Egypt. J. Agric. Res., 78(5), 2000

EFFECT OF ORGANIC FERTILIZATION, SUPPLEMENTARY FEEDING AND STOCKING RATE ON CARCASS AND CHEMICAL COMPOSITION OF NILE TILAPIA AND SILVER CARP

By

Fatma, A. Hafez 1Soltan M. A2 and Ibrahim M. K,2

1 Central Laboratory for Aquaculture Research at Abbassa, Agriculture Research Center.

2 Department of Animal Production, Faculty of Agriculture at Moshtohor, Zagazig University (Banha Branch).

(Manuscript received Dec ember 1999)

ABSTRACT

Six ponds were stocked by 1000 of Nile tilapia fingerlings for each pond (4000 fingerlings/feddan). The six ponds assigned into two groups, each group composed of three ponds, the three ponds of each group stocked with 100, 200 and 300 silver carp for the first, second and third pond, respectively. The three ponds of the first group had the first feeding regime (M) (fertilized with 50 kg poultry litter/pond/week) and the three ponds of the second group had the second feeding regime (F)(fish feed containing 30% crude protein).

Tilapia fish fed supplementary feeds compared with fish fed the first feeding treatment (natural food) show higher percentages of dressing (50.3 vs. 47.7%) and flesh (39.2 vs. 37.3%) and lower percentage of head (30.8 vs. 33.3%), viscera (7.1 vs. 7.7%) and by-products (54.5 vs. 56.8%). The differences between these components, due to feeding regime were significant for dressing and head percentages.

The second stocking rate (SR2) had higher percentage of dressing (50.1%) compared with 49.2 and 47.6% for the first (SR1) and third (SR3) stocking rate, respectively. The differences between dressing percentages were significant.

The carcasses of silver carp fish fed the first feeding treatment had higher percentages of by-products (51.3 vs. 49.%) and lower percentages of flesh (48.2 vs. 50.8%) compared with fish fed the supplementary feeding. The three stocking rates had insignificant effect on carcass traits.

Tilapia flesh of the first treatment (M)compared with the flesh from fish fed supplementary feed, had higher and significant percentages of protein (87.02 vs. 84.00%) and ash (7.54 vs. 6.23%) but lower percentages of fat (6.12 vs. 10.53%). The same trend was obtained with respect to chemical composition of by-products. Tilapia flesh raised in the first stocking rate had the lowest protein percentages (82.82%) and the largest fat percentage (9.98%), whereas the third stocking rate had the largest protein percentage (87.37%) and the lowest ash percentage (6.21%). The same trend of results was obtained with respect to chemical composition of by-products.

Silver carp flesh from fish raised under the first feeding treatment (M)compared with that fed the supplementary feed (F) had larger percentages of dry matter (22.14 vs. 20.98%), protein (84.39 vs. 77.65%), fat (9.52 vs. 6.48%), and lower percentages of ash (6.99 vs. 8.67%) and moisture (78.86 vs. 79.02%). Stocking rates of silver carp had insignificant effect on percentages of protein, fat and ash.

INTRODUCTION

Tilapias have become one of the most important fish species for freshwater culture. Tilapia culture has become more popular because of the relative ease of their culture in variety of aquaculture systems and because of their favourable attributes as food fishes. Despite the popularity of tilapia culture, the overall production of market-size tilapia per hectare has remained relatively low because of the introduction of poor culturable species, mixed-six culture and poor management. However, the introduction of better management practices (selection of more suitable species for culture, the use of protein rich diets, water quality management ect.) have led to the improvement of tilapia production (Siddiqui and Al-Harbi, 1995).

Polyculture, between tilapia and other aquatic species, is an established option when natural food from different pond niches are independently exploited by fish, when there is a market for all species in culture and when their combination provides an economic benefit which is high enough to cover extra labour expenses required to grade and sort fish at sampling and harvesting.

Fish filleting is an important process for preparing a much better fish flesh than dealing directly with whole fish. Fish filleting has the following advantages; it is easier to prepare, more convenient for the consumer to cook, easier for packing and transportation, especially when the refrigerated space in the transportation means is limited (Hussein, 1990).

By-products or fish wastes are those non-edible parts of the fish body. They include fish head, skin, bones and cartilage, fins, scales and viscera which includes gonads, intestine and liver. After some processing, fish wastes represent a good source for animal nutrition which can be prepared as protein source for laying hens and broilers due to its high contents of fish protein containing the essential amino acids.

The aim of this experiment is to study the effect of feeding regime and silver carp stocking rate on carcass and chemical analysis of tilapia and silver carp.

MATERIALS AND METHODS

The current experiment was conducted during the period between 15 may and 1 September 1995 (14 weeks) in six fresh water earthen ponds each of a total area of 0.25 feddan at the Central Laboratory for Aquaculture Research at Abbassa, Sharkia Governorate, Egypt.

The fish used in this experiment included Nile tilapia *(Oreochromis niloticus)* which is an efficient converter of phytoplankton but can utilize a wide variety of foods. Ponds were stocked also with silver carp (*Hypophthalmichthys molitrix)* which feeds primary on phytoplankton. Tilapia fingerlings were obtained from Abbassa hatchery, the average weight of fingerlings was 11.3 gm. Silver carp were obtained from the production ponds in Abbassa farm and where their average body weight of silver carp was 164 gm.

