	68.83 c ± 1.70	97.94 a ± 2.57	82.16 b ± 1.09	69.96 c ± 0.25	79.72 ± 4.48
Final	92.79 c ± 10.33	148.39 a ± 1.92	127.96 ab ± 2.75	117.92 b ± 2.79	121.76 ± 7.86

Note:
AF = artificial feed pellets 25% crude protein at a daily rate of 3% of fish biomass,
60PD/feed = 60 days fertilizing with poultry droppings then artificial feed pellets,
60SW/feed = 60 days fertilizing with silkworm wastes then artificial feed pellets,
60FRC/feed = 60 days fertilizing with fresh rumen contents then artificial feed pellets,
a-b: means in row with the same letter had no significant difference (P>0.05).

At the first 60 days of the study

The average daily weight gain (g/fish/day) was differed significantly ($P<0.05$) among treatments during the first period of the study (60 day) and it ranged from 0.42 at the control treatment to 1.10 at the 60PD/feed treatment with a general mean of 0.78 for all treatments. But, at the rest period of the study (last 60 days) the average daily weight gain had no significant differences ($P>0.05$) among treatments, it ranged from 1.10 at the control treatment to 1.34 at the 60PD/feed treatment with a general mean of 1.22 for all treatments. The average daily weight gain (g/fish/day) and specific growth rate (%/day) showed higher significant differences ($P<0.05$) between the two periods (first 60 days and the final 60 days of the study) for all treatments, except the 60SW/feed treatment as shown in Table (5). This indicated that the silkworm wastes produced a similar effect on both daily weight gain and specific growth rate at first 60 days with that of artificial feed pellets at the final 60 days, regarding to the final fish body weight of 60SW/feed treatment (127.96 g/fish), which was not differed significantly ($P>0.05$) with that of 60PD/feed treatment (148.39 g/fish).

General mean of average daily weight gain (g/fish/day) for all the study period differed significantly ($P<0.5$) and ranged from 0.76 at the control treatment to 1.22 at the 60PD/feed treatment with a general average mean of 1.0 (g/fish/day). Also, the same trend for general mean of specific growth rate (%/day) was observed for the whole study period and differed significantly ($P<0.5$) and ranged from 3.76 at the control treatment to 4.16 at the 60PD/feed treatment with a general average value of 3.98. Survival rate (%) of the 60SW/feed treatment (96 %) was higher than all treatments, followed by that for the 60PD/feed treatment (94 %) then by 60FRC/feed treatment (93%) and finally the control treatment (90%).

It was clear from the work of (Abd El-Mageed et al., 2009) that fresh rumen contents treatment had higher values of male Nile tilapia performance parameters (average daily weight, 0.085 g/fish/day, specific growth rate, 2.22 %/day and survival rate 86.50 %) when compared with the other types of rumen contents (with house fly maggot and with efficient microorganisms. Also, Kamal et al. (2010) found that the growth performance parameters of the same fish under silkworm litter treatment were 0.17 g/fish/day, 2.81 %/day and 79 % for average daily weight gain, specific growth rate and survival rate, respectively. Under waste mulberry leaf treatment, the average daily weight gain, specific growth rate and survival rate were 0.21 g/fish/day, 3.02 %/day and 72 %, respectively. Finally, under mixed of silkworm litter and waste mulberry leaf treatment, the same parameters were 0.17 g/fish/day, 2.81 %/day and 74 %, respectively. Lower values of the growth performance parameters were recorded in studies of both Abd El-Mageed et al. (2009) and Kamal et al. (2010) than those of the present study and this may be due to that fish were stocked at high densities (25 fish/ m^3 and 20 fish/m^3 for both Abd El-Mageed et al. (2009) and Kamal et al. (2010), respectively, in fingerlings' system concert ponds. The silkworm fecal matter (pellets) induced the best growth of silver carp than that of de-oiled silkworm pupae pellets and fish meal pellets (Nandeesha et al., 1989). Nandeesha et al. (1986) reported that the growth of rohu was found to be superior on pellets of silkworm fecal based diet, while it was almost equal on pellets of slaughter house waste based diet and pellets FM (pellets of fish meal based diet).

