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GROWTH PERFORMANCE, FEED UTILIZATION AND CARCASS COMPOSITION OF SEX REVERSED NILE TILAPIA BY 17α-METHYLTESTOSTERONE AND/OR FADROZOLE UNDER VEGETARIAN DIET FEEDING.

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SUMMARY

A feeding grow-out trial was conducted using sex reversed Nile tilapia (15 g/fish of initial weight) masculinized by 17 α-methyltestosterone and/or fadrozole (aromatase inhibitor) and normal mixed-sex to compare the growth performance, feed utilization and carcass composition among them. They were a product of eight groups of fry that treated with 0 + 0, 60 + 0, 30 + 30, 18 + 30, 18 + 20, 9 + 20, 30 + 0 and 0 + 70 mg/kg diet 17α-methyltestosterone (MT) + fadrozole (FAD), respectively, as masculinity treatments. Fingerlings were kept in nylon net enclosures (10 fish/net enclosure in duplicate groups) in fertilized earthen pond of 1 feddan. Fish fed on vegetarian diet of 31.7 % protein and 444.67 kcal/100 g dry matter and fed at 3% of body weight. The experiment continued for 16 weeks. Results revealed that a higher growth performance parameters were achieved by groups 2 (standard technique), 3, 5, 6 and 8 with insignificant differences among them compared to the control and group 7. Sex-reversed fish into males with standard technique had better feed conversion ratio, protein productive value (%) and energy utilization (%) compared to other groups, while the normal mixed-fish achieved the lowest values. Feed intake, g/fish and protein efficiency ratio did not affect by various treatments. In relation to carcass composition, apart from dry matter and crude protein, there were significant differences in whole body ether extract, energy contents (kcal/100 g dry matter) and ash among the treatment groups. These results suggest that sex-reversed Nile tilapia into males by 30 + 30, 18 + 30, 18 + 20, 9 + 20 and 0 + 70 mg/kg diet of 17α-methyltestosterone + FAD, respectively, can be used in farm culture surpassing the normal mixed-sex fish and equally the Sex-reversed fish into males by standard technique (60 mg of MT/kg diet) in growth and feed utilization under feeding on vegetarian diet.

Keywords: Nile tilapia, 17 α-methyltestosterone, fadrozole, vegetarian diet.

INTRODUCTION

Poor performance of mixed-sex Nile tilapia (*Oreochromis niloticus*) in semi-intensive systems has been a major constraint to the commercial development of the species (Okorie, 1975; Pillay, 1979; Hepher and Pruginin, 1982 and Teichert-Coddington *et al.*, 1998). The culture of mixed sex populations often results in precocious maturation and early reproduction (AIT/DOF, 2000). Males, and especially females, divert energy which could be utilized for somatic growth, into gamete production and behavioral interactions. In addition, competition with recruits in confined environments further suppresses the growth of stocked fish and can result in 30 – 50 % of harvested biomass consisting of largely unmarketable recruits (Mair *et al.*, 1995). De Graff *et al.* (1999) found that early maturation of fish and breeding was not a major bottleneck to production of Nile tilapia for fish raised on supplementary feed and marketable at a size of under 200 g. Brummett (2000) reports that most fish consumed in rural Africa are less than 200 g and that huge demand among poorer people exists. Mono-sex population technology has been used in aquaculture to prevent unwanted reproduction and its consequences of overcrowding and stunting and/or increase yield by culturing the faster growing sex (Bye and Lincoln, 1986; Dunham, 1990 and Green *et al.*, 1997). Individuals in mono-sex populations have increased somatic growth rate due to the avoidance of energy losses associated with gonadal development and reproduction. Furthermore, all-male tilapia populations are desirable because males achieve a larger final size than females (Macintosh and Little, 1995).

