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Study the Role of Feed Additives in Prevention of Fish Diseases Incidence in Oreochromis Niloticus and Common Carp Fish and Its Economic Importance

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ABSTRACT

This study aimed to investigate the effect of some feed additives on immunity and economic efficiency of fish production through investigating dietary supplementation of some feed additives as probiotics (bactocell), antibiotic (oxytetracycline) and vitamins (C&E) that commonly used under Egyptian conditions in Tilapia nilotica and Common carp fingerlings as well as studying the effect of these additives on immunity and livability as well as productive and economic efficiency parameters. The design of this study include four groups of fingerlings of Oreochromis niloticus and Common carp , the groups that included in this study classified to group 1, which Received basal diet without any supplementation of feed additive (control group), group 2, which received basal diet with supplementation with bactocell (Pediococcus acidilactici) at 1gm Bactocell/ kg, group 3 which , received basal diet with supplementation with oxytetracycline at 0.6 gm oxytetracycline/ kg , group 4 that received basal diet with supplementation with Vitamin C at 400 mg/kg diet and vitamin E at 300 mg / kg diet. The results of this study concluded that, addition of feed additives to fish diet improve fish immunity, livability, body weight, body weight gain and decrease the mortality level with improvement of productive and economic efficiency of fish farms. Also, Nile tilapia fingerlings of higher costs, returns and net profit than Common carp fingerlings and the addition of feed additives to the ration of the fish improved economic and productive efficiency parameters of fish farms.

Keywords:

INTRODUCTION

Improving feed efficiency, metabolic assimilation and minimizing mortality in fish farms through improvements of fish immunity against different fish diseases, is of high priority in contemporary animal production and it will causes reduction in production costs and improvement of fish production with minimizing feed costs. Any reduction in feed costs would have a direct positive effect on profitability of aquaculture. (Francis et al., 2005 and Henry and Alexis, 2009).

The feed additives improved fish immunity and decrease mortality of fish through improvements of the differential leucocytic count (Lymphocyte, monocytes, basophils, eosinophils and neutrophils) in fish (Lin and Shiau, 2005), where they reported that, the beneficial effects of feed additives on various immunological parameters have been reported, that enhanced serum bactericidal activity, phagocytic activity, antibody levels, serum complement activity and lysozyme activity. (Ali et al., 2004 and Ren et al., 2007).

The Phagocytic activity and Phagocytic index improved by addition of feed additives into fish diets due to Phagocytosis and extracellular burst activity of blood leukocytes were significantly higher in by addition of all feed additives to fish diet and also, increased the total protein level in the blood. (Dügenci et al., 2003).

The mortality rate decreased with the addition of feed additives in fish diet, as the feed additives have a binding characteristic on T helper cell differentiation, effects on functional levels, gene expression profiles and application of the commonly used feed additives in the aquaculture sector. In addition, it shows promises in aquaculture by inducing disease resistance, (Dalmo and Bøgwald, 2008).

The feed additives improve the immunity, productivity and economic efficiency of fish via its improvement body weight of the fish (Carnevali et al., 2006), weight gain (Venkat, 2004), feed conversion ratio and efficiency (Abdel Hamid and Mohamed, 2008).

For all the previous reasons and the effect of feed additives into the fish ration the returns and net profit will be improved with minimization of the fish production costs (Abdel Hamid and Mohamed, 2008 and Henry and Alexis, 2009).

This study aimed to study the effect of some feed additives on immunity and economic efficiency of fish production through study dietary supplementation of some feed additives (probiotics (bactocell), antibiotic (oxytetracycline) and vitamins (C&E) that commonly used under Egyptian conditions on Tilapia nilotica and Common carp fingerlings through study the effect of these additives on immunity economic and productive efficiency parameters.

MATERIALS AND METHODS

This work was conducted at the Department of Animal Wealth Development, Faculty of Veterinary Medicine, Alexandria University, Egypt.

