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Effect of Some Growth Promoters on Growth Performance 0f Nile Tilapia (*Oreochromis niloticus*) Fingerlings

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ABSTRACT

This study aimed to evaluate of the effect of dried yeast (DY) and Gromone, (GR, YGF-251) on growth performance of *Oreochromis niloticus* fingerlings with an average initial weight of 20 g. At the beginning of the experiment, 330 fingerlings were divided into five groups, and fed different levels of Gronome, 30 fingerlings per group, 10 in each of three replicates, at levels of 0.1, 0.2, 0.3, 0.4 and 0.5 g /kg diet, respectively. Other five groups were fed dry yeast at levels of 5, 10, 15, 20 and 25 g/kg diet, respectively. The control group was fed unsupplemented diet. Results show that GR and DY supplementation increased ($P<0.05$) final body weight, total weight gain, average daily gain and specific growth rate of fish as compared to the control group, being the highest values were for GR5 (38.38 g, 18.48 g, 0.44 g and 1.57). All GR groups increased ($P<0.05$) feed intake as compared to DY groups and the control group, being the highest in GR2 (35.38 g) versus (24.19 g) in the control group. Fish in GR5 showed the best ($P<0.05$) feed conversion rate and survival ratio (1.9 and 100%) compared to the control (2.95 and 90%). Carcass of fish in GR5 showed the best ($P<0.05$) chemical composition in term of decreasing the contents of moisture (74.81%) and ash (7.7%) and increasing the contents of CP (50.2%) and EE (30%) as compared to the control group, with the values of 77.3, 9.2, 49.3 and 21.9%, respectively. However, gross energy content increased ($P<0.05$) from 484.8 Kcal/100 gm in the control to 568.5 Kcal/100 gm in GR5**.** In blood serum of fish, concentration of urea increased ($P<0.05$) only in all GR groups compared with the control group, being the highest in GR4 and GR5 (25.0 mg/dl in each). While, concentration of creatinine increased ($P<0.05$) only in all DY groups, with the highest values were obtained in DY5 (56.0 mg/dl). Activity of asprtate amino transaminase (AST) increased ($P < 0.05$) in all high levels of GR and DY with the highest values were obtained in GR4 and DY5 (117 and 115 IU/dl). Activity of alanine amino transaminase (ALT) increased ($P < 0.05$) in all DY groups and high levels from GR with the highest values were in DY4 and DY5 (26.0 IU/dl in each).

Keywords: (*Oreochromis niloticus*, dried yeast, gromone, growth performance, blood, water analysis).

INTRODUCTION

In Egypt, *Oreochromis niloticus* species have become very important and are cultured in fish farms throughout the country. Their economic importance is constantly increasing due to fast their growth and different feeding habits (Dadzie, 1982). Feed additives including dried yeast and medicinal plants were used to maximize utilization of ration ingredients by fish. Antibiotic had some seriously adverse effect on fish and consumers (Wary and Davis, 2000) so interest of nutritionist were directed to use probiotics and medicinal plants as feed additives to improve feed utilization.

Using natural food additives to substitute antibiotic became essential request (Kumar *et al.*, 2003).

Therefore, the present study was carried out to evaluate natural herbal product Gromone and dried yeast as additives in the diets of *Oreochromis niloticus* fingerlings.

MATERIALS AND METHODS

The present study was carried out at Aquaculture Unit Laboratory, Sakha, Central Laboratory of Aquaculture Research, Abassa, during the period from August to September 2007.

Fish management

At the beginning of the experiment, total of 330 *O. niloticus* fingerlings with an average weight of 20 g were divided into five groups, which were fed different levels of Gronome (GR1, GR2, GR3, GR4 and GR5, 30 fingerlings in each group, 10 in three replicates), at levels of 0.1, 0.2, 0.3, 0.4 and 0.5 g /kg diet, respectively. Other five groups were fed dry yeast (DY1, DY2, DY3, DY4 and DY5, 30 fingerlings in each group, 10 in three replicates), at levels of 5, 10, 15, 20 and 25 g/kg diet, respectively.