One of the most common techniques for producing mono-sex populations is steroid-induced sex inversion (Hunter and Donaldson, 1983). This involves the administration of synthetic androgens or estrogens to differentiating fry. The steroid acts as a sex-inversion agent by functionally masculinizing or feminizing individuals in the population. Among several mono-sex production techniques, hormonal sex reversal directly or indirectly, through breeding of sex-reversed fish, has commonly been used to produce mono-sex populations in aquaculture (Beardmore *et al.*, 2001 and Piferrer, 2001). Al-Ablani and Phelps (1997) obtained 90 % masculinization by feeding the same age fry with 60 mg 17α-methyltestosterone (MT)/kg diet for 30 days. Otherwise, in tilapia *Oreochromis niloticus*, brief treatment with an aromatase inhibitor during sex differentiation causes sex-reversal from genetic females to develop into normal phenotypic males (Kitano *et al.*, 2000; Kwon *et al.*, 2000). However, many studies has been conducted to compare the growth of mono-sex induced by 17α-methyltestosterone and mixed sex of tilapia (Little *et al.*, 2003; Little and Edwards, 2004 and De Graaf *et al.*, 2005). Considering the large volume of literature on techniques of hybridisation and sex reversal for the production of mono-sex male tilapia, no information is available on the comparison among the growth performance of tilapia mixed-sex, mono-sex induced by 17α-methyltestosterone or aromatase inhibitor (Fadrozole) in Nile tilapia after vegetarian diet feeding. Therefore, the present study was conducted to assess the growth performance, feed utilization and carcass composition of Nile tilapia, *Oreochromis niloticus*, mono-sex (masculinized by 17α-methyltestosterone and/or FAD) and mixed-sex under feeding on vegetarian diet.

MATERIALS AND METHODS

Fish and culture facilities:

Nile tilapia (*O. niloticus*) fingerlings (150 days in age) used in the present study were outcomes of 7 methods of masculinity (for a month) beside the control (without masculinity). Accordingly, eight groups (treatments) were used when the fish reached 15 g/fish in average (reared in circular tanks). The eight groups (treatments) sex reversed by 17α-methyltestosterone (MT) and/or fadrozole (FAD) at levels of 0 + 0, 60 + 0, 30 + 30, 18 + 30, 18 + 20, 9 + 20, 30 + 0 and 0 + 70 mg (MT + F)/kg diet, respectively.

Fish were transported to a private farm (located in Halk El-Gamel, Kafr El-Dawar) afterward receipted to nylon net enclosures (80 W × 80 L × 100 H cm in diameter) in duplicate groups. The nets were placed in fertilized earthen pond of 1 feddan, 1 meter in depth (80 cm depth of water allowance). The bottom of each net enclosure was sated contacting the bed-pond. About 50 % of the earthen pond water was changing every week. The net enclosures were randomly stocked in all treatments at a rate of 10 fish/net enclosure, with two replications per treatment. Fish of each replicate were weighed at the start of the experiment, henceforth counted and weighed biweekly. The experiment began on 1st June and continued for 16 weeks.

Experimental diets:

The vegetarian diet of the feeding trial was formulated as follow: the ingredients were thoroughly mixed in a plastic container, the oil was added, a few drops at a time, during mixing then warm water (45° C) was slowly added under continuous mixing until the diets began to clump, the diet were passed through commercial meat mincer (3.0 mm in diameter) three times, and dried for 24 hrs at 75° C in a drying oven. The dried diet was kept in a plastic dispenser throughout the experimental period. Diet was sufficient in essential vitamins and trace minerals (NRC, 1993). All of treatments in the feeding trial fed on the vegetarian diet that contained 32 % crude protein and 444.67 kcal/100 g diet of gross energy (Table 1). The fish were fed 3 % of body weight per day, divided into two equal feedings (0830 and 1730 h.) for six days a week. The feed was recorded biweekly and fish from each net enclosure were weighed collectively every two weeks and the amount of diet fed was adjusted accordingly. Diet was sufficient in essential vitamins and trace minerals (NRC, 1993). The ingredients of the pellets form diet were thoroughly mixed in a plastic container, oil and warm water were added, during mixing until the diets began to clump. The diets were passed through commercial meat mincer 3 times, and dried for 24 hrs at 75° C in a drying oven. The dried diet was kept in a plastic dispenser throughout the experimental period.

