Abbassa Int. J. Aqua., V0l.6 No.(2) 2013. *389-406*

EFFECT OF ONION POWDER USED AS A FEED ADDITIVE ON GROWTH PERFORMANCE, FEED UTILIZATION AND WHOLE BODY OMPOSITION OF NILE TILAPIA FINGERLINGS CHALLENGED WITH PATHOGENIC *AEROMONAS HYDROPHILA*

Medhat E.A. Seden

Department of Fish Nutrition, Central Laboratory for Aquaculture, Research Abbassa, Egypt

Received 7/ 11/ 2013 *Accepted 17/ 12/ 2013*

Abstract

A 15-week experiment was conducted to evaluate the effect of onion powder (OP) on growth performance, feed utilization, and body composition of Nile tilapia, *Oreochromis niloticus* and its challenge against pathogenic *Aeromonas hydrophila*. All diets were iso-nitrogenous (35% crud protein), iso-lipidic (8.11%) and iso-caloric (4.63 kcal/g diet). OP was added to the diets at a rate of 0.0, 0.1, 0.2, 0.3, 0.4 and 0.5%. Eighteen glass aquaria were stoked with 20 fish (0.82 g) per each in triplicates for each treatment. Fish were fed at feeding rate of 8% of fish body weight for the first forty five days then reduced to 5% for the second thirty days and finally reduced to 3% for the rest of the study. After the feeding trial, fish of each treatment were challenged with pathogenic *A. hydrophila* by intraperitoneal injection (I / P) for 10 days. The results showed that no significant difference was observed in fish survival among the different treatments and its range was 98.33-91.65%. The maximum growth was obtained when fish fed on a diet contained 0.5% OP, while the lowest growth was obtained at the control group. The best feed conversion ratio (FCR), feed efficiency ratio (FER), protein efficiency ratio (PER), apparent protein utilization (APU) and energy utilization (EU) were obtained at 0.5% OP diet, while the lowest values were obtained at the control group. No fish mortalities were observed in fish fed on diets containing different OP levels and challenged against *A. hydrophilla*, while it was found to be 90% with the control group. Adding OP to fish diet at 0.5% reduced the feed cost by 26.47%. This study clearly showed that the OP could be added to practical fish diet at 0.5% to improve growth performance, feed utilization and fish immunity. Moreover it can reduce the feed cost.

Key words: Onion powder, Nile tilapia, growth performance, feed utilization, *Aeromonas hydrophila*-challenge.

INTRODUCTION

Aquaculture has become a key component of the animal health industry, due to the continued expansion of cultured fish and shellfish species (Kolkovski and Kolkovski 2011). Aquaculture is the fastest growing industry around the world with about 80 million tones being produced annually (Kolkovski and Kolkovski 2011). The use of dietary additives in fish farming is one of the methods commonly used to improve fish growth, feed efficiency, and/or there disease resistance. Fish is one of the cheapest and promising sources of animal protein; people can easily digest 93.2% and 93.7% of fish protein and fat, respectively. There are several kinds of additives for aqua-feeds that are used to improve the fish performance including Chinese herbs *Astragalus radix* and *Ganoderma lucidum* (Yin *et al*., 2009); green tea, *Camellia sinensis* L. (Abdel-Tawwab *et al*., 2010); microalgae such as *Chlorella ellipsoidea* (Kim *et al*., 2002) and *Dunaliella* (Supamattaya *et al.*, 2005).

The development of new additives for aqua-feeds, however, still attracts the attention of many researchers and fish farmers. Recent studies showed that the incorporation of medicinal plants in the fish diets stimulated the immune system of fish and enhanced their disease resistance (Chakrabarti *et al*., 2012). Onion (*Allium cepa*) is a member of the Liliaceae family and it's used as a medicinal plant, vegetable and spice and it has antibiotic, antiseptic and antiinfectious properties. It has a strong hipoglicemiant effect, therefore being recommended in diabetes. Onion contains small quantities of sugar, fats and vitamins A, C and B complex; it has a high content of magnesium, potassium and copper. Onion has been known to have antibacterial, antioxidant, and/or anticancer effects (Ramos *et al*., 2006; Jeong *et al*., 2009), and it reduces endogenous lipogenesis and increases catabolism of lipids (Kumari and Augusti, 2007). Additionally, a previous study revealed that onion extract

was one of the most effective dietary additives tested that improve weight gain of juvenile olive flounder, *Paralichthys olivaceus* (Cho *et al*., 2010). Further identification of commercially available dietary additives to improve fish performance and disease resistance is still highly desired.

