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EFFECT OF HYDROYEAST AQUACULTURE® AS GROWTH PROMOTER FOR ADULT NILE TILAPIA *Oreochromis niloticus*

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ABSTRACT

The objectives of the present study were to evaluate the effects of graded levels of a new commercial probiotic Hydroyeast Aquaculture® (0, 5, 10 and 15 g/Kg diet) on both sexes of adult Nile tilapia *Oreochromis niloticus*, referred to treatments No. T_1, T_2, T_3 and T_4, respectively, for males and T_5, T_6, T_7 and T_8 treatments for females, on their growth performance, feed and nutrients utilization and carcass composition for 8 weeks. The obtained results showed that tested probiotic at level of 15 g /kg diet (T_4) and 10 g /kg diet (T_7) for adult males and females *O. niloticus* respectively, significantly ($P \leq 0.05$) enhancing fish growth, feed intake and nutrients utilization, as well as realized slight improving of fish carcass composition. Hence, it could be concluded that Hydroyeast Aquaculture® probiotic is useful at levels of 15 g /kg diet (T_4) and 10 g /kg diet (T_7) for enhancing production performance of adult males and females Nile tilapia (*O. niloticus*) respectively, so may be using of this probiotic led to economic efficiency especially, for fish farming and hatcheries.
Keywords: Nile tilapia – probiotic - adult - growth performance.

INTRODUCTION

Hormones, antibiotics, ionophers and some salts compounds have been used as growth promoters and to some extent to prevent diseases. However, their inadequate applications show a negative effect on aquaculture production and environment (Góngora, 1998). Functional additive, like probiotics, is a new concept on aquaculture (Li and Gatlin III, 2004) where the additions of microorganisms on diets show a positive effect on growth caused by the best use of carbohydrates, protein, and energy (Irianto and Austin, 2002). It further diminishes mortality by disease, antagonism to pathogen, and better microbial intestinal balance in the environment (Holmström *et al.*, 2003).

The use of probiotics for farm animals has increased considerably over the last 15 years. Once ingested, the probiotic microorganisms can modulate the balance and activities of the gastrointestinal microbiota, whose role is fundamental to gut homeostasis. The most important benefits of yeast and bacterial probiotics upon the gastrointestinal microbial ecosystem in ruminants and monogastric animals (equines, pigs, poultry, fish) were reported in the recent scientific literature (Chaucheyras-Durand and Durand, 2010). Nowadays, a number of preparations of probiotics are commercially available and have been introduced to fish, shrimp and molluscan farming as feed additives, or are incorporated in pond water (Wang *et al.*, 2005).

Tilapias are the most successfully cultured fish in the world because of their fast growing and high efficiency to utilize the natural and artificial supplemented feeds (Ishak, 1980). Tilapias have become increasingly popular for farming as they are able to reproduce rapidly, easily bred in captivity, tolerate to a wide range of environmental conditions, highly resistant to diseases, and most important of all, have good flavour. Though the fish originated in Africa, Asian countries have become the leading producers of these fishes (Rana, 1997). Tilapias are second only to carps as the most widely farmed freshwater fish in the world (FAO, 2010).

Food availability and quality are known to influence both fecundity and egg size in tilapia (Coward and Bromage, 2000). So, brood stock nutrition is recognized as a major factor that can influence fish reproduction and subsequent larval quality of many fish species (Izquierdo *et al.*, 2001). The development of cost effective and nutrient optimized brood stock feeds for tilapia is both pertinent and crucial. Yet, many studies revealed the positive effects of probiotics on growth performance in different *O. niloticus* stages such fry (Abdel-Tawwab *et al.*, 2008; Lara-Flores *et al.*, 2010; Abdelhamid *et al.*, 2012; Abdel-Tawwab, 2012) and fingerlings (Mehrim, 2009; Ghazalah *et al.*, 2010; Khalafalla, 2010). However, no any attempts were designed concerning the effects of probiotics on growth performance of adult fish. Therefore, the objectives of the present study were to evaluate the effects of graded levels of a new dietary probiotic Hydroyeast Aquaculture® on both sexes of adult Nile tilapia *Oreochromis niloticus*, concerning their growth performance, feed and nutrients utilization and carcass composition for 8 weeks.

