Partial Replacement of Beef Heart with Druckweed (*Lemna minor*) for Ornamental Carp (*Cyprinus carpio*)

G.L.U.C. Jayarathne, S.C. Jayamanne, M. Bambaranda
Uva Wellassa University, Badulla, Sri Lanka

and

L.D.R. Bandaranayake
Department of National Zoological Gardens, Dehiwala, Sri Lanka

Abstract

Koi (Carp) is an ornamental fish variety belongs to family Cyprinidae. Beef heart is used as a good source of protein for fish. Since the cost of beef heart is high, formulation of fis h feed using an alternative protein source is important to reduce the cost of fish feed. Duckweed was used as the alternative source for beef at the present study. Main objectives of the study were to determine the optimum inclusion level and examine the growth performance of koi fingerlings that are very important for the ornamental fish industry.The experimental system was consisted of 18 rectangular glass tanks as having three replicates for each treatment. Ten fish were stocked in each tank (average weight 1.17±0.01 g and average length 3.3±0.05 cm). *Lemna minor* (duckweed) was collected and sun dried for two days and finely ground. Beef heart, duckweed, rice bran and wheat flour were used as feed ingredients. Vitamin and mineral were equally fixed as 0.5 % by weight for each six diets. Six different diets were formulated by following the Pearson square method with inclusion of different levels of duckweed 0 %, 10 %, 20 %, 30 %, 40 %, and 50 % (Named as Diet 1,2,3,4,5 and 6 respectively). Dietary protein level of diets was estimated as 35 %. The amount of feed offered was 5 % body weight of fish. Daily feed allowance was twice a day. Weight and standard length of all fish were measured weekly intervals for seven weeks. Water quality parameters (Temperature, pH and Dissolved oxygen) were recorded and maintained throughout the experimental period. Percentage survival rate, Mean Weight Gain (MWG), Specific Growth Rate (SGR), Food Conversion Ratio (FCR), Protein Efficiency Ratio (PER) were calculated using standard methods. Data were analyzed using one-way Analysis of Variance (ANOVA). According to the mean values of growth parameters of fish fed with six different diets, the best values were recorded for diet 2 replacing beef heart with 10 % duckweed leaf meal. There was a significantly difference among mean values for FBW, MWG, SGR (% day $^{-1}$), FCR and PER values of six different diets ($P<0.05$). MWG and SGR recorded for fish fed with diet 2, 3, 4 and 5 were not significantly different from that of the control diet ($P>0.05$). The best SGR value (1.95 % day $^{-1}$) and the best FCR value was recorded for fish fed with diet 2. PER value of fish fed with control diet did not show a significant difference from that of other diets. There was a significantly difference ($P > 0.05$) among PER values of fish fed with diet 2 from that of other diets except from the control diet. There was no significantly difference ($P > 0.05$) in any of the water quality parameters in relation to different diets. Average water temperature was ranged between 29.61 °C to 29.66 °C while dissolved oxygen content was fluctuated from 6.35 ppm to 6.50 ppm. pH was ranged between 7.04 ppm to 7.09 ppm. This study showed that the use of *Lemna minor* leaf meal is suitable to partially replace very expensive beef heart for the growth of koi fingerlings. Low level of inclusion (10 %) of duckweed was the most efficient.

Keywords: Fish feed, protein source, ornamental fish, lemna minor, Koi