In each replicate 10 fingerlings were stocked in a glass aquarium (80 x 32 x 40 cm) containing dechlorinated tap water and part of the water in each aquarium aerated though electric

compressor were partially replaced every day to renew the water. Electric light was used to adjust the daylight to 14 hours.

Feeding system and feed additives

The experimental fish were fed the tested diets twice daily at 9 a.m. and 3 p.m., six days a week for an experimental feeding period of 42 days. The daily feeding rate was 3% (on DM basis) of live fish body weight and the feed amount was adjusted every week on the basis of the actual average biomass of the fish within each replicate.

A ground basal diet was offered to fish in all treatments at the same times. Proximate analysis of the basal diet fed to the experimental fish is presented in Table (1).

It is growth hormone secretagogue of natural herbal extract to help release the animal body insulin-like growth factor-1 (IGF-1) naturally through the feed additives administration. It promotes physical growth of the animal including fishes.

Table (1): *Proximate analysis of the experimental basal diet fed to fish in all treatments.*

Ingredient	**%**
Dry matter	93
Crude protein	25
Ether extract	17
Crude fiber	2.8
Ash	8.9
NFE*	46.3
Gross energy**	501.79
Protein ratio/ Energy ***	45.84

* *NFE = 100 – (CP + EE + CF + ash)*

** *Gross energy (GE) = (CP x 5.6) + (EE x 9.44) + (CF x 4.1) + (NFE x 4.1) Kcal/100g (NRC 1993).*

*** *Protein ratio/Energy: (mg/Kcal).*

Experimental procedures

Live body weight and feed intake of fish were weekly recorded. Also, initial and final live body weight as well as average total and daily gain, specific growth rate, feed conversion ratio and protein efficiency ratio were calculated. Survival rate was also recorded. All previous traits were calculated according to the following equations:

Table (2): *Experimental treatment groups with different levels of feed additives fed to O. niloticus fish.*

Feed additives	**Treatment**	**Level of supplementation /kg basal diet**
Without additive	Control	Basal diet
Dried yeast	DY1	5 g
	DY2	10 g
	DY3	15 g
	DY4	20 g
	DY5	25 g
Gromone	GR1	0.1 g
	GR2	0.2 g
	GR3	0.3 g
	GR4	0.4 g
	GR5	0.5g

Total weight gain (g) = $Wt_1 – Wt_0$

Where:

Wt_1 is the final body weight (g) and Wt_0 is the initial body weight (g).

Average daily gain (g) = $Wt_1 – Wt_0 / T$

Where:

T is the experimental period (day), Wt_0 is the initial body weight (g) and Wt_1 is the final body weight (g) according to Castell and Tiews (1980).

Specific growth rate (SGR)

(%/d) = (Ln Wt_1 – Ln Wt_0 /T) x 100

Where:

Ln is the natural logarithm of final and initial weight, respectively, and T is the experimental period (day) according to Pouomogne and Mbongblang (1993).

Feed conversion ratio (FCR)

= feed intake (g)/weight gain (g) (Tacon, 1987)

Protein efficiency ratio = (TWG (g)/TPI (g)).

Where:

TWG is total weight gain and TPI is

total protein intake according to (Davis and Morries, 1997)

Survival rate = (No. of fish at end/ No. of fish at start) x 100

At the end of the experiment, 6 fish from each treatment, 2 fish from each replicate were randomly taken for chemical analysis of the whole body.

The chemical analysis of the basal diet and the whole fish body were carried out using the methods of A.O.A.C. (1990).

Analytical procedures and blood samples

Blood samples were collected at the end of the experiment from 6 fish of each treatment, two fish from each replicate. In blood serum of fish activity of liver enzymes, aspartate amino transaminase (AST) and alanine amino transaminase (ALT) were determined using commercial kits (Biomerieux) and spectrophotometer according to Reitman and Frankel (1957). Creatinine and urea were determined according to (Henery, 1964 and Barham, *et al.* 1972).

Statistical analysis

The obtained data were analyzed to Snedecor and Cochran (1982) using SAS (1996) procedure for personal computer, least significant difference according to Duncan (1955) was used for the comparison among the significant group means.