Bacteria, the major group of pathogens, pose one of the most significant threats to successful fish production throughout the world (Rahman *et al*., 2009). Bacterial diseases are one of the limiting factors for fish culture including Nile tilapia. In particular, *Aermonas hydrophila* causes mass mortalities in several species and is the etiological agent of several diseases (Rahman *et al*., 1997, 2001) and (*Li et al*., 2006).

Tilapia is an ideal candidate for aquaculture especially in developing countries because of their fast growth, tolerance to a wide range of environmental condition such as (temperature, salinity, low dissolved oxygen, ect), resistance to stress and disease, ability to reproduce in captivity and short generation time, and feeding on low trophic levels and acceptance of artificial feeds, immediately after yolk sac, absorption. Recently, tilapia has emerged to become one of the biggest aquatic species groups, with a worldwide harvest of over 2 million metric ton (MT) representing about 5% of the global finfish aquaculture (FAO, 2004).

Therefore, this study was carried out to investigate the effect of onion powder (OP) on growth performance, feed utilization, whole body composition of Nile tilapia, *O.niloticus* and its response to pathogenic *Aeromonas hydrophila*.

MATERIALS AND METHODS

Diet preparation and feeding regime:

A fifteen week experiment was conducted in the nutritional laboratory at Central Laboratory of Aquaculture Research (CLAR), Abbassa, Abu-Hammad, Sharkiya Governorate. Six experimental diets

(35% crude protein, 8.21% crude fat and 4.14 kcal/g diet) were formulated to contain different levels of OP (obtained from Ginseng Company Dashing Industrial Zone Mambo-Ginseng Shandong, China) in the diets. Diets formulation and proximate composition of the experimental diets are shown in Table (1). Dry ingredients of each diet were thoroughly mixed and 100 ml of water was added per kg diet. Afterwards, the mixture (ingredients and water) were blended using kitchen blender to make a paste from each diet. Pelleting of each diet was carried out by passing the blended mixture through laboratory pelleting machine with a 1mm diameter matrix. The pellets were dried in at 85 ºC a drying oven model (Fisher oven 13–261–28A) for 24 hours and stored in plastic bags which were kept in a refrigerator at 2 ºC during the experimental period to avoid rancidity. Experimental diets were formulated to meet the nutritional requirement of Nile tilapia (NRC, 1993).

Fish and culture technique:

Nile tilapia fry, *Oreochromis niloticus* (L) with an average initial body weight of 0.82 g were obtained from the fish hatchery ponds, (CLAR). Fish were kept in indoor tank for 2 weeks as an acclimation period to the laboratory conditions. Fish were divided into 6 groups (3 replicates per treatment). Twenty fish were transferred at random into a 100 L glass aquarium. De-chlorinated tap water was used throughout the study. In order to avoid accumulation of the metabolites, a one-half of the aquarium is water replaced was daily by new tape water. Each aquarium was also supplied with air produced by a small electric compressor unionized. The photoperiod was set on a 12 hour light-dark cycle using fluorescent tubes as the light source. During the course of the experiment, all fish from each aquarium were collected every two weeks and collectively weighed. The feeding rate was 8% of fish body weight for the first forty five days then reduced to 5%for the next thirty days and

further reduced to 3% for the remaining experimental period of the study. Fish feeding was carried out 7 days/week, three times / day (15-week) and the rations were adjusted each time the fish were weighed.

Chemical analysis of diets and fish:

The tested diets and fish from each treatment were analyzed according to the standard methods of AOAC (1990) for moisture, protein, fat and ash. Moisture content was estimated by heating samples in an oven at 85ºC until constant weight and calculating weight loss. Nitrogen content was measured using a microkeldahl apparatus and crude protein was estimated by multiplying nitrogen content by 6.25. Total lipids content was determined by ether extraction and ash was determined by combusting samples in a muffle furnace at 550ºC for 6 hours. Crude fiber was estimated according to Goering and Van Soest (1970). Gross energy was calculated according to NRC (1993).

