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EVALUATION OF POWERTOP® AS GROWTH ENHANCER OF NILE TILAPIA (*Oreochromis siloticus*) FINGERLINGS AT DIFFERENT STOCKING WEIGHTS

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SUMMARY

This study was performed to estimate the effects of fish initial live body weight (3.5 and 35 g/fish) and probiotic, powertop® extract (β-glucan, formic acid, lactic acid, propionic acid and silicate) at 0.5 and 1.0 g of powertop®/kg diet on growth performance, feed utilization, body composition and some blood components of Nile tilapia (Oreochromis niloticus) fingerlings. The stocking weight, powertop® supplementation and their interaction had significant (P<0.001 or 0.01) effects on growth performance parameters while the survival rate was insignificantly affected. Also both of it(what) and its interaction had no significant influence on dry matter, crude protein and ash contents of whole body composition. Fish group supplemented with 0.5 g powertop® / kg diet recorded the highest (P<0.05) value for ether extract of fish body composition. Powertop® supplementation, stoking weight and their interaction had no adverse effects on blood parameters and liver activity. Superior return from body gain and final profit were obtained in the fish group fed diet supplemented with 0.5 g/kg diet powertop® and reared at low stocking weight. It was concluded that, Powertop® probiotic improved the growth performance, body composition and some blood motilities of Nile tilapia (Oreochromis niloticus) fingerlings. Therefore, it can be used as growth enhancer in Nile tilapia fingerlings diets.

Keywords: Nile tilapia, weight, powertop®, performance, body composition and blood components.

INTRODUCTION

Probiotics are live bacteria, that have received some attention in aquaculture, reported a decline in mortality rate (El-Haroun *et al.,* 2006), improved the ability to inhibit other organisms (Burgents *et al*., 2004), improved fish growth rate, feed conversion (El-Haroun *et al.,* 2006), improved making of digestive enzyme activity and polyamines (Tovar *et al.,* 2002). Also, probiotics support good health for fish by invigorating the immune system against infections, alleviate lactose intolerance, dropping blood cholesterol levels (Salminen *et al.,* 2004 and Lara-Flores and Aguirre-Guzman, 2009).

Probiotic bacteria must be non-pathogenic and non-toxic (Vine *et al*., 2004). Lactic acid is one of the compounds which is able to inhibit the growth of harmful microorganisms (Ringø and Gatesoupe, 1998 and Gatesoupe, 1999). Maurilio *et al.* (2002) have exposed that the utilize of bacteria *Streptococcus faecium, Lactobacillus acidophilus* and yeast *Saccharomyces cerevisiae* as probiotics in tilapia fish diets improved growth performance, and decreased the effects of stress factors.

Among the most used propionic acids that make sure a stable product free of pathogenic microorganisms (Morales-Ulloa and Oetterer, 1995). Also, the formic acid can be used alone or with additional fatty acids as a citric acid to reduce the cost and be more effective antimicrobial activity, besides providing a better stability to the material (Fagbenro and Fasakin, 1996 and Gao *et al.,* 1992).

In aquaculture, β-glucan has been shown to promote disease resistance (Lauridsen and Buchmann, 2010) and to enhance the immune reaction in various fish species such as common carp (*Cyprinus carpio*), sea bass (*Dicentrarchus labrax*), and rainbow trout (Dalmo and Bøgwald, 2008). However the beneficial effects of β -glucan that has been report by several authors (Rodriguez et al., 2009 and Guselle et al., 2007) appear to be strongly dependent on dose, duration of action and route of administration. Dalmo and Seljelid, (1995) showed that, β-glucans as one of its contents is wide spread in nature, plant, algae, bacteria, yeast and mushrooms. β-glucans are non-antigenic in animals, but have been implicated to be powerful activators of non-specific defense mechanisms in a wide range of fishes (Kumari and Sahoo, 2006 and Guselle *et al.,* 2007). Forms of β-glucan also, derived from yeast mainly comprise D-glucose units with β-1,3-linkages and side-chains of D-glucose at position six. These homopolysaccharides are denominated as b-1,3/ 1,6-glucans and have been shown to reduce the susceptibility to infection (Chen and Seviour, 2007, and Dalmo and Bøgwald, 2008).