MATERIALS AND METHODS

The experimental management:

This study was conducted in Fish Research Unit, Faculty of Agriculture, Mansoura University, Al-Dakahlia governorate, Egypt. Both sexes of healthy adult Nile tilapia *O. niloticus*, with an average initial body weight (83.4 ± 0.001 g) for adult males and (80.1 ± 0.002 g) for adult females were purchased from Integrated Fish Farm at Al-Manzala (General Authority for Fish Resources Development – Ministry of Agriculture) Al-Dakhalia governorate, Egypt. Fish were stocked into rearing tanks for two weeks as an adaptation period, and fed on a basal diet during this period. Fish in both sexes (males and females), were distributed separately into eight experimental treatments (as three replicates per treatment) (Table 1). Fish in each treatment were stoked at 10 fish/ m^3 per tank. Each tank ($1m^3$ in volume) was constructed with an upper irrigation open, an under drainage, an air stone connected with electric compressor. Fresh under ground water was used to change one third of the water in each tank every day.

The tested probiotic Hydroyeast Aquaculture® formula was showed in Table (2), which producing by Agranco corp., Gables, International Plaza Suite, No. 307, 2655 Le Jeune Rd., 3rd Floor, Coral Gables, Fl 33134, USA. (http://www.agranco.com/hydroyeast_aquaculture.htm).

Table (1): Details of the experimental treatments

Treat.	Details
T_1, ♂	Basal ration (BR)+ 0 g Hydroyeast Aquaculture®/Kg diet (as a control)
T_2, ♂	Basal ration (BR)+ 5 g Hydroyeast Aquaculture®/Kg diet
T_3, ♂	Basal ration (BR)+ 10 g Hydroyeast Aquaculture®/Kg diet
T_4, ♂	Basal ration (BR)+ 15 g Hydroyeast Aquaculture®/Kg diet
T_5, ♀	Basal ration (BR)+ 0 g Hydroyeast Aquaculture®/Kg diet (as a control)
T_6, ♀	Basal ration (BR)+ 5 g Hydroyeast Aquaculture®/Kg diet
T_7, ♀	Basal ration (BR)+ 10 g Hydroyeast Aquaculture®/Kg diet
T_8, ♀	Basal ration (BR)+ 15 g Hydroyeast Aquaculture®/Kg diet

Table (2): Formula of the tested probiotic, Hydroyeast Aquaculture®

Ingredients	Units/ kg min.	Yeast probiotics	CFU/ kg min.
Oligosaccharides	50,000 ppm	Active live yeast	5,000,000,000,000
Enzymes		Probiotics	
Amylase	3,750,000	*Lactobacillus acidophylus*	22,500,000,000
Protease	500,000	*Bifedobacterium longhum*	22,500,000,000
Cellulase	200,000	*Bifedobacterium thermophylum*	22,500,000,000
Pectinase	100,000	*Streptococcus faecium*	22,500,000,000
Xylanase	10,000		
Phytase	3,000		

The commercial diet, as basal ration (BR), used in the present study contains 25% crude protein, it was purchased from Al-Manzala manufacture for fish feed, Integrated Fish Farm at Al-Manzala (General Authority for Fish Resources Development - Ministry of Agriculture), Dakhalia governorate, Egypt. This commercial diet ingredients and proximate chemical analysis according to the manufacture's formula, as shown in Table (3). The diet was ground to add the tested probiotic (Hydroyeast Aquaculture®) at levels of 0, 5, 10 and 15 g/Kg diet, referred to treatments No. T_1, T_2, T_3 and T_4, respectively, for males and T_5, T_6, T_7 and T_8 treatments for females (Table 1) and then all diets were repelleted. The experimental diets were introduced by hand twice daily at 9 a.m and 15 p.m at 3% of the fish biomass at each tank. The feed quantity was adjusted bi-weekly according to the actual body weight changes.