Water quality analysis:

Water samples were collected biweekly from each aquarium. Water temperature and dissolved oxygen were measured on site with an YSI model 58 oxygen meters (Yellow Spring Instrument Co., Yellow Spring, Ohio, USA). The pH degree was measured using a pH–meter (Digital Mini-pH Meter, model 55, Fisher Scientific, USA). Unionized ammonia was measured using DREL/2 HACH kits (HACH Co., Loveland, Colorado, USA).

Growth parameters:

Weight gain (WG) = W2- W1

Daily gain (DG) = W2 - W1 / T;

Where W2 = average final body weight (g), W1 = average initial body weight (g) and T = the experimental period (days).

Feed utilization parameters:

Feed conversion ratio (FCR) = feed intake (g) / body weight gain (g);
Protein efficiency ratio (PER) = gain in weight (g)/protein intake in feed (g);
Feed efficiency ratio (FER) = body weight gain (g) / feed intake (g);
Apparent protein utilization (APU %) = 100 [protein gain in fish (g)/ protein intake in feed (g)].
Energy utilization (EU %) = [energy gain in fish/energy intake in feed] x 100.

Challenge test:

At the end of the feeding trial, ten fish of each treatment were divided into two subgroups. The first subgroup was challenged with pathogenic *Aeromonas hydrophila*. A 0.2 ml dose of 24-h broth from virulent bacterial pathogen of *A. hydrophila* ($5x10^5$ CFU/ml) was given by interperitoneal injection (I.P) (Schaperclaus *et al*., 1992). The second subgroup was I.P injected by 0.2 ml of saline solution as a control. Both subgroups were kept under observation for 10 days to record any abnormal clinical signs and the daily mortality rate.

Statistical analysis:

The obtained data were subjected to one-way ANOVA. Differences between means were tested at the 5% probability level using Duncan test. The statistical analysis was done using SPSS program version 10 (SPSS, Richmond, USA) as described by Dytham (1999).

Economical evaluation:

All the ingredients were obtained from the local market. The cost of feed required to produce a unit of fish biomass was estimated using a simple economic analysis. The estimation was based on local retail sale market price of all the dietary ingredients at the time of the study. These prices (in LE/kg) were as follows: herring fish meal, 12; soybean meal, 3.0; corn meal, 2.0; starch 8.0, wheat bran 1.50; fish oil,10.0; corn oil,

7.0; vitamins premix,8.0; minerals mixture, 4.0 and 30 LE /kg onion powder.

RESULTS AND DISCUSSION

The values of water quality parameters showed that temperatures range was 27-29 °C, dissolved oxygen range was 5.3-5.8 mg/L, pH range 7.5-8 and total ammonia range was 0.7-0.9 mg/L. These data were within the acceptable ranges required for normal growth of tilapia (Boyd 1990). Nile tilapia fed on treated diets actively and efficiently grew without any external signs of nutritional deficiency. Growth performance (final weight, weight gain and daily gain) increased significantly ($P< 0.05$) with supplementation of diets with different levels of OP compared with control diet (Table 2). The highest growth rate was obtained diet with 0.5% onion powder, as compared to the control diet. No significant differences were reported in fish survival rate among different treatments ($P< 0.05$), since it ranged from 98.33 to 91.65 %. This may indicate that OP enhanced fish growth and feed utilization. The results are in agreement with those reported by (Cho *et al*., 2010). Survival of olive flounder was over 94% for all experimental diets and not significantly ($P > 0.05$) affected by dietary concentrations of OP. Additionally, a previous study revealed that onion extract was one of the most effective dietary additives tested that improve weight gain of juvenile olive flounder, *Paralichthys olivaceus*.

Feed intake increased significantly ($P< 0.05$), while FCR improved significantly by supplements diets with different OP levels (Table 3). Moreover, PER, APU and EU values increased significantly ($P< 0.05$) with supplements diets with OP level until 0.5%. The best FCR and higher values of FI, PER, APU, and EU were obtained when fish fed diet contained 0.5% OP level. Increased feed intake was the result of a high demand for nutrients with stimulated growth or due to improved appetite

because of sensory stimulation. Similarly, El-Saidy (1999) reported that feed consumption with higher in the onion-fed Nile tilapia throughout the experimental period and the control group exhibited the lowest feed intake. Also, these results are similar to the previous studies with Nile tilapia when fed 0.5 g green tea/kg diet (Abdel-Twwab *et al*., 2010) or fed 1.0% fennel seed meal/kg diet (Ahmad *et al*., 2011). El-Dakar *et al*. (2004) studied the effect of dried marjoram leaves (0, 0.5, 1.0 and 2.0% of the diet) on *Oreochromis niloticus* x *Oreochromis auraus* fingerings averaging 13 g/fish for initial weight the best of growth performance was obtained at the 2% level.