1. The feed additives used were include:

- Probiotics: Pediococcus acidilactici "Bactocell" as probiotics each 1gm contains 1 x 10^9 CFU. EGAVET, Geiza, Egypt.
- Antibiotics: Oxytetracycline. "antibiotics" 20 %. Unipharma, universal industrial pharmaceutical Co. El obour City, Cairo, Egypt.
- Vitamins (Vitamin C and Vitamin E).
  - Vitamin C: Coated vitamin C ethyl cellulose (CEC).
  - Vitamin E: Vitamin E adsorbate 50%.

2- Fish used: Two species was involved: Oreochromis niloticus (Nile tilapia) and Cyprinus carpio (Common carp). The fish were stocked in clean concrete ponds (3 X 1 X 1 m). Each pond had four net partitions which divided it into 4 equal parts (nearly 30 fishes/partition) and all the environmental conditions from pH value, dissolved oxygen (DO), chloride content, nitrite, nitrate, phosphate, water hardness and temperature was recorded at Fish Research Center, Faculty of Vet. Med. Alexandria University.

3- Diet preparation and feeding rate:

Table (1): ***Physical composition of the basal diet used in the experiment***:

Ingredients	%
Yellow corn	**25.00**
Wheat flour	**9.00**
Soybean meal	**20.70**
Fish meal	**20.70**
Poultry by-product meal	**18.00**
Vegetable oil	**6.00**
Vitamin mixture	**0.5**
Mineral mixture	**0.1**

A fixed feeding rate of 3% of the fish wet weight per day (dry feed / whole fish) was supplied according to Eurell et al. (1978) and Jauncey and Ross (1982).

4-Experimental Design: The design of the experiment was clear in Table (2).

II. A. Productive efficiency measurements:-

a- Body weight:_The fish of each group were weighed at the beginning of the experiment to obtain initial body weight then, the fishes were weighted biweekly. (Windell et al., 1978 and Siddiqui et al., 1988).

b- Body weight gain (BWG):

Body weight gain of fish (grams) was calculated as the difference between two successive weights each two weeks. (Siddiqui et al., 1988). BWG = W2 – W1

a- Feed intake: Was calculated as the total weight diet offered in a given period (every two weeks) divided by the number of survival fish. (Castle and Tiews, 1980).

b- Feed conversion ratio (FCR): FCR = Feed intake (g)/ Weight gain (g)

II. B. Economic efficiency measurements:- Were measured according to (El-Telbany and Atallah, 2000).

1. Costs parameters: was classified and calculated according to (Selvatore, 1974).:-

a. Total variable costs (TVC): It includes price of purchased fingerlings, the selected feed additives used and feed costs. It was estimated per piaster during the cycle of the experiment.

b. Total fixed costs (TFC):__It includes fuel, labour, veterinary, the costs of land and equipment depreciation it was estimated per piaster.

c. Total costs (TC):__It was calculated from the summation of total fixed cost and total variable cost.

Table (2): ***Experimental design for selected feed additive used for Tilapia nilotica and Common carp.***

Groups	Received diet
Group 1	**Received basal diet without any supplementation of feed additive (control group).**
Group 2	**Received basal diet with supplementation with bactocell (*Pediococcus acidilactici*) at 1gm Bactocell/ kg.**
Group 3	**Received basal diet with supplementation with oxytetracycline at 0.6 gm oxytetracycline/ kg.**
Group 4	**Received basal diet with supplementation with Vitamin C at 400 mg/kg diet and vitamin E at 300 mg / kg.**

Experimental period extended for 12 weeks	
Water quality	
Temperature	**26 – 34°c ± 2 °c**
DO (ppm)	**5.5 mg / L**
PH value	**8.2**
Nitrite(NO2)	**0.15 mg / L.**
Nitrate(NO3)	**23 mg / L.**
Ammonium (NH4)	**0.425 mg / L.**
Phosphate(PO4)	**0.85 mg / L .**
Water hardness	**190.44 mg / L.**

2. Total returns (TR):- Expressed per piaster from fingerling sale.

3. Net profit = Net income: It was calculated by using the following equation: Net profit = Total return - Total cost.

III-Haematological examination :

III.A-Fresh blood samples were collected weekly from caudal blood vessels in 2 forms (from injected and control fish) and the citrated blood for measuring (differential Leucocytic count (D.L.C), Phagocytic activity (P.A) and Phagocytic index (P.I) according to (Lied et al., 1975).