Fish sampling and performance parameters:

At the start and at the end of the experiment, fish samples were collected and kept frozen till the proximate analysis of the whole fish body according to AOAC (2000). Energy content in experimental fish was calculated according to NRC (1993), being 5.64 and 9.44 kcal/g for CP and EE, respectively.

Growth performance parameters of both sexes of adult *O. niloticus* such as average total weight gain (AWG), average daily gain (ADG), relative growth rate % (RGR), specific growth rate %/day (SGR) and survival rate % (SR) were calculated. Feed conversion ratio (FCR), feed efficiency % (FE), protein efficiency ratio (PER), protein productive value % (PPV) and energy utilization % (EU) were calculated according to the following equations:

AWG (g/fish) = [Average final weight (g) – Average initial weight (g)].

ADG (g/fish/day) = [AWG (g) / experimental period in days (d)].
RGR = 100 [AWG (g)/Average initial weight (g)].
SGR (%/day) = 100 [ln final body weight - ln initial body weight] / experimental period in days (d).
FCR = Feed Intake, (g)/Live weight gain (g).
FE = 100 [Live weight gain (g)/Feed Intake, (g)].
PER = Live weight gain (g)/protein intake (g).
PPV (%) = 100 [Final fish body protein content (g) – Initial fish body protein content (g)]/crude protein intake (g).
EU (%) = Retained energy x 100/consumed feed energy
SR = 100 [Total No. of fish at the end of the experimental/Total no. of fish at the start of the exsperiment].

Table (3): Ingredients and proximate chemical analysis (% on dry matter basis) of the experimental basal diet

Ingredients	%
Yellow corn	22.50
Rice bran	23.00
Soybean meal (44%)	37.50
Fish meal (65%)	6.00
Salts	0.50
Calcium Carbonate	4.67
Vegetable Oil	3.00
Premix	0.30
Di-nitro bio (Anti oxidant)	0.025
Bintonite (as banding agent)	2.50
Nutrients composition	**%**
Dry matter (DM)	88.18
Crude protein (CP)	25.10
Ether extract (EE)	7.90
Ash	6.30
Crude fiber	6.00
Nitrogen free extract (NFE)	54.70
Gross energy (Kcal/100 g DM) (GE)*	440.94
Protein/energy (P/E) ratio (mg CP/Kcal GE)	56.92

*** GE (Kcal/100 g DM) = CP x 5.64 + EE x 9.44 + NFE x 4.11 calculated according to NRC (1993).**

Statistical analysis:

The obtained data for males or for females were statistically analyzed using general liner models (GLM) procedure according to SAS (2001) for users guide. The differences between means of treatments were compared for the significance ($P \leq 0.05$) using Duncan's multiple rang test (Duncan, 1955), as described by Bailey (1995).

RESULTS

Growth performance parameters:

Male:

Growth performance parameters of adult males *O. niloticus* illustrated in Table (4) revealed that T_4 (15 g Hydroyeast Aquaculture®/Kg diet) was the best treatment followed by T_2 (5 g Hydroyeast Aquaculture®/Kg diet) and T_3

(10 g Hydroyeast Aquaculture®/Kg diet), which were gave significantly ($P \leq 0.05$) final body weight, AWG, RGR, ADG and SGR than the control (T_1). But, no significant ($P \geq 0.05$) differences between T_2 and T_3 for final weight, AWG and ADG, as well as in SR among all treatments.

Female:

Data of growth performance parameters of adult females *O. niloticus* revealed that T_7 (10 g Hydroyeast Aquaculture®/Kg diet) was the best treatment followed by T_6 (5 g Hydroyeast Aquaculture®/Kg diet), which were gave significantly ($P \leq 0.05$) increased final body weight, AWG, RGR, ADG and SGR than T_8 (15 g Hydroyeast Aquaculture®/Kg diet) and the control (T_5). However, no significant ($P \geq 0.05$) effects in SR among all treatments (Table 5).