The six ponds were stocked by 1000 of Nile tilapia fingerlings for each pond. Then the six ponds assigned into two groups, each group composed of three ponds, the first pond of each group stocked with the first stocking rate (SR1) of silver carp (100 fish/pond), the second pond stocked with the second stocking rate (SR2) of silver carp (200 fish/pond) and the third pond stocked with the third stocking rate (SR3) of silver carp (300 fish/pond).The three ponds of the first group had the first feeding treatment (M)(fertilization with poultry litter) and the three ponds of the second treatment group received supplementary feed (F) as described in table (1).

Table (1): Stocking density of Nile tilapia and silver carp under the two feeding treatments.

Treatment	Stocking density	pond No.	stocking density per pond	Stocking density per feddan
Fertilization with poultry litter (M)	SR1	1	1000 tilapia+100 silver carp	4000 tilapia+400 silver carp
	SR2	2	1000 tilapia+200 silver carp	4000 tilapia+800 silver carp
	SR3	3	1000 tilapia+300 silver carp	4000 tilapia+1200 silver carp
Supplementary feed (3% of body Weight/day) (F)	SR1	4	1000 tilapia+100 silver carp	4000 tilapia+400 silver carp
	SR2	5	1000 tilapia+200 silver carp	4000 tilapia+800 silver carp
	SR3	6	1000 tilapia+300 silver carp	4000 tilapia+1200 silver carp

The three ponds in the first treatment were fertilized with 50 kg poultry litter every week for each pond throughout the experimental period to stimulate the natural foods.

The fish in the three ponds of the second treatment were fed fish feed containing 30% crude protein. Feed was offered six days per week (except Friday) during the experimental period. The feeding rate was 3% of the total fish mass presented in each pond and the feed amount was adjusted biweekly for each pond separately according to the biomass available which determined using a fish sample (50 fish) every two weeks. Chemical analysis of poultry litter and supplementary feed are presented in Table (2).

Table (2): Chemical analysis of poultry litter and supplementary feed.

Item	No. of Samples	Poultry litter Mean±SE	Supplementary feed Mean±SE
Moisture%	5	4.23±0.35	9.46±0.35
Crude protein%	5	10.50±0.26	29.77±0.26
Crude fat%	5	1.01±0.08	2.60±0.08
Crude fibre%	5	30.02±0.98	5.40±0.98
Ash%	5	19.15±0.34	9.10±0.34

At the end of the experiment (1 , 1995), ponds were gradually drained from the water and fish were harvested and transferred to fiberglass tanks and carried to the processing centre where they washed, and the fish of the two species (tilapia and silver carp) were sorted and collectively weighed. Random sample from the two species was taken to determine carcass test and the chemical analysis of fish flesh and by-products.

After harvesting ten fish of tilapia and 5 fish of silver carp were taken from each pond at random for carcass traits. All chemical analysis (moisture, protein, fat and ash) of flesh and by-products were determined according to the methods described by A.O.A.C (1990) and Lovell (1981).

The statistical analysis of data of the experiments was carried out by applying the computer program Harvey (1990) by adopting the following fixed model.

$$Y_{ijk} = \mu + T_i + S_j + (TS)_{ij} + e_{ijk}$$

where:

Y_{ijk} = observation of the ijk-th fish

μ = overall mean

T_i = fixed effect of the i-th treatment

S_j = fixed effect of the j-th stocking density within the i-th treatment.

$(TS)_{ij}$ = interaction between the effect of i-th treatment and j-th stocking density

e_{ijk} = a random error.

Differences among means were tested for significance according to Duncan's multiple range test (1955).

RESULTS AND DISCUSION

Carcass traits

Nile tilapia

As shown in table (3) tilapia fish fed the second treatment (F) (supplementary feeds) compared with fish raised under the first feeding treatment (M) (poultry litter) show higher percentage of dressing and flesh and lower percentages of head, viscera and by-products. The differences between these components due to feeding treatment were significant (P<0.05) for flesh and by-products percentages and highly significant (P<0.001) for dressing and head percentages. The feeding treatment had no effect on the percentage of skeleton and viscera. From these results it could be concluded that fish fed supplementary feed beside the natural feed available in the pond had higher percentages of flesh and dressing, and this indicates that balanced diet provides tilapia fish with extra amounts of protein, fat, minerals and vitamins required for fish growth and consequently flesh production. Li and Lovell (1992) with channel catfish found that the increase in protein percentage of diet from 26-32% was followed by increase in the dressing percentage. Hillestad and Johnsen (1994) with Atlantic salmon found that the dress-out percentage was significantly lower by about 27- 35% than for the 42% protein diets.

The second stocking rate (SR2) had higher percentage of dressing compared with SR1 and SR3 and the differences between dressing percentages were significant (P<0.05). The effect of stocking rate on the other carcass components were insignificant.

The dressing percentage for the different interactions between the two factors ranged from 44.7-52.9% and the differences between the six interactions were highly significant (P<0.001), the higher dressing percentage was obtained by fish in the second stocking rate and fed the supplementary feed (52.9%). But the lowest one was obtained by fish at the third stocking rate and fed with natural food enhanced by poultry litter. Also the interaction between the two factors had highly significant effect (P<0.001) on the flesh percentage.