III-B-Differential leucocytic count :

Blood film was taken and prepared according the method described by Lucky (1977). A drop of citrated blood put on slide at one end and by another slide make distribution of it and then make drying of it in air for about 2 minutes then make fixation by methyle alchol for about 5 ml then make staining of blood slide by diluted diluted Giemsa's solution (10 drops of the dye were added to 10 ml of distilled water) was poured over the film and left for (20 minutes for 30 minutes) then rinsed with water current and examined by oil immersion lense. The percentage and absolute value for each type of cells were calculated according to (Belo et al., 2008).

III-C. Determination of phagocytic activity and phagocytic index :

Phagocytic activity was determined according to (Kawahara et al., 1991). Fifty µg Candida albicans culture was added to 1 ml of citrated blood collected from exposed and control fish and shaken in water bath at -25 ^{o}C for 5 hours. Smears of the blood were then stained with Giemsa solution. Phagocytosis was estimated by determining the proportion of macrophages which contained intracellular yeast cells in a random count of 300 macrophages and expressed as percentage of phagocytic activity (PA). The number of phagocytized organisms was counted in the phagocytic cells and called phagocytic index (PI). Results were expressed as means ± S.E. and differences were evaluated by Student's t–test.

Phagocytic activity (PA) = Percentage of phagocytic cells containing yeast cells.

Phagocytic index (PI) = No. of yeast cells phagocytized / No. of phagocytic cells

IV. Statistical method:- Data collected, arranged, summarized and analyzed using the computer programs, the statistical method used was two way ANOVA followed by Duncan test according to (SPSS/PC+ 2001) to estimate the effect of treated groups and species on productive and economic efficiency parameters. Data were presented as mean ± SE and significance declared at ($P < 0.05$).

RESULTS AND DISCUSSION

Table (3) explain the significant differences ($P < 0.05$) among different treatment groups

Table (3): ***Effect of Feed Additives on body weight (gm) of Common Carp and Nile Tilapia fingerlings (Mean ± S.E) at different weeks of experiment.***

Species	Groups	Initial weight	Week 2	Week 4	Week 6	Week 8	Week 10	Week 12
Common Carp	Control	5.92 ± 0.25[a]	7.32 ± 0.24[d]	8.88 ± 0.23[e]	10.61 ± 0.23[f]	12.57 ± 0.24[f]	14.57 ± 0.26[g]	16.66 ± 0.28[g]
	Bactocell	6.22 ± 0.25[a]	7.86 ± 0.25[cd]	9.68 ± 0.25[de]	11.68 ± 0.25[e]	13.81 ± 0.26[e]	16.03 ± 0.27[f]	18.36 ± 0.29[f]
	Oxytetracycline	6.03 ± 0.33[a]	7.94 ± 0.33[cd]	10.07 ± 0.33[d]	12.39 ± 0.34[de]	14.79 ± 0.34[cd]	17.30 ± 0.35[de]	19.92 ± 0.36[de]
	Vitamin (C & E)	6.52 ± 0.30[a]	8.89 ± 0.29[ab]	11.43 ± 0.30[b]	14.08 ± 0.30[b]	16.79 ± 0.30[b]	19.57 ± 0.30[b]	22.43 ± 0.31[b]
Nile Tilapia	Control	6.05 ± 0.33[a]	7.84 ± 0.32[cd]	9.90 ± 0.37[d]	12.08 ± 0.37[de]	14.34 ± 0.38[de]	16.68 ± 0.39[ef]	19.16 ± 0.40[ef]
	Bactocell	6.16 ± 0.36[a]	8.22 ± 0.36[bc]	10.49 ± 0.37[cd]	12.89 ± 0.38[cd]	15.37 ± 0.39[c]	18.02 ± 0.41[cd]	20.77 ± 0.42[cd]
	Oxytetracycline	6.83 ± 0.27[a]	8.95 ± 0.28[ab]	11.27 ± 0.29[bc]	13.73 ± 0.29[bc]	16.26 ± 0.30[b]	18.92 ± 0.30[bc]	21.68 ± 0.30[bc]
	Vitamin (C & E)	7.11 ± 0.26[a]	9.69 ± 0.27[a]	12.43 ± 0.28[a]	15.25 ± 0.28[a]	18.11 ± 0.28[a]	21.03 ± 0.28[a]	23.98 ± 0.29[a]

