

Effects of different levels of dietary vitamin E on growth and tissue α -tocopherol concentrations in olive flounder *Paralichthys olivaceus*

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Introduction

Vitamin E occurs in several naturally occurring forms, with α -tocopherol having the highest vitamin E activity. Vitamin E is a major membrane-bound antioxidant present in the lipid of cell membranes and lipoproteins, where it protects polyunsaturated fatty acids against free radical-mediated peroxidation. Vitamin E deficiency signs described in fish are numerous such as muscular dystrophy, erythrocyte fragility, anemia, and exudative diathesis. Therefore, vitamin E is essential for fish to maintain their normal growth and metabolism. Established vitamin E requirements are 30 mg of α -tocopherol/kg of diet for salmonids, 30-50 mg/kg of diet for channel catfish, 200-300 mg/kg of diet for common carp, 25-50 mg/kg of diet for Nile tilapia, and 45 mg/kg of diet for juvenile Korean rockfish (Bai and Lee, 1998). The dietary vitamin E requirement in olive flounder has not been studied. The purpose of this experiment was to determine dietary vitamin E requirement in olive flounder.

Materials and Methods

Composition of the semi-purified basal diet is shown in Table 1. Five diets were formulated to contain five levels 0, 15, 30, 60, and 600 mg dl-tocopheryl acetate (TA)/kg diet. Casein and gelatin were used as the main protein sources in the semipurified experimental diets. Defatted flounder muscle was added to the diets to increase the palatability of the experimental diets. Prior to the start of the feeding trial, fish were fed the vitamin E free diet for 3 weeks to adjust to the semi-purified diet and to deplete possible body reserves of vitamin E. The feeding trial was conducted in a flow-through system with 160-l aquaria receiving filtered seawater at a rate of 1.2 l/min. Supplemental aeration was provided to maintain dissolved oxygen near saturation. Water temperature was 22 °C at the beginning of the feeding trial and was 17 °C at the end of the feeding trial according to the normal changes of natural water

temperature. Fish averaging 3.92 ± 0.01 g (mean \pm SD) were randomly distributed to each aquarium as groups of 20 fish and fed the experimental diets in triplicate at a rate of 4 to 5% of wet body weight per day for 12 weeks. Total fish weight per aquarium was measured every 3 weeks, and the amount of diet fed was adjusted accordingly.

Results and Conclusion

Growth performance was shown in Table 1. After 12 weeks of feeding trial, weight gain (WG, %) of fish fed 15, 30, 60 and 600 mg TA diets was significantly higher than that from fish fed vitamin E free diet ($P < 0.05$). There was no significant difference in WG among fish fed diets containing 15, 30 and 60 mg TA/kg diet, and among fish fed diets containing 15, 30 and 600 mg TA/kg diet. Fish fed 600 mg TA/kg diet showed adverse response in terms of growth and survival rate. Broken-line analysis indicated that the dietary vitamin E requirement could be 21.2 ± 3.1 mg TA/kg diet based on WG at 7% dietary lipid level. Tissue α -tocopherol concentrations will be included at presentation.

Table 1. Percent weight gain (%), feed efficiency (FE), and survival of olive flounder fed diets varying in dl- α -tocopheryl acetate for 12 weeks¹

dl- α tocopheryl acetate (mg/kg diet)	WG (%)	FE	Survival (%)
0	518.5 ^c	64.5 ^c	81.7 ^{ab}
15	582.9 ^{ab}	73.3 ^b	86.7 ^a
30	598.6 ^{ab}	77.4 ^b	88.3 ^a
60	618.6 ^a	87.2 ^a	91.7 ^a
600	560.5 ^b	74.6 ^b	68.3 ^c
Pooled SEM	10.5	2.4	3.2

References

- Bai, S. C. and Lee, K. J. 1996. Different levels of dietary DL- α -tocopheryl-acetate affect the vitamin E status of juvenile Korean rockfish, *Sebastes schlegeli*. *Aquaculture* 161: 405-414.