RESULTS AND DISCUSSION

Growth performance

Data presented in Table (3) show significant ($P < 0.05$) effects of dietary additives on final body weight, total weight gain, average daily gain and specific growth rate of fish different treatment groups. It was cleared that GR5 obtained the highest final body weight while the highest ADG, SGR and total gain were obtained with GR5 and GR4 compared to other groups and control. Adding high level of Dried Yeast (DY5) recorded highest growth performance values.

Table (3): *Growth performance parameters of O. niloticus fish fed diets with or without feed additives.*

Group	Initial weight	Final weight	Total gain	ADG	SGR
GR. 1	20.0 ± 0.1	34.70 ± 0.03^{c}	14.70 ± 0.01^{c}	0.35 ± 0.005^{c}	1.31 ± 0.040^{b}
GR. 2	20.0 ± 0.3	35.12 ± 0.31^{c}	15.12 ± 0.01^{bc}	0.36 ± 0.000^{c}	1.34 ± 0.050^{b}
GR. 3	21.0 ± 0.0	37.38 ± 0.01^{b}	16.38 ± 0.05^{b}	0.39 ± 0.011^{b}	1.37 ± 0.003^{b}
GR. 4	20.2 ± 0.01	37.42 ± 0.40^{b}	17.22 ± 0.01^{a}	0.41 ± 0.130^{a}	1.47 ± 0.110^{a}
GR. 5	19.9 ±0.00	38.38 ± 0.05^{a}	18.48 ± 0.07^{a}	0.44 ± 0.070^{a}	1.57± 0.700^{a}
DY 1	20.0 ± 0.03	30.08 ± 0.07^{d}	10.08±0.00 ^{d}	0.24 ± 0.05^{e}	0.97 ± 0.07^{d}
DY 2	20.0 ± 0.2	30.5 ± 0.03^{b}	10.50 ± 0.03^{d}	0.25 ± 0.03^{e}	1.05 ± 0.01^{c}
DY 3	21.0 ± 0.3	34.02 ± 0.00^{c}	13.02 ± 0.01^{c}	0.31 ± 0.11^{d}	1.15 ± 0.05^{c}
DY 4	20.9 ± 0.1	35.18 ± 0.01^{c}	14.28 ± 0.01^{c}	0.34 ± 0.03^{c}	1.24 ± 0.01^{c}
DY 5	21.0 ± 0.0	37.38 ± 0.10^{b}	16.38 ± 0.05^{b}	0.39 ± 0.03^{b}	1.37 ± 0.00^{b}
Control	20.3	28.7 ± 0.001^{e}	8.20 ± 0.20^{f}	0.2 ± 0.02 ^{e}	0.82 ± 0.001 ^{d}

Group with different superscripts within the same column are significantly different at P < 0.05.

ADG = Average Daily Gain,

SGR = Specific Growth Rate

Tolan (2006) proved increasing total gain of fish by increasing level of Dry Yeast (DY) from 1 up to 3g/kg diet, which may indicated that fish require higher level to achieve the highest growth performance. The beneficial effects of probiotics may be mediated by a direct antagonistic effect against specific groups of microorganisms, resulting in suppression of viable count, suppression of bacterial number, an alteration of microbial metabolism or by stimulation of immunity (Fuller, 1989 and Sissons, 1989). Also, Diab *et al.* (2006) stated that Dried Yeast (*Saccharomyces cerevisea*) possessed high average body weight compared to control group. Moreover, Bagni *et al.* (2005) agree with these those in sea

bass diet. These results agree with results obtained by Kim *et al.* (2002a), who used Gromone at level 0.1, 0.2 g/kg diet for juvenile olive flounder. survival rate was ranged between (80-100 %) in the other groups. The similar trend was recorded by Tolan (2006) and Hanan (2005) where no mortality was recorded in Dried Yeast (DY) experimental groups.

Feed utilization and survival rate

Results shown in Table (4) revealed significant ($P < 0.05$) effect of dietary feed additives on feed intake, feed conversion ratio, protein efficiency ratio and survival rate of fish at different treatment groups. The highest total gain was recorded in GR5, which was reflected in the best feed conversion ratio and protein efficiency ratio when compared to the other treatment groups and also control group. Meanwhile, fish control showed the lowest values.