Means within the same column carrying different litters are significant at ($P \leq 0.05$).

on body weight of both species, a highly increase in body weight appeared in Nile tilapia vitamin (C & E) treated group and the lowest value of body weight appeared in control group of common carp. This results, indicated that, the vitamin (C & E) improved body weight than other treatments for both species followed by Oxytetracycline treated group and finally bactocell treated group. These results could be attributed to the action of vitamin C as a metabolic antioxidant and detoxifying numerous peroxide metabolites, thus protecting cell membranes and other intracellular components and processes that are sensitive to oxidation. Also, Combination of vitamin (C & E) improves body weight and this may be due to a synergistic simultaneous protection effect of the lipid and aqueous phases against oxidation, and the action of vitamin C on vitamin E regeneration in the tissues. These results agreed with those reported by (Hamre et al,. 1997; Shiau and Hsu, 2002; Shewita, 2003; Belo et al,. 2005; Xie et al., 2006 and Abd El-Ghany, 2009).

The weight gain showed a significant differences (P < 0.05) among the treated groups, Nile tilapia vitamin (C & E) treated group showed higher value among all other groups, followed by common carp vitamin (C & E) treated group then, Nile tilapia Oxytetracycline treated group which showed no significant with Nile tilapia bactocell treated group followed by Common carp Oxytetracycline treated group. Meanwhile, the lowest value appeared in Common carp control group followed by Common carp bactocell treated group then, Nile tilapia control group (Table, 4). These results indicated that, the feed additives improve the weight gain than the control non-treated group and these results agreed with those recorded by (Shewita, 2003; Belo et al., 2005; Xie et al., 2006 and Abd El-Ghny, 2009), where they reported that feed additives improve the productive efficiency of fish than the other non-treated groups.

Table (5) indicated that, the FCR showed a significant differences (P < 0.05) among the different treated groups, Nile tilapia vitamin (C & E) treated group showed a higher value among all other groups and the lowest value showed by Nile tilapia bactocell treated group followed by Common carp Oxytetracycline treated group. These results in harmony with those of (Bogut et al., 1998; Venkat et al., 2004 and El-Sayed, 2007) where they, noticed that Carp that subjected to diets containing feed additives probiotics had better feed conversion, increased efficiency of existing digestive processes with promoting the digestion of indigestible substances than the control groups.

Table (4): ***Effect of Feed Additives on body weight gain (gm) of Common Carp and Nile Tilapia Fingerlings (Mean ± S.E) at different weeks of experiment.***

Species	Groups	Gain1 (W2 – Initial)	Gain2 (W4 - W2)	Gain3 (W6 - W4)	Gain4 (W8 - W6)	Gain5 (W10 - W8)	Gain6 (W12 - W10)
Common Carp	Control	1.41 ± 0.02[g]	1.56 ± 0.04[g]	1.73 ± 0.04[g]	1.96 ± 0.03[g]	1.99 ± 0.04[g]	2.09 ± 0.03[g]
	Bactocell	1.64 ± 0.03[f]	1.82 ± 0.03[f]	1.99 ± 0.04[f]	2.14 ± 0.04[f]	2.22 ± 0.03[f]	2.33 ± 0.03[f]
	Oxytetracycline	1.92 ± 0.03[d]	2.12 ± 0.03[de]	2.32 ± 0.02[d]	2.40 ± 0.03[d]	2.51 ± 0.03[d]	2.62 ± 0.03[d]
	Vitamin (C & E)	2.36 ± 0.05[b]	2.54 ± 0.04[b]	2.65 ± 0.03[b]	2.72 ± 0.04[b]	2.78 ± 0.03[b]	2.86 ± 0.03[b]
Nile Tilapia	Control	1.79 ± 0.03[e]	2.06 ± 0.02[e]	2.17 ± 0.04[e]	2.26 ± 0.04[e]	2.34 ± 0.03[e]	2.49 ± 0.03[e]
	Bactocell	2.06 ± 0.03[c]	2.27 ± 0.04[cd]	2.40 ± 0.03[cd]	2.48 ± 0.03[cd]	2.65 ± 0.03[c]	2.75 ± 0.03[c]
	Oxytetracycline	2.12 ± 0.03[c]	2.32 ± 0.03[c]	2.45 ± 0.03[c]	2.53 ± 0.03[c]	2.66 ± 0.03[c]	2.76 ± 0.02[c]
	Vitamin (C & E)	2.58 ± 0.04[a]	2.74 ± 0.03[a]	2.81 ± 0.03[a]	2.86 ± 0.02[a]	2.93 ± 0.02[a]	2.95 ± 0.01[a]

