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Assessment Study About Effect of Vitamin E (a-Tocopheryl) on Feeding Performance, Survival Rate and Reproductive Performance of Angel Fish (*Pterophyllum scalare*)

Moein Faramarzi

Young Researchers Club, Science and Research Branch, Islamic Azad University, Tehran, Iran

Abstract: This study was conducted to determine the effect of dietary level of vitamin E on feeding performance, survival rate and reproductive performance of angel fish (*Pterophyllum scalare*). A basal supplemented with 50, 100 and 200 mg vitamin E/kg (treatment 1 (T1), 2 (T2) and 3 (T3) respectively). Each diet was fed to Angel fish in triplicate aquaria for 60 days. According to the results of this study, the best spawning and hatching were found in T3 but there was no significant difference with other groups ($p>0.05$). Also survival rate in group T3 showed significant difference with group T2 ($p<0.05$) and higher than other groups. The best weight gain were found in T1 as it showed significant difference with group T2 ($p<0.05$).

Key words: Angel Fish (*Pterophyllum scalare)* % Vitamin E % Survival Rate % Weight Gain

INTRODUCTION

Vitamin E is an indispensable nutrient required to maintain flesh quality, immunity, normal resistance of red blood corpuscles to haemolysis, permeability of capillaries and heart muscle [1]. Vitamin E occurs in several naturally occurring forms, with a-tocopherol having the highest vitamin E activity [2]. Vitamin E functions as a lipid soluble antioxidant and protects biological membranes, lipoproteins and lipid stores against oxidation. Its main function is to protect unsaturated fatty acids against free radical-mediated oxidation [3].

The tocopheryl acetates do not act as antioxidants, but are hydrolyzed by digestive enzymes prior to absorption into the body [4]. A dietary requirement of vitamin E has been demonstrated in a number of fish, which includes 120 mg/kg diet [5] for Atlantic salmon, 30 to 50 mg/kg diet for channel catfish [6, 7] and 200 to 300 mg/kg diet for common carp [8].

An increased dietary polyunsaturated fatty acid (PUFA) level in diet causes an increased requirement of vitamin E in carp [9, 10] and Atlantic salmon [11]. Shiau and Shiau [12] reported the optimum dietary vitamin E requirement of juvenile hybrid tilapia to be 40-44 and 60-66 mg in 50 and 120 g lipid per kg diets, respectively. Ruff *et al*. [13] suggested that supplementation of feeds with at least 550 mg a-tocopheryl acetate/kg diet for market size turbot 2 months prior to slaughter improved fillet quality. Increasing the concentration of vitamin E in a 30% lipid feed from 300 to 1500 mg/kg can reduce the rate of lipid oxidation in fish fillets and reduce the formation of flavors [14]. The objectives of the present study were to determine the dietary vitamin E requirement, fish performance and its effect on carcass composition.

MATERIALS AND METHODS

In this study, 18 pairs of 14 months angel fish (average weight of 4.05 g) were randomly stocked into each aquarium with three replications per treatment. Angel fish were obtained from the Institute of Ornamental Fish Hatchery in Sari, Iran and were transferred to the place of experiment and acclimated for 2 weeks. Fish were fed to satiation twice per day. The feeding trials were conducted in 9 (80×30×40 cm) glass aquaria. Gentle aeration was provided by air stones. During the experiment, the water quality parameters were monitored during the trial and average value for temperature, dissolved oxygen, hydrogen ion concentration (pH) and salinity were 26±2°C, 5.7-7.7 mg l^{-1}, 6.9-7.8 units and 0.1 mg l^{-1} respectively. Dark cycle of 12:12 h was maintained during the feeding trial. We used a diet which was supplemented with 50, 100 and 200 mg vitamin E/kg (treatment 1, 2 and 3 respectively). Nutrient compositions of experimental diets are given in Table 1. Proximate composition of diets was carried out using the Association of Analytical

Corresponding Author: M. Faramarzi, Young Researchers Club, Science and Research Branch, Islamic Azad University, Tehran, Iran.

