EFFECT OF EXTRUDED AND NON-EXTRUDED FISH PELLET ON GROWTH PERFORMANCE AND TOTAL PRODUCTION OF NILE TILAPIA AND GREY MULLET FINGERLINGS REARED IN A POLYCULTURE SYSTEM IN EARTHEN PONDS

AYMAN A. AMMAR.[1], A. S. ABD-ELGAWAD[2] AND A. A. SALAMA[3]

1. *Fish Culture Systems Dep., Central Laboratory for Aquaculture Research, Agricultural Research Center, Egypt.*
2. *Fish Biology and Ecology Dept., Central Laboratory for Aquaculture Research, Agricultural Research Center, Egypt.*
3. *Fish Economy Dept., Central Laboratory for Aquaculture Research, Agricultural Research Center, Egypt*

Abstract

A 20 week field trial was conducted in a private fish farm consisting of eight earthen ponds one feddan each (4200 m^2), in order to investigate the effect of extruded and non-extruded fish diet on the growth performance and total yield of Nile tilapia (*Oreochromis niloticus*) and grey mullet (*Mugil cephalus*) fingerlings, reared in a polyculture system. Duplicated four treatments were carried out and divided to 2 stocking density groups. The A 2x2 factorial design, including tow stocking densities (10000 tilapia and 750 mullets or 15000 tilapia and 750 mullets per pond) and tow feed types (extruded or nun extruded pellets) has been adopted. Duplicate groups of Nile tilapia and mullets at average initial weights of 23.5 g and 32.9 g, respectively, were fed a 25% CP diet, in extruded or non-extruded form, at a daily rate of 3% of the total fish biomass. Results indicated that growth rates and feed utilization efficiency of Nile tilapia and mullet increased significantly when they were fed on extruded pellet compared with the fish fed on non extruded pellets. The total fish production increased significantly with increasing stocking density from 10000 to 15000 fish per feddan. The highest net returns were obtained when the extruded pellet diet was used at a density of 15000 Nile tilapia per feddan.

Key words: Nile tilapia, *Oreochromis niloticus*, grey mullet, *Mugil cephalus*, stocking density, extruded pellets, non-extruded pellets, polyculture system and earthen ponds.

INTRODUCTION

Fish feeding is one of the most important factors in commercial fish farming because feeding regime may have consequences on both growth efficiency and feed wastage (Tsevis *et al.*, 1992; Azzaydi *et al.*, 2000). During the last decade, there has been a marked increase in the use of extruded diets for feeding fish. These diets have superior water stability, better floating properties and a higher energy than pelleted diets (Hilton *et. al.*, 1981; Johnsen and Wandsvik, 1991 and Ammar, 2008).

The main effects on fish are: an increase in fish growth and an improvement in feed conversion (Robert *et al.*, 1993; Lanari *et al.*, 1995).

Hicking (1968); Moav, *et al.* (1977), Balarin and Haller. (1979) showed that the ponds have their maximum standing crop, when the fish makes use of all food without any gain or less in weight and consequently, length and depth. In addition, Van der Lingen (1959) proved that total yield per unit area is dependent upon stocking mass per unit area. Abdel-Hakim *et al.*, (1995) reported that growth performance parameters of Nile tilapia cultured in earthen ponds decreased as the stocking density increased from 3000 to 4500 or 6000 fish/feddan. Abdel-Hakim and Ammar, (2005) reported that cultured mono-sex Nile tilapia fry at 16 thousand fish/feddan ($4200m^2$) gives the highest production. Also, Ammar *et al.*, (2005) showed that Nile tilapia stocking density rate of 3 fingerlings /m^3 (12000 fish/feddan) and cultured for 140 days in monoculture revealed the best economic efficiency, compared with other stocking densities

Tilapias and mullet response very good to pond polyculture in earthen ponds, Afifi *et al.*, (1996), reported that both tilapia and mullet responded in their growth performance when they stocked together in earthen pond fertilized with chicken manure, super phosphate and urea with supplementary diet containing 13% crude protein. Baradach *et al.*, (1973) and Afifi *et al.*, (1996), noted that total yield of tilapia and carp increased by 13 to 35% when mullets were added. Similar results were reported by Abdel-Hakim and Sadek (1986), Sadek and Hammad (1990), by using polyculture systems of tilapia, mullet and carp. Also, Abdel-Hakim *et al.,* (2001) noted that the performance of tilapia, mullet and eel in a polyculture system in earthen ponds has been improved compared with monoculture system of each species.