Means within the same column carrying different litters are significant at (P ≤ 0.05).

Table (5): ***Effect of Feed Additives on Feed Conversion Ratio (FCR) of Common Carp and Nile Tilapia Fingerlings (Mean ± S.E) at different weeks of experiment.***

Species	Groups	FC1	FC2	FC3	FC4	FC5	FC6
Common Carp	Control	2.20 ± 0.09[a]	2.42 ± 0.10[a]	2.59 ± 0.08[a]	2.71 ± 0.06[a]	3.07 ± 0.05[a]	3.35 ± 0.04[ab]
	Bactocell	2.01 ± 0.07[ab]	2.24 ± 0.06[ab]	2.47 ± 0.07[ab]	2.72 ± 0.06[a]	3.04 ± 0.05[ab]	3.32 ± 0.03[ab]
	Oxytetracycline	1.75 ± 0.08[cde]	1.99 ± 0.07[c]	2.24 ± 0.06[c]	2.59 ± 0.06[c]	2.90 ± 0.06[bc]	3.19 ± 0.06[cd]
	Vitamin (C & E)	1.59 ± 0.06 [de]	1.89 ± 0.05[c]	2.24 ± 0.06[c]	2.60 ± 0.06[bc]	2.96 ± 0.06[abc]	3.30 ± 0.05[abc]
Nile Tilapia	Control	1.85 ± 0.09[bc]	2.10 ± 0.14[bc]	2.34 ± 0.08[bc]	2.67 ± 0.07[ab]	2.99 ± 0.06[abc]	3.24 ± 0.06[bcd]
	Bactocell	1.68 ± 0.07[cde]	1.95 ± 0.06[c]	2.25 ± 0.06[c]	2.60 ± 0.06[bc]	2.85 ± 0.06[c]	3.17 ± 0.02[d]
	Oxytetracycline	1.78 ± 0.05 [cd]	2.04 ± 0.05[bc]	2.35 ± 0.06[bc]	2.70 ± 0.05[a]	2.99 ± 0.05[abc]	3.30 ± 0.07[abc]
	Vitamin (C & E)	1.58 ± 0.04[e]	1.91 ± 0.04[c]	2.28 ± 0.05[c]	2.66 ± 0.04[abc]	3.02 ± 0.04[ab]	3.42 ± 0.04[a]

Means within the same column carrying different litters are significant at (P ≤ 0.05).

The level of Differential leucocytic counts, Phagocytic activity and Phagocytic index also, differed according to the type of feed additives used and type of fish species. The value of all differential leucocytic counts, Phagocytic activity and Phagocytic index appeared of higher level in Nile tilapia than that of Common carp and the Vitamin C and E of higher differential leucocytic counts than the Oxytetyracyclin followed by Bactocell and finally by the control group. (Table, 6). These results agreed with those of (Ren et al. 2007 and Eo and Lee, 2008) where they indicated that the immunity, WBCs and Phagocytic activity improved with addition of feed additive groups than the non treated groups.