Table (4): Effects of Hydroyeast Aquaculture® probiotic on growth performance of adult male *O. niloticus*

Treat.	Body weight (g/fish)			RGR	ADG (mg/fish/day)	SGR (%/d)	SR (%)
	Initial weight	Final weight	AWG				
T_1	81.0	117.6b	36.5c	45.1c	0.63c	0.64c	100.0
T_2	82.4	137.2a	54.8ab	66.5a	0.94ab	0.88a	100.0
T_3	83.0	136.2a	48.9b	56.1b	0.84b	0.77b	100.0
T_4	87.3	142.0a	58.9a	71.07a	1.01a	0.92a	100.0
± SE	0.001	2.36	2.35	2.83	0.04	0.03	0.000
P- value	0.253	0.0004	0.0008	0.0008	0.0008	0.0015	0.526

Means in the same column having different small letters are significantly differ ($P \leq 0.05$); SE: Standard Error.

Table (5): Effects of Hydroyeast Aquaculture® probiotic on growth performance of adult female *O. niloticus*

Treat.	Body weight (g/fish)			RGR	ADG (mg/fish/day)	SGR (%/d)	SR (%)
	Initial weight	Final weight	AWG				
T_5	75.4	105.3b	29.8b	39.6b	0.52b	0.57b	100.0
T_6	81.1	122.4a	41.3a	50.9a	0.71a	0.71a	100.0
T_7	83.0	126.1a	43.1a	51.9a	0.74a	0.72a	100.0
T_8	81.0	102.4b	21.4c	26.4c	0.37c	0.41c	100.0
± SE	0.002	1.43	1.42	1.73	0.02	0.02	0.000
P- value	0.128	0.0001	0.0001	0.0001	0.0001	0.0001	0.466

Means in the same column having different small letters are significantly differ ($P \leq 0.05$); SE: Standard Error

Feed and nutrients utilization:

Male:

Results of feed nutrients utilization parameters of adult males *O. niloticus* were shown in Table (6), whereas T_4 gave the highest significantly ($P \leq 0.05$) increased FE, PER and the best FCR followed by T_2 compared with the control (T_1) and T_3. In contrast, PPV or EU increased significantly ($P \leq 0.05$) in T_1 followed by T_2 compared with T_3 and T_4. However, no significant ($P \geq 0.05$) differences in FI among all treatments.

Table (6): Effects of Hydroyeast Aquaculture® probiotic on feed and nutrients utilization of adult male *O. niloticus*

Treat.	FI (g/fish)	FCR	FE (%)	Protein utilization		EU (%)
				PPV (%)	PER	
T_1	123.1	3.4a	29.6c	30.9a	1.2c	15.7a
T_2	117.7	2.1b	46.9a	29.0a	1.8a	13.6b
T_3	129.3	2.7b	37.8b	15.8b	1.5b	6.6d
T_4	129.9	2.2b	45.4a	18.8b	1.8a	8.9c
± SE	5.22	0.16	1.97	1.22	0.07	0.64
P- value	0.364	0.002	0.0009	0.0001	0.0008	0.0001

Means in the same column having different small letters are significantly differ ($P \leq 0.05$); SE = Standard Error

Female:

Adult females' *O. niloticus* fed 10g Hydroyeast Aquaculture®/kg diet (T_7) showed a significant ($P \leq 0.05$) increase in FI, FE, PER and the best FCR followed by fish fed 5g Hydroyeast Aquaculture®/kg diet (T_6) compared with the control (T_1). However, treatment No. 6 gave significantly ($P \leq 0.05$) increase of PPV and EU among all treatments (Table 7).

Generally, the differences between males and females within all treatments concerning, feed and nutrients utilization parameters may be due to the differences in sexes, metabolism, physiological responses and sexual behaviors of fish during this stage of life.