The results of proximate analysis of whole body of Nile tilapia for moisture, protein, fat and ash at the end of the study are shown in Table (4). Results indicated that no significant difference ($P< 0.05$) in contents of moisture, crude protein, and ether extract of Nile tilapia fed diets containing various OP levels. Ash levels were irregularly fluctuated in fish bodies among treatments at the end of the experiment. These results agree with those found by Abdel Wahab *et al*. (2007) who found no significant differences in moisture and crude protein of Nile tilapia fed diets containing various levels of cinnamon seed meal. Also, Abd El Hakim *et al*. (2010) and Ahmad *et al*. (2011) found no significances in the chemical body composition of Nile tilapia fed diets containing fennel or cinnamon, respectively.

The results of challenge test are presented in Table (5). These results reveal that fish mortality did not observe in fish fed with diet containing different OP levels, while mortality percentage in fish fed the control group was 90%. OP had antibacterial antagonized in *Aeromonas hydrophila* in Nile tilapia, (Vogler *et al*., 1999 and Dey *et al*., 2003). Abdel Wahab *et al.* (2007) found that adding 0.5% cinnamon level in the diet is enough to eliminate harmful microbes in the gut, improve food absorption and control blood sugar to a certain extent.

The economical evaluation of the experimental diets contained different OP levels is shown in Table (6). The highest reduction in feed cost compared with the control diet to produce one kg fish gain was at treatment containing 0.5% OP. The reduction in feed cost compared with the control diet is 29.58% to produce one kg fish gain of treatment containing 0.5% OP level. Previous studies showed that the use of spices in small amounts gave lower incidence cost and higher profit index of fish spices (Seden *et al*., 2009). In conclusion, supplemented diet with 0.5% onion powder improved growth performance, feed utilization and Nile tilapia fry immunity.

Table 1: Feed ingredients and chemical composition (% on dry matter basis) of the experimental diets.

Ingredients	%
Herring Fish meal	15.86
Soybean meal	43.05
Corn meal	23.10
Wheat bran	9.08
Corn oil	1.6
Cod liver oil	1.22
Starch	3.09
Vitamins premix[1]	1.0
Minerals premix[2]	2.0
Onion powder	0.0
Total	100
The chemical composition:	
Dry matter	92.88
Crude protein	35.07
Total lipids	8.11
Ash	6.55
Crude fiber	4.36
NFE[3]	45.91
GE (kcal/100g) [4]	463.48

1- Vitamins premix (per kg of premix): thiamine, 2.5 g; riboflavin, 2.5 g; pyridoxine, 2.0 g; inositol, 100.0 g; biotin, 0.3 g; pantothenic acid, 100.0 g; folic acid, 0.75 g; para-aminobenzoic acid, 2.5 g; choline, 200.0 g; nicotinic acid, 10.0 g; cyanocobalamine, 0.005 g; α-tocopherol acetate, 20.1 g; menadione, 2.0 g; retinol palmitate, 100,000 IU; cholecalciferol, 500,000 IU.

2- Minerals premix (g/kg of premix): CaHPO4.2H2O, 727.2; MgCO4.7H2O, 127.5; KCl 50.0; NaCl, 60.0; FeC6H5O7.3H2O, 25.0; ZnCO3, 5.5; MnCl2.4H2O, 2.5; Cu(OAc)2.H2O, 0.785; CoCl3..6H2O, 0.477;CaIO3.6H2O, 0.295; CrCl3.6H2O, 0.128; AlCl3.6H2O, 0.54; Na2SeO3, 0.03.

3- Nitrogen-Free Extract (calculated by difference) = 100 – (protein + lipid + ash + fiber).

4- Gross energy (GE) was calculated according to NRC (1993) as 5.65, 9.45, and 4.11 kcal/g of protein, lipid and carbohydrates, respectively.

Table 2: Growth performance (means ± SE) of Nile tilapia fed diets containing different onion powder levels for 15 weeks.