Ayyat *et al*. (2014) reported that superlative growth rate and feed conversion were recorded in the fish group fed a cocktail of three bacteria (*Lactobacillus acidophilus*, *Streptococcus thermophilus* and *Bifidobacterium bifidum*). Profit margin increased in fish groups fed diets inoculated with probiotics. Supplementation with *Lactobacillus acidophilus*, *Bifidobacterium bifiduim*, and the three-bacterium cocktail were most effective in eliminating mortality in an *A. hydrophila* challenge.

Therefore, the objectives of the current study are to satisfy and to establish the effects of fish initial live body weight and probiotics; powertop extract (β-glucan, formic acid, lactic acid, propionic acid and silicate); on growth performance, feed utilization, body composition and some blood parameters of Nile tilapia (*O. niloticus*).

MATERIAL AND METHODS

Experimental design and diets:

Nile tilapia (*Oreochromis niloticus*) used in the present study were obtained from the Central Laboratory for Aquaculture Research at Abbassa, Abou-Hammad, Sharkia, Egypt and used for experimental period of 12 weeks (84 days) ONLY ONE OF THEM from June to September, 2014. The experiment was carried out at the Wet Laboratory, Animal Production Department, Faculty of Agriculture, Zagazig University, Egypt.

All of the experimental fish groups were fed on a basal pelleted diet consisting of fish meal, soybean meal, corn, wheat bran, wheat flour, goluten (60%), sunflower oil minerals mixture and vitamin mixture (Table 1). Diets were formulated to contain about 31.22% crude protein and 4267.5 Kcal/Kg gross energy. Diets were offered to fish three times daily (8.00, 12.00 and 15.00) in equal proportions, six days a week for a period of 12 weeks at a rates of 3 and 5% of fish biomass daily for tilapia fry and fingerlings, respectively. Quantity of the additional feed was re-adjusted biweekly according to the increase in fish body weight. Fresh tap water was stored in fiberglass tanks for 24h under aeration for dechlorination and half of all aquaria were replaced every two days. Air pebbles were used for aerating the aquaria water. Feces were disinterested daily by siphoning. Fish from each replicate were weighted at the start of the experiment, counted and weighted every two weeks throughout the experimental period (12 weeks).

Table 1. Ingrediants and proximate analysis of experimental diet

Ingredients	D1,Control diet
Ingredients %	
Fish meal (72%)	10
Soybean meal (44%)	32
Yellow corn	20
Gluten (60%)	7
Wheat bran	14
Wheat flour	14
Soybean oil	2
Vitamin	0.5
Minerals	0.5
Total	100
Chemical composition(% DM)	
Moisture	10.543
Dry Matter	89.457
Crude protein	31.22
Ether extract	4.97
Crude fiber	4.91
Nitrogen Free Extract[1]	43.297
Crude ash	5.06
Calculated energy value	
GE (kcal/g) [2]	426.79

1. Nitrogen Free Extract was calculated by the difference: 100 - (moisture + protein + lipid + ash + Crude fiber).
2. Gross energy was calculated according to NRC(2011) using factors of 5.65, 9.45 and 4.22 kcal g^{-1} of protein, lipid and carbohydrate, respectively.

In factorial design (2 X 3), all fish were separated into two main groups, the 1st main group contained tilapia fry with initial body weight about 3.5 g/fish and the 2nd group contained tilapia fingerlings with initial body weight about 35 g/fish. Each of the two main groups were divided into three sub-groups (3 replicates per sub-group, each one stoked at 10 fish / aquarium; 75 l^3); the 1st sub-group was fed on a diet without supplementation of powertop®, the 2nd and 3rd sub-groups were fed on a diet supplemented with 0.5 or 1.0 g of powertop®/kg diet. Fish in all groups were kept under an artificial photo period equal to natural light/darkness period (12h light: 12h darkness), the same optimum conditions and water quality were provided.

Water Quality:

Water temperature and dissolved oxygen were measured every other day using HI 9146 (Oxygen and Temperature Meter, Hanna Instruments, Romania). Water quality parameters were measured twice weekly before replacing the water in the aquarium during the whole experimental period. Total ammonium, nitrite and pH levels were estimated using the Hach kit model HI 83205 (Multipurameter Bench Photometer, Hanna Instruments, Romania).