Stocking density is a major factor affects fish growth under farmed conditions (Jobling, 1995; Yi *et al.* 1996; Hengsawat *et al.*; 1997 and Maragoudaki *et al.*, 1999).

In polyculture system, *Oreochromis niloticus* was stocked with *Mugil cephalus* at stocking density of 8000 fish/fed, at different ratio (60:40, 70:30, 80:20 and 90:10). The best mixed species ratio was 70% of *O. niloticus* and 30% of *M. cephalus* for highest pond production in polyculture system (Abdel-Gawad, 2003). Also, Abdel-Gawad and Salama, (2007) cited that the stocking density at the rate of 1050 grey mullet *Mugil cephalus* fingerlings per feddan without any supplementary food and cultured for 180 days in monoculture system, had the highest net return.

This study aims to investigate the effects of feed forms (extruded pellet and non extruded pellet) and stocking density on growth performance, total yield and the economic returns of Nile tilapia and grey mullet reared in a polyculture system in earthen ponds.

MATERIALS AND METHODS

This study was carried out for 20 weeks (12 June to 30 October 2006), at a private fish farm located in Ibshway, Fayoum Governorate, Egypt.

Experimental ponds

A total of eight earthen ponds, each of one feddan total area, with a water depth of one and half meter were used in this study. Four ponds were stocked with Nile tilapia and mullet fingerling of an initial weight of 23.5 and 32.9 g, respectively, at a stocking density of 10000 and 750 fingerling/feddan respectively, while the other four ponds were stocked with Nile tilapia and mullet fingerlings of an initial weight of 24.0 and 33.6g, respectively, at a stocking density of 15000 and 750 fingerling/feddan. Prior to the start, ponds were dried completely and exposed to direct sun for 4 weeks for complete drying. The ponds were then filled with water (drainage water) coming from the first El Wadi drainage canal. Ponds water was changed to keep water quality suitable for fish growth.

Experimental fish

Mono-sex Nile tilapia was purchased from a privet tilapia hatchery. The tilapia fingerlings used in the present study were over wintered at the experimental site. The mullet fingerlings were purchased from a privet farm. At the start of the experiment, fish weight (gram) and length (cm) were determined from 50 fish of each pond. The weights and lengths of the fish were recorded in a sample of 50 fish from each pond at 14-day intervals. At experimental termination the fish were harvested by seining and total yield were recorded.

Fish feeding

The eight experimental ponds received two pellet forms (extruded and non-extruded pellets). At each stocking density, duplicate groups of fish were fed either the extruded or non-extruded 25% cp pellets (Table.1). The extruded and non-extruded diets were purchased from commercial feed mill. The diets were fed to the fish at a daily rate of 3% of the total pond biomass, divided into four feedings, 7 days a week, for 20 weeks.

Table 1. Composition, approximate chemical analysis and gross energy of the experimental diet.

Ingredients	Diet 25 %C.P
Rice bran	34
Yellow corn	26
Soybean meal (44% c.p.)	18
Fish meal	7
Meat meal	12
Molass	3
Total	100
Analyzed on dry matter basis	
Moisture	7.02
Crude protein (C.P)	24.92
Ether extract (E.E)	8.54
Nitrogen free extract	37.48
Ash	16.21
Crude fibers	5.73
Gross energy K.cal/ kg*	3750
C/P**	149.88

* GE= Gross energy based on 5.65 K. Cal/g for protein 9.45 K. cal/g for Fat, 4.1 K. cal/g for Carbohydrate.