Samples collection and analysis:

Ten fish were taken at the beginning of the experiment, dried (at 60 - 70° C for 48 hrs), grounded and submitted to proximate analysis. At the end of experiment, the fish were collected, weighed and counted per each replicate in each treatment. All fish from each experimental unit were collected and submitted to anatomy to determine the percentage of males. Moreover, the same fish after sex determination for each treatment were oven dried at 60 – 70° C for 48 hrs, and then ground to minute particles. Finally, fish samples and the experimental diets were presented to proximate chemical analyses

following the AOAC (1999) standard procedures. The nutrition equations were used according to Hepher (1988). All data were statistically analyzed with ANOVA using SAS package for the IBM-PC (SAS User's Guide, 1988). Duncan's multiple range tests were used to resolve the differences among treatment means (Steel and Torrie, 1980). Differences between treatment means were considered significant at $P < 0.05$. Standard error (±SE) was calculated to identify the range of means per fish.

RESULTS AND DISCUSSION

Results of experimental diet analysis revealed that the values of protein (%), gross energy (kcal/100 g dry matter) and protein to energy ratio were 31.7, 444.67 and 71.29, respectively. Otherwise, the anatomy of fish samples revealed that the percentage of males for groups 1, 2, 3, 4, 5, 6, 7 and 8 were 45, 95, 90, 90, 90, 90, 75 and 95 % males, respectively.

Table (1): Ingredients (%) and chemical composition of the experimental diet.

Item	%	Proximate composition	
Soybean meal	30	Dry matter (DM)	90.1
Yeast	17	On dry matter basis (%)	
Yellow corn	10	Protein	31.70
Lupine	23.5	Ether extract	8.66
Rice particle	3.5	Crude fiber	7.76
Wheat bran	12	Ash	7.08
Vegetable oil	2	NFE[2]	44.8
Vit & Min[1]	2	GE[3]	444.67
Total	**100**	Protein to energy ratio	71.29

[1]Meveco premix, Vit. & Min., every 1.5 kg contains Vit. A 125 million IU, D_3 3 million IU, E 15 g, K_3 2.5 g, B_1 1.5 g, B_2 5 g, B_6 2 g, Pantothanic acid 10 g, B_{12} 0.01g, Nicotenic acid 30 g, , Folic acid 1.2 g, Fe 30 g, Mn 60 g, Cu 10 g, I1 g, Cobalt 0.25 g, Se 10 g and Zn 55 g.

[2] NFE = Nitrogen free extract calculated by difference.

[3]Gross energy (kcal/100g DM), calculated on the basis of 5.64, 4.11 and 9.44 Kcal GE/g protein, NFE and lipid, respectively (NRC, 1993).

Results presented in Table (2) illustrate growth performance parameters as initial and final body weights, total gain in weight, average daily gain (ADG mg/day/fish) and specific growth rate SGR, %/day. This table shows that average of initial weight was 15 g/fish with insignificant differences among the experimental groups indicating the homogeneity of the tested groups at the experimental start. At termination of the experiment, averages of final weight ranged between 99 g/fish (group 1) and 139 g/fish (group 5). Similarly, average of weight gain ranged between 84 and 124 g/fish for the control group and group 5. Significant differences were obtained between treatments. The control (mixed-sex) and that sex reversed by 30 mg MT showed nearly similar results and were lower than that sex-reversed by the other methods. The best results were achieved with 18 mg MT + 20 mg Fad.

Table (2): Growth performance of Nile tilapia mono-sex (induced by MT and/or FAD) compared to mixed-sex fed on vegetarian diet.

Group[1]	Initial weight (g/fish)	Growth performance			
		Final weight (g/fish)	Gain[2] (g/fish)	ADG[3] (mg/fish/day)	SGR[4] (%/day)
1	15	99±1.61^{c}	84±1.99^{c}	0.75±0.16^{c}	1.68±0.18^{c}
2	15	135.5±11.57^{ab}	120.5±4.49^{ab}	1.08±0.04^{ab}	1.96±0.03^{ab}
3	15	130±7.99^{ab}	115±7.99^{ab}	1.04±0.07^{ab}	1.93±0.06^{ab}
4	15	114.5±4.49^{bc}	99.5±4.49^{bc}	0.89±0.04^{bc}	1.81±0.04^{bc}
5	15	139±7.99^{a}	124±7.99^{a}	1.11±0.07^{a}	1.99±0.05^{a}
6	15	133±3.99^{ab}	118±3.99^{ab}	1.05±0.04^{ab}	1.99±0.03^{ab}
7	15	109±6.99^{c}	94±6.99^{c}	0.84±0.06^{c}	1.77±0.06^{c}
8	15	131±7.99^{ab}	116±7.99^{ab}	1.04±0.07^{ab}	1.93±0.05^{ab}

Values are mean ±SE; values in the same column having the same superscripts are not significantly different ($P > 0.05$).