Items	Onion powder (%)					
	0.0	**0.1**	**0.2**	**0.3**	**0.4**	**0.5**
Initial weight (g)	0.81 ±0.01	0.82 ±0.01	0.83 ±0.01	0.81 ±0.01	0.82 ±0.01	0.82 ±0.01
Final weight (g)	15.14 [d] ±0.54	16.80 [c] ±0.57	19.32 [b] ±0.81	19.82 [b] ±0.04	23.69 [a] ±0.13	23.72 [a] ±0.05
Weight gain (g)	14.33 [d] ±0.54	15.98 [c] ±0.57	18.49 [b] ±0.81	19.01 [b] ±0.05	22.87 [a] ±0.12	22.90 [a] ±0.05
Growth rate (g/day)	0.14 [d] ±0.01	0.15 [c] ±.01	0.18 [b] ±0.01	0.18 [b] ±0.00	0.22 [a] ±0.02	0.22 [a] ±0.01

Means with the same letter in the same row are not significantly different at P>0.05.

Table 3: Feed intake, feed conversion ratio (FCR), protein efficiency ratio (PER), apparent protein utilization (APU) and energy utilization (EU) of Nile tilapia fed diets containing different onion powder levels for 15 weeks.

Items	Onion powder levels (%)					
	0.0	0.1	0.2	0.3	0.4	0.5
Feed intake(g feed/fish)	26.42 [b] ±0.99	23.84 [d] ±0.05	27.09 [b] ±0.85	25.13 [c] ±0.08	30.38 [a] ±0.35	29.11 [a] ±0.16
FCR	1.84 [a] ±0.02	1.50 [b] ±0.05	1.47 [b] 0.02	1.32 [c] ±0.01	1.33 [c] ±0.02	1.27 [c] ±0.01
PER	1. 67 [c] ±0.02	2.06 [b] ±0.07	2.13 [b] ±0.05	2.32 [a] ±0.02	2.31 [a] ±0.04	2.42 [a] ±0.02
APU (%)	29.54 [d] ±0.61	35.70 [c] ±1.35	40.93 [b] ±0.88	40.89 [b] ±0.91	43.16 [b] ±0.53	46.09 [a] ±0.59
EU (%)	17.03 [d] ±0.22	21.03 [c] ±1.08	24.01 [b] ±0.52	24.00 [b] ±0.38	25.65 [a b] ±0.53	27.17 [a] ±0.62

Means with the same letter in the same row are not significantly different at P>0.05.

Table 4: Proximate chemical analysis (on dry weight basis) of whole body of Nile tilapia fry fed diets containing different onion powder levels for 15 weeks.

Items	Onion powder levels (%)					
	0.0	**0.1**	**0.2**	**0.3**	**0.4**	**0.5**
Moisture (%)	75.20 [a] ±0.27	75.67 [a] ±0.58	73.57 [ab] ±0.58	75.80 [a] ±1.11	74.27 [ab] ±0.41	73.97 [ab] ±0.49
Crude protein (%)	70.20 [ab] ±0.84	70.37 [ab] ±0.55	71.67 [a] ±0.07	71.93 [a] ±0.09	71.80 [a] ±0.92	72.46 [a] ±0.24
Ether extract (%)	14.53 [a b] ±1.15	15.70 [a] ±0.96	16.30 [a] ±0.53	15.93 [a] ±0.73	16.60 [a] ±0.55	16.27 [a] ±0.56
Ash (%)	15.27 [a] ±0.46	13.93 [a] ±1.28	12.03 [b] ±0.48	12.13 [b] ±0.82	11.60 [b] ±0.76	11.27 [b] ±0.50

Means with the same letter in the same row are not significantly different at P>0.05.

Table 5: Mortality rate (%) of Nile tilapia *O. niloticus* fry fed diets containing different onion powder levels for 15 weeks and challenged by *A. hydrophila* for 10 days.

Items	Onion powder levels (%)					
	0.0	**0.1**	**0.2**	**0.3**	**0.4**	**0.5**
No. injected fish	10	10	10	10	10	10
Bacterial dose(5x 10^5 CFU/ml)	0.3 ml	0.3 ml	0.3 ml	0.3 ml	0.3 ml	0.3 ml
Injection route	I / P	I / P	I / P	I / P	I / P	I / P
Mortality rate (%) after 10 days of injection	90	0	0	0	0	0

Table 6: Economic efficiency for production of one kg gain of Nile tilapia fry *O. niloticus* fed diets containing different onion powder levels for 15 weeks.