Water quality

Water samples were taken monthly for determination of pH, dissolved oxygen, salinity, hardness, alkalinity, contents of nitrite, nitrate and ammonia. Average water quality parameters are illustrated in table (2). Analytical methods were done according to the American Public Health Association (APHA, 1992). The pH values were determined by digital pH meter model 68 engineered systems and Designs. The water temperature; seccki disk reading (transparency) and oxygen saturation were measured daily at 8:00 a.m. by an oxygen meter, WPA 20 Scientific Instrument.

Table 2. Average of physical and chemical properties of pond water during experimental period through intervals (2 weeks) (mean ± SE)* from 20th of April to 30th of October (2006).

ITEMS	Period				
	12/6/06 To 11/7/06	12/7/06 To 11/8/06	12/8/06 To 11/9/06	12/9/06 To 11/10/06	12/10/06 To 30/10/06
Temp. (C)°	25.5 ± 0.4	29.0 ± 0.4	30:1 ± 0.45	29. 2 ± 0.5	27.4 ± 0.05
Secki Disk (cm)	>17 ±0.28	>19 ± 0.28	>15 ± 0.3	19 ± 0.4	20 ± 0.42
pH values (Unit)	9.0 ± 0.1	9.0 ± 0.1	9.0 ± 0.11	9.0 ± 0.15	9.0 ± 0.16
D. Oxygen (mg/L)	7.4 ± 0.2	3.7 ± 0.2	3.3 ± 0.25	3.6 ± 0.24	5.0 ± 0.27
Salinity (g/L)	6.0 ± 0.1	6.0 ± 0.1	7.0 ± 0.1	7.0 ± 0.1	6.0 ± 0.11
Hardness (mg/L)	1200 ± 48	1200 ± 48	1200 ± 42	1200 ± 60	1200 ± 50
Alkalinity (mg/l)	260 ± 35	260 ± 35	240 ± 25	260 ± 35	220 ± 30
NO_3 (mg/L)	0.28 ± 0.03	0.28 ± 0.03	0.30 ± 0.05	0.26 ± 0.04	0.24 ± 0.06
NH_4 (mg/L)	1.6 ± 0.04	1.4 ± 0.04	1.4 ± 0.04	1.2 ± 0.05	1.0 ± 0.03
NH_3 (mg/L)	0.79 ± 0.05	0.86 ± 0.05	0.75 ±0.03	0.65 ± 0.05	0.59 ± 0.06

Growth performance

Condition factor (K) $W/L^3 X 100$

Where: W= fish weight "grams", L = fish length "cm"

Daily Weight Gain (DWG) was calculated as:

$(W_2-W_1) / t$, where W_2 is the interval time in days.

Feed Conversion Ratio (FCR) was calculated by using the following equation: **FCR**= dry feed ingested/ weight gain time of experiment (days).

Statistical analysis

The statistical analysis was performed using One-way Analysis Of Variance (ANOVA), Duncan's multiple Range Test (Duncan 1955) to determine differences between treatments (stocking density and feed processing type as main effects), and means at significance level of 0.05 Standard errors of treatment means were also estimated. All statistics were carried out using Statistical Analysis Systems (SAS) program (SAS, 2005).

RESULTS AND DISCUSSION

Water quality parameters

Physical and chemical water quality parameters are presented in table (2), results reveled that all tested physical and chemical parameters were within the permissible levels required for tilapia growth. The lowest water temperature was recorded in June (25.5 °C) while the highest was in August (30.1 °C). Sicki disc reading ranged between 15 cm in August and 20 cm in October after the experiment start that reflects the water very wealthy with nutrients required for plankton growth. Water pH value was 9.0 during the experimental period. The dissolved oxygen concentration ranged from 3.3 to 7.4 mg/L, which was sufficient for normal growth and development of tilapia. On the other hand, water salinity ranged between 6 and 7 ppt. Water hardness (mg/L) was found to be 1200 mg/L. alkalinity (mg/L) had ranged between 220 mg/L and 260 mg/L. Nitrite levels ranged between 0.24 to 0.30 mg/L and ammonia between 1.0 to 1.6mg/L, while nitrate concentration fluctuated between 0.59 to 0.86 mg/L throughout the study period.