[1]Groups of 1, 2, 3, 4, 5. 6, 7 and 8 were treated at the first month of age with 0 + 0, 60 + 0, 30 + 30, 18 + 30, 18 + 20, 9 + 20, 30 + 0 and 0 + 70 mg/kg diet of 17α-methyltestosterone (MT) + fadrozole (FAD), respectively.

[2]Gain (g/fish) = Final wt., g. – Initial wt., g.

[3]Average daily gain (mg/fish/day) = (Final wt. – Initial wt.) / period in days.

[4]Specific growth rate (%) = 100 (ln final weight–ln initial weight) / time in days.

Averages of nutritional parameters including feed intake, feed conversion ratio (FCR), protein efficiency ratio (PER), protein productive value (PPV %) and energy utilization efficiency (%), are presented in Table 3. Feed intake (g/fish) and protein efficiency ratio of Nile tilapia did not affect significantly ($P > 0.05$) by different sex-reversal treatments. Otherwise, feed conversion ratio (FCR), protein productive value (PPV, %) and energy utilization (EU, %) were affected significantly in sex-reversed fish into males (irrespective the techniques of sex-reversal) compared to the control group (mixed-sex). Whereas, FCR of the groups 2 (standerd method), 3, 5, 6 and 8 were nearly significant and better than the other groups. Values of PPV (%) and EU (%) of the control group (mixed-sex) decreased significantly ($P < 0.05$) compared to other groups.

Results of final carcass composition of Nile tilapia mono-sex induced by MT and/or FAD, compared to mixed-sex after 14 week feeding on vegetarian diets are existed in Table 4. Fish carcass analysis revealed that neither dry matter nor crude protein had significant ($P > 0.05$) differences among various treatments. Otherwise, ether extract (EE) and energy contents (kcal/100 g dry matter) decreased significantly in the control group (mixed-sex) compared to other groups. Notably, the sex-reversed groups into males had insignificant differences among each other. Groups 1, 3, 4, 5, 7 and 8 revealed a significantly higher ash content compared to groups 2 and 6; meanwhile they had insignificant differences with groups 3, 4, 5, 7 and 8.

Table (3): Feed and nutrient utilization of Nile tilapia mono-sex (induced by MT and/or FAD) compared to mixed-sex fed on vegetarian diet.

Group[1]	Feed intake (g/fish)	FCR[2]	Feed utilization		Energy utilization[5] (%)
			PER[3]	PPV[4] (%)	
1	187.67±9.99^{a}	2.24±0.06^{c}	1.42±0.04^{a}	21.12±0.17^{b}	14.37±0.11^{c}
2	172.47±18.31^{a}	1.43±0.09^{a}	1.72±0.65^{a}	31.59±3.21^{a}	22.37±2.16^{a}
3	188.43±13.94^{a}	1.66±0.23^{ab}	1.95±0.27^{a}	26.75±5.55^{ab}	19.46±3.81^{ab}
4	187.40±3.39^{a}	1.89±0.04^{bc}	1.66±0.04^{a}	23.10±1.56^{ab}	16.87±1.46^{abc}
5	183.14±13.51^{a}	1.48±0.01^{a}	2.14±0.02^{a}	28.98±0.85^{ab}	21.00±0.28^{ab}
6	1.66.33±5.28^{a}	1.42±0.09^{a}	2.25±0.14^{a}	31.43±0.21^{a}	22.81±1.01^{a}
7	182.50±6.49^{a}	1.95±0.07^{bc}	1.63±0.06^{a}	22.85±1.63^{ab}	16.36±1.00^{bc}
8	176.00±4.99^{a}	1.52±0.08^{a}	2.08±0.08^{a}	28.67±2.13^{ab}	20.69±1.52^{abc}

Values are mean + SE; values in the same column having the same superscripts are not significantly different ($P > 0.05$).