The results in Table (7) about mortality and survivability showed a significant difference among the two species and different treatments. The highest survivability and lowest mortality (%) recorded in Nile tilapia vitamin (C & E) treated groups. Similar findings were obtained by (Ren et al., 2007, Eo and Lee, 2008 and Henry and Alexis, 2009) where they found that, the vitamin C non-supplemented group showed significantly ($P < 0.01$) higher mortality rates compared to vitamin C supplemented group.

From table (8) we can notice that the all different treatment groups have the same Total Fixed Costs (TFC) and this results attributed to the all treatments take the same value of feed, building , equipment, nets and labor that is the cause that lead to the costs are of the same value , this results agreed with those of Aly (2009) who reported that, the fixed costs of the fish under the same experiment have the equal value of fixed costs from building, equipment, nets and labor.

Table (8) cleared that, the Total variable cost (TVC) in Common carp vitamin (C & E) treated group showed highest value, while the Common carp control group showed the lowest value. The obtained results due to total variable costs that included purchased fry cost, feed costs and feed additive cost agreed with those of (Shafey, 1993 and El-Telbany and Atallah, 2000) where they

Table (6): Effect of Feed Additives on Immune Response Measurements (Differential leucocytic count and Phagocytic activity and Phagocytic index) of Common Carp and Nile Tilapia Fingerlings (Mean ± S.E) at different weeks of experiment.

Species	Groups	Differential leukocytic count (%)					Phagocytic activity & index	
		Lymphocyte	Monocyte	Basophils	Eosinophils	Neutrophils	Phagocytic Activity	Phagocytic Index
Common Carp	Control	50.48 ± 0.66^{f}	1.93 ± 0.02^{g}	7.79 ± 0.01^{g}	9.99 ± 0.03^{f}	26.38 ± 0.03^{g}	19.33 ± 0.36^{g}	2.70 ± 0.06^{f}
	Bactocell	51.60 ± 0.79^{e}	2.24 ± 0.03^{f}	7.84 ± 0.02^{fg}	10.06 ± 0.03^{f}	27.68 ± 0.05^{f}	23.80 ± 0.12^{e}	3.48 ± 0.10^{e}
	Oxytetracycline	53.02 ± 0.10^{d}	2.48 ± 0.03^{e}	7.99 ± 0.03^{e}	11.04 ± 0.01^{d}	28.20 ± 0.05^{d}	27.06 ± 0.09^{d}	3.89 ± 0.02^{d}
	Vitamin (C& E)	55.08 ± 0.15^{c}	2.69 ± 0.01^{c}	8.63 ± 0.10^{b}	12.04 ± 0.03^{b}	28.91 ± 0.02^{b}	31.10 ± 0.48^{a}	4.47 ± 0.03^{b}
Nile Tilapia	Control	51.20 ± 0.61^{e}	2.26 ± 0.02^{f}	7.86 ± 0.02^{f}	10.00 ± 0.04^{f}	26.40 ± 0.03^{g}	20.45 ± 0.23^{f}	3.48 ± 0.09^{e}
	Bactocell	54.84 ± 0.15^{c}	2.54 ± 0.01^{d}	8.05 ± 0.04^{d}	10.66 ± 0.17^{e}	27.77 ± 0.03^{e}	27.55 ± 0.29^{c}	3.94 ± 0.03^{d}
	Oxytetracycline	56.09 ± 0.06^{b}	2.75 ± 0.01^{b}	8.37 ± 0.03^{c}	11.12 ± 0.02^{c}	28.28 ± 0.05^{c}	28.65 ± 0.06^{b}	4.36 ± 0.02^{c}
	Vitamin (C & E)	58.20 ± 0.39^{a}	2.84 ± 0.02^{a}	8.93 ± 0.04^{a}	12.13 ± 0.04^{a}	28.96 ± 0.03^{a}	31.46 ± 0.48^{a}	4.75 ± 0.03^{a}

Means within the same column carrying different litters are significant at ($P \leq 0.05$).