Silver carp

As described in table (4) feeding treatment had insignificant effect on the percentage of dressing (DP), head percentage and viscera. The second feeding treatment had significant effect on the percentages of flesh (P<0.001). The carcasses of fish seemed to be affected by the first treatment (fertilization) which resulted in higher percentages of skeleton, by-products and lower percentage of flesh.

Table 4 show that, the three stocking rates had insignificant effects on carcass composition. The effect of the interactions between stocking rates and feeding treatments was insignificant except for flesh percentage ($P<0.05$). The carcasses of fish of second feeding treatment and the three stocking rates had flesh percentage ranged from 50.2 to 51.8%, while the carcasses of fish of the first feeding treatment and the three stocking rates had flesh percentages ranged from 46.8-49.6%.

Chemical composition of flesh
Nile tilapia

Table 5 shows that, tilapia flesh from fish fed the first feeding treatment (organic fertilization) had higher percentages of protein, ash and lower percentages of fat compared with flesh obtained from the second feeding treatment (supplementary feeds) and the difference between percentages under the two feeding treatments were significant. The higher fat content of fish fed the pellets than the fat content of those raised in ponds fertilized with poultry litter was probably due to the high energy content of the commercial pellets, and these results are partially agreed with those obtained by Barash and Schroeder (1984), who found that tilapia fat content was higher for fish fed with pellets compared with that raised with fermented cow manure and the differences were significant. Eves et al., (1995) also found that the growth and proximate analysis of *O. niloticus* fed with septage were smaller and contained less fat than pellet-fed fish. From the means outlined in table (5) it was we noticed that the larger size fish class usually had statistically lower muscle protein and ash percent and higher muscle fat percent and these results are in agreement with that obtained by Brown and Murphy (1991) for juvenile striped bass.

Stocking rate had insignificant effect on percentages of moisture and dry matter but significant effect was found with percentage of protein ($P<0.001$) , fat and ash. Table 5 show that SR1 had the lowest protein percentage and the largest fat percentage whereas SR3 had the largest percentage of protein and the lowest percentage of ash. Yousif (1996) found that stocking density of *O.niloticus* had significant effect on the chemical composition of the whole fish, but Abdel-Wares (1993) found insignificant effect of stocking density (3000, 4500 and 6000 fish/feddan) on the chemical composition of tilapia raised in earthen ponds and this may be due mainly to smaller fish size used in his study. The interaction between stocking rates and feeding treatment had insignificant effect on the chemical composition of tilapia flesh Table 5.

Table (3): Least-square means and standard error of the tested factors affecting on carcass composition of Nile tilapia.

					By-product			
		Body weight	Dressing %	Flesh %	Head %	Skeleton %	Viscera %	Total
Independent variable	No.	Mean±SE	Mean±SE	Mean±SE	Mean±SE	Mean±SE	Mean±SE	Mean±SE
Feeding treatment (T)		***	***	*	***	ns	ns	*
M (poultry litter)	30	78.1±12.4 b	47.7±0.52 b	37.3±0.62 b	33.3±0.50 a	10.4±0.22 a	7.7±0.44 a	56.8±0.76 a
F (artificial feed)	30	137.2±12.4 a	50.3±0.52 a	39.2±0.62 a	30.8±0.50 b	10.4±0.22 a	7.1±0.44 a	54.5±0.76 b
Stocking rate (SR)		ns	*	ns	ns	***	ns	ns
SR1 (1000 tilapia + 100 S. carp)	20	99.0±15.2 a	49.2±0.64 ab	38.8±0.76 a	31.7±0.62 a	9.4±0.27 b	8.0±0.54 a	53.9±0.93 b
SR2 (1000 tilapia + 200 S. carp)	20	94.2±15.2 a	50.1±0.64 a	38.5±0.76 a	31.9±0.62 a	11.6±0.27 a	6.7±0.54 a	56.3±0.93 ab
SR3 (1000 tilapia + 300 S. carp)	20	129.8±15.9 a	47.6±0.64 b	37.4±0.76 a	32.6±0.62 a	10.2±0.27 b	7.6±0.54 a	56.7±0.93 a
T × SR		*	***	***	ns	ns	ns	ns
M×SR1	10	97.8±21.5 b	51.0±0.91 a	41.5±1.08 a	32.6±0.87 abc	9.5±0.38 b	8.0±0.76 a	53.5±1.32 c
M×SR2	10	66.6±21.5 b	47.4±0.91 b	36.0±1.08 b	33.4±0.87 ab	11.4±0.38 a	7.4±0.76 a	58.3±1.32 ab
M×SR3	10	69.9±21.5 b	44.7±0.91 c	34.4±1.08 b	33.9±0.87 a	10.3±0.38 b	7.8±0.76 a	58.3±1.32 a
F×SR1	10	100.2±21.5 b	47.5±0.91 b	36.0±1.08 b	30.8±0.87 bc	9.4±0.38 b	8.0±0.76 a	54.2±1.32 c
F×SR2	10	121.7±21.5 b	52.9±0.91 a	41.1±1.08 a	30.4±0.87 c	11.8±0.38 a	6.0±0.76 a	54.4±1.32 bc
F×SR3	10	189.7±21.5 a	50.4±0.91 a	40.4±1.08 a	31.2±0.87 abc	10.0±0.38 b	7.4±0.76 a	54.9±1.32 abc
Overall mean	60	107.7±8.8	49.0±0.37	38.2±0.44	32.1±0.37	10.4±0.16	7.4±0.31	55.6±0.54

\+ Means with the same letter in each column are not significantly different.
* P<0.05 ** P<0.01 *** P<0.001

Table (4): Least-square means and standard error of the tested factors affecting on carcass composition of silver carp.