Growth performance

Body weight

As presented in table (3), at 10 thousands stocking density treatments (T1 and T2), results revealed that the average of body weight of tilapia at the intervals of 2; 4; 6; 8; 10 and 12 weeks after experimental start, had insignificant differences ($p<0.05$) between the fed extruded and non-extruded diet groups. That is because; it had been still enough natural food to compensate the essential nutrients for tilapia.

However, at the intervals of 14 to 20 weeks, tilapia body weight tended to significant increasing ($p<0.05$) for fed extruded diet group. The average of tilapia body weights after 14 weeks of the experimental start were 139.2 ±7.63 and 137.0 ±7.58 g.; for fed extruded and non-extruded groups respectively, and after 20 weeks, they were 215.6 ±11.25 and 206.5 ±13.1g for extruded and non extruded diets respectively. Variance analysis of results at those intervals indicated that fish of fed extruded diet group had significantly ($p<0.05$) superior body weights compared of these fed non-extruded diet.

For mullet at the same stocking density, the body weight, at 2 to 8 week intervals after the experiment start, had no significant differences ($p<0.05$) between fed extruded and non extruded diet groups, because the natural food satisfied the nutritional requirements of fish. However, from 10 weeks interval till termination of the experiment (20 weeks after start), the fed extruded diet group showed significantly ($p<0.05$) heavier body weights compared to the fed non-extruded diet group. It can be explain that in case of fed extruded diet group, tilapia preferred extruded food than natural food which was satisfied for mullet fish. The finally body weights of mullet were 228.9 ±8.6 and 149.0 ±7.0g for extruded and non extruded diets respectively.

At 15 thousands stocking density(T_3 and T_4), the average body weight of tilapia after 14 weeks of the experimental start till the final interval (20 weeks interval), showed significant differences ($p<0.05$) between the extruded and non-extruded groups. Final body weight of tilapia reached 227.1 ±11.00 and 201.2 ±13.2 g for fed extruded and non-extruded diet groups respectively (table 3). Analysis of variance for results at these intervals indicated that groups fed extruded diet had significantly ($p<0.05$) superior body weights compared to those fed on the non-extruded. The same trend can be noticed in mullet fish that had significantly ($p<0.05$) superior body weights compared of these fed non-extruded diet.

For mullet at 15 thousand stocking density, analysis of variance of results at the period of 10 to 20 weeks intervals indicated that groups fed extruded diet had significantly ($p<0.05$) superior body weights compared to those fed on the non-extruded. The finally body weights of tilapia reached 285.0 ±12.00 and 162.0 ±7.8g for extruded and non extruded diets respectively.

Table 3. Average of body weight (W in grams) of *O. niloticus* and *M. Cephalus* during experimental period (20 weeks) as effecting with extruded and non-extruded fish food under tow different stocking densities.