Chemical analysis:

Proximate analyses were done for diet ingredients and fish sample at the end of the experiment according to standard methods (AOAC, 1995) for dry matter, crude protein, ether extract, crude fiber and ash. Gross energy (GE) stuffing of the experimental diet and fish samples were calculated by using factors of 5.65, 9.45 and 4.22 kcal/g of protein, lipid and carbohydrates, respectively (NRC, 2011).

The body composition crude protein and ether extract content of experimental tilapia fish (Fry and fingerlings) fed on experimental diet with or without powertop® supplementations were determined using Kjeldahl and Soxhlet apparatu, respectively.

Hematological parameters

Blood samples were collected at the end of experiment, fry in each aquarium was weighed and 5 fry were taken at random for blood analysis. Heparinized syringes were used to collect the blood samples from fish caudal vein. Samples were used to measure the hemoglobin (Hb) content using a commercial kit (Diamond Diagnostic, Egypt), was measured according to the methods of Stoskopf (1993). Total erythrocyte (RBCs), platelets and leukocyte (WBCs) counts were determined by using an Ao Bright–Line Haemocytometer (Neubauer improved, Precicolor HBG, Germany) according to the methods described by Jain (1993). Other blood samples for serum separation were collected without the addition of anticoagulants and then were centrifuged at 4000 rpm for 20 min. to make separation of plasma for determining plasma total protein (Tietz, 1990). The activity of alanine aminotransferase (ALT) and aspartate aminotransferase (AST) were estimated according to Young (1990).

Measurements of growth and feed utilization parameters:

Fish were weighed to the nearest 0.1 g at the beginning of the experiment and every 15 days and the amount of feed given was re-adjusted in accordance with the new measured biomass. The specific growth rate was calculated according to Laird and Needham (1988) by following equation: 100 (Ln final mean body weight - Ln initial mean body weight)/time intervals (days). The feed conversion ratio is expressed as the proportion of dry food fed required per unit live weight gain of fish according to Berger and Halver (1987).

Profitable evaluation:

Profitable evaluation was calculated as reported by Ayyat (1991): Final margin (profit) = Returns from body gain in weight - Feed cost. Other overhead costs were assumed constant. Price of one kg of diet was 4.10 LE (Egyptian pound = 0.113 US dollar) and price of selling of one kg live body weight of fish was 14.0 LE. Relative margin = Final margin X Survival rate

Statistical analysis:

Analysis of variance for data was accomplished using the SAS General Liner Models Procedure (SAS, 2002). The effects of initial body weight and probiotic supplementation were statistically analyzed by factorial analysis of variance (2X3) (Snedecor and Cochran 1982) according the following statistical model: $Y_{ijk} = \mu + W_i + P_j + WP_{ij} + e_{ijk}$, where: Y_{ijk} is an observation, μ is the overall mean, W_i is the fixed effect of initial body weight (i=1…2), P_j is the fixed effect of probiotic as power treatments (j=1…3), WP_{ij} is the interaction effect of initial body weight and powertop® treatments and e_{ijk} is random error. Means were tested for significant differences by using Duncan's multiple range test (Duncan, 1955). All percentage and ratios were transformed to arc sin values previous to analysis (Zar 1984).

RESULTS AND DISCUSSION

No clear effect of fish initial live body weight and probiotic on the water quality in the all experimental groups, was observed. During the whole experimental period water-quality parameters averaged water temperature was 27.8±0.9 ºC, dissolved oxygen was 5.6±0.7 mg/l, total ammonia was 0.19±0.12 mg/l, nitrite was 0.07±0.03 mg/l and pH was 8.4±0.3. Ranges of water quality parameters were within the acceptable ranges required for normal growth of tilapia as mentioned by Boyd (1990).

Growth performance and feed utilization:

The results obtainable in Table (2) show that stocking weight, powertop® supplementation and their interaction had significant **(P<0.001 or 0.01)** effects on growth performance studied except survival rate was insignificantly affected.

The best values of specific growth rate and feed conversion (2.57 and 1.37, respectively) were recorded with Nile tilapia stocked at low initial body weight. Final live body weight, daily growth rate and daily feed intake increased as affected by increasing stocking weight, while feed conversing retreated. Daily growth rate was increased by 60.6% in fish group stocked at higher initial body weight, while feed conversion was declined by 44.2%.