Independent variable	No.	Body weight Mean±SE	Dressing % Mean±SE	Flesh % Mean±SE	By-product: Head % Mean±SE	By-product: Skeleton % Mean±SE	By-product: Viscera % Mean±SE	By-product: Total Mean±SE
Feeding treatment (T)		***	ns	***	ns	***	ns	**
M (poultry litter)	15	470.0±15.4 a	55.6±0.51 a	48.2±0.51 b	32.2±0.36 a	7.4±0.24 a	10.2±0.39 a	51.3±0.50 a
F (artificial feed)	15	383.8±15.4 b	56.9±0.51 a	50.8±0.51 a	32.7±0.36 a	6.0±0.24 b	9.2±0.39 a	49.1±0.50 b
Stocking rate (SR)		**	ns	ns	ns	ns	ns	ns
SR1 (1000 tilapia + 100 S. carp)	10	466.1±18.9 a	56.0±0.63 a	49.3±0.62 a	32.9±0.45 a	6.7±0.29 a	9.3±0.47 a	50.2±0.61 a
SR2 (1000 tilapia + 200 S. carp)	10	416.8±18.9 ab	56.4±0.63 a	49.3±0.62 a	32.0±0.45 a	6.5±0.29 a	10.1±0.47 a	50.0±0.61 a
SR3 (1000 tilapia + 300 S. carp)	10	398.3±18.9 b	56.4±0.63 a	46.8±0.62 a	32.4±0.45 a	7.0±0.29 a	9.7±0.47 a	50.3±0.61 a
T × SR		ns	ns	*	ns	ns	ns	ns
M×SR1	5	525.8±26.7 a	54.4±0.89 b	46.8±0.88 c	33.4±0.63 a	7.6±0.41 a	9.5±0.67 ab	52.3±0.87 a
M×SR2	5	454.8±26.7 ab	56.6±0.89 ab	49.6±0.88 ab	31.1±0.63 b	6.9±0.41 ab	11.3±0.67 a	50.3±0.87 abc
M×SR3	5	430.4±26.7 bc	55.9±0.89 ab	48.2±0.88 bc	32.0±0.63 ab	7.6±0.41 a	9.8±0.67ab	51.2±0.87 ab
F×SR1	5	406.4±26.7 bc	57.7±0.89 a	51.8±0.88 a	32.4±0.63 ab	5.9±0.41 b	9.1±0.67 ab	48.2±0.87 c
F×SR2	5	378.8±26.7 bc	56.3±0.89 ab	50.2±0.88 ab	32.9±0.63 ab	6.1±0.41 b	8.9±0.67 b	49.7±0.87 abc
F×SR3	5	366.2±26.7 c	56.8±0.89 ab	50.2±0.88 ab	32.8±0.63 ab	6.3±0.41 b	9.6±0.67 ab	49.7±0.87 bc
Overall mean	5	427.1±10.9	56.3±0.36	49.5±0.36	32.4±0.26	6.7±0.17	9.7±0.27	50.2±0.35

\+ Means with the same letter in each column are not significantly different.
* P<0.05 ** P<0.01 *** P<0.001

Silver carp

As described in table (6) feeding type (natural or supplementary feeding) had a significant effect on chemical composition of silver carp flesh except protein percentage. Silver carp flesh from fish fed on natural food only (first treatment) had higher percentages of dry matter, protein, fat and lower percentages of ash (6.99 vs. 8.67%) and moisture (78.86 vs. 79.02%) compared with that fed the supplementary feed (F). These results are in agreement with that reported by (Billard, 1995) for carp, who reviewed that, the protein content of carp was higher in fish fed zooplankton and benthos compared with a feeding regime based on cereals but artificial feed, such as cereals and formulated pellets which increases the amount of fat.

Fish stocking rate had insignificant effect on the percentages of protein, fat and ash but there was significant effect of stocking rate on the moisture and dry matter percentages of silver carp flesh. The interaction between the two factors studied (feeding treatment and stocking rate) had insignificant effect on the chemical composition of silver carp flesh. The flesh of the smallest fish had relatively lower percentages of dry matter, protein and fat but had larger percentages of ash and moisture.

Chemical composition of by-products

Nile tilapia

Table 7 shows that by-products for the fish in the first feeding treatment compared with that recorded for the second treatment had higher percentages of protein and ash percentage and lower percentages of fat and the differences between the two treatments were highly significant.

Fish stocking rate had significant effect on the percentages of protein and fat but had insignificant effect on the percentage of ash. The by-products from fish raised under SR3 had highpercentage of protein (50.02%) and lower percentage of crude fat .The interaction between the two factors studied (feeding regime stocking rate) had insignificant effect on the percentage of protein, fat and ash percentage.