Table (7): Effects of Hydroyeast Aquaculture® probiotic on feed and nutrients utilization of adult female *O. niloticus*

Treat.	FI (g/fish)	FCR	FE (%)	Protein utilization		EU (%)
				PPV (%)	PER	
T_5	113.0c	3.7b	26.4b	13.6b	1.1b	11.2b
T_6	120.5b	2.9c	34.3a	25.6a	1.3a	15.4a
T_7	122.6a	2.8c	35.1a	15.0b	1.4a	11.1b
T_8	113.2c	5.3a	18.8c	5.2c	0.8c	4.9c
± SE	0.62	0.12	1.17	0.67	0.04	0.41
P- value	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001

Means in the same column having different small letters are significantly differ ($P \leq 0.05$); SE = Standard Error.

Fish Carcass composition:

Male:

Proximate chemical analysis of the whole adult males' *O. niloticus* body at the start and at the end of the experiment is summarized in Table (8). These data indicated that there were significant ($P \leq 0.05$) increases of DM and EC content in the control group (T_1) compared with the dietary inclusion of Hydroyeast Aquaculture® (T_2, T_3 and T_4), but CP content was increased significantly ($P \leq 0.05$) in T_1 or T_2 than the T_3 and T_4. However unclear trend was observed in EE, where the increasing in EE content was not significant in T_1 compared with T_3 and T_4 and significant as compared with T_2. In contrast, of these results ash content increased significantly in T_3 and T_4 compared with T_2 and the control T_1. Generally, proximate chemical analysis of the whole fish body at the start, revealed higher DM, EE and EC than in the end of the experiment, but CP and ash were lower at the start than at the end of the experiment.

Female:

Adult female *O. niloticus* fed 5g Hydroyeast Aquaculture®/kg diet (T_6) showed significant ($P \leq 0.05$) increase in DM, CP and EC contents among all treatments. However, both of EE and ash contents recorded the same trend, whereas increased insignificantly in the control group (T_5) compared with T_7 and T_8 and significantly increased compared with T_6. In general, unclear trend was recorded in proximate chemical analysis of the whole adult females' *O. niloticus* body at the start and at the end of the experimental period, which there were higher DM and CP than in the end of the experiment, but EE and ash were lower at start than at the experimental end. Meanwhile, no any remarkable changes were observed in EC content at the start and the end of the experimental period (Table 9).

Generally, the present findings of fish carcass composition were took unclear trends between males and females within all treatments may be due to the differences in sexes, metabolism, physiological responses and sexual behaviors of fish during this stage of life, which effected in biochemical contents in their bodies.

Table (8): Effects of Hydroyeast Aquaculture® probiotic on carcass composition of adult male *O. niloticus*

Treat.	DM	% On Dry matter basis			
		CP	EE	Ash	EC
At the start of the experiment					
	25.3	52.2	30.7	16.9	585.1
At the end of the experiment					
T_1	24.8a	58.9a	25.2a	15.9c	570.4a
T_2	20.6b	58.1a	23.8b	18.1b	552.9b
T_3	18.2c	55.4b	24.3ab	20.3a	541.8c
T_4	17.9c	55.5b	24.8ab	19.7a	547.5bc
± SE	0.19	0.55	0.37	0.35	2.21
P- value	0.0001	0.003	0.123	0.0001	0.0001

Means in the same column having different small letters are significantly differ ($P \leq 0.05$). DM: Dry matter (%); CP: Crude protein (%); EE: Ether extract (%); EC: Energy content (Kcal/100 g), calculated according to NRC (1993); SE: Standard Error.

Table (9): Effects of Hydroyeast Aquaculture® probiotic on carcass composition of adult female *O. niloticus*

Treat.	DM	% On Dry matter basis			
		CP	EE	Ash	EC
At the start of the experiment					
	24.3	59.2	23.6	17.1	557.5
At the end of the experiment					
T_5	20.9b	53.9c	26.8a	19.1a	557.7b
T_6	22.4a	60.2a	24.1b	15.7b	566.9a
T_7	17.1d	55.7b	25.7a	18.5a	557.6b
T_8	18.4c	55.6bc	25.7a	18.6a	556.9b
± SE	0.09	0.50	0.44	0.29	2.54
P- value	0.0001	0.0001	0.015	0.0001	0.070

Means in the same column having different small letters are significantly differ ($P \leq 0.05$). DM: Dry matter (%); CP: Crude protein (%); EE: Ether extract (%); EC: Energy content (Kcal/100 g), calculated according to NRC (1993); SE: Standard Error.

