PE-5

# Effects of feeding rate and number of meal on growth and body composition of ayu *Plecoglossus altivelis*

Sung Hwoan Cho, Jong Kwan Lee, Jong Ha Lee, Young Soo Lim,
Jung Youn Park, Han Kyu Lim and Sang Min Lee*
Uljin Marine Hatchery, National Fisheries Research and Development Institute
Osan-Ri, Wonnam-Myon, Uljin, Kyungbook 767-863, Korea
*Kangnung National University, Kangnung 210-702, Korea

## Introduction

Supply of nutrition-balanced feed is very important for growth of fish, especially for growth of early period of fish. Therefore, most of commercial feeds for larval and juvenile fish are relatively expensive due to high level of the several nutrients to satisfy their requirements for growth. Overfeeding larval fish may increase fish production cost because of larvae feeds high price and deteriorate water quality, eventually reduce growth of fish. However, less feeding than desired amount to achieve normal growth of fish is also undesirable because of poor growth. Therefore, optimum feeding rate and feed allowance for growth of early period of fish is critical due to the economical and biological aspects.

Some nutrition studies for the growth of ayu have been reported (Kanazawa et al., 1982, Nematipour et al., 1987, Yao et al., 1994, Lee et al. 2001). However, no study on optimum feed allowance and feeding rate for growth of ayu larvae has been done yet. Therefore, in this study, the effects of feeding rate and number of meal for growth and body composition of ayu larvae were investigated.

## Materials and methods

About 100-day old fish larvae were used in this study. Four hundreds of larvae (An initial body weight of 0.157 g and 3.5 cm in total length) were randomly distributed into thirty of 300 L tanks (water volume: 260 L) and acclimated for 7 days before the initiation of the feeding trial. During acclimation period, ayu larvae were fed 3 times daily by

commercial feed at the rate of 5% of body weight of fish and dead fish were replaced with live fish. Water exchange rate was 20 L/min. Water temperature and salinity during the feeding trial ranged from 9.5 to 12.0 ℃ and salinity ranged from 33 to 34‰, respectively. Water temperature and photoperiod followed the natural conditions throughout the feeding trial. All tanks were daily cleaned and dead fish were removed and counted during the feeding trial. Fish were fed 7 days a week and the feeding trial lasted for 8 weeks. Feed allowance was weekly increased by 10%.

A 2 (Feeding rate: 3 and 6% of body weight of fish) x 5 (Number of meal: 1 meal/2 day at 09:30, 1 meal/1 day at 09:30, 2 meals/1 day at 09:30 and 17:00, 4 meals/1 day at 09:30, 12:00, 14:00 and 17:00 and 6 meals/1 day at 08:00, 09:30, 12:00, 14:00, 17:00 and 18:30) factorial experiment design with 3 replications was used in this study. All fish were hand-fed during the feeding trial except for fish receiving 6 meals daily at 08:00 and 18:30.

200 fish at initial and all fish at the end of the feeding trial were sacrificed for proximate analysis of the whole body composition of fish. Crude protein, lipid, ash and moisture contents were measured according to standard method (AOAC 1990). The significance of variables was determined by using One-way ANOVA, Duncan's test and Two-way ANOVA analysis on SAS (SAS Institute, Cary, North Carolina).

## Results

Survival of ayu larvae was significantly affected by number of meal ($P<0.0001$), but not by feeding rate. Survival of ayu tended to increase with number of meal, but did not increase over 4 meals per day at both feeding rate. A significant interaction of feeding rate and number of meal on survival was observed ($P<0.04$).

Weight and total length gained of ayu during feeding trial was significantly affected by number of meal ($P<0.0001$), but not by feeding rate. The highest weight and total length gained of ayu was observed in 6 meals per day at both feeding rate, but was not significantly different from that of fish fed 4 meals per day ($P>0.05$). Specific growth rate (SGR, g/day) was significantly affected by number of meal ($P<0.0001$), but not by feeding rate. Under limited feed allowance like 1 meal per 2 day or 1 meal per 1 day, weight and length gained of fish tended to improve with feeding rate. Feed efficiency ratio (FER) was significantly affected by both number of meal and feeding rate ($P<0.0001$). Chemical composition of whole body of fish was significantly affected by feeding rate and/or number of meal, especially, body lipid content of larvae significantly increased with number of meal ($P<0.05$).

According to the results of this study, the optimum feeding rate and number of meal for growth of ayu larvae (an initial weight of 0.159 g) during 8 weeks seemed to be 3% and 4 meals per day .

## References


Duncan D.B. (1955) Multiple-range and multiple F tests. Biometrics. 11, 1-42.

Kanazawa, A., Teshima, S., Sakamoto, M. 1982. Requirements of essential fatty acids for the larval ayu. Bull. Jap. Soc. Sci. Fish. 48 (4), 587-590

Lee, S., Kim, D., Cho, S.H. 2001. Effects of dietary protein and lipid level on growth and body composition of juvenile ayu (*Plecoglossus altivelis*) reared in seawater. Aquaculture Nutrition. (in printing).

Nematipour, G.R., Nakagawa, H., Nanba, K., Kasahara, S., Tsujimura, A., Akira, K. 1987. Effect of Chlorella-extract supplement to diet on lipid accumulation of ayu. Nippon Suisan Gakkaishi Bull. Jap. Soc. Sci. Fish. 53 (9), 1687-1692

Yao, S., Umino, T., Nakagawa, H. 1994. Effect of feeding frequency on lipid accumulation in ayu. Fish. Sci. 60 (6), 667-671