Silver carp

By-products for the first feeding treatment compared with by-products obtained from the second feeding treatment had higher percentages of dry matter and fat and lower percentages of protein and ash (Table, 8). Stocking rate and the interaction between feeding treatment and stocking rate had insignificant effect on the percentages of moisture, dry matter, protein, fat and ash percentage of the silver carp by-products.

Table (5): Least-square means and standard error of the tested factors affecting on the composition of flesh of Nile tilapia.

Independent variable	No.	body weight Mean±SE	moisture % Mean±SE	dry matter % Mean±SE	protein % Mean±SE	fat % Mean±SE	ash % Mean±SE
Feeding treatment (T)		***	ns	ns	*	***	**
M (poultry litter)	30	78.1±12.4 b	78.78±0.26 a	21.22±0.26 a	87.02±0.91 a	6.12±0.68 b	7.54±0.29 a
F (artifical feed)	30	137.2±12.4 a	78.33±0.26 a	21.67±0.26 a	84.00±0.91 b	10.53±0.68 a	6.23±0.29 b
Stocking rate (SR)		Ns	ns	ns	**	*	*
SR1 (1000 tilapia + S.carp)	20	99.0±15.2 a	78.32±0.32 a	21.68±0.32 a	82.82±1.11 b	9.98±0.84 a	6.86±0.35 ab
SR1 (1000 tilapia + S.carp)	20	94.2±15.2 a	78.21±0.32 a	21.79±0.32 a	86.35±1.11 a	6.68±0.84 b	7.58±0.35 a
SR1 (1000 tilapia + S.carp)	20	129.8±15.9 a	79.13±0.32 a	20.87±0.32 a	87.37±1.11 a	8.32±0.84 ab	6.21±0.35 b
T × SR		*	ns	ns	ns	ns	ns
M×SR1	10	97.8±21.5 b	78.93±0.45 ab	21.07±0.45 ab	82.38±1.57 b	8.55±1.18 ab	7.80±0.50 a
M×SR2	10	66.6±21.5 b	78.93±0.45 ab	21.54±0.45 ab	89.65±1.57 a	3.82±1.18 c	7.74±0.50 a
M×SR3	10	69.9±21.5 b	78.95±0.45 ab	21.05±0.45 ab	89.03±1.57 a	5.98±1.18 bc	7.08±0.50 ab
F×SR1	10	100.2±21.5 b	77.72±0.45 b	22.29±0.45 a	83.25±1.57 b	11.41±1.18 a	5.92±0.50 bc
F×SR2	10	121.7±21.5 b	77.96±0.45 ab	22.04±0.45 ab	83.05±1.57 b	9.54±1.18 a	7.42±0.50 a
F×SR3	10	189.7±21.5 a	79.30±0.45 a	20.70±0.45 b	85.71±1.57 ab	10.56±1.18 a	5.34±0.50 c
Overall mean	10	107.7±8.8	78.55±0.18	21.45±0.18	85.51±0.64	8.32±0.48	6.88±0.20

\+ Means with the same letter in each column are not significantly different.
* P<0.05 ** P<0.01 *** P<0.001

Table (6): Least-square means and standard error of the tested factors affecting on the composition of flesh of silver carp.

Independent variable	No.	body weight Mean±SE	moisture % Mean±SE	dry matter% Mean±SE	protein % Mean±SE	fat % Mean±SE	ash % Mean±SE
Feeding treatment (T)		***	*	*	ns	**	*
M (poultry litter)	15	470.0±15.4 a	78.86±0.38 b	22.14±0.38 a	84.39±3.17 a	9.52±0.65 a	6.99±0.62 a
F (artifical feed)	15	383.8±15.4 b	79.02±0.38 a	20.98±0.38 b	77.65±3.17 a	6.48±0.65 b	8.67±0.62 a
Stocking rate (SR)		*	*	*	ns	ns	ns
SR1 (1000 tilapia + S.carp)	10	466.1±18.9 a	78.04±0.46 b	21.96±0.46 a	83.27±3.88 a	8.57±0.80 a	7.17±0.76 a
SR1 (1000 tilapia + S. carp)	10	416.8±18.9 ab	77.87±0.46 b	22.7130.46 a	83.33±3.88 a	7.89±0.80 a	7.50±0.76 a
SR1 (1000 tilapia + S. carp)	10	398.3±18.9 b	79.41±0.46 a	20.59±0.46 b	76.47±3.88 a	7.55±0.80 a	8.82±0.76 a
T × SR		ns	ns	ns	ns	ns	ns
M×SR1	5	525.8±26.7 a	77.84±0.65 b	22.16±0.65 a	83.24±5.49 a	10.68±1.13 a	6.58±1.08 b
M×SR2	5	454.8±26.7 ab	77.11±0.65 b	22.89±0.65 a	85.39±5.49 a	9.76±1.13 ab	7.28±1.08 ab
M×SR3	5	430.4±26.7 bc	78.63±0.65 ab	21.37±0.65 ab	84.55±5.49 a	8.14±1.13 abc	7.12±1.08 ab
F×SR1	5	406.4±26.7 bc	78.24±0.65 ab	21.76±0.65 ab	83.29±5.49 a	6.47±1.13 bc	7.76±1.08 ab
F×SR2	5	378.8±26.7 bc	77.63±0.65 ab	21.37±0.65 ab	81.27±5.49 a	6.02±1.13 c	7.72±1.08 ab
F×SR3	5	366.2±26.7 c	80.20±0.65 a	19.81±0.65 b	68.39±5.49 a	6.95±1.13 bc	10.52±1.08 a
Overall mean	30	427.1±10.9	78.44±0.27	21.56±0.26	81.02±2.24	8.00±0.46	7.83±0.44

+ Means with the same letter in each column are not significantly different. * P<0.05 ** P<0.01 *** P<0.001

Table (7): Least-square means and standard error of the tested factors affecting on the composition of by-products of Nile tilapia.