ITEMS		T1 Stock: 10000 Feed: Extruded		T2 Stock: 10000 Feed: Non-extruded		T3 Stock: 15000 Feed: Extruded		T4 Stock: 15000 Feed: Non-extruded	
Exp. Period									
Intervals	Weeks	T	M	T	M	T	M	T	M
12/06/06 Initial	0	23.5 a ±1.14	32.9 a ±1.6	23.6 a ±1.2	33.6 a ±1.8	24.0 a ±1.2	33.6 a ±1.5	23.2 a ±1.1	32.9 a ±1.9
26/06/06	2	37.9 a ±3.2	45.9 a ±3.3	37.9 a ±3.2	40.4 a ±2.8	38.2 a ±3.1	47.9 a ±3.07	38.1 a ±3.19	41.6 a ±3.0
10/07/06	4	55.0 a ±5.15	64.9 a ±4.2	54.8 a ±5.16	49.9 a ±4.0	55.0 a ±5.15	65.4 a ±4.1	55.0 a ±5.15	49.9 a ±4.0
27/07/06	6	70.2 a ±5.17	82.7 a ±4.9	70.3 a ±5.20	61.0 a ±3.0	70.3 a ±5.2	82.7 a ±4.9	70.0 a ±5.13	65.9 a ±3.0
07/08/06	8	87.0 a ±6.53	92.7 a ±6.7	87.0 a ±6.50	73.7 a ±3.0	87.0 a ±7.50	104.1 a ±6.4	87.0 a ±6.0	78.7 a ±5.1
21/08/06	10	102.0 a ±6.93	111.3 a ±5.0	101.6 a ±6.84	84.8 b ±5.0	101.8 a ±6.89	126.1 a ±4.6	101.9 a ±6.8	91.7 ab ±3.6
04/09/06	12	119.8 a ±7.98	128.4 a ±6.4	119.8 a ±8.0	98.4 b ±5.9	121.0 a ±8.19	156.3 a ±4.6	119.8 a ±7.80	105.4 ab ±5.8
18/09/06	14	139.2 a ±7.63	150.3 a ±6.2	137.0 ab ±7.58	108.3 b ±4.9	142.3 a ±7.7	185.7 a ±9.3	135.1 b ±7.4	115.3 ab ±4.8
04/10/06	16	160.0 a ±8.15	177.4 a ±7.9	154.2 b ±8.53	119.3 b ±6.0	163.0 a ±8.4	219.3 a ±9.9	153.2 b ±8.01	130.1 b ±6.0
16/10/06	18	186.0 b ±11.2	200.9 a ±6.9	178.3 c ±11.31	132.3 b ±13.23	193.6 a ±11.02	250.7 a ±11.2	177.7 c ±11.3	144.29 b ±6.4
30/10/06	20	215.6 b ±11.25	228.9 a ±8.6	206.5 c ±13.10	149.0 b ±7.0	227.1 a ±11.0	285.0 a ±12.0	201.2 c ±13.2	162.0 b ±7.8

-a, b, c within each row show the same superscripts that do not differ significantly (pc0.05).

Growth parameters

Growth parameters of tilapia and mullet cultured in earthen ponds as affected with diet type are presented in table (4). The averages of initial biomass of (tilapia and mullet) were (23.5, 32.9 g) for T1; (23.5, 33.6 g) for T2; (24.0, 33.6 g) for T3 and (23.2; 33.6 g) for T4. At harvesting total pond productions were 2327.7; 2176.75; 3620.25 and 3139.5 kg for T1, T2, T3 and T4 respectively. These results are in accordance with the findings of Abdel-Hakim and Ammar (2005), who reported that the highest total production was obtained by the stocking density at the rate of 14 thousand tilapia fingerlings /feddan due to the high contribution of super size and grade 1 fish in the harvest, compared to other densities.

On the other hand, the average final body weights of mullet were 228.9, 149.0, 285.0 and 162.0 g., for T1, T2, T3 and T4 respectively. From the result, can be concluded that the mullet which was fed with extruded diet had the higher average body weight than the mullet fed with non-extruded diet.

Results in table (4) showed that the total gain per pond was 2068; 1916.5; 3235 and 2766.8 kg for T1; T2; T3 and T4 respectively. These results indicated that the stocking density rate of 15 thousands tilapia fingerlings / feddan was best than the stocking density rate of 10 thousand tilapia fingerlings / feddan, when extruded diet was fed. So, the total weight gain per pond was 2068; 1916.5; 3235 and 2766.8 kg respectively.

Concerning feed consumption (FC) and feed conversion ratio (FCR) as affected with diet type was illustrated in table (4). Results revealed that the total amounts of feed consumption during the whole experimental period were 3887.3; 4011; 4959.7 and 4741 kg for T1; T2; T3 and T4respectively.

The corresponding FCR values of the extruded and non-extruded diets were 1.88; 2.1; 1.5 and 1.7 kg feed for each kg gain in weight for T1; T2; T3 and T4 respectively. These results indicated that the best feed conversion ratio was obtained by extruded diet and 15 thousand stocking density. They agree with the findings of Venou *et al.* (2003), who reported that extrusion improved significantly all apparent digestibility coefficients (ADC), also, Andrew *et al.* (2004) who reported that softer pellets increased consumption and reduced waste from handling.