Table (7): ***Effect of Feed Additives on Mortality and Survivability (%) of Common Carp and Nile Tilapia Fingerlings (Mean ± S.E).***

Species	Groups	Initial number	At end of experiment (Week12)			
		Total number of fish	No	Dead (%)	No	Survivability (%)
Common Carp	Control	25	8	32	17	68
	Bactocell	25	6	24	19	76
	Oxytetracycline	25	5	20	20	80
	Vitamin (C & E)	25	2	8	23	92
Nile Tilapia	Control	25	7	28	18	72
	Bactocell	25	5	20	20	80
	Oxytetracycline	25	3	12	22	88
	Vitamin (C & E)	25	1	4	24	96

Table (8): Effect of Feed Additives on Fixed Costs (piaster) of Common Carp and Nile Tilapia Fingerlings (Mean ± S.E).

Species	Groups	Total fixed costs	Variable costs	Total costs	Total returns	Net profit	TR/TC
Common Carp	Control	18.31	13.93 ± 0.33[c]	32.24 ± 0.33[c]	49.98 ± 0.83[h]	17.73 ± 0.51[g]	1.55 ± 0.016[g]
	Bactocell	18.31	14.79 ± 0.46[c]	33.10 ± 0.46[c]	55.08 ± 0.87[g]	21.98 ± 0.54[f]	1.67 ± 0.016[f]
	Oxytetracycline	18.31	14.61 ± 0.62[c]	32.92 ± 0.62[c]	59.75 ± 1.07[f]	26.83 ± 0.51[e]	1.82 ± 0.015[e]
	Vitamin (C & E)	18.31	15.92 ± 0.52[c]	34.23 ± 0.52[c]	67.28 ± 0.92[e]	33.05 ± 0.54[d]	1.97 ± 0.020[d]
Nile Tilapia	Control	18.31	38.71 ± 1.86[b]	57.03 ± 1.86[b]	114.97 ± .43[d]	57.94 ± 1.44[c]	2.03 ± 0.045[cd]
	Bactocell	18.31	39.61 ± 1.90[b]	57.92 ± 1.90[b]	124.63 ±2.52[c]	66.71 ± 1.00[b]	2.17 ± 0.046[ab]
	Oxytetracycline	18.31	43.77 ± 1.47[a]	62.08 ± 1.47[a]	130.08 ±1.82[b]	68.00 ± 0.94[b]	2.11 ± 0.035[bc]
	Vitamin (C & E)	18.31	45.75 ± 1.41[a]	64.06 ± 1.41[a]	143.88 ±1.71[a]	79.83 ± 0.80[a]	2.26 ± 0.033[a]

Means within the same column carrying different litters are significant at ($P \leq 0.05$).

reported that, the total variable costs differed according to the type of fish , its growth, immunity and profitability of fish farm and incidence of fish diseases in fish farms.

The obtained data in Table (8) we can concluded that, the Nile tilapia fingerlings of higher total costs (TFC and TVC) than Common carp fingerlings. All the dietary treated groups of both species had increase in average total costs when compared with those of control groups of both species. The vitamin (C & E) showed higher total costs than other treatments for both species followed by oxytetracycline treated group and finally bactocell treated group. The obtained results agreed with those of Green et al. (1995) where they concluded that, the total costs reached to 2.3 L.E / kg and the results obtained by Engle and Stone (2002) indicated that, the total costs of each kilogram of fish were 200 piaster/kg, while, Dunning and Danies (2001) reported that, the total costs of each pound of fish reached to 11.76 L.E. Our result confirmed with those obtained by Aly, (2006) who reported that total costs ranged from 1305.13 to 3119.98 L.E per 1000 fish for Tilapia species and Carp fish in Ismalia governorate, respectively, and this results attributed to the differences in fish diseases incidence, immunity and weight of fish.

Also, Table (8) indicated that, the Nile tilapia fingerlings showed higher return than Common carp fingerlings. The vitamin (C & E) improved return higher than other treatments for both species followed by oxytetracycline treated group and finally bactocell treated group. These results may be due to the return depending on fingerlings sale weight and its price, the Nile tilapia fingerlings showed the highest weight and also higher price. Also, vitamin (C & E) had a highest body weight in comparison with other treated groups followed by oxytetracycline and bactocell treated group in comparison with control group so it is of higher economic and productive efficiency than other groups. Also, (Sinha and Sinha, 1994 and Verlhac and Gabaudan, 1994) reported that, the addition vitamin C and E in the fish diet improve the body weight gain feed conversion and economic returns compared with the other dietary levels.