DISSCUSION

The positive effects in the present study, of Hydroyeast Aquaculture® probiotic on adult males and females *Oreochromis niloticus* growth performance and feed utilization, was found by Eid and Mohamed (2008), where they proved that Biogen® and Prmifer® improved the growth performance, feed conversion, protein efficiency ratio and apparent protein digestibility for monosex tilapia fingerlings compared to fish fed the control diet. Moreover, El-Ashram *et al.* (2008) concluded that, super Biobuds® can improve body gain, survival and enhance resistance to challenge infection. Yet, Abdelhamid and Elkatan (2006) found that dietary supplementation of Biobuds® slightly improved body weight gain but reduced the survival rate of tilapia fingerlings. El-Haroun *et al.* (2006) and El-Haroun (2007) reported that Biogen® dietary supplementation improved growth performance and feed utilization, carcass protein and fat percentages as well as economical profit in Nile tilapia and catfish culture, respectively. In this respect, also Mehrim (2009) reported that dietary probiotic (Biogen®) had significantly ($P \leq 0.05$) increased all growth performance parameters of *O. niloticus* compared with the control group. Yet, Marzouk *et al.* (2008) found that probiotics (*B. subtillis* and *Saccharomyces cerevisae*) revealed significant improvement in growth parameters of *O. niloticus*. However, Shelby *et al.* (2006) noted that the probiotic used with juvenile channel catfish diet had lack effect on specific growth promoting. Also, He *et al.* (2009) found that supplementation of dietary DVAQUA® showed no effects on growth performance, feed conversion and survival rate of the hybrid tilapia (*Oreochromis niloticus* ♀ × *O. aureus* ♂). The reasons for the differences between fish species have not been elucidated, but might be due to the differences in aquaculture and physiological conditions, composition of the probiotic and the type of basal ingredients in diets.

In this context, many studies concluded a positive effect of using viable microorganisms in probiotic mixtures into diets of fish (Pangrahi *et al.*, 2005; Barnes *et al.*, 2006; Abo-State *et al.*, 2009). According to, the results of the present study and those obtained by other attempts; it seems that probiotics may stimulate appetite and improve nutrition by the production of vitamins, detoxification of compounds in the diet, and by breakdown of indigestible components (Irianto and Austin, 2002). Also, Varley (2008) cited also that probiotics show real benefits in the synergistic effects with the beneficial bacteria in making inroads into improving gut health.

Probiotics improve feed conversion efficiency and live weight gains (Saenz de Rodriguez *et al.*, 2009). So, the supplementation of commercial live yeast, *S. cerevisiae*, improved growth and feed utilization (Abdel-Tawwab *et al.*, 2008). Yet, similar results were obtained when *S. cerevisiae* was added to fish diet for Israeli carp (Noh *et al.*, 1994) and Nile tilapia (Lara-Flores *et al.*, 2003). Moreover, Mehrim (2009) found similar positive effects of Biogen® on growth performance, feed conversion ratio and carcass composition of *O. niloticus*. Rawling *et al.* (2009) reported that daily feed intake was significantly higher in red tilapia (*O. niloticus*) fed Sangrovit® (Phytobiotics Gmbh, Etville, Germany) supplemented diets compared to control and that feed utilization was not significantly affected suggesting that improved growth was likely to be due to improved appetite of fish fed diets containing Sangrovit®. The improved fish growth and feed utilization may possibly be due to improved nutrient digestibility. In this regard, Tovar *et al.* (2002), Lara-Flores *et al.* (2003), and Waché *et al.* (2006) found that the addition of live yeast improved diet and protein digestibility, which may explain the better growth and feed efficiency seen with yeast supplements. Also, De Schrijver and Ollevier (2000) reported a positive effect on apparent protein digestion when supplementing turbot feeds with the bacteria *Vibrio* proteolyticus.