The most excellent results in final weight, daily weight gain, specific growth rate and feed conversion ratio were observed in fish group fed on a diet supplemented with 0.5 g powertop® as compared with others fish groups. Daily growth rate increased by 47.1 and 29.4%, respectively in fish group fed diets supplemented with 0.5 and 1.0 g powertop®/kg diet, also feed conversion improved by 17.4 and 12.6%, respectively.

Regarding to the results interaction between initial body weight of tilapia fry and powertop® supplementation, fish group fed diet supplemented with 0.5 g powertop® and reared at high stocking body weight had the preferable values of growth performance and best feed conversion.

Table 2. Effect of stocking weight, Powertop® supplementation and their interaction on Nile tilapia performance and feed utilization.

Items	Initial weight (g)	Final weight (g/fish)	Daily weight gain (g/fish)	Specific growth rate, SGR (%/ day)	Relative growth rate, RGR (%)	Daily Feed Intake (g/fish)	Feed conversion (g food/ g gain)	Survival rate (%)
Effect of fish stocking weight								
Low stocking weight (W_1)	3.57±0.02	31.19±1.65	0.33±0.02	2.57±0.06^a	158.21±2.00^a	0.45±0.01	1.37±0.04	92.22±2.78
High stocking weight (W_2)	35.27±0.06	79.49±2.20	0.53±0.03	0.96±0.03^b	76.70±2.49^b	1.48±0.02	2.86±0.11	98.89±1.11
Significance	***	***	***	***	***	***	***	NS
Effect of dietary probiotic supplementation								
Control (T_1)	19.44±7.12	48.19±10.27^c	0.34±0.04^c	1.59±0.34^c	109.06±18.73^c	0.89±0.22^c	2.39±0.40^a	95.00±3.42
0.5 g powertop® (T_2)	19.37±7.08	61.22±11.01^a	0.50±0.05^a	1.92±0.38^a	124.19±18.11^a	1.02±0.24^a	1.92±0.30^c	96.67±2.11
1.0 g powertop® (T_3)	19.44±7.07	56.61±11.13^b	0.44±0.05^b	1.79±0.35^b	119.12±17.85^b	0.98±0.23^b	2.04±0.30^b	95.00±3.42
Significance	NS	***	***	***	***	***	***	NS
The interaction effect of stocking weight and dietary probiotic supplementation								
W_1* T_1	3.53±0.01	25.24±0.27^f	0.26±0.00^f	2.34±0.01^b	150.92±0.34^c	0.39±0.01^f	1.50±0.03^c	90.00±5.77
W_1* T_2	3.55±0.03	36.61±0.23^d	0.39±0.00^d	2.78±0.02^a	164.67±0.43^a	0.49±0.00^d	1.24±0.02^e	96.67±3.33
W_1* T_3	3.62±0.04	31.72±0.23^e	0.33±0.00^e	2.58±0.01^a	159.03±0.31^b	0.46±0.01^e	1.37±0.02^d	90.00±5.77
W_2* T_1	35.36±0.11	71.14±0.64^c	0.43±0.01^c	0.83±0.01^d	67.19±0.91^e	1.39±0.01^c	3.28±0.07^a	100.00±0.00
W_2* T_2	35.19±0.09	85.84±0.57^a	0.60±0.01^a	1.06±0.01^c	83.70±0.66^d	1.56±0.01^a	2.59±0.04^b	96.67±3.33
W_2* T_3	35.25±0.11	81.49±0.46^b	0.55±0.01^b	1.00±0.01^c	79.20±0.58^d	1.49±0.01^b	2.71±0.03^b	100.00±0.00
Significance	NS	***	**	***	**	***	***	NS

Means in the same rows within each classification having different superscript letters were significantly different at P<0.05.
W_1 = Low stocking weight, W_2 = High stocking weight, T_1= Control, T_2 = 0.5 g powertop® and T_3 = 1.0 g powertop®.

Lara- Flores *et al.* (2003) found that the fry fed diets supplemented with a probiotic exhibited greater growth than those fed the control diet. Also, significant improvements in growth rate and feed efficiency were observed in all indices of growth with using probiotic biogen supplementation as a growth promoter for Nile tilapia *Oreochromis niloticus* (El-Haroun *et al.,* 2006). In contrast, Hidalgo *et al.* (2006) found that growth and feed conversion of juvenile dentex were not significantly influenced by probiotics. Improving the feed intake in the current study may be due to bactericidal effects which increases the palatability of feed and stimulates the appetite.