Independent variable	No.	body weigh Mean±SE	moisture % Mean±SE	dry matter% Mean±SE	protein % Mean±SE	fat % Mean±SE	ash % Mean±SE
Feeding Treatment (T)		***	ns	ns	***	***	***
M (poultry litter)	30	78.1±12.4 b	69.74±0.57 a	30.19±0.57 a	50.97±0.80 a	12.27±1.64 b	32.95±1.10 a
F (artificial feed)	30	137.2±12.4 a	68.83±0.57 a	31.17±0.57 a	46.55±0.80 b	24.74±1.64 a	23.88±1.10 b
Stocking rate (SR)		ns	***	***	*	**	ns
SR1 (1000 tilapia +100 S.carp)	20	99.0±15.2 a	65.13±0.69 b	34.77±0.70 a	46.62±0.98 b	22.83±2.01 a	26.47±1.35 b
SR2 (1000 tilapia +200 S.carp)	20	94.2±15.2 a	71.03±0.69 a	28.98±0.70 b	49.65±0.98 a	13.23±2.01 b	30.62±1.35 a
SR3 (1000 tilapia +300 S.carp)	20	129.8±15.9 a	71.69±0.69 a	28.31±0.70 b	50.02±0.98 a	19.44±2.01 a	28.15±1.35 ab
T × SR		*	**	**	ns	ns	ns
M×SR1	10	97.8±21.5 b	64.06±0.98 c	35.71±1.00 a	48.55±1.38 ab	20.29±2.85 a	29.64±1.90 bc
M×SR2	10	66.6±21.5 b	71.32±0.98 ab	28.68±1.00 bc	51.84±1.38 a	5.90±2.85 b	35.88±1.90 a
M×SR3	10	69.9±21.5 b	73.81±0.98 a	26.19±1.00 c	52.54±1.38 a	10.60±2.85 b	33.32±1.90 ab
F×SR1	10	100.2±21.5 b	66.17±0.98 c	33.83±1.00 a	44.69±1.38 b	25.37±2.85 a	23.30±1.90 d
F×SR2	10	121.7±21.5 b	70.73±0.98 b	29.27±1.00 b	47.46±1.38 b	20.55±2.85 a	25.36±1.90 dc
F×SR3	10	189.7±21.5 a	69.58±0.98 b	30.42±1.00 b	47.49±1.38 b	28.29±2.85 a	22.98±1.90 d
Overall mean	60	107.7±8.8	69.28±0.40	30.68±0.41	48.76±0.56	18.50±1.16	28.41±0.20

+ Means with the same letter in each column are not significantly different. * P<0.05 ** P<0.01 *** P<0.001

Table (8): Least-square means and standard error of the tested factors affecting on the composition of by-products of silver carp.

Independent variable	No.	body weight Mean±SE	moisture % Mean±SE	dry matter% Mean±SE	protein % Mean±SE	fat % Mean±SE	ash % Mean±SE
Feeding treatment (T)		***	***	***	ns	***	**
M (poultry litter)	15	470.0±15.4 a	74.38±0.50 b	25.62±0.50 a	47.63±1.28 a	19.71±0.77 a	29.80±0.81 b
F (artificial feed)	15	383.8±15.4 b	77.76±0.50 a	22.24±0.50 b	48.17±1.28 a	10.13±0.77 b	32.84±0.81 a
Stocking rate (SR)		**	ns	ns	ns	ns	ns
SR1 (1000 tilapia +100 S.carp)	10	466.1±18.9 a	75.72±0.61 a	24.28±0.61 a	46.51±1.57 a	15.10±0.95 a	32.26±0.99 a
SR2 (1000 tilapia +200 S.carp)	10	416.8±18.9 ab	75.92±0.61 a	24.08±0.61 a	47.67±1.57 a	15.51±0.95 a	31.80±0.99 a
SR3 (1000 tilapia +300 S.carp)	10	398.3±18.9 b	76.57±0.61 a	23.43±0.61 a	49.52±1.57 a	14.14±0.95 a	29.90±0.99 a
T × SR		ns	ns	ns	ns	ns	ns
M×SR1	5	525.8±26.7 a	74.52±0.87 bc	25.48±0.87 ab	44.90±2.21 a	20.65±1.34 a	29.92±1.40 b
M×SR2	5	454.8±26.7 ab	73.73±0.87 c	26.27±0.87 a	49.10±2.21 a	20.71±1.34 a	30.80±1.40 ab
M×SR3	5	430.4±26.7 bc	74.88±0.87 bc	25.12±0.87 ab	48.89±2.21 a	17.75±1.34 a	28.68±1.40 b
F×SR1	5	406.4±26.7 bc	76.91±0.87 ab	23.09±0.87 bc	48.13±2.21 a	9.55±1.34 b	34.60±1.40 a
F×SR2	5	378.8±26.7 bc	78.10±0.87 a	21.90±0.87 c	46.23±2.21 a	10.30±1.34 b	32.80±1.40 ab
F×SR3	5	366.2±26.7 c	78.26±0.87 a	21.74±0.87 c	50.15±2.21 a	10.54±1.34 b	31.12±1.40 ab
Overall mean	30	427.1±10.9	76.07±0.87	23.93±0.35	47.90±0.91	14.92±0.55	31.32±0.57

