Influence of the dietary protein and fat contents on the growth performances of *Xiphophorus maculatus*: A preliminary study

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1. Introduction

Ornamental fish culture has been a hobby and a commercial industry since 1930's in Sri Lanka. The geographical location and the climatic conditions were also being beneficially affected on the ornamental fish industry in Sri Lanka. Even though Sri Lankan fish enthusiasts have paid their attention towards keeping of goldfish and koi carps, guppies, swordtails and platies were the foremost species in Sri Lankan export trade. Fish exporters used to collect the required quantity of guppies, swordtails and platies through a buy back system, in which the contact farmers grow the demanded fish species in cement tank or mud pond systems. However, platy (*Xiphophorus maculatus*) was such a demanded ornamental fish species, who had given a low priority in the sense of culturing for exports (Wijesekara & Yakupitiyage, 2000).

Sri Lankan ornamental fish growers were facing a lot of difficulties throughout the rearing period, where unavailability of a targeted, cost-effective and quality feed is the major problem. Thus, developing an economically viable, good quality feeds to match different ornamental fish species would be essential for further development of the industry (Heenetigala, 2012). However, development of a feed has to be done with a proper way, with the use of appropriate crude protein and crude fat levels while balancing the energy levels for outstanding overall performances in the fish.

2. Materials and Methods

Experimental Diets

Four treatment diets i.e., T_1: Crude protein (CP)-35% and crude fat (CF)-6%, T_2: CP-35% and CF-12%, T_3: CP-40% and CF-6%, T_4: CP-40% and CF-12%, were prepared to comprise 02 crude fat levels (6% and 12%) and 02 crude protein levels (35% and 40%).

In the preparation of diets, properly sieved dry feed ingredients i.e., coconut poonac, rice bran, wheat flour, fishmeal, vitamin-mineral mixture, L-lysine and DL-methionine, were uniformly mixed with fish oil and water at appropriate ratios. Then the prepared mixture was minced using a 4 mm mesh sized mincer. After that, the minced mixture was oven dried at 50 ^{0}C for 24 hours until the moisture content reaches 8-10 %. Finally, the particles were grounded and sieved using a 0.4 mm mesh sized net.

Feeding trial

One day old *X. maculatus* fry were introduced into glass tanks (Length =2 ft, width =1ft and water height =6 inches) which were arranged in triplicates, with a rate of 50 fries per tank. Fish in each tank were acclimatized for a week before the feeding trial. Fish were fed to apparent satiation, 03 times per day.

Growth performances

Body weight (BW) and body length (BL) of fish were measured at the beginning and after 30 days. Water quality parameters (temperature, pH and dissolved oxygen) were regulated at appropriate levels. Fish mortality in each tank was recorded at the end of the feeding trial.

Statistical analysis

Data was analysed using IBM SPSS Statistics (version 21.0) software and Two-way ANOVA. The mean comparison was done using, Duncan's Multiple Range Test.

3. Results and Discussion

To our knowledge this was the first attempt ever made to evaluate the growth performances of *X. maculatus* with reference to the different dietary protein and lipid levels. A significant ($P<0.05$) effect was observed in between the two test factors i.e., crude fat content and crude protein content, on the growth performances of *X. maculatus* nurselings. Evaluation of individual treatments evidenced that the T_3 (0.056±0.004 g) group had the highest body weight gain than those of T_1 (0.036±0.004 g), T_2 (0.030±0.004 g) and T_4 (0.029±0.001 g) where the body length gains also showed the self-same (T_3- 0.819±0.081 cm, T_1- 0.577±0.051 cm, T_2- 0.524±0.069 cm, T_4- 0.520±0.043 cm).

At the 40% dietary protein content, the specific growth rate (SGR) was highest at 6% fat content (9.533±0.268 % day^{-1}), whereas, the SGR was negatively affected at 12% fat content (8.067±0.119 % day^{-1}). At 35% dietary protein content, SGR was not affected by different dietary fat contents i.e., 6% (8.492±0.303 % day^{-1}) and 12% (8.171±0.297 % day^{-1}). However, with reference to the all four diets, T_1 had the best SGR. The feed conversion ratio (FCR) was proven to be best at T_3 (2.435±0.172) than those of T_1 (3.455±0.450), T_2 (3.897±0.483) and T_4 (4.093±0.209). Compliance with the results of this study, Kruger et al. (2000), also experienced poor growth performances in *X. helleri* juveniles, at high lipid levels (over 6%) where the protein contents were comparatively low (below 38%).

Feed intake (FI) was highest at 6% dietary fat content, at 40% protein content (0.135±0.001), followed by 35% protein content (0.122±0.001), whereas the FI was extremely impaired at 12% fat content among 35% (0.116±0.001) and 40% (0.117±0.001) crude protein containing dietary groups. This effect was evidenced by Li et al. (2011) for Snout bream (*Megalobrama amblycephala*), where the FI showed a huge variation with the dietary fat content. A proper balance in between dietary protein and energy contents was requisite for an efficient protein intake. Unless the protein and energy were balanced in a diet, "sparing effect"; a phenomenon in which the body protein deposits forced to breakdown, due to poor availability of dietary carbohydrates, would be possible (Steffens, 1996).

Velasco-Santamaría, and Corredor-Santamaría (2000) found that the protein requirement of the finfish could be varied specifically in relevant with the kind of species and growth stage. Compliance with the available literature, the results of this preliminary study implied that the growth performances of *X. maculatus* nurselings were best in the diet where 40% dietary protein content combined with 6% fat content.

4. Conclusions

A combination of high protein content together with a low-fat content in *X. maculatus* nurseling diets would be ideal for an effective utilization of the proteins and the optimum growth performances thereof. A well-balanced protein and energy content in a diet was also a prerequisite to avoid body protein degeneration and a better growth thereby.

5. References

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Acknowledgement

The authors acknowledged AHEAD/ RIC grant and the National Aquaculture Development Authority for facilitating the research.