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REPRODUCTIVE PERFORMANCE OF ORNAMENTAL RED CHERRY SHRIMP, *NEOCARIDINA HETEROPODA* (KUBO) IN AQUARIUM TANKS

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Abstract: Reproductive performance of ornamental red cherry shrimp, *Neocaridina heteropoda* was studied by feeding different protein feeds for a period of 60 days in six glass aquarium tanks (30x60x30cm). Pellet feed having 20, 30 and 40% protein were prepared and fed daily at 5% body weight. Reproductive performance of shrimp was assessed by observing ova maturation, Gonado Somatic Index (GSI) and fecundity. Significant ($p<0.01$) difference in GSI and fecundity was observed between different protein diet fed shrimp. Mean GSI was found to be high in 40% protein when compared to 30 and 20 % protein feeds; whereas fecundity was high in 30% followed by 40% protein feed fed shrimp. Shrimp fed with higher levels of protein (40 and 30%) showed bright colour and good health than that of 20% protein feed fed shrimp. Dietary protein plays significant role in gonad development and reproductive performance in Red cherry shrimp.

Key words: Red cherry shrimp, Protein feeds, Gonado somatic index, Fecundity.

INTRODUCTION

In ornamental fish industry, supplementary feed and their nutrient quality plays significant role in triggering growth, reproductive performance and health of fishes (Yousefian *et al*., 2012). A correct formulation of the diet improves the nutrient digestibility, growth, maturation and reducing the maintenance cost (Yohana and Wilson, 2011). The protein in feed is directly related to the amino acid content which is essential for growth and gonad maturation (Lovell, 2000). The quantity of protein required for the fish to be healthy depends on a number of variables like the species of fish, amount of natural food available, growth rate etc. (Dahlgren, 1980; Shim *et al*., 1989; Chong *et al*., 2004; Bilen and Bilen, 2013).

Red cherry shrimp, *Neocaridina heteropoda,* is an ornamental fresh water shrimp mostly found in Taiwan and Asia. Due to the bright colour, the wild variety of *Neocaridina heteropoda* is used by aquarists to selectively breed colour morphs like the red cherry shrimp and the yellow shrimp (Nur and Annie, 2013). Red cherry shrimp will adapt to a wide range of water conditions and will thrive in the same conditions as many common aquarium fish.

At present no study has been reported on the role of protein feed on reproductive performance of fascinating Red cherry shrimp. Considering the importance of red cherry shrimp in ornamental aquaculture, a study was conducted to assess the effect of different protein feeds on Gonado somatic index (GSI) and fecundity.

MATERIALS AND METHODS

Experimental set up

The experiment was conducted in six glass aquarium tanks kept at the wet lab of Dept. of Zoology, All Saints' college for a period of 60 days. Required number (30) of Red cherry shrimp was procured from an Aquarium shop at Chakkai, Thiruvananthapuram and stocked them in an aquarium tank for acclimation. After one week acclimation, ten shrimp each was transferred to previously set six aquarium tanks (60 x 30 x 30 cm).

Before transferring shrimp, bottom of each tank was layered with mixture of gravel and sand and planted Java moss and *Vallisneria*. Adequate aeration was also provided at the centre of each tank. Shrimp with two tanks were considered as a unit for testing each protein feed.

Preparation of Protein feeds

Three different type of protein feed such as 20, 30 and 40% were prepared based on Hardy's square method (Hardy, 1980). Rice bran, Fish meal, Ground nut oil cake, Tapioca flour, Vegetable oil, B complex Vitamin were the feed ingredients used for feed formulation. After weighing feed ingredients, these were mixed thoroughly, sprinkled with water and cooked. The cooked and cooled dough was added with vegetable oil and B complex Vitamin (0.5%) and extruded the dough through a pelletizer having 2mm in the die. The fine threads of feed thus prepared was oven dried (60°C) and later crumbled it into small pellets and kept in airtight containers.

Shrimp rearing

Ten pieces of uniform size (1.8-2 cm) shrimp including males and females were stocked in each tank at 1:1ratio. Feeding was done at 5% of body weight daily at 9:00 am and 3:00pm. Shrimp in all the tanks were sampled once in every week to check stages of gonad maturity.