\+ Means with the same letter in each column are not significantly different. * P<0.05 ** P<0.01 *** P<0.001

REFERENCES

Abdel-wares, A. A. (1993): Studies on growth and development of Tilapia nilotica as affected by different environmental factors. M.Sc. Thesis, Faculty of Agriculture, Al-Azhar University, Egypt.

A.O.A.C. (1990): Official Methods of Analysis. Association of Official Analytical Chemists. Washington, D. C.

Barash, H. and Schroeder, G. L., (1984): Use of fermented cow manure as a feed substrate for fish polyculture in Stagant water ponds. Aquaculture, 36:127-140.

Billard, R. (1995): The major carps and other cyprinids. pp. 21-55 in: C.E. Nash and A.J. Novotny(Editors).Production of aquatic animals (fishes).World Animal science,C8.

Brown, M. L. and Murphy, B. R. (1991): Relationship of relative weight (Wr) to proximate composition of juvenile Striped bass and hybrid Striped bass. Trans. Am. Fish. Soc., 120:509-518.

Duncan, D. B. (1955): Multiple range and multiple F test. Biometrics, 11:1-42.

Eves, A., Turner, C., Yakupitiyage, A., Tongdee, N. and Ponza, S. (1995). The microbiological and sensory quality of septage-raised Nile tilapia *(Oreochromis niloticus).* Aquaculture, 132:261-272.

Harvey, W. R. (1990): User's guide for LSMLMW. mixed model least-squares and maximum likedlihood computer program. Ohio state University, Columubs, USA:

Hillestad, M. and Johnsen, F. (1994): high-energy/low-protein diets for Atlantic salmon: effect on growth, nutrient retention and slaughter quality. Aquaculture, 124:109-116.

Hussein, A. A. (1990): Biochemical studies on fish by-products. M. Sc. Thesis, Faculty of Agriculture, Zagazig University, Egypt.

Li, M. and Lovell, R. T. (1992, a): Growth, feed efficiency and body composition of second and third year Channel catfish fed various concentrations of dietary protein to satiety in production ponds. Aquaculture, 103:153-163.

Lovell, R. T. (1981): Laboratory manual for fish feed analysis and fish nutrition studies. Auburn University, Alabama.

Siddiqui, A. and Al-Harbi, A. (1995). Evaluation of three species of tilapia, red tilapia and hybrid tilapia as culture species in Saudi Arabia. Aquaculture, 138:147-157.

Yousif, O. M. (1996): Effects of rearing conditions in closed recireulatory systems on growth, feed utilization, carcass composition and nutrient digestibility of juvenile tilapia (*Oreochromis niloticus* L*)*. Ph.D. thesis, Institute of Animal physiology and Animal Nutrition. University of Göttingen, Germany.

تأثير التسميد العضوى، الأعلاف الإضافيه وكذلك معدل الكثافه على مكونات الذبيحه والتحليل الكيميائى للبلطى النيلى والمبروك الفضى

فاطمه عبد الفتاح حافظ١ مجدى عبد الحميد سلطان٢ محمد خيرى ابراهيم٢

١ المعمل المركزى لبحوث الثروه السمكيه بالعباسه – محافظة الشرقية.
٢ كلية الزراعه بمشتهر–جامعة الزقازيق–فرع بنها–قسم الإنتاج الحيوانى.

أجريت هذه التجربة فى الفتره من ١٥ مايو وحتى الأول من سبتمبر عام ١٩٩٥ وذلك بإستخدام ستة أحواض ترابيه بالمعمل المركزى لبحوث الثروه السمكيه بالعباسه–مركز أبوحماد–محافظة الشرقيه. وقد استهدفت هذه التجربه دراسة تأثيرإستزراع كثافات مختلفه من أسماك المبروك الفضى مع أسماك البلطى النيلى تحت نظام التربية المختلطه لأنواع الأسماك هذا بالإضافه إلى دراسة تأثير تسميد الأحواض تسميداً عضوياً بإستخدام فرشة الدجاج ودراسة تأثير ذلك على صفات الذبيحه والتحليل الكيميائى لأجزاء الذبيحه المأكوله والغير مأكوله لأسماك البلطى والمبروك الفضى.