Concerning total fish production per feddan the average weights of tilapia and mullet at 10 thousand stocking density which fed extruded and non-extruded diet were 2327.7 and 2176.75 kg/feddan for T1 and T2 respectively, while for treatments at 15 thousand stocking density fed extruded and non-extruded diet. The total fish production was 3620.25 and 3139.5 kg/feddan for T3and T4 respectively.

Table 4. Final body weight, final weight gain, consumed extruded and non-extruded fish diet, and total production per pond and per feddan of extruded and non-extruded fish food under tow different stocking densities.

Parameter	T1	T2	T3	T4
Average area of pond	4200	4200	4200	4200
Initial stocking/pond				
Tilapia	10000	10000	15000	15000
Mullet	750	750	750	750
Average initial body weight (g),				
Tilapia	23.5	23.5	24.0	23.2
Mullet	32.9	33.6	33.6	32.9
Initial biomass (kg/pond)				
Tilapia	235	235	360	348
Mullet	24.67	25.2	25.2	24.7
Average final body weight (g/fish)				
Tilapia	215.6	206.5	227.1	201.2
Mullet	228.9	149.0	285.0	162.0
Total production/pond				
Tilapia	2156	2065	3406.5	3018
Mullet	171.7	111.75	213.75	121.5
Weight gain (g/fish)				
Tilapia	192.1	183.0	203.1	178.0
Mullet	196.0	115.4	251.4	129.1
Total weight gain (kg)				
Tilapia	1921	1830	3046.5	2670
mullet	147	86.5	188.5	96.8
Total weight gain (kg) /pond	2068	1916.5	3235	2766.8
Total production (kg)/pond	2327.7	2176.75	3620.25	3139.5
Total feed costumed (kg)/pond	3887.3	4011.0	4959.7	4741.0
Feed conversion ratio (FCR)	1.88	2.1	1.5	1.7

Economically efficiency

Results of table (5) showed that total variable costs for T1; T2; T3 and T4 were 11520; 11697.8; 14792.5 and 14342.75 LE, respectively. The differences in variable costs had due to differences in fry prices and feed costs. Total fixed costs were almost the same for all treatments; however total operating costs (variable + fixed) had differences among treatments due to the differences in variable costs. As illustrated in table (5) net returns recorded by T1; T2; T3 and T4 were 6860.1; 5574.95; 14538.25 and 10779.55 LE. However, net returns as percent of the lowest one (T2- 100) were 123; 260.7 and 193.3 for T1; T3 and T4 respectively.

Table 5. Effect of dietary treatments stocking density on economical efficiency of extruded and non-extruded fish food under tow different stocking densities.

Item	T1	T2	T3	T4
1- Variable costs LE per pond				
a- fingerlings/feddan				
Tilapia	2000	2000	3000	3000
Mullet	1125	1125	1125	1125
b- Artificial food	6997.1	7219.8	8927.5	8533.8
c-Labor	700	700	700	700
d-Harvest	698.3	653	1086.0	1046.5
Total variable costs, LE	11520.4	11697.8	14792.5	14342.75
2-Fixed costs, LE				
a-Depreciation (materials and others)	600	600	600	600
b- Taxes	100	100	100	100
Total fixed costs, LE	700	700	700	700
Total operating costs (variable + fixed)	12220	12397.8	15492.5	15042.75
3-Return:				
Tilapia	17248	16520	27252	24144
Mullet	2232.1	1452.75	2778.75	1678.3
b-Total return/feddan, LE	19080.1	17972.75	30030.75	25822.3
Net Returns (total returns - costs)	6860.1	5574.95	14538.25	10779.55
% of lowest return value	123	100	260.7	193.3

These results are in agreement with those reported by Bakeer (2006) who cited that in mullet monoculture system with supplemental feeding, the highest profitability was recorded for the lowest stocking density which had the rate of 1 fish/m^3. Also, Abdel-Gawad and Salama, (2007) reported that the highest result was received at stocking density of 1050 fish/fingerling/feddan without supplemental feed. From the economical point of view, it is recommended culture tilapia and mullet at 15 thousand stocking density and fed extruded diet.