Growth of fish and feed conversion together with carcass composition are generally affected by species, genetic strain, sex, stage of reproductive cycle, etc., leading to different nutritional requirements. (Jauncey, 1998). In this respect, yeast supplementation significantly affected the whole-fish body composition (Abdel-Tawwab *et al.*, 2008). These results suggest that yeast supplementation plays a role in enhancing feed intake with a subsequent enhancement of fish body composition, as well as yeast supplements significantly affected ash content of *O. niloticus* (Abdel-Tawwab, 2012). On the other hand, changes in protein and lipid content in fish body could be linked with changes in their synthesis, deposition rate in muscle and/or different growth rate (Abdel-Tawwab *et al.*, 2006).

In this topic, Khattab *et al.* (2004) reported that crude protein, total lipids and ash were significantly ($P < 0.01$) affected by protein level and increasing stocking density rate of tilapia fish. Yet, Abdelhamid *et al.* (2007) reported that increasing dietary Betafin® (betaine) level caused a significant improve of *O. niloticus* body composition. On the other side, the results in the present study are in close agreement with those of EL-Haroun *et al.* (2006), Mohamed *et al.* (2007), and Eid and Mohamed (2008) for tilapia and EL-Haroun, (2007) for catfish. In addition, Mehrim (2009) found positive effects of inclusion of Biogen® at a level of 3g/kg on carcass composition of mono-sex *O. niloticus* fingerlings. Also, who reported that these positive effects in carcass composition of experimental fish may be due to the dietary probiotic Biogen®, which caused the good growth performance of treated fish compared with the control group, as present findings of adult males and females *O. niloticus* growth performance (Tables 4 & 5), respectively.

From the forgoing results, it could be concluded that Hydroyeast Aquaculture® probiotic is useful at levels 15 g /kg diet (T_4) and 10 g /kg diet (T_7) for enhancing production performance of adult males and females Nile tilapia *O. niloticus* respectively, so may be using of this probiotic led to economic efficiency especially, for fish farming and hatcheries.

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تأثير هيدروييست أكواكلشر كمنشط نمو لأسماك البلطى النيلى الناضجة

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الهدف من هذه الدراسة هو تقدير تأثير المستويات المتدرجة للبروبيوتيك التجارى الجديد Hydroyeast Aquaculture® لمدة ٨ أسابيع على كل من الجنسين (الذكور ، الإناث) لأسماك البلطى النيلى الناضجة بمستويات صفر، ٥ ، ١٠ ، ١٥ جرام/ كجم علف كمعاملات أرقام ١ ، ٢ ، ٣ ، ٤ للذكور وأرقام ٥ ، ٦ ، ٧ ، ٨ للإناث على التوالى، فيما يتعلق بأداء النمو ، كفاءة الاستفادة من الغذاء و العناصر الغذائية ، تركيب جسم الأسماك. النتائج المتحصل عليها أوضحت أن البروبيوتيك المختبر Hydroyeast Aquaculture® بالمستويين ١٥ جرام / كجم علف (المعاملة الرابعة) ، ١٠ جرام / كجم علف (المعاملة السابعة) لذكور وإناث أسماك البلطى النيلى الناضجة على التوالى أدى إلى تحسين أداء النمو للأسماك، الاستفادة من الغذاء والعناصر الغذائية مقارنة بالمجموعة الضابطة. لذا يمكن التوصية بأن البروبيوتيك تحت الدراسة Hydroyeast Aquaculture® مفيد بالمستويين ١٥ ، ١٠ جرام / كجم علف لتحسين الأداء الإنتاجى لكل من ذكور وإناث أسماك البلطى النيلى الناضجة على التوالى. لذلك ربما أن يكون استخدام هذا البروبيوتيك مفيد أيضاً من الوجهة الاقتصادية للمزارع والمفرخات السمكية.

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