Items	Onion powder levels (%)					
	Control 0.0	0.1	0.2	0.3	0.4	0.5
Price/ kg feed (L.E)	4.54	4.56	4.58	4.60	4.65	4.63
FCR (kg feed/kg gain)	1.84	1.50	1.47	1.32	1.32	1.27
Feed cost / kg gain(L.E)	8.35	6.84	6.73	6.07	6.14	5.88
Reduction in feed cost/ kg gain	0.0	1.51	1.62	2.28	2.21	2.47
Reduction in feed cost/ kg gain (%comparing with the control)	0.0	18.08	19.40	27.31	26.47	29.58

REFERENCES

Abd El Hakim, N.F.; M.H Ahmad; E.S. Azab; M.S. Lashien and E.S. Baghdady. 2010. Response of Nile tilapia, *Oreochromis niloticus* to diets supplemented with different levels of fennel seeds meal (*Foeniculum vulgare*). Abbassa International Journal of Aquaculture, 3: 215–230.

Abdel Wahab, A.M.; M.M.E. Hassouna; A.M.S. Abd El-Maksoud; A. Abd El Tawab and A.M.M. Abu-Seef. 2007. Cinnamon as a feed supplemented in Nile tilapia (*Oreochromis niloticus*) diets reared in earthen ponds. Egypt. J. Nutr. Feeds, 10 (2): 881–890.

Abdel-Tawwab, M.; M.H.Ahmad; S.M.F. Sakr and M.E.A. Seden. 2010. Use of green tea, *Camellia sinensis* L. in practical diets for growth and protection of Nile tilapia, *Oreochromis niloticus* (L.) against *Aeromonas hydrophila* infection. Journal of the World Aquaculture Society, 41: 203–213.

Ahmad, M.H.; A.M. El Mesallamy; F. Samir and F. Zahran. 2011. Effect of different levels of cinnamon (*Cinnamomum zeylanicum*, NEES) on growth performance, feed utilization, whole-body composition and entropathogenic *Aeromonas hydrophila* - challenge of all male Nile tilapia, *Oreochromis niloticus* L. fingerlings. Journal of Applied Aquaculture, 23 (4): 289-298.

AOAC (Association of Official Analytical Chemists). 1990. Official methods of analysis of the association of official analytical chemists, 15th edition. Association of Official Analytical chemists, Arlington, Virginia, USA.

Boyd, C.E. 1990. Water Quality in pounds for aquaculture. Birmingham Publishing Co., Birmingham, Alabama.USA.

Chakrabarti, R.; P.K. Srivastava; K. Kundu; R.S. Khare; S. Banerjee. 2012. Evaluation of immunostimulatory and growth promoting effect of seed fractions of *Achyranthes aspera* in common carp *Cyprinus carpio* and identification of active constituents. Fish and Shellfish Immunology, 32: 839-843.

Cho, S.H.; Y.J. Cho; S. Lee and J. Yoo. 2010. Effects of putative growth or health enhancing dietary additives on juvenile olive flounder, *Paralichthys olivaceus*, performance. Journal of the World Aquaculture Society, 42: 90–95.

Dey, L.; J.T. Xie; A. Wang; J. Wu; S.A. Maleckar and C.S. Yuna. 2003. Anti-hyperglycemic effects of ginseng: comparison between root and berry. Phyomedicine, 10: 600-605.

Dytham, C. 1999. Choosing and using statistics: A biologist's guide. London, UK: Blackwell Science.

El-Dakar, A.Y.; G.D.I. Hassanien; S. Seham; Gad and S.E. Sakr. 2004. Use of Medical and Aromatic Plants in Fish Diets: I. Effect of dried marjoram leaves on performance of hybrid tilapia

Oreochromis niloticus x *Oreochromis aureus*, fingerlings. Journal of the Egyptian Academic Society for Environment Development, (B.Aquaculture), 5 (1): 67-83.

El-Saidy, D.S.M.D. 1999. Effect of different levels of dry onion meal supplemented to the diets on growth, feed utilization and body composition of Nile tilapia, *Oreochromis niloticus* (Boulenger) fingerlings. Minufiya J. of Agric.Res., 24, 2 (1): 481-492.