Values of protein efficiency ratio were significantly ($P<0.05$) different, which was higher in all GR groups. The results of feed utilization agree with Abdelhamid *et al.* (2000) and Magouz *et al.* (2002). They studied the effect of feeding Nile Tilapia fingerlings on diets supplemented with dried yeast. Concerning the survival rate, no mortality cases were recorded in GR except GR1 (10%). However,

Chemical composition and energy content

Data in Table (5) revealed that moisture content significantly ($P<0.05$) decreased in fish fed high level of GR (GR4 and GR5), while moisture content was not affected by low GR levels (GR1 and GR2). An opposite trend was observed with CP content. Which was significantly ($P < 0.05$) increased in all GR and DY groups. Generally body composition of fish in all groups in within the normal range similar to that reported by Abdelhamid *et al.* (2000). However, contents of EE significantly ($P<0.05$) increased in all treated groups. Content was significantly ($P<0.05$) decreased in all treatment groups, (GR and DY) (Table 5).

Table (4): *Feed intake and feed utilization of O. niloticus fish fed diets with or without feed additives.*

Group	FI	Total gain	FCR	PER	SR%
GR. 1	34.25 ± 0.01[a]	14.70 ± 0.220[b]	2.33 [a] ± 0.05a	1.72 ± 0.09[ab]	90
GR. 2	35.38 ± 0.00[a]	15.12 ± 0.011[b]	2.34 [a] ± 0.01a	1.71 ± 0.01[ab]	100
GR. 3	34.56 ± 0.01[a]	16.38 ± 0.003[a]	2.11 [a] ± 0.11a	1.98 ± 0.10[a]	100
GR. 4	34.44 ± 0.20[a]	17.22 ± 0.220[a]	2.0 [b] ± 0.01b	2.00 ± 0.09[a]	100
GR. 5	35.11 ± 0.03[a]	18.48 ± 0.020[a]	1.9 [b] ± 0.00b	2.1 0 ± 0.02[a]	100
DY 1	24.19 ± 0.110[c]	10.08 ± 0.01[c]	2.40 ±0.00[a]	1.67 ±0.00 [b]	90
DY 2	25.10 ± 0.010[c]	10.50 ± 0.11[c]	2.39 ±0.03[a]	1.7 ± 0.13[ab]	100
DY 3	30.73 ± 0.011[b]	13.02 ± 0.09[b]	2.36 ±0.05[a]	1.69 ± 0.11[b]	80
DY 4	31.27 ± 0.055[b]	14.28 ± 0.19[b]	2.19 ±0.03[a]	1.83 ± 0.10[a]	100
DY 5	31.86 ± 0.110[b]	16.38 ± 0.13[a]	2.8 ± 0.11[a]	2.06 ± 0.14[a]	100
Control	24.19 ± 0.12[c]	8.02 ± 0.13[c]	2.95 ± 0.10[a]	1.36 ± 0.09[b]	90

Group with different superscripts within the same column are significantly different at P < 0.05).

Feed Intake=FI, Feed conversion Ratio= FCR , Protein Efficiency Ratio =PER Survival Rate, SR.

Generally body composition of fish in all group[s is within the normal range reported by Abdelhamid *et al.* (2000).

Blood analyses

The results in Table (6) revealed that concentration of urea significantly (P<0.05) increased in all GR and DY groups compared with control group. Concentrations of creatinine were also significantly (P<0.05) increased in all GR and DY groups, being the highest in all DY groups. On the other hand, activity of AST was significantly (P<0.05) increased in all DY groups, and activity of ALT was significantly (P < 0.05) increased in all DY groups. While those in DY and GR showed only highest activity of AST and ALT in all DY groups as well as GR4 and GR5 groups (Table 6).

