ABSTRACT

The thesis embodies information on some aspects of nutrition in selected cultivable finfish species. The thesis consists of two parts. Part one of the thesis contains information on the digestibility of some selected feedstuffs, determined with both endogenous as well as exogenous markers, and the influence of factors such as species, feeding frequency, temperature, size and diurnal variation on the nutrient digestibility of cultivable catfish species, *Heteropneustes fossilis* (Bloch), *Clarias batrachus* (Linnaeus) and *C. gariepinus* (Burchell).

Part two embodies data on the effect of antinutritional factors, dietary gossypol and synthetic phytic acid, on the growth, conversion efficiencies, and carcass composition of the Indian major carps, namely, *Labeo rohita* (Hamilton) and *Cirrhinus mrigala* (Hamilton).

Evaluation of apparent drymatter and protein digestibility (%) of some selected plant and animal origin feedstuffs was carried out in the catfish, *H. fossilis* (9-11cm; 6-8 g) using exogenous (chromic oxide) and endogenous (hydrolysis resistant organic matter, acid insoluble ash, crude fibre and ash) markers. In general, digestibility varied insignificantly (P>0.05) with the type of marker used. However, with each marker the protein digestibility varied significantly (P<0.05) with the feedstuffs tested, and these variations may be attributed to the composition of the feedstuffs, as also to the flow pattern of the marker through the gastrointestinal tract with respect to the digesta. The study demonstrates that chromic oxide, used as exogenous
marker for nutrient digestibility estimates, produces more consistent values.

Apparent protein digestibility in catfishes, *C. batrachus* (16-18 cm; 45-50 g), *C. gariepinus* (21-22 cm; 60-65 g) and *H. fossilis* (10-12 cm; 10-15 g) was estimated for nine different plant and animal origin feedstuffs. Fat digestibility was tested for *C. batrachus* and *C. gariepinus*, wherein the influence of feeding frequency on protein digestibility was also examined. The protein digestibility of the feedstuffs varied significantly (P<0.05) within each test species. However, the digestibility values for most of the ingredients tested were comparable (P>0.05) between the three catfish species. The most efficient utilization of protein in these fishes was noted for soybean meal followed by fishmeal. The lowest protein digestibility was noted for rice bran. Similarly, the utilization of fat from the feedstuffs was also significantly (P<0.05) different within each of the two species, *C. batrachus* and *C. gariepinus*. Fat digestibility of feed ingredients was insignificantly (P>0.05) different between the two species. With respect to the fat content soybean was most efficiently utilized. Poorest fat digestibility was obtained for rice bran. A marked decline in protein utilization was discernible in the above two species on increasing the feeding frequency from two to four times a day.

Influence of protein source and varying temperature on apparent protein digestibility was determined in the catfish, *H. fossilis* (9-11 cm; 6-8 g). The fish effectively utilized protein from both the plant as well as animal origin feedstuffs. With the exception of fishmeal and soybean meal, protein digestibility varied significantly (P<0.05) with the feedstuffs tested. The trend
in utilization of protein from different sources remained similar at the three temperatures (18, 28, 38°C). For each ingredient, digestibility values varied (P<0.05) with temperature. A temperature of 28°C was found to be most suitable for optimal protein utilization in *H. fossilis*.

Influence of protein source and fish size on apparent protein digestibility (%) was studied in African catfish, *C. gariepinus*. Three size classes (27-30 cm, 105-109 g; 42-44 cm, 780-830 g; 60-62 cm, 1250-1300 g) of fish were taken for this study. Within each size-class, the digestibility varied significantly (P<0.05) with the source and quality of protein used. Soybean meal and fishmeal were utilized with greater efficiency, while rice bran was least digestible. An increase in digestibility was apparent with increase in fish size for high protein sources such as soybean meal, full-fat soybean, laboratory prepared fishmeal, Peruvian brown fish meal and dried fish. Protein from other plant sources was less efficiently utilized with increase in size. Evidence of daily variation in protein digestibility was also noticeable in small fish.

Effect of feeding glanded cottonseed meal was examined on the growth, conversion efficiency, and carcass composition of *Labeo rohita* fry (3.0-3.5 cm) reared at 24±1. Inclusion of ≥ 5.41% cottonseed meal in the diet was found to depress fish growth. The specific growth rate (%) was significantly (P<0.05) higher (1.77) in fish fed diet containing cottonseed meal at the rate of 2.16-4.33%. The best-feed conversion ratio (1.98) was seen in diets containing 2.16% cottonseed meal. While protein efficiency ratio was highest (1.26) in fish fed diets containing cottonseed meal at 2.16 and 3.25% Body fat and moisture
declined significantly in fish fed diet with \( \geq 5.41\% \) cottonseed meal. Variations in body protein and ash were not significant at levels tested.

Effect of phytic acid was studied on the growth, conversion efficiency, and carcass composition of *C. mrigala* (2.5-3.5) fry, reared at 18-22°C. The fish were fed isonitrogenous (40% CP) and isocaloric (4.32 kcal/g) purified test diets, containing varying levels (0.5, 1.0, 1.5, 2.0, and 2.5%) of phytic acid (dodecasodium salt). The highest weight gain (94.87%), specific growth rate (1.58%), protein efficiency ratio (2.02), and best food conversion ratio (1.21) were obtained in fish fed the control diet containing no phytic acid. Live weight gain and specific growth rate were significantly affected by dietary phytic acid inclusion beyond a level of 1%. Dietary inclusion of phytic acid markedly influenced the carcass composition of the fish. Crude protein and fat content declined significantly (P<0.005) in fish fed phytic acid contained diet. The percentage of moisture and ash in these fish were found to be significantly (P<0.05) higher.

The information, in addition to contributing to the existing knowledge on the subject, would be of interest to fish nutritionists and farmers, and find application in developing practical diets for semi-intensive/intensive culture of these fishes.