Estimation GSI and Fecundity

Shrimp having egg mass on belly were collected for the estimation of Gonado somatic index and Fecundity (Halver and Ronald, 2002). Gonado Somatic Index (GSI %) was calculated as weight of ovary/weight of shrimp x 100. Fecundity was calculated as the total number of eggs / sub sample (g) x weight of the ovary (g).

Statistical analysis

One-way analysis of variance (ANOVA) was employed to find out the statistical difference in GSI and fecundity between different protein feeds (MS Office, 2007).

RESULTS

Shrimp fed with 40% protein feed showed faster ovary development and maturation than that of 30 and 20% protein feed and it was visible from three weeks of culture. Females were found to be larger and displayed bright colour when compared to male shrimp (Fig. 1). During growth phase, shape of ovaries were found to be draped across both sides of female, giving rise to a saddle and showed signs of mating (Fig.2).

Details on GSI and fecundity are presented in Fig.3. Mean GSI was high in 40% protein when compared to 30 and 20 % protein feed and it showed significant difference between each group. Fecundity was high in 40% and 30% protein and it differed significantly from 20% protein fed shrimp. Shrimp fed with 20% protein feed showed poor performance when compared to other protein diets.

DISCUSSION

Result of the study shows that a diet containing 40 and 30% protein brought higher GSI and fecundity rate in Red cherry shrimp, which indicates that higher level of protein is required for

Fig. 1. Shrimp fed with 40% protein feed carrying egg mass

Fig. 2. Female (top) and male shrimp (below) fed with 40% protein feed

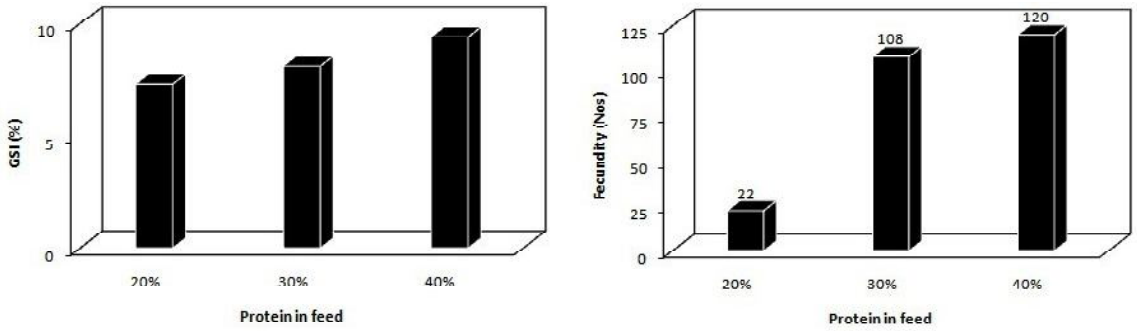

Fig. 3. GSI and Fecundity of shrimp fed with differen protein feeds

gonad development. Similar enhanced reproductive performance was also observed in dwarf gourami and sword tail when it was fed with a diet containing 35% protein (Shim *et al*., 1989; Chong *et al*., 2004). According to Sales and Janssens (2003), higher level of protein (40-50%) in diet enhances gonad maturation and inadequate protein retards maturation and affect egg development and embryo hatching in ornamental fishes. This observation is true in the present study also that the shrimp fed with low protein feed (20 %) showed poor GSI and fecundity.

It is interesting to note that egg development was started in 40% and 30% protein feed fed shrimp from the second week of experiment onward; which shows that higher protein in feed plays significant role in gonad maturation. Moreover, shrimp fed with higher levels of protein showed bright colour and health than that of low protein (20%) diet fed shrimp. Reports suggest that dietary protein enhances growth, colour and health in sword tail, *Xiphophorus helleri* and gold fish, *Carassius auratus* (Ling *et al.*, 2006; Bilen and Bilen, 2013) and the results of the present study are agreeing with the observation. It is suggested that the optimum level of protein required for gonad maturation and reproduction in cherry shrimp is found to be 30-40% protein in feed. Since studies on nutritional requirements of Red cherry shrimp are scanty, results of the study can be considered as baseline information for the dietary protein requirement for red cherry shrimp culture.

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