The net profit and total return to total costs results appeared in Table (8) indicated that, the Common carp control group achieved the lower net profit value Meanwhile, the Nile tilapia fingerlings (C & E) treated groups showed higher significant ($P < 0.05$) value than the other treated groups. The net profit of Nile tilapia fingerlings was higher than that of Common carp. These results agreed with those obtained by Green et al. (1995) and Shahat (2001) observed that, the net profit were higher for fish fed diet supplemented with vitamin C.

From the previous results, we can concluded that, the addition of feed additives to fish diet improve fish immunity, body weight, body weight gain and decrease the mortality level with improvement of economic efficiency of fish farms. The Nile tilapia fingerlings of higher costs, returns and net profit than Common carp fingerlings and the addition of feed additives improved economic and productive efficiency parameters of fish farms.

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دراسة دور إضافات الاعلاف فى منع حدوث أمراض الاسماك فى البلطى النيلى والمبروك العادى و أهميتها الاقتصادية

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الملخص العربى

إستهدفت هذه الدراسة دراسة مدى تأثير بعض إضافات الاعلاف على مناعة أسماك البلطى النيلى والمبروك العادى وكذلك الكفاءة الاقتصادية لاضافات الاعلاف فى البلطى النيلى والمبـــروك العادى وذلك من خلال إستخدام بعض إضافات الاعلاف الاكثر إستخداما تحت الظروف المصـــرية مثل البروبيوتك (الباكتوسيل) ، المضادات الحيوية (الاوكسى تتراسيكلين) ، الفيتامينات (فيتامين ج ، هـــ) .

تم تقسيم الاسماك المستخدمة لكل نوع من الاسماك (البلطى النيلى والمبروك) إلى اربعـــة مجاميع لكل نوع.

المجموعة الاولى (لكل من البلطى والمبروك) غذيت على العليقة الاساســية بـــدون أيـــة إضافات أعلاف , و إعتبرت كمجموعة ضابطة ، بينما المجموعة الثانية لكل نوع غـــذيت علـــى العليقة الاساسية مضافا اليها الباكتوسيل بمعدل 1جرام / كجم ، بينما المجموعة الثالثة غذيت علـــى العليقة الاساسية مضافا اليها الاوكسى تتراسيكلين بمعدل 0.6 جرام / كجم من متوسط وزن الجسم للاسماك بينما المجموعة الرابعة غذيت على فيتامين ج بمعدل 400 مجم / كجم و فيتـــامين هـــــ بمعدل 300 مجم / كجم من متوسط وزن الجسم.

تم حساب متوسط وزن الجسم ، ومعدل الزيادة الاسبوعية للاســـماك كمعـــايير للكفـــاءة الانتاجية بينما إعتبرت نسبة ،وتصنيف خلايا الدم البيضاء وكذلك حساب النشاط الالتهامى ومعدلـــه كمعايير للمناعة والوزن النهائى للاسماك كمعايير للكفاءة الانتاجية ، بينما تم تقدير التكاليف الثابتـــة و المتغيرة و إجمالى الايرادات ، وصافى العائد لكل مجموعة ,و إعتبرت معايير للكفاءة الاقتصادية لكل مجموعة على حدة.

وخلصت هذه الرسالة إلى أن كل إضافات الاعلاف تؤدى إلى زيـــادة الكفـــاءة المناعيـــة والانتاجية والاقتصادية لمزارع إنتاج الاسماك عن المجموعات الضـــابطة , وان أفضـــل إضـــافات الاعلاف هو فيتامين (ج ، هـــ) يليه الاوكسى تتراسيكلين ثم الباكتوسيل وحققـــوا كفـــاءة مناعيـــة وإنتاجية وإقتصادية أفضل من المجموعات الضابطة.