[1]Groups of 1, 2, 3, 4, 5, 6, 7 and 8 were treated at the first month of age with 0 + 0, 60 + 0, 30 + 30, 18 + 30, 18 + 20, 9 + 20, 30 + 0 and 0 + 70 mg/kg diet of 17α-methyltestosterone (MT) + fadrozole (FAD), respectively.

[2]Feed conversion ratio: total dry diet fed (g)/total wet weight gain (g).

[3]Protein efficiency ratio: wet weight gain (g)/amount of protein fed (g).

[4]Protein productive value (%): $(P\text{-}P_0)\ 100/P_i$ where P is protein content in fish carcass at the end of the experiment, P_0 is the protein content in fish carcass at the start of the experiment and P_i is the protein in feed intake.

[5]Energy utilization (%): $(E\text{-}E_0)\ 100/E_i$ where E is the energy in fish carcass (Kcal) at the end of the experiment, E_0 is the energy in fish carcass (Kcal) at the start of the experiment, and E_i is the energy in feed intake (Kcal).

Table (4): Carcass composition of Nile tilapia mono-sex (induced by MT and/or FAD) compared to mixed-sex fed on vegetarian diet.

Group[1]	Dry matter (%)	On dry matter basis (%)			Energy content[2] (kcal/100g dry matter)
		Crude protein	Ether extract	Ash	
1	27.8±0.92^{a}	53.2±0.19^{a}	22.2±0.09^{b}	24.6±0.09^{a}	509.62±0.18^{b}
2	26.4±0.50^{a}	52.1±0.70^{a}	25.1±9.89^{a}	22.8±0.60^{b}	530.79±3.00^{a}
3	26.4±1.40^{a}	51.7±0.29^{a}	24.7±0.40^{a}	23.6±0.09^{ab}	524.76±2.08^{a}
4	26.7±1.20^{a}	51.7±0.50^{a}	24.7±0.70^{a}	23.6±0.19^{ab}	524.76±3.78^{a}
5	26.3±0.70^{a}	51.7±0.40^{a}	24.8±0.19^{a}	23.5±0.19^{ab}	525.70±0.36^{a}
6	26.7±0.59^{a}	51.8±0.79^{a}	25.3±0.70^{a}	22.9±0.09^{b}	530.99±2.09^{a}
7	26.8±0.60^{a}	52.4±0.29^{a}	24.1±0.29^{a}	23.5±0.52^{ab}	523.04±1.13^{a}
8	26.6±0.99^{a}	51.9±0.40^{a}	24.3±0.19^{a}	23.8±0.60^{ab}	522.11±4.14^{a}

Values are mean + SE; values in the same column having the same superscripts are not significantly different ($P > 0.05$).

[1]Groups of 1, 2, 3, 4, 5, 6, 7 and 8 were treated at the first month of age with 0 + 0, 60 + 0, 30 + 30, 18 + 30, 18 + 20, 9 + 20, 30 + 0 and 0 + 70 mg/kg diet of 17α-methyltestosterone (MT) + fadrozole (FAD), respectively.

[2]Gross energy (kcal/100g DM) calculated on the basis of 5.64, 4.11 and 9.44 Kcal GE/g protein, NFE and lipid respectively (NRC, 1993).