CONCLUSION

In conclusion, the present study revealed that the performance and production of Nile tilapia and mullet reared in a polyculture system in earthen ponds increased significantly when they were fed on extruded pellets, compared to non extruded pellets. The total fish production increased significantly with increasing stocking density from 10000 to 15000 fish per feddan. The highest net returns were obtained when the extruded pellets were used at a density of 15000 Nile tilapia per feddan.

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تأثير أعلاف الأسماك المطبوخة والغير مطبوخة على النمو والإنتاج الكلى لأصبعيات أسماك البلطى النيلى وأسماك البورى المرباة فى تربية مختلطة فى الأحواض الترابية

أيمن أنور عمار [١]، أحمد صلاح الدين عبد الجواد[٢] و عبد الرحمن عبد الرازق سلامه [٣]

١- *قسم نظم الإستزراع، المعمل المركزى لبحوث الثروة السمكية. مركز البحوث الزراعية، جمهورية مصر العربية.*

٢- *قسم بيولوجيا وبيئة الأسماك، المعمل المركزى لبحوث الثروة السمكية. مركز البحوث الزراعية، جمهورية مصر العربية.*

٣- *قسم إقتصاد الأسماك ، المعمل المركزى لبحوث الثروة السمكية، مركز البحوث الزراعية ، جمهورية مصر العربية.*

تم إجراء هذه التجربة الحقلية لمدة ٢٠ أسبوعا فى مزرعة خاصة بمنطقة إبشواى بمحافظة الفيوم، جمهورية مصر العربية، بغرض دراسة تأثير الأعلاف السمكية المطبوخة والغير مطبوخة على مظاهر النمو والإنتاجية الكلية لأصبعيات أسماك البلطى النيلى وأسماك البورى الأصيل واللذان تم تربيتهما بنظام مختلط فى ثمانية أحواض ترابية، مساحة كل منها واحد فدان (٤٢٠٠ متر مربع)، وذلك لتمثيل أربعة من المعاملات ثنائية التكرار ، قسمت إلى مجموعتين من حيث الكثافة التخزينية.(١٠٠٠٠ أصبعية من البلطى علاوة على ٧٥٠ أصبعية من البورى) للمجموعة الأولى، أما المجموعة الثانية فكانت (١٥٠٠٠ أصبعية من البلطى علاوة على ٧٥٠ أصبعية من البورى) وكانت أصبعيات البلطى النيلى بمتوسط وزن ٢٣,٥ جرام أما أصبعيات البورى فكانت بمتوسط وزن ٣٢,٩ جرام. وتم إستخدام نوعين من أعلاف الأسماك فى شكل حبيبات مطبوخة أوغير مطبوخة تحتوى على ٢٥ % بروتين خام . وتمت التغذية بمعدل يومى ٣ % من وزن الأسماك. وقد أشارت النتائج إلى أن معدلات النمو والإستفادة من الغذاء لأسماك البلطى النيلى والبورى تتزايد معنويا ($p<0.05$) عند تغذية الأسماك بحبيبات الأعلاف المطبوخة مقارنة بالأسماك المغذاة على حبيبات الأعلاف الغير مطبوخة. وقد تزايد الإنتاج الكلى بشكل معنوى ($p<0.05$) بزيادة الكثافة التخزينية من ١٠٠٠٠ إلى ١٥٠٠٠ سمكة لكل فدان مع إستخدام العلف المطبوخ (٣٦٢٠,٢٥ كجم) مقارنة بإستخدام العلف غير المطبوخ (٣١٣٩,٥ كجم). وقد كان أعلى عائد إقتصادى للمعاملة التى تم فيها إستخدام الأعلاف المطبوخة مع كثافة ١٥٠٠٠ بلطى للفدان (14538.25 جنيها مصريا) مقارنة بالمعاملة التى تم فيها إستخدام الأعلاف الغير مطبوخة مع نفس الكثافة التخزينية (10779.5 جنيها مصريا) .