Table (5): ***Growth performance parameters (Mean ±SE) of mixed Nile tilapia (O. niloticus; 5000 fry/pond) reared in earthen ponds (1000 m^2) under different treatments of feeding and organic fertilizers (poultry droppings, silkworm wastes and fresh rumen contents) for 4 months.***

Item	Control (AF)	(60PD/feed)	(60SW/feed)	(60FRC/feed)	General main
Ave. daily weight gain (g/fish/day):					
During the first 60 days	0.42 cB ± 0.03	1.10 aB ± 0.04	0.88 bA ± 0.07	0.72 bB ± 0.00	0.78 ± 0.10
During the rest 60 days	1.10 aA± 0.15	1.34 aA ± 0.01	1.22 aA ± 0.12	1.22 aA ± 0.05	1.22 ± 0.05
General mean of the study	0.76 c ± 0.09	1.22 a ± 0.02	1.05 ab ± 0.02	0.97 b ± 0.03	1.00 ± 0.07
Specific growth rate (%/day):					
During the first 60 days	5.37 cB ± 0.13	6.98 aB ± 0.07	6.62 abA ± 0.14	6.27 bB ± 0.00	6.31 ± 0.23
During the rest 60 days	6.96 aA ± 0.22	7.32 aA ± 0.02	7.14 aA ± 0.16	7.15 aA ± 0.06	7.14 ± 0.07
General mean of the study	3.76 b ± 0.10	4.16 a ± 0.02	4.03 a ± 0.02	3.96 a ± 0.02	3.98 ± 0.06
Survival rate (%)	90 d	94 b	96 a	93 c	93.25 ± 0.70

Note:
- AF = artificial feed pellets 25% crude protein at a daily rate of 3% of fish biomass,
- 60PD/feed = 60 days fertilizing with poultry droppings then artificial feed pellets,
- 60SW/feed = 60 days fertilizing with silkworm wastes then artificial feed pellets,
-60FRC/feed = 60 days fertilizing with fresh rumen contents then artificial feed pellets,
- a and b: means in row with the same letter had no significant difference (P>0.05),
- Weight gain and specific growth rate with the same capital litter at the same column had no significant difference (P>0.05)

So, it can be concluded that the 60PD/feed and 60SW/feed treatments participated the high level of the positive effect on the water quality parameters, which produced a considerable quantity of plankton biomass (35,230 & 29,205 org./ml of phytoplankton and 75 & 63 org./ml of zooplankton, respectively. This was reflected on a higher growth performance (general mean of average daily weight gain 1.22 & 1.05 g/fish/day; final body weight 148.39 & 127.96 g/fish; general mean of specific growth rate, 4.16 & 4.03 %/day and highest survival rate, 94 & 96 % for both 60PD/feed and 60SW/feed treatment, respectively) with highly significant difference (P<0.05) than the other treatment. Choosing one of them (poultry droppings, silkworm wastes and fresh rumen contents) in aquaculture ponds fertilizing will depend primary on the price, abundant quantities and their inclusion level of infectious diseases causatives, so, other studies (economic and veterinary, strongly recommended) must be conducted to demonstrate these unknown sides.

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دراسة حقلية لتقييم كل من زرق الدواجن ومخلفات دودة القز ومحتويات الكرش الطازجه فى استزراع أسماك البلطي النيلي المختلط

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أجريت هذه الدراسة تحت ظروف محافظة المنيا- قرية بديني- مصر.وكان الهدف من هذه الدراسة هو تقييم المخلفات (زرق الدواجن ومخلفات دودة القز ومحتويات الكرش) على معدلات نمو اسماك البلطي النيلي للتقليل من تكاليف الاستزراع. واستمرت هذه التجربة لمدة ٤ أشهر، أُستزرع خلالها أسماك البلطي النيلي المختلطة بوزن ابتدائي (٢,٠٣ جم) بكثافة ٥سمكة/م^{٣} حيث وزرعت عشوائيا على ٨ أحواض بكثافة ٥٠٠٠ سمكة/ حوض، مساحة الحوض ١٠٠٠م^{٢} بعمق ١م، وكل معاملة لها ٢ مكررة