وعند بداية التجربه وضعت ١٠٠٠ سمكة من أصبعيات البلطى (١١٫٣ جرام) فى كل حوض ثم قسمت هذه الأحواض إلى مجموعتين تحتوى كل مجموعه على ثلاث أحواض ثم وضعت ١٠٠ سمكة مبروك فى الحوض الأول ، ٢٠٠ سمكه فى الحوض الثانى ، ٣٠٠ سمكه فى الحوض الثالث من كل مجموعه. هذا وقد سمدت الأحواض الثلاثه المكونه للمجموعه الأولى بإستخدام فرشة الدجاج بواقع ٥٠ كجم/أسبوع طول فترة التجربه وذلك بهدف تنمية الغذاء الطبيعى الميسر فى هذه الأحواض أما الأحواض الثلاثه المكونه للمجموعه الثانيه فقد غذيت بإستخدام أعلاف الأسماك المصنعه والمحتويه على ٣٠% بروتين خام وذلك بمعدل ٣% من وزن الأسماك الموجوده فى كل حوض يومياً (ستة أيام أسبوعياً) . ومن أهم النتائج المتحصل عليها مايلى:

<u>أولاً: صفات الذبيحه:</u>

١–أعطت أسماك البلطى التى حصلت على المعامله الغذائيه الثانيه نسب أعلى لنسبة التصافى (٥٠٫٣ مقابل ٤٧٫٧%) واللحم (٣٩٫٢ مقابل ٣٧٫٣%) والأجزاء الغير مأكوله مجتمعه (٥٤٫٥ مقابل ٥٦٫٨%) وذلك مقارنة بالأسماك التى ربيت فى الأحواض التى سمدت بالسماد العضوى وكانت الإختلافات بين المعاملتين الغذائيتين إختلافات معنويه بالنسبه لنسبة التصافى.

٢–أعطت أسماك البلطى التى ربيت مع معدل الكثافة الثانية مع أسماك المبروك نسب أعلى بالنسبة لنسبة التصافى (٥٠٫١%) مقارنة بالكثافة الأولى (٤٩٫٢%) والكثافة الثالثة (٤٧٫٦%) على التوالى. وكانت الأختلافات معنويه. كما أعطت الأسماك التى غذيت على العلف الإضافى مع الكثافة الثانيه من المبروك الفضى نسبة عاليه (٥٢٫٩%). أما أقل نسبة تصافى فقد حصلنا عليها من الأسماك التى غذيت على الغذاء الطبيعى فقط مع الكثافة الثالثه لأسماك المبروك الفضى (٤٤٫٧%).

٣–أوضحت نتائج تحليل الذبيحه لأسماك المبروك الفضى أن الأسماك التى حصلت على المعامله الغذائيه الأولى (الغذاء الطبيعى) أعطت نسباً أعلى للأجزاء الغير مأكوله (٥١٫٣ مقابل ٤٩%) ونسباً أقل للحم (٤٨٫٢ مقابل ٥٠٫٨%) مقارنة بالأسماك التى حصلت على المعاملة الغذائيه الأولى (العلف الإضافى).

٤–لم يكن لمعدلات الكثافه الثلاثه من أسماك المبروك الفضى أى تأثير معنوى على مكونات الذبيحه.

<u>ثانياً: التحليل الكيميائى للحوم ومخلفات الأسماك:</u>

١–أظهرت نتائج التحليل الكيميائى للحوم أسماك البلطى التى حصلت على المعاملة الغذائيه الأولى مقارنة بتلك التى غذيت على المعامله الغذائية الثانية أظهرت أنها تحتوى على نسب أكبر من البروتين (٨٧٫٠٢ مقابل ٨٤%) والرماد (٧٫٥٤ مقابل ٦٫٢٣%) كما أحتوت على نسب أقل من الدهن (٦٫١٢ مقابل ١٠٫٥٣%) وقد كانت الفروق معنويه كما حصلنا على هذا الإتجاه عند إجراء التحليل الكيميائى للأجزاء الغير مأكولة من الأسماك. هذا وقد أعطت لحوم الأسماك التى ربيت مع الكثافه الثانيه أعطت أقل نسب من البروتين (٨٢٫٨%) ونسبة أكبر للدهن ٩٫٩٨% فى حين أحتوت لحوم أسماك البلطى مع الكثافة الثالثه من المبروك الفضى على نسبة أكبر من البروتين (٨٧٫٣٧%) ونسبة أقل من الرماد (٦٫٢١%) كما أعطت نتائج تحليل الأجزاء الغير مأكوله من الأسماك نتائج متشابهة مع نتائج تحليل لحوم هذه الأسماك.

٢–أظهرت نتائج التحليل الكيميائى للحوم أسماك المبروك الفضى التى حصلت على المعامله الغذائيه الأولى (غذاء طبيعى فقط) أنها قد أحتوت على نسب أكبر من البروتين (٨٤٫٣٩% مقابل ٧٧٫٦٥%) والدهن (٩٫٥٢ مقابل ٦٫٤٨%) ونسب أقل من الرماد (٦٫٩٩ مقابل ٨٫٦٧%) وذلك مقارنة بلحوم الأسماك التى حصلت على المعاملة الغذائيه الثانيه. أما معدل كثافة أسماك المبروك الفضى فلم يكن لها أى تأثير معنوى على نسب البروتين والدهن والرماد ولكن كان لها تأثيراً معنوياً على نسبة الرطوبة والمادة الجافة فى لحوم أسماك المبروك الفضى.

٣–لم يكن للتأثير المشترك لكلاً من نوع الغذاء و معدل الكثافه تأثيراً معنوياً على التحليل الكيميائى للحوم والأجزاء