Table 1: Nutrient composition of experimental diets (%)

Nutrient composition	(%)
Protein	54
Lipid	18
Fiber	1.5
Ash	10
Vitamin	2

Chemists [15] methods. Protein was determined by measuring nitrogen (N×6.25) using the Kjeldahl method; Crude fat was determined using petroleum ether (40-60 Bp) extraction method with Soxhlet apparatus and ash by combustion at 550 °C. The experiment was conducted for 60 days with angel fish. All fish from each replicate were individually measured and weighed at the beginning and every two weeks until the end of the experiment. Wet weight (g) was determined at each sampling day, with an electronic balance (0.01 g sensitive) and a scale.

Reproduction parameters were investigated after 60 days. Breeders after 60 days feeding were spawned during one month. Spawning, hatching and larval survival for each pair of breeders were investigated.

The data obtained from the trial were subjected to one-way analysis of variance (ANOVA) (using SPSS 16.0 programme) to test for effects of dietary treatments. When ANOVA identified significant difference among groups, multiple comparison tests among means were performed using Duncan's new multiple range test. For each comparison, statistically significant differences were determined by setting the aggregate type I error at 5% ($P<0.05$).

RESULT AND DISCUSSION

Results (Figure 1-6) showed that the growth of fish in T1 was significantly higher than other treatments ($p<0.05$). There were no significant differences ($p>0.05$) among the experimental groups in spawning and hatching (%). The percentage of larval survival rate in T1 and T2 as well as T2 and T3 showed no significant difference ($p>0.05$), while T1 and T3 significantly showed higher survival rate in group T3 (70.84±6.98) ($p<0.05$).

Previous investigations have showed that vitamin E requirements of fish are affected by dietary lipid levels [16-18].

The best spawning and hatching were found in group T3 but there was no significant difference with other groups ($p>0.05$). Also survival rate in group T3 showed significant difference with group T2 ($p<0.05$) and higher than other groups. The best weight gain were found in T1 as it showed significant difference with group T2 ($p<0.05$).

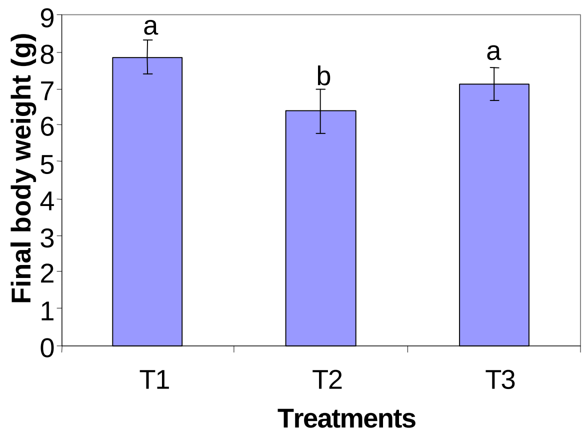

Fig 1: Final body weight (g) of Angel fish in different treatments ($p<0.05$)

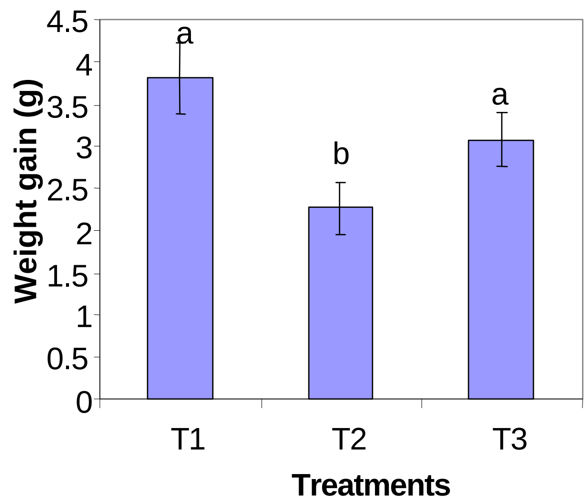

Fig. 2: Weight gain (g) of Angel fish in different treatments ($p<0.05$)

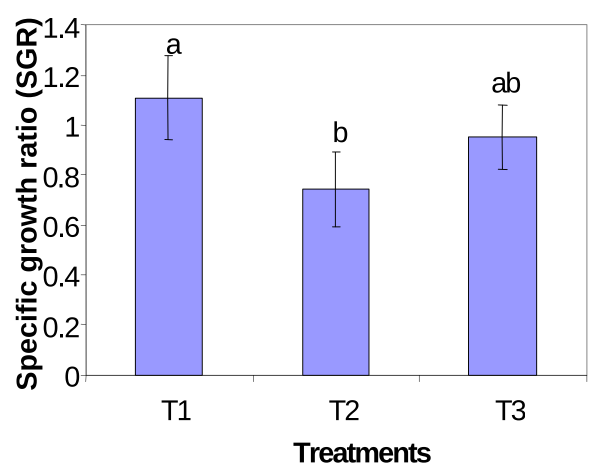

Fig. 3: Specific growth ratio (SGR) of Angel fish in different treatments ($p<0.05$)

