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Effects of dietary n-3 highly unsaturated fatty acids levels on growth and body composition of juvenile flounder (*Paralichthys olivaceus*)

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Introduction

The importance of dietary lipid as essential fatty acids (EFA) source for fish growth and development is well demonstrated. Marine fish contain large amounts of DHA and EPA in the phospholipids of their cellular membranes. Especially 22:6n-3 is present in high concentrations in the membrane of neural and visual cell membranes such as brain and retina of fish. Usually marine fish have low or no capacity to synthesize highly unsaturated fatty acids (HUFA), and hence require those fatty acids as dietary constituent. However, no information on the quantitative requirement for n-3HUFA of juvenile flounder. Therefore, this study was conducted to investigate the effects of dietary n-3HUFA levels on growth and body composition, and to evaluate requirement of juvenile flounder for n-3HUFA.

Materials and Methods

Eight experimental diets containing graded seven levels of n-3HUFA (containing both EPA and DHA) at 0.0, 0.4, 0.8, 1.2, 1.6, 2.0 and 2.4 %, and only 1.2 % EPA were prepared. Defatted white fish meal and casein were used as the protein sources. White fish meal was defatted by mixture of chloroform and methanol (2:1, v/v) to avoid the influence of fish meal oil, and dextrin was used as dietary carbohydrate. Three replicate groups of fish average weighing 8.5 g were hand-fed to visual satiety twice a day for 8 weeks. Growth performance, body composition

and hemochemical parameters of fish were determined. Data for each treatment was analyzed by ANOVA and Duncan's multiple range test.

Results and conclusion

No significant difference was observed in survival among all diet groups ($P>0.05$). However, weight gain, feed efficiency and protein efficiency ratio of fish were significantly increased ($P<0.05$) with increasing dietary n-3HUFA levels up to 0.8%, however, further increase of dietary n-3HUFA level decreased growth performance of fish. Weight gain of fish fed the diet containing only EPA as 1.2% n-3HUFA was significantly lower than that of fish fed the 1.2% n-3HUFA diet containing both EPA and DHA ($P<0.05$). DHA and n-3HUFA contents of fish increased gradually with the elevation of dietary n-3HUFA level ($P<0.05$). However, EPA content increased with the increase of n-3 HUFA in the diet up to 1.2%, and then reached a plateau between 1.2 and 2.4% n-3HUFA. 18:1n-9/n-3HUFA as an indicator of EFA status and monoenoic fatty acids contents of fish decreased with increase of dietary n-3HUFA level. Hematocrit, hemoglobin and red blood cell of fish were not affected by dietary n-3HUFA level ($P>0.05$). Serum triglyceride and GOT concentrations decreased with the increase of dietary n-3HUFA level.

These results suggest that the n-3HUFA requirement of juvenile flounder as ethyl ester is about 0.8%. Furthermore, DHA is superior to EPA as EFA, and excessive n-3 HUFA supplement in diet can impair the growth of juvenile flounder.

References

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