Table (5): *Carcass chemical composition and energy content of O. niloticus fish fed diets with or without feed additives.*

Group	Moisture	Chemical composition (%)			GE
		CP	EE	Ash	
GR. 1	75.1 ^{a} ± 0.09	48.9 ^{b} ± 0.1	29.9 ^{a} ± 0.1	20.9 ^{a} ± 0.05	558.05 b
GR. 2	75.0 ^{a} ± 0.03	48.8 ^{b} ± 01	29.8 ^{a} ± 0.9	20.2 ^{bc} ± 0.01	556.54 b
GR. 3	74.2^{b} ± 0.03	49.2 ^{ab} ± 0.01	29.7 ^{a} ± 0.9	20.9 ^{c} ± 0.01	557.8 b
GR. 4	74.9 ^{b} ± 0.04	50.6^{a} ± 0.09	29.8 ^{a} ± 0.9	18.1 ^{c} ± 0.00	564.4 a
GR. 5	74.81 ^{b} ± 0.04	50.2 ^{a} ± 0.08	30.0 ^{a} ± 0.8	18.7 ^{c} ± 0.11	568.6 a
DY 1	77.9 ^{a} ± 0.09	47.9 ^{bc} ± 0.1	29.00 ^{b} ± 0.1	23.00 ^{a} ± 0.4	543.9 c
DY 2	78.1 ^{a} ± 0.9	48.0 ^{b} ± 0.1	28.21 ^{b} ± 0.2	23.11 ^{b} ± 0.3	536.5 c
DY 3	78.0 ^{a} ± 1.3	48.2 ^{b} ± 0.3	29.0 ^{b} ± 0.3	22.73 ^{b} ± 0.3	545.6 c
DY 4	77.8 ^{a} ± 3.1	49.0 ^{a} ± 0.3	29.3 ^{b} ± 0.3	21.51 ^{b} ± 0.3	552.9 b
DY 5	78.9 ^{a} ± 31	48.8 ^{b} ± 0.3	29.5 ^{b} ± 0.1	21.49 ^{b} ± 0.00	535.7 c
Control	77.3 ^{a} ± 0.31	49.3 ^{b} ± 0.3	21.9 ^{c} ± 0.3	9.2 ^{a} ± 0.33	484.8 ^{b}

Group with different superscripts within the same column are significantly different at P<0.05.

CP = Crude Protein

EE =Ether extract.

Gross energy (GE) contents (Kcal/100 g of Nut.) was calculated according NRC (1993) using the factors 5.64, 9.44 and 4.11 (Kcal/g) for protein, lipid and carbohydrates, respectively.

In agreement with the present results concerning the changes in ALT activity in fish fed DY, Ragheb *et al*. (2003) found that the effect of Lacto-Sacc on the concentration of total protein was insignificant, while concentration of urea in blood plasma of growing calves significantly increased in supplemented than the control calves. Kim *et al.* (2002b) observed alteration in human liver and kidneys functions by

administration of YGF251. The significant effect of Gormone on activity of transaminases in this study was mainly associated with its function as GH hormones and increasing IGF-1, which affect protein synthesis and metabolism (Kim *et al.,* 2002a and b). Also, it is well known that DY acts as a protein supplementation, which may affect protein metabolism in animal body (Ragheb *et al.*, 2003).

Table (6): *Concentration of urea and creatinine and activity of transminases AST & ALT) in blood serum of O. niloticus fish as affected by additives.*

