

# **Preferential Incorporation of Fatty Acids in the Testis and Ovary of Cultured and Wild Sweet Smelt *Precoglossus altivelis***

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## **Introduction**

Although cultured sweet smelt production recently have been rapidly increased from 89 metric tons (M/T) in 1997 to 500M/T in 1999 in Korea, wild fish have been still used as broodstock for cultured fish seed. This is considered due to having higher sperm and egg quality in wild fish broodstock than cultured fish. However, capturing a number of wild sweet smelt broodstock might lead to decreasing of the production of wild fish, in truth, of which production has been greatly decreased so that a number of artificial juvenile have been stocked some rivers in Korea. Therefore, it is necessary to improve quality of cultured fish in order to use as broodstock for cultured fish seed. The fatty acid composition of fish tissue reflects dietary lipid to a great extent and thus the fatty acid compositions of some key tissues such as muscle and reproductive tissue can be manipulated easily by dietary lipid. During an investigation into the quality, in particular, watermelon-like aroma of cultured sweet smelt by different dietary fatty acid compositions, it was found that testes and ovaries have great differences in PUFA compositions of cultured and wild sweet smelt. We believe that this study could be provided information in detail to manipulation of dietary lipid for cultured sweet smelt broodstock.

## **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 three dietary groups. Each group was reared for 12 weeks in duplicate polypropylene tanks (ID. 5.3m) of 500 fish each. Fish were fed a control diet (CO group) rich in EPA (12.1%) and DHA (12.3%), and a commercial diet deficient n-3 PUFA but rich in 18:1n-9 (DP group), and a diet deficient in EPA and DHA but rich in alpha-linolenic acid (ALA, 18:3n-3, 41.2%) and linoleic acid (LA, 18:2n-6, 16.4%) (L

group). Diet of DP group was used a commercial diet containing EPA or DHA less than approximately 2% in order to demonstrate the effect of de novo synthesis of n-3 PUFA in fish tissues. Diet of LP group was immersed perilla oil (10%) as lipid resource of the commercial diet. Wild fish was captured in the Seomjin River in Korea. The fish muscles and gonads were removed from 20 specimens of male and female, respectively, in each tank and mixed with a speed cutter (National, MK-K51, Japan). Duplicate samples from each tank were subjected to analyses. Total lipid (TL) was extracted and purified according to the method of Bligh and Dyer (1959). Fatty acid was determined after methylation (Jeong et al., 2000).

## Results

The effect of dietary lipids on the fatty acid compositions of muscle, testis and ovary of cultured sweet smelt, *Plecoglossus altivelis*, was investigated and compared with those from wild fish. For this purpose, cultured fish were fed three types of different diets for 12 weeks; a control diet rich in docosahexaenoic acid (DHA, 22:6n-3) and eicosapentaenoic acid (EPA, 20:5n-3) (CO group), a diet deficient in DHA and EPA (DP group) but rich in alpha-linolenic acid (ALA, 18:3n-3) and linoleic acid (LP group). Muscle and gonads fatty acid compositions, on the whole, were related with their dietary fatty acids. Despite difference of DHA and EPA contents in diets, muscles and gonads, respectively, contained almost equal level of DHA and EPA, in particular, in each CO and DP group. However, muscle and gonads of LP group showed lower level of DHA than other groups, due to being the highest level of ALA. In the wild fish muscle, DHA content was similar to that of CO and DP groups, but EPA content showed the highest level in all groups. There was almost no difference of fatty acid proportions by sex in all muscles. On the other hand, testes of cultured and wild fish were rich in DHA, EPA, docosapentaenoic acid and arachidonic acid, while ovaries were rich in oleic, palmitoleic and linoleic acids as well as ALA. These results indicate that in the sweet smelt tissues the synthesis of n-3 PUFA more than C20 are capable de novo from their precursors and special fatty acids are preferentially incorporated to testis or ovary, respectively, to play different physiological function.

## References

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