Formulated diet for juvenile of Pacific bluefin tuna, *Thunnus orientalis* at 18-25 day after hatch

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As Pacific bluefin tuna (PBT), *Thunnus orientalis* has great demand in the 'sushi' and 'sashimi' market in Japan, the scientists from Kinki University have been carried out different experiments to establish a complete life cycle of this species in the captivity. Once we have established the full life cycle under captivity,[1] a series of experiments have been carried out to formulate artificial diet for juvenile PBT.[2-8] We have been succeeded to establish a nutritionally balanced artificial diet from 25 day after hatch (DAH) PBT juveniles.[9,10] However, a suitable diet for 18-25 DAH PBT juveniles is yet to be established. Although it is very difficult to get PBT juvenile accustomed to artificial diet at this stage, we have to give our continuous efforts to formulate the diet.

In this study, we have investigated the suitability of freeze-dried saba meal as protein source for PBT juveniles at 18-25 DAH.

Materials and methods

Experimental diets

Dietary formula is given in Table 1. The enzyme treated Chilean fish meal, EFM (Profish S.A, Santiago, Chile) and freeze-dried saba meal (FD saba) were used as protein sources. Ishidai larvae were used as control diet. Salmon egg oil was used as lipid source. Once moist pellets were prepared using pellet machine, appropriate sizes were adjusted using sieves and were stored in a freezer at -20°C until used. *Fish, experimental design and sampling*Naturally spawned fertilized eggs were obtained from the Fish Nursery Center, Kinki University, Oshima, Wakayama. The eggs were reared in the Fish Nursery Center, Kinki University, Uragami, Wakayama and cultured until 17 DAH. On 18 DAH, 100 juveniles with an initial body weight of 0.147 g were randomly distributed into each of duplicate 500-L tanks for each treatment. Initial fish were also sampled and kept frozen at -20 and -80°C until analysis. Test diets were fed to fish 6 times daily (5:30, 8:00, 11:00, 14:00, 1600 and 18:00) upto apparent satiety for 7 days. Ishidai larvae were supplied according to the protocol used by Uragami Nursery Center. The tanks were illuminated for 24 h. A clock-wise water circulation was created inside the tank. Bottom cleaning was performed two times a day (10:00 and 16:00), and dead fish were collected and weighed. The mean water temperature and DO were 26.8 ± 0.1°C and 6.9±0.4 mg/L, respectively. At the end of the rearing trial, 20 fish from each tank were randomly selected to measure length and weight. As we didn't have sufficient fish to analyze proximate composition, only growth data are provided here to compare the performance among treatments.

Table 1. Dietary formula

Ingredients (%)	EFM	FD saba Ishidai larvae
EFM	70.5	
FD saba		70.5
Casein	20.0	20.0
SRO	3.0	3.0
α-starch	1.0	1.0
Vitamin C	0.1	0.1
Vitamin mix	1.5	1.5
Mineral mix	1.0	1.0
Soybean lecithin	2.0	2.0
Feeding stimulant	0.5	0.5
CM-cellulose	0.2	0.2
P-Na	0.2	0.2

The growth data among treatments were compared using Tukey's test and significance was considered at $P<0.05$.

Results and discussion

Initial and final mean body weight under different treatments are given in Fig. 1. Control group had significantly higher final mean body weight followed by EFM and FD saba groups. As FD saba group had one third final mean body weight than that of control group, it is assumed that this diet cannot be used for 18-25 DAH PBT juveniles. Moreover, EFM also could not produce satisfactory results.

Specific growth rate and survival rate are given in Fig. 2. Again both parameters showed the similar trend as was in final mean body weight. Control group had significantly higher values for both parameters and FD saba group had the lowest values. Specially, there was great variation in survival rate. Control group had 79.5% survival rate, while EFM and FD saba groups had only 38.5 and 25.0%, respectively. This data again suggested that FD saba cannot be used as protein source for PBT juvenile at 18-25 DAH. Although we did not analyze in detail why PBT juveniles could not sustain their growth

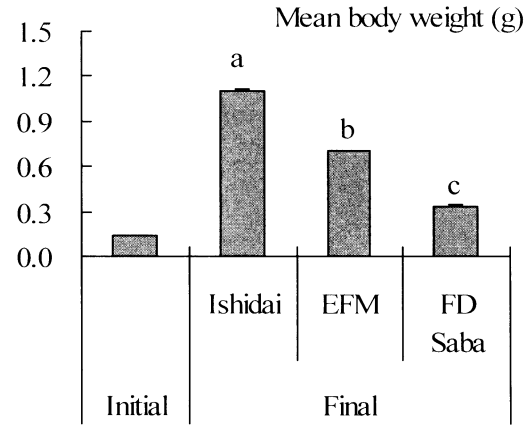

Fig. 1. Initial and final mean body weight of PBT juveniles under different treatments.

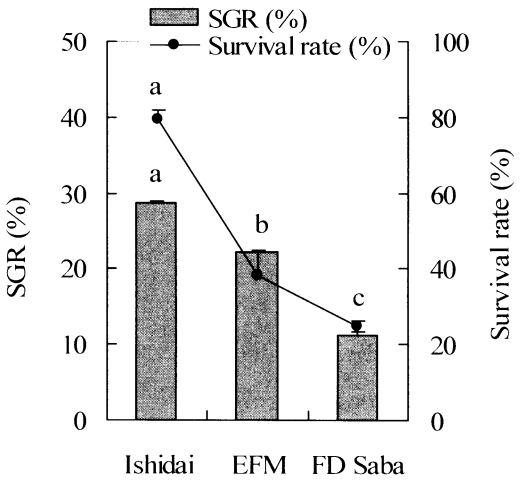

Fig. 2. Variation in specific growth rate (SGR) and survival rate among treatments. SGR = 100 × (ln final weight – ln initial weight)/rearing period.

when fed FD saba diet, it is assumed that the juveniles may not digest properly to sustain their fast growth.

In conclusion, FD saba meal cannot be used as protein source for PBT juvenile at 18-25 DAH at least at the dietary formula used here.

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References

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