All-male populations are preferred in tilapia aquaculture because mixed-sex populations often results in precocious maturation and early reproduction (Mires, 1995). The potential benefits of mono-sex culture are: (1) Higher growth rate. (2) Preventing large energy diversion into gonad production, courtship behavior and production of uneconomic recruits. (3) Reducing aggressive interactions (Beardmore *et al.*, 2001). Several techniques of steroid administration are possible, including injection, feeding, and immersion of fry. Use of steroid-treated feeds for the production of all-male populations is widespread in tilapia aquaculture (Macintosh and Little, 1995). As many authors have not chosen to undertake long-term studies on the growth of sex reversed fish by 17α-methyltestosterone or FAD, available information on this aspect is scanty and inconsistent. The present study was designed to compare the growth performance of mono-sex Nile tilapia masculinized by two androgens 17α-methyltestosterone (standard technique) and/or FAD (aromatase inhibitor) with Nile tilapia mixed-sex. The results of the present study clearly demonstrated that treatments of 60 + 0 (standard technique), 30 + 30, 18 + 20, 9 + 20, and 0 + 70 mg/kg diet of MT + FAD, respectively achieved the higher percentage of males, growth performance and feed utilization parameters compared to the control (mixed-sex) and the group of 30 + 0 mg/kg diet of MT + FAD_1 respectively. The present experiment started on 1st of June and continued for 16 weeks in natural conditions which induced tilapia to spawn naturally. The initial weight of fish was 15 g/fish (over 150 days in age), that mean fish could breed throughout the experiment. Uraiwan (1988) stated that the timing of maturation and reproduction in Nile tilapia is variable (154- 190 days) when cultured. Thus the control group (mixed-sex) had breed throughout this period. Regarding the group 7, the treatment of 30 mg 17α-methyltestosterone/kg diet seams to be not enough to produce high percentage of males; because the standard technique recommended that the dose of 17α-methyltestosterone must be 60 mg/kg diet (Macintosh and Little, 1995; Little *et al.*, 2003) to produce all-male population. Subsequently, other treated groups achieved all-or nearly all male population. As a result, these groups attained higher growth performance and feed utilization because they saved the energy spent in spawning activities (in the control and group 2) which directed to somatic growth. Additionally, the treatment with methyltestosterone is normally considered as a growth promoter as shown in *0. mossambicus* (Kuwaye *et al.*, 1993 and Pandian and Sheela, 1995). However, the treatment with FAD only (group 8) was imitable the groups treated with methyltestosterone in growth performance. The results of males-ratio coincide with previous studies of Kobayashi *et al.* (2003) who obtained all male Nile tilapia when 7-14 day fry after hatching were treated with Fadrozole. At the same manner, the results of growth performance were in accordance with those obtained by Macintosh and Little (1995) who demonstrated that individuals in mono-sex populations have increased somatic growth rate due to the avoidance of energy losses associated with gonadal development and reproduction. Furthermore, all-male tilapia populations achieve a larger final size than females. Additionally, growth trends observed for hormonally sex reversed fish belonging to cichlids (Macintosh *et al.*, 1985) show a positive growth response of one to two times faster than the control group. Also, Pandian and Sheela (1995) reviewed that the relative growth of molly, *Poecilia sphenops,* treated with different doses of 17α-methyltestosterone was enhanced in 3 month old treated individuals with increasing steroid dose up to the preoptimal level (for sex reversal). Otherwise, a decreasing trend in daily weight gain, specific growth rate and individual harvested size of the stocked fish was observed with increase in nursing period in mixed-sex tilapia due to reproduction (Little *et al.*, 2003). On

the other hand, Little and Edwards (2004) showed that fish growth and net yield were not significantly affected by sex (mono or mixed-sex) in either wet or dry seasons.

Results of feed conversion ratio (FCR) agree with the observations of Beardmore *et al.* (2001) who found that the FCR of mono-sex *O. niloticus* was better than that recorded by mixed-sex. Otherwise, the insignificancy between the standard technique and the groups of 30 + 30, 18 + 20, 9 + 20, and 0 + 70 mg/kg diet of MT + FAD, respectively indicated the ability of these treatments to produce all-or nearly all male population compared to sex-reversed fish into males by standard technique. Aromatase is the critical enzyme for the biosynthesis of 17β-estradiol. The inhibition of the aromatase enzyme activity during the appropriate developmental period can cause genetically female fish to develop as phenotypic males (Piferrer *et al.*, 1993; Kitano *et al.*, 2000 and Kroon and Liley, 2000) and FAD could inhibit this enzyme. Nakamura (2000) found that FAD (200 and 500 µg/g diet) masculinizes genetic female by inhibiting aromatase activity. Regarding the carcass composition, dry matter and crude protein contents did not differ significantly among treatments otherwise, sex-reversed fish into males gained higher ether extract and energy contents in their bodies compared to the control group. In a study on the effect of feed form and fish sex on carcass composition. Salem *et al.* (2007) noted that fish sex (mono or mixed-sex) did not affected carcass composition of Nile tilapia.

However, an impediment to the widespread application of FAD in the commercial production of all male tilapia is its high price and restricted availability to the producing Novartis Company. Meanwhile, the usage of FAD could be lowering the commonly used dose of 17 MT (60 mg/Kg feed) in sex-reversal technique, to 9 mg/Kg feed only through combined addition of FAD at 20 mg/Kg feed.