FAO (Food and Agriculture Organization of United Nations). 2004. Aquaculture production statistics. FAO Fish. Circle No. 815, Rev. 9, Rome, Italy.

Goering, H.K. and P.G.Van Soest. 1970. Forage Fiber Analysis. US Department of Agriculture, Agriculture Research Service,Washington, DC,USA.379pp.

Jeong, C.; H.J. Heo; S. Choi and K. Shim. 2009. Antioxidant and anticancer properties of methanolic extracts from different parts of white, yellow and red onion. Food Science and Biotechnology, 18: 108–112.

Kim, K.; S. Bai; J. Koo; X. Wang and S. Kim. 2002. Effects of dietary *Chlorella ellipsoidea* supplementation on growth, blood characteristics, and whole-body composition in juvenile Japanese flounder *Paralichthys olivaceus*. Journal of the World Aquaculture Society, 33: 425–431.

Kolkovski, S.; J. Kolkovski. 2011. Herbal medicine in aquaculture. *International Aquafeed*, 14 (2): 28-31 (www.aquafeed.co.uk). Retrieved on 17th September, 2012.

Kumari, K. and K.T. Augusti. 2007. Lipid lowering effect of S-methyl cysteine sulfoxide from *Allium cepa* Linn in high cholesterol diet fed rats. Journal of Ethnopharmacy, 109: 367–371.

Li, A.; W. Yang; J. Hu; W.Wang; T. Cai and J. Wang. 2006. Optimization by orthogonal array design and humoral immunity of the bivalent vaccine against *Aermonas hydrophila* and vibrio fluvialis infection in crucian carp (*Carassius auratus* L.). Aquac. Res., 37: 813-820.

NRC. 1993. Nutrient requirements of fish. Committee on Animal Nutrition. Board on Agriculture.National Research Council. National Academy P. Washington DC, USA. p114.

Rahman, M.H.; k. Kawai and kusuda, R. 1997 .Virulence of starved *Aermonas hydrophila* to cyprinid fish. Fishpathol., 32: 163-168.

Rahman, M. H.; S. Suzuki and kawai, K. 2001. The effect of temperature on *Aeromonas hydrophila* infectin I goldfish, *Carassius auratus*.J. Appl. Ichthyol., 17: 282-285.

Rahman, T.; M.M.R Akanda; M.M. Rahman and M.B.R. Chowdhury. 2009. Evaluation of the efficacies of selected antibiotics and medicinal plants on common bacterial fish pathogens. J. Bangladesh Agril. Univ., 7 (1): 163–168.

Ramos, F. A.; Y. Takaishi; M. Shirotori; Y. Kawaguchi; K. Tsuchiya; H. Shibata; T. Higuti; T. Tadokoro and M. Takeuchi. 2006. Antibacterial and antioxidant activities of quercetin oxidation products from yellow onion (*Allium cepa*) skin. Journal of Agricultural and Food Chemistry, 54: 3551–3557.

Schaperclaus, W.; H. Kulow and K. Schreckenbach. 1992. Fish disease. A.A. Balkema, Rotterdam, The Netherlands.

Seden, M.E.A; F.E. Abbass and M.H. Ahmad. 2009. Effect of *Origanum vulgar* as a feed tilapia additiveon growth performance, feed utilization and whole body composition of Nile tilapia *Oreochromis niloticus* fingerlings challenged with pathogenic

Aeromonas hydrophila. J. Agric.Sci. Mansoura Univ., 34 (31): 1683-1695.

Supamattaya, K.; S. Kiriratnikom; M. Boonyaratpalin and L. Orowitzka. 2005. Effect of a *Dunaliella* extract on growth performance, health condition, immune response and disease resistance in black tiger shrimp (*Penaeus monodon*). Aquaculture, 248: 207–216.

Vogler, B.K.; M.H. Pittler and E. Ernst. 1999. The efficacy of ginseng: A systematic review of randomized clinical trials. Eur. J. Clin. Pharmacol., 55: 567.

Yin, G.; L. Ardo; K.D. Thompson; A. Adams; Z. Jeney and G. Jeney. 2009. Chinese herbs (*Astragalus radix* and *Ganoderma lucidum*) enhance immune response of carp, *Cyprinus carpio*, and protection against *Aeromonas hydrophila*. Fish and Shellfish Immunology, 26: 140–145.