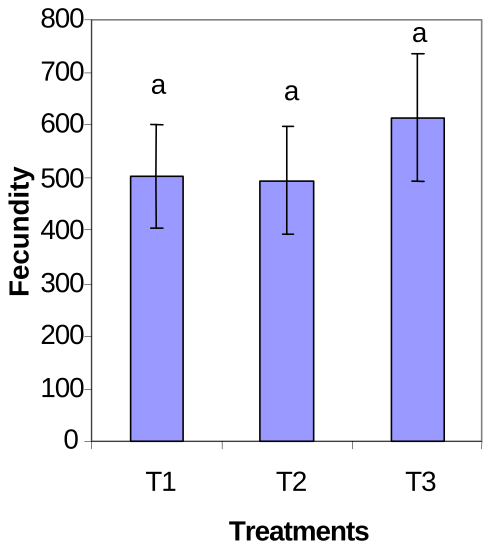

Fig. 4: Fecundity of Angel fish in different treatments ($p<0.05$)

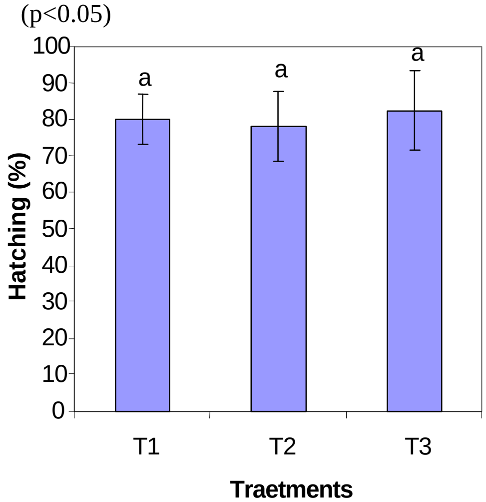

Fig. 5: Hatching (%) of Angel fish in different treatments ($p<0.05$)

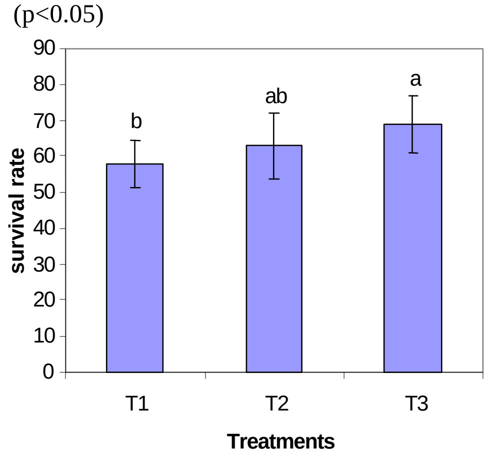

Fig. 6: Survival rate of Angel fish in different treatments ($p<0.05$)

The highest SGR were found in T1 and it significantly difference among groups ($p<0.05$).

Vitamin E, which is abundant in immune cell membranes [19], plays an important role in the fish immune response [20]. Peritoneal macrophage function was adversely affected in rainbow trout [21] and channel catfish [22] fed vitamin E-deficient diets. Deficiency of vitamin E has been reported to reduce serum protein, serum globulin and phagocyte activity in rainbow trout [23] and serum complement activity in Atlantic salmon [24], gilthead seabream [25] and sea bass [26]. Ortuno *et al.* [27, 28] reported that serum complement and phagocytic activity in gilthead seabream were correlated with dietary levels of vitamin E supplementation, but neither leukocyte migration nor respiratory burst was affected. Lin and Shiau [29] also obtained significantly higher respiratory burst activity and plasma lysozyme and alternative complement activity in grouper (*Epinephelus malabaricus*) fed diets supplemented with vitamin E ranging from 25 to 800 mg/kg diet than fish fed the unsupplemented control diet.

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