This may be due to the effect of the tested probiotics which improved absorption of nutrients and depressed harmful bacteria which may causes growth depression. The pervious results are in agreement with those obtained by Hoyos and Cruz (1990) who stated that the positive effect of probiotcs may be due to their beneficial effects since its microbial constituents produce natural lactic acid that helps in maintaining an optimum low pH in the digestive tract which inhibits growth of undesirable bacteria leading to optimum enzyme activity. Also, Probiotices can enhance the metabolism and energy of fish body cells, raising the efficiency of feed utilization and balance the secretion of various secretory glands. Moreover, it increases the vitality of cells by supplying oxygen to whole body, improves the immune responses, helps to excrete heavy metals, inhibits aflatoxin and maintains the normal functions of the endocrine system.

Blood components:

Effect of fish stocking weight and powertop® supplementation and their interactions on blood components of Nile tilapia is presented in Table 3. Current results explain that, ALT, RBC and HB are affected significantly with stocking weight, while other blood components were insignificantly affected by the stocking weight.

Blood total protein and its fractions were insignificantly affected by powertop® supplementation, while other blood parameters were affected significantly (P<0.01). The highest value for blood albumin was recorded by fingerlings fish with 1 g powertop®/kg diet. Blood concentration of ALT enzyme was significantly (P<0.01) affected by initial body weight but not for blood AST concentration. Powertop® supplementation significantly (P<0.01) affected both of alanine aminotransferase enzyme and Aspartate aminotransferase concentrations.

Table 3. Effect of fish initial body weight, Powertop® treatment and their interaction on blood components of Nile tilapia

Items	Total protein, TP (g/dl)	Albumin, ALB(g/dl)	Globulin, GLB(g/dl)	AST(U/dl)	ALT(U/dl)	TWBC (10^6 mm-3)	TRBC (10^6 mm-3)	Hb (%)
Effect of fish stocking weight								
Low stocking weight (W_1)	5.35±0.13	2.88±0.07	2.47±0.10	32.75±1.32	17.09±0.39	22.66±0.44	3.62±0.10	6.07±0.08
High stocking weight (W_2)	5.12±0.19	2.67±0.17	2.45±0.17	32.28±2.50	15.65±0.53	22.79±0.58	3.08±0.15	4.77±0.17
Significance	NS	NS	NS	NS	**	NS	**	**
Effect of dietary probiotic supplementation								
Control (T_1)	5.42±0.21	2.71±0.14	2.71±0.13	27.25±2.01^b	14.81±0.58^b	20.88±0.21^c	2.90±0.18^c	5.78±0.27^a
0.5 g powertop® (T_2)	5.33±0.11	2.93±0.21	2.40±0.13	34.85±0.88^a	17.16±0.31^a	23.25±0.32^b	3.48±0.11^b	5.19±0.38^b
1.0 g powertop® (T_3)	4.97±0.23	2.70±0.15	2.27±0.20	35.46±2.44^a	17.14±0.42^a	24.03±0.11^a	3.68±0.12^a	5.29±0.29^b
Significance	NS	NS	NS	**	**	**	**	*
The interaction effect of stocking weight and dietary probiotic supplementation								
W_1* T_1	5.72±0.06	3.01±0.05^a	2.72±0.00	31.45±1.62^c	15.88±0.36	21.10±0.31	3.30±0.06	6.28±0.05
W_1* T_2	5.13±0.10	2.61±0.05^b	2.52±0.05	35.45±1.71^b	17.48±0.56	22.93±0.30	3.70±0.06	6.01±0.11
W_1* T_3	5.21±0.28	3.03±0.07^a	2.18±0.21	31.35±3.15^c	17.93±0.42	23.93±0.22	3.87±0.18	5.92±0.16
W_2* T_1	5.12±0.35	2.41±0.07^b	2.71±0.28	23.05±0.26^d	13.75±0.64	20.67±0.27	2.50±0.06	5.28±0.32
W_2* T_2	5.53±0.07	3.25±0.33^a	2.28±0.25	34.25±0.78^b	16.85±0.32	23.57±0.58	3.25±0.09	4.37±0.21
W_2* T_3	4.73±0.36	2.36±0.01^b	2.37±0.37	39.56±1.76^a	16.35±0.29	24.13±0.03	3.50±0.06	4.67±0.08
Significance	NS	**	NS	**	NS	NS	NS	NS

Means in the same rows having different superscript letters were significantly different at 0.05 levels.
W_1 = Low stocking weight, W_2 = High stocking weight, T_1= Control, T_2 = 0.5 g powertop® and T_3 = 1.0 g powertop®.

