

Effects of alpha-Tocopherol Level in Diet on the Biological and Biochemical Properties of Cultured Sweet Smelt *Precoglossus altivelis*

Soo-Kyung Moon, Woo-Geon Jeong, Bo-Young Jeong, Masashi
Maita* and Toshiaki Ohshima*

Gyeongsang National University, *Tokyo University of Fisheries

Introduction

Alpha-tocopherol (alpha-Toc) is a classical lipophilic antioxidant well known as a scavenger of free radicals in a hydrophobic milieu. The primary function of alpha-Toc is to stabilize cellular and subcellular membrane by preventing peroxidative damage of structural polyunsaturated fatty acids (PUFA). The characteristic aroma of sweet smelt *Precoglossus altivelis* is known as oxida breakdown products of PUFA ironically. The key compounds of the fish aroma have been reported to be volatile nine-carbon aldehydes and alcohols such as (*E*)-2-nonenal, (*E,Z*)-2,6-nonadienal and 3,6-nonadien-1-ol. The tissues of arom fish including sweet smelt have unusual amounts of lipid hydroperoxdes. Unlikely non-aromatic fish, when alpha-Toc is overdosed to aromatic fish, lipid peroxidation may be suppressed excessively in the fish tissues and subsequently the generation of aroma may be also suppressed.

In the present study, effects of overdose of alpha-Toc on the intensity of aroma growth, lipid peroxidation, plasma component, non-specific immune parameter, proximate composition and fatty acid compositions in cultured sweet smelt were investigated.

Materials and Methods

Juvenile sweet smelts were purchased from a hatchery and reared up to 36.2g on a commercial diet for approximately 4 months prior to experiment at Kyeongsangnam-do Hatchery, Korea. The fish were randomly divided into two dietary groups. Each group was reared for 8 weeks in duplicate polypropylene tanks (ID. 5.3m) of 500 fish each. Fish were fed a control diet (CO group, alpha-tocopherol 0.01%) and experimental diet (HT group, alpha-tocopherol 1.00%) Blood samples were collected from a representative sample of the experimental

fish. The fish muscle and liver were removed from 20 specimens of male and female, respectively, in each tank and stored at 80 C until analysis. Lipid content was extracted with chloroform-methanol. Fatty acid was determined after methylation (Jeong et al., 2000). Plasma component levels were determined with an automatic biochemical analyzer (CL-7100, Shimadzu Seisakusho, Co. Ltd., Kyoto, Japan) using the following methods: total protein, Biuret method; urea nitrogen, glucose, total cholesterol and triglyceride, enzymatic method. TBARS, OH radical and SOD activity were assayed in the fish plasma. The flavor intensity such as watermelon-like aroma or cucumber-like aroma of cultured sweet smelt was ranked from + to +++++ by increasing intensity and that of wild fish was designated by +++++ .

Results

The effect of alpha-tocopherol (alpha-Toc) level in diet on the biological and biochemical properties of cultured sweet smelt, *Plecoglossus altivelis*, was investigated. For this purpose, the cultured fish were fed on two types of different diets for 8 weeks; a control diet was added 0.01% of alpha-Toc (CO group) and an experimental diet was added 1.00% of alpha-Toc (HT group). Both diets were rich in docosahexaenoic acid (DHA, 22:6n-3) and eicosapentaenoic acid (EPA, 20:5n-3), accounting for 12.3-13.2% and 12.1-12.4%, respectively. The fish of CO group showed slightly high level of growth rate (GR) and feed efficiency (FE), and female fish were superior to male fish in GR and FE. Lipid content of muscle and ovary was high in CO group compared with HT group, but that of testis showed a similar level in both groups. The proportion of polyunsaturated fatty acids (PUFA) in muscle had almost no difference by sex and both groups. In testes, the proportion of PUFA was 1.35 times (HT group) to 1.54 times (CO group) as much as in ovaries, in which was high approximately 1.5 times compared with muscle. TBARS and OH radical levels of plasma were higher in CO group than HT group, SOD activity was also slightly high in the former. The intensity of aroma, such as watermelon-like and cucumber-like aroma, was related positively with TBARS and OH radical levels in plasma. The level of triglyceride (TG) and total cholesterol (CHOL) in plasma of CO group was higher than those of HT group. Survival rate was high in CO group with higher level of TG and CHOL in plasma.

References

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