	Blood parameter		Enzyme activity	
	Urea (mg/dL)	Creatinine (mg/dL)	AST IU/dL	ALT IU/dL
GR. 1	$23^{b} \pm 1.2$	$0.3^{b} \pm 0.1$	$113^{bc} \pm 1.4$	$15^{c} \pm 2.2$
GR. 2	$23^{b} \pm 1.2$	$0.33^{b} \pm 0.11$	$114^{b} \pm 0.4$	$19^{c} \pm 2.3$
GR. 3	$22^{b} \pm 1.0$	$0.35^{b} \pm 0.11$	$114^{b} \pm 1.4$	$20^{b} \pm 2.3$
GR. 4	$25^{a} \pm 1.31$	$0.36^{b} \pm 0.09$	$117^{a} \pm .31$	$21^{ab} \pm 2.3$
GR. 5	$25^{a} \pm 1.4$	$0.36^{b} \pm 0.09$	$115^{a} \pm 1.39$	$21^{ab} \pm 1.4$
DY 1	$17^{c} \pm 1.4$	$0.51^{a} \pm 1.2$	$110^{c} \pm 2.1$	$24^{a} \pm 0.9$
DY 2	$18^{c} \pm 1.2$	$0.5^{a} \pm 1.2$	$110^{c} \pm 2.3$	$24^{a} \pm 0.9$
DY 3	$18^{c} \pm 0.9$	$0.53^{a} \pm 1.2$	$113^{bc} \pm 2.3$	$25^{a} \pm 0.8$
DY 4	$19^{c} \pm 0.9$	$0.53^{a} \pm 1.3$	$114^{b} \pm 2.3$	$26^{a} \pm 0.2$
DY 5	$20^{bc} \pm 0.8$	$0.56^{a} \pm 1.3$	$117^{a} \pm 2.2$	$26^{a} \pm 0.2$
Control	15 ± 1.2^{c}	$0.31^{b} \pm 1.4$	$109^{c} \pm 2.3$	$20^{b} \pm 0.2$

Group with different superscripts within the same column are significantly different at P < 0.05.

ALT = Alanine amino transaminase AST= Aspartate amino transaminase

Table (7): *Averages and standard errors (X±SE) of water quality measurements during the experimental period.*

Group	O2 mg/l	pH mg/l	Ammonia mg/l	Nitrite mg/l	Nitrate mg/l
GR. 1	5.2 ^{b} ± 0.9	6.3 ^{c} ± 0.01	0.08 ± 0.00	0.01 ^{b} ± 0.00	1.2 ^{b} ± 0.02
GR. 2	5.41 ^{ab} ± 0.9	6.4 ^{bc} ± 0.09	0.07 ^{c} ± 0.001	0.09 ^{a} ± 0.01	1.25 ^{b} ± 0.002
GR. 3	5.51 ^{ab} ± 0.91	6.4 ^{bc} ± 0.09	0.07 c ± 0.002	0.4 ^{b} ± 0.002	1.21 ^{b} ± 0.03
GR. 4	5.49 ^{ab} ± 0.36	7.7 ± 0.01	0.09 ^{c} ± 0.003	0.00 ^{c} ± 0.00	1.11 ^{b} ± 0.03
GR. 5	5.49 ^{a} ± 0.33	7.11 ^{a} ± 0.00	0.1 a ± 0.00	0.01 ^{b} ± 0.00	1.3 ^{b} ± 0.009
DY 1	5.5 ^{ab} ± 0.88	7.0 ^{ab} ± 0.00	0.9 ^{a} ± 0.1	0.02 ^{b} ± 0.01	1.25 ^{b} ± 0.09
DY 2	5.6 ^{a} ± 0.81	7.02 ^{ab} ± 0.02	0.92 ^{a} ± 0.01	0.00 ± 0.007	2.0 ^{a} ± 0.0
DY 3	5.6 ^{a} ± 0.33	7.02 ^{ab} ± 0.00	0.92 ^{a} ± 0.1	0.03 ^{b} ± 0.01	2.1 ^{a} ± 0.01
DY 4	5.51 ^{a} ±0.2	6.9 ^{ab} ± 0.2	0.88 ^{b} ± 0.09	0.01 ^{b} ± 0.11	11.9^{a} ± 0.2
DY 5	5.7 ^{a} ± 0.21	6.85 ^{b} ± 0.3	1.05 ^{a} ± 0.08	0.01 ^{b} ± 0.009	1.85 ^{a} ± 0.2
Control	5.9 ^{a} ± 0.36	6.39 ^{c} ± 0.3	0.81 ^{b} ± 0.08	0.05 ^{b} ± 0.00	7.03^{a} ± 0.01

Group with different superscripts within the same column are significantly different at P < 0.05.

Water quality parameters

The results present in Table (7) showed that water quality parameters were suitable for cultured *O. niloticus* according Boyd (1990), with exception of ammonia at DY groups.