Moreover, the interaction between fish stocking weight and powertop® supplementation affected significantly (P<0.01) blood concentration of AST and albumin, while other blood components were insignificantly affected. Mohamed (2007) revealed an increase in plasma total protein of *O. niloticus* fingerlings fed on probiotic and yeast. Measurement of globulin is of considerable diagnostic procedure in experimental animals as it relates to general nutritional status, the integrity of the vascular system, and liver functions. High blood albumin concentration may be due to an increase of protein synthesis, or a decrease catabolism (Nguyen et al., 1999). Moreover, there were no harmful effects on liver functions by probiotic treatment, initial body weight and their interaction. Compared to control serum level, transferase enzymes (ALT and AST) were decreased significantly with fingerlings than fry fish. These results indicate that fish fingerlings may utilize the experimental diets with powertop® more than fish fry and therefore improved liver functions. The pervious results were in agreement with estimating hematological procedures contained TRBC, TWBC count and Hb percentage. Hematological parameters were improved by probiotic treatment especially with fingerlings fish but this improvement was lower with their interaction. Current results are close to the results of Mohsen *et al.* (2010) who categorized experimental fish into three weights; 0.4–0.5 g (fry), 17–22 g (fingerling), and 37–43 g (advanced juvenile) and fed them on diets containing 45, 35, or 25 % crude protein. Beside, activities of aspartate amninotransferase (AST) and alanine aminotransferase (ALT) in serum, liver, and muscles were significantly affected by dietary protein level and fish weight. While, the interaction between fish weight and supplemental protein levels had no significant effect except for serum AST level.

Fish Body Composition:

Results in Table 3 explain that stocking weight had no significant influence on whole fish body composition. The same trend of insignificant effect was observed with powertop® supplementation and its interaction with stocking weight on dry matter, crude protein and ash content of whole body components. In contrast, powertop® supplementation and its interaction with stocking weight affected significantly (P<0.05) on ether extract. High ether extract content was obtained by interaction of stocking weight and powertop® supplementation at 0.5 g/ kg diet.

Jamali *et al.* (2014) fed probiotic bacteria (*Lactobacillus sp., Bifidobacterium sp. and Streptococcus sp.*) to rainbow trout larvae and found that, protein values of carcass in all probiotic treated groups were significantly (p<0.05) higher than other experimental groups. Also, crude lipid, ash and gross energy of the experimental probiotic fish groups differed significantly compared to the other fish treatment groups.

Profit Analysis:

Return from body gain and feed cost was increased in fish group reared at high initial body weight, while final profit was decreased (Table 4).

Feed cost, return from body gain and final profit were improved in fish groups treated with powertop®. The return from body gain was increased by 72.9 and 52.1% in fish fed diets supplemented with 0.5 and 1.0 g powertop®/kg diet, respectively. Also, the same trend for the final margin was 154.8 and 91.4%, respectively.

Table 4. Effect of fish initial body weight, Powertop® treatment and their interaction on fish body components

Items	Dry matter %	Crude protein %	Ether extract %	Ash %
Effect of fish stocking weight				
Low stocking weight (W_1)	24.75±0.22	61.47±0.41	12.53±0.31	10.94±0.18
High stocking weight (W_2)	24.58±0.13	62.58±0.37	12.35±0.20	10.61±0.10
Significance	**NS**	**NS**	**NS**	**NS**
Effect of dietary probiotic supplementation				
Control (T_1)	24.88±0.23	61.73±0.60	12.59±0.34[a]	10.66±0.14
0.5 g powertop® (T_2)	24.76±0.22	61.87±0.35	12.93±0.22[a]	10.69±0.15
1.0 g powertop® (T_3)	24.35±0.15	62.49±0.61	11.80±0.21[b]	10.98±0.26
Significance	**NS**	**NS**	*	**NS**
The interaction effect of stocking weight and dietary probiotic supplementation				
W_1* T_1	25.24±0.33	61.55±0.89	12.96±0.24[a]	10.83±0.24
W_1* T_2	24.70±0.47	61.40±0.60	13.28±0.21[a]	10.99±0.09
W_1* T_3	24.31±0.18	61.47±0.91	11.34±0.05[c]	11.01±0.57
W_2* T_1	24.53±0.19	61.91±0.98	12.22±0.62[b]	10.50±0.10
W_2* T_2	24.83±0.16	62.35±0.19	12.58±0.26[ab]	10.39±0.14
W_2* T_3	24.39±0.28	63.50±0.04	12.26±0.12[b]	10.95±0.11
Significance	**NS**	**NS**	*	**NS**