CONCLUSION

Sex-reversed Nile tilapia into males by 30 + 30, 18 + 30, 18 + 20, 9 + 20 and 0 + 70 mg/kg diet of 17α-methyltestosterone + FAD, respectively could be used in tilapia culture successively and did not differ statistically with that reversed by the standard technique (60 mg/kg diet of 17α-methyltestosterone) under vegetarian diet feeding.

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كفاءة النمو والاستفادة من الغذاء والتحليل الكيماوى لأسماك البلطى النيلى المحولة الى ذكور بواسطة الميثايل تستستيرون مع/أو الفادروزول تحت التغذية على عليقة نباتية

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أجريت تجربة تغذية باستخدام أسماك البلطى النيلى (وزن إبتدائى ١٥ جرام/سمكة) المحولة الى ذكور بواسطة ١٧ ألفاميثايل تستستيرون و/أو الفادروزول وأسماك البلطى النيلى المختلطة الجنس وذلك للمقارنة فيما بينهما من حيث كفاءة النمو والاستفادة من الغذاء والتركيب الكيماوى لأجسام هذه الأسماك. وقد أعد لذلك ثمانية مجموعات من الأسماك وهى الأسماك المختلطة الجنس (الطبيعية) و المحولة الى ذكور بواسطة ٦٠ +٠ و٣٠ +٣٠ و١٨ + ٣٠ و١٨ + ٢٠ و٩ + ٢٠ و٣٠ + ٠ و٠ + ٧٠ ملليجم /كجم عليقة من الـ ١٧ الفاميثايل تستستيرون + الفادروزول على الترتيب. تم تخزين إصبعيات البلطى فى سياجات شبكية من النايلون بمعدل ١٠ سمكة/سياجة شبكية فى مكررتين، وقد وضعت هذه السياجات الشبكية فى حوض ترابى مسمد ذو مساحة ١ فدان. تمت تغذية الأسماك على عليقة نباتية بمستوى بروتين ٣١.٧ ٪ وطاقة ٤٤٤.٦٧ كيلوكالورى/١٠٠ جرام من المادة الجافة وكان معدل التغذية ٣ ٪ من وزن الجسم. بدأت التجربة فى أول يونيو واستمرت ١٤ أسبوعا. وقد أشارت النتائج إلى أن مجموعة الأسماك المعاملة بالطريقة القياسية (المجموعة رقم ٢) والمجموعات ٣ و٥ و٦ و٨ قد أعطت أعلى كفاءة نمو، وكانت الفروق فيما بينهم غير جوهرية مقارنة بالمعاملة المعيارية والمجموعة رقم ٧. وقد أعطت الأسماك المعاملة بالطريقة القياسية أفضل معدل تحويل غذائى وإنتاجية للبروتين واستفادة من الطاقة مقارنة بباقى المجموعات، بينما أعطت المعاملة المعيارية أقل القيم لهذه القياسات. لم يتأثر كل من معدل استهلاك الغذاء ونسبة فاعلية البروتين فى مختلف المعاملات. وفيما يتعلق بالتحليل الكيماوى لأجسام الأسماك فقد كانت الفروق فى المحتوى من المادة الجافة والبروتين بين المعاملات المختلفة غير معنوية بينما تأثر المحتوى من الدهون والطاقة و الرماد فيما بين المعاملات. وقد اقترحت النتائج أن الأسماك المحولة الى ذكور بواسطة ٣٠ +٣٠ و١٨ + ٣٠ و١٨ + ٢٠ و٩ + ٢٠ و٠ + ٧٠ ملليجم/كجم عليقة من الـ ١٧ الفاميثايل تستستيرون + الفادروزول على الترتيب يمكن أن تستخدم فى مزارع الأسماك متفوقة على الأسماك المختلطة الجنس الطبيعية ومتساوية مع تلك المحولة الى ذكور بواسطة الطريقة القياسية (٦٠ ملليجم ألفا ميثايل تستستيرون/كجم عليقة) فى النمو والاستفادة من الغذاء بعد التغذية على عليقة نباتية.