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تاثير بعض محفزات النموعلي معدلات النمولاصبعيات اسماك البلطي النيلي

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تهدف الدراسة الى تقييم تاثير الخميره والجرومون على اداء النمولاصبعيات سمكة البلطى النيلى فى بداية التجربة تم تقسيم اصبعيات البلطى النيلى وعددهم ٣٣٠ اصبعية بوزن ابتدائى قدرة ٢٠ جرام حيث قسمت الى ٥ مجاميع٣٠ اصبعية فى كل مجموعة والتى لها ثلاث مكررات وكل مكرر به ١٠اصبعيات) وتم تغذيتها علي عليقه متساويه في الطاقه والبروتين بنسبه ٣% من وزن الجسم (٦ ايام في الاسبوع لمده ٤٢ يوم وتم اضافه الجرومون بنسب مختلفة GR1 وكانت معدلات الاضافة على النحو التالى (٠.١ – ٠.٢ -٠.٣ – ٠.٤ – ٠.٥ جرام/ كيلوجرام) بالترتيب ، والخمس مجموعات الاخري تم تغذيتها علي الخميره النشطه الجافه علي النحو التالي (٢٠،٢٥،٥،١٠،١٥ جرام / كجم) بالترتيب وكانت المجموعه الضابطه والتي تم تغذيتها علي علف خالي من الاضافات .

وقد اظهرت نتائج التجربه ان الجرومون والخميره النشطه ادت الي زياده الوزن النهائي والوزن الكلي المكتسب ومعدل الزياده اليوميه ومعدل النمو الخاص مقارنه بالمجموعه الضابطه وكانت اعلى قيمة هى الخاصة بالمجموعه GR5 (٣٨.٣٨ جم و ١٨.٤٨ جم و ٥.٤٤ جم و ١.٥٧) وكانت مجموعات الجرومون زادت بمعدل استهلاك العلف مقارنه بالمجموعه الضابطه والخميره وكانت الاعلي مجموعه GR5 (٣٥.٣٨ جم) مقارنه بالمجموعه الضابطه (٢٤.١٩ جم) اظهرت المجموعه GR5 اعلي معدل تحويل علف ومعدل اعاشه (١.٩ و ١٠٠%) مقارنه بالمجموعه الضابطه (٢.٩٥ و ٩٠%) .

بالتحليل الكيماوي لجسم الاسماك المستخدمه في التجربه اظهرت المجموعه GR5 افضل النتائج من حيث الرطوبه (٧٤.٨١ %) ورماد (٧.٧ %) و البروتين الخام (٥٠.٢ %) والمستخلص الايثيري (٣٠ %) مقارنه بالمجموعه الضابطه (٧٧.٣ % و ٩.٢ % و ٤٩.٣ % و ٢١.٩ %) بالترتيب . بينما انخفض محتوي الطاقه في المجموعه GR5(٥٦٨.٦ كيلو كالوري/١٠٠جرام) مقارنه بالمجموعه الضابطه (٤٨٤.٩ كيلو كالوري/١٠٠جرام) .

اظهرت نتائج اختبار سيرم دم الاسماك لانزيمات الكبد زياده نسبه اليوريا في كل مجموعات الجرومون مقارنه بالمجموعه الضابطه وكانت الاعلي في GR5 و GR4 (٢٥ ملج / ديسيليتر)

بينما اظهرت كل مجموعات الخميره زياده في نسبه الكرياتنين وكانت الاعلي في المجموعه DY5 (٥٦ ملج / ديسيليتر) .

وقد اظهرت التجربه زياده قيم AST في كل المجموعات التي بها الاضافه بمستويات عاليه من كل من الجرومون والخميره وكانت الاعلي في مجموعات GR4 و DY5 (١١٧ و ١١٥ وحده دوليه / ديسيليتر) علي الترتيب بينما كانت قيم ALT اعلي في مجموعات الخميره ومجموعات الجرومون التي بها نسب الاضافه العاليه من الجرومون والخميره وكانت اعلي القيم في المجموعات DY4 و DY 5 (٢٦ وحده دوليه / ديسيليتر) لكل منهما . وبتحليل العينات من مياه الاحواض كانت جميع القياسات لقيم عناصر المياه من اكسجين و PH والامونيا والنيتريت والنيترات في مستويات مناسبه للاستزراع السمكي