وقسمت التجربة إلي ٤ معاملات:

١- "المعاملة الأولى" غذيت الأسماك على عليقة صناعية ٢٥% بروتين خام، بمعدل ٣%من وزن الأسماك يومياً من بداية التجربة حتى نهايتها،

٢-"المعاملة الثانية" التسميد بزرق الدواجن بمعدل (٥٠كجم/١٠٠٠م^{٢}/أسبوع) لمدة شهرين ثم التغذية الصناعية (٢٥%بروتين خام وبمعدل ٣% من وزن الأسماك يومياً) لمدة شهرين حتى نهاية التجربة،

٣- "المعاملة الثالثة" التسميد بمخلفات دودة القز (إخراجات الدود، فضلات الشرانق وبواقى ورق التوت) بمعدل (٥٠ كجم/ ١٠٠٠م^{٢}/أسبوع) لمدة شهرين ثم التغذية الصناعية (٢٥%بروتين خام بمعدل ٣% من وزن الأسماك يومياً) حتى نهاية التجربة،

٤- "المعاملة الرابعة" التسميد بمحتويات الكرش الطازجة بمعدل (٥٠ كجم /١٠٠٠م^{٢}/أسبوع) لمدة شهرين ثم التغذية الصناعية (٢٥%بروتين خام وبمعدل ٣% من وزن الأسماك يومياً) حتى نهاية التجربة.

أوضحت نتائج تحاليل مياه الأحواض أنها كانت في الحدود المسموح بها، وملائمة لنمو الأسماك. كذلك أظهرت النتائج أن المعاملة الثانية سجلت أعلى قيمة بمستوي معنوية ($P<0.05$) للهائمات الحيوانية (٣٥,٢٣ كائن/مل) وتلتها المعاملة الثالثة (٢٩,٢٠ كائن/مل)،

وسجلت اقل قيمة بمستوي معنوية ($P<0.05$) للهائمات الحيوانية للمعاملة الأولى (١٧.٢٣ كائن/مل). وتلتها المعاملة الرابعة (١٩,٢٧ كائن/مل) وانعكس ذلك على نفس هذه المعاملات الثانية والثالثة علي التوالي حيث سجلت أعلى قيم بمستوي معنوية ($P<0.05$) للوزن النهائي للأسماك والوزن اليومي المكتسب والوزن النوعي ونسبة الإعاشة للمعاملة الثانية وذلك بالمقارنة بباقي المعاملات وكانت قيمها

كالأتي (١٤٨,٣٩جم/سمكة، ١,٢٢ جم/يوم/سمكة، ٤,١٦% /يوم و٩٤%) و(١٢٧,٩٦جم/سمكة، ١,٠٥جم/يوم/سمكة، ٤,٠٣%/يوم و٩٦%) على التوالي. وسجلت أقل قيم للمعاملات الأولى والرابعة على التوالي حيث أظهرت النتائج أن معدلات أداء نمو الأسماك بالنسبة للوزن النهائي والوزن اليومي المكتسب والوزن النوعي ونسبة الإعاشة (٩٢,٧٩ جم/سمكة، ٠,٧٦جم/يوم/سمكة، ٣,٧٦ %/يوم و٩٠%) (١١٧,٩٢جم/سمكة، ٠,٩٧ جم/يوم/سمكة، ٣,٩٦ %/يوم و٩٣%) على التوالي.

١ - هذا وتوصي الدراسة بإمكانية استخدام أي من هذه الأسمدة سواء زرق الدواجن أو مخلفات دودة القز أو محتويات الكرش الطازجة لاستزراع أسماك البلطي آخذين في الاعتبار أسعارها، مدى توافركمياتها وخلوها من مسببات الأمراض وذلك بعد إجراء دراسات إقتصادية وبيطرية للوقوف على هذه الجوانب.