Means in the same rows having different superscript letters were significantly different at 0.05 levels.
W_1 = Low stocking weight, W_2 = High stocking weight, T_1= Control, T_2 = 0.5 g powertop® and T_3 = 1.0 g powertop®.

Table 5. Effect of fish initial body weight, Powertop® treatment and their interaction on economic evaluation

Items	Feed cost (LE/fish)	Return from gain (LE/fish)	Margin (LE/fish)	Margin efficiency (LE/fish)
Effect of fish stocking weight				
Low stocking weight (W_1)	0.155	0.388	0.233	0.215
High stocking weight (W_2)	0.510	0.623	0.114	0.112
Effect of dietary probiotic supplementation				
Control (T_1)	0.307	0.340	0.093	0.089
0.5 g powertop® (T_2)	0.351	0.588	0.237	0.229
1.0 g powertop® (T_3)	0.338	0.517	0.178	0.171
The interaction effect of stocking weight and dietary probiotic supplementation				
W_1* T_1	0.134	0.306	0.171	0.154
W_1* T_2	0.169	0.459	0.290	0.280
W_1* T_3	0.158	0.388	0.230	0.207
W_2* T_1	0.479	0.506	0.027	0.027
W_2* T_2	0.537	0.706	0.168	0.163
W_2* T_3	0.513	0.647	0.134	0.134

W_1 = Low stocking weight, W_2 = High stocking weight, T_1= Control, T_2 = 0.5 g powertop® and T_3 = 1.0 g powertop®.

Within each stocking weight, feed cost, return from body gain and final profit were increased in fish groups treated with powertop®. Higher return from body gain and final profit were obtained in fish group fed diet supplemented with 0.5 g powertop® and reared at low stocking weight.

CONCLUSION

The current data explain that, powertop® probiotic improved the growth performance, carcass parameters and some blood motilities. Therefore, it can be used as growth promoters in Tilapia fry and fingerlings.

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تقييم الباورتوب كمحسن نمو لاصبعيات البلطى النيلى فى اوزان تربية مختلفة

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هذه الدراسة تم تنفيذها لقياس تاثيرات الوزن (٣.٥ و ٣٥جم) ومستخلص الباورتوب بروبيوتيك (بيتا-جلوكا و حمض الفورميك و حمض اللاكتيك و حمض الفورميك و السيلكات) بمعدلات ٠.٥ و ٠.١ جم باورتوب/كجم عليقة على اداء النمو و الاستفادة من الغذاء و تركيب الجسمو بعض مكونات الدم لاصبعيات البلطى النيلى. وزن التربية و اضافة البورتوب والتداخل فيما بينهم كان له تاثير معنوى على اداء النمو فيما عدا معدا الحياة فلم يتاثر معنويا. وكذلك كلا منهما والتداخل بينهما لم يكن له تاثير معنوى على مكونات الجسم الكلية من المادة الجافة و البروتين الخام والمادة المعدنية. كانت اعلى نسبة لدهن الجسم تم الحصول عليها مع اضافة الباورتوب بمعدل ٠.٥ جم/ كجم عليقة. وزن التربية و اضافة البورتوب والتداخل فيما بينهم لم يكن له تاثير ضار على قياسات الدم ونشاط الكبد. اعلى ربح واعل نمو تم الحصول عليه من مجموعة الاسماك المغذاة على عليقة مضاف اليها ٠.٥ جم/كجم عليقة مع معدل تربية منخفض. يمكن التلخيص ان الباورتوب بروبيوتكيحسن من اداء النمو وتركيب الجسم و بعض مكونات الدم لاصبعيات البلطى النيلى. لذلك يمكن استخدامه كمحسن نمو فى علائق اصبعيات البلطى النيلى.