تأثير إضافة مسحوق البصل على النمو وكفاءة الاستفادة من الغذاء لأسماك البلطى النيلى ومقاومتها لبكتريا ايروموناس هيدروفيلا

مدحت السعيد سيدين

قسم تغذية الأسماك – المعمل المركزى لبحوث الثروة السمكية – *مركز البحوث الزراعية.*

الملخـــص العربـــى

استمرت هذه التجربة ١٥ أسبوع لتقييم تأثير إضافة مسحوق البصل فى علائق أسماك البلطى النيلى على معدلات النمو وتركيب الجسم والمناعة ضد البكتريا. ١٨ حوض زجاجى كل حوض وضع به ٢٠ سمكة بصورة عشوائية بمتوسط وزن٠,٨٢ جرام/سمكة وقد قسمت التجربة إلى ستة معاملات(كل معاملة ثلاث مكررات) غذيت كل منها كما يلى: المعاملة الأولى تتغذى على عليقة بدون أى إضافات وتمثل (الكنترول) بينما غذيت باقى المعاملات على علائق مضاف إليها مستويات مختلفة من مسحوق البصل حيث كانت جميع علائق التجربة تحتوى ٣٥% بروتين، ٨.١١% دهن، ٤.٦٣ كيلو كالورى/جرام عليقة. استخدم البصل بنسبة ٠,٠ ، ٠,١ ، ٠,٢ ، ٠,٣ ، ٠,٤ ، ٠,٥ % على التوالى وكان الغذاء يقدم طوال فترة التجربة بنسب معينة من وزن الجسم تعدل كل ١٥ يوم حسب الزيادة فى وزن الجسم كما يلى: منذ بداية التجربة ولمدة ٤٥ يوم بمعدل ٨% من الوزن و خفضت بعد ذلك الى ٥% من الوزن لمدة ٣٠ يوم ثم خفضت هذه النسبة بعد ذلك الى ٣% واستمرت هكذا حتى نهاية التجربة ، بعد ذلك تم حقن أسماك جميع المعاملات ببكتريا أيروموناس هيدروفيلا للوقوف على مدى تأثير مسحوق البصل المضاف على مناعة الأسماك. وأظهرت نتائج التجربة أن نسبة الإعاشة كانت مرتفعة حيث تراوحت بين ٩٨,٣٣ إلى٩١,٦٥ بدون فروق معنوية حتى نهاية التجربة وقبل حقن البكتريا ،كما أوضحت النتائج زيادة معدلات النمو (الوزن النهائى – ومعدل الزيادة فى الوزن – والزيادة اليومية) حيث حققت أعلى قيم فى المعاملة التى تناولت غذاء يحتوى على ٠,٥% مسحوق بصل ، مقابل ذلك حقق الكنترول أقل قيم لنفس المقاييس السابقة. تحسنت قيم معدل التحويل الغذائى ومعدلات الاستفادة من الغذاء (معدل كفاءة الغذاء، معدل الاستفادة من البروتين، وكفاءة البروتين الانتاجية، والاستفادة من الطاقة) فى المعاملات المضاف إليها مسحوق البصل وكان أفضلها هى المعاملة الخامسة ، كذا لم يكن هناك تغيير فى تركيب الجسم لجميع المعاملات فى الرطوبة والمادة الجافة والبروتين والدهن بينما تغيرت نسبة الرماد بين المعاملات بينما أظهرت نتائج حقن أسماك التجربة ببكتريا ايروموناس هيدروفيلا ارتفاع مناعة الأسماك فى جميع المعاملات حيث لم يسجل معدلات وفيات للأسماك فى جميع المعاملات المضاف إليها مسحوق البصل مقارنة بالكنترول الذى وصلت فيه نسبة الوفيات الى ٩٠%. المعاملات التى تغذت على علائق مضاف إليها مسحوق البصل حققت عائد اقتصادى أفضل من الكنترول وكان أفضلها المعاملة الخامسة. تشير النتائج إلى أن إضافة مسحوق البصل حتى معدل ٠,٥% حسن معدلات النمو والاستفادة من الغذاء كما أنه يقلل تكلفة إنتاج علائق الأسماك بنسبة ٢٩,٥٨%.