

# **USE OF FERMENTED FEATHER MEAL IN THE ARTIFICIAL FEED OF GIFT TILAPIA (*Oreochromis niloticus*) FRY**

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## **INTRODUCTION**

Nile tilapia is the most widely cultured freshwater species among the farmed tilapias and contributes about 71 % of the total tilapia production in Sri Lanka (Pethiyagoda, 2006). The major problems in tilapia culture are the deterioration of quality of the fish stock through stunting and slower growth rate in females than in males. Genetically Improved Farmed Tilapia (GIFT) was produced with characters of late maturation and fast growth to address the above problems (Siriwardena, 2003). Feeding represents over 50% of the operational costs of aquaculture and it is a major problem for a sustainable aquaculture operation in Sri Lanka. The search for feed ingredients which could replace fish meal viz. the main protein source, is an important aspect in the production of low cost feeds. Feather is a wastage of poultry industry and could be collected free of charge. Feathers constitute 9% by weight of a live bird and it contains high amount of protein (80-90%). The fermentation of feather meal may digest the protein to small peptide and free amino acids which facilitates the absorption in the intestine (Arunlertaree and Moolthongnoi, 2008). The amino acid balance of feather meal is similar to fish meal and soybean meal. The main objectives of this study were; to formulate low cost feed for the fry stage of GIFT tilapia to be used by the small scale farmers, to assess the suitability of feather meal in supplementing the protein requirement in GIFT tilapia fry feed, to evaluate growth performance and survival of fry fed with feather meal.

## **MATERIALS AND METHODS**

Raw feathers were fermented using yeast, wheat flour and water for 48hrs. Five feeds were formulated with partial replacement of fish meal by fermented feather meal as protein source. Feed formula of control feed (T<sub>1</sub>) is Fish meal 60%: Soy bean 13%: Rice bran 12%: Coconut poonac 8%: Wheat flour 5%: coconut oil 1%: Vitamin pre mix 0.5%: Mineral pre mix 0.5%: Fermented feather meal 0%. The amount of fish meal in the control feed was replaced by fermented feather meal by 25%, 50%, 75% and 100% in the feeds of T<sub>2</sub>, T<sub>3</sub>, T<sub>4</sub>

and T<sub>5</sub> respectively. The amount of other feed ingredients was remained unchanged. Control and 4 treatments were carried out with three replicates for each. Fifteen individuals (5 days old fry) with a mean body weight of 19.0 ± 0.893mg and mean total length of 12 ± 1.5mm were stocked in each replicate glass tank. The fry were fed manually at a rate of 5% of their body weight in 2 portions per day at 8.00-9.00a.m. and 3.00-4.00p.m. for 30 days. Excess feed and faeces were removed daily. Water was exchanged daily and the tanks were aerated. Growth performance was determined by measuring wet body weight and total length at weekly intervals. The data were analyzed using SAS computer software by one way Analysis Of Variance (ANOVA) procedure and the means were compared using Duncan's Multiple Range Test (DMRT) at 95% significance level. Relationship between total length and body weight was determined by MINITAB Computer software.

## **RESULTS AND DISCUSSION**

### **Physical characters of experimental feeds**

The colour of the experimental feeds varied from dark brown to light brown and breakability was decreased with the increase in the fermented feather meal fraction. It was observed that the feeds containing high percentage ( $\geq 75\%$ ) of fermented feather meal (T4 and T5 feed) showed a difficulty in consuming and disliked by fry than that of the feeds containing low percentage ( $\leq 50\%$ ) of fermented feather meal (T1, T2, T3 feeds). All experimental feeds were stable in water for about 5-10 minutes.

### **Composition of experimental feeds**

The proximate analysis revealed that the protein percentage of fermented feather meal was 88.45 and it was higher than the crude protein percentage (85.0%) in hydrolyzed feather meal. Protein percentage ranged from 44.17 to 53.84 in experimental feeds. The percentage of fiber was increased whereas ash was decreased with the increase of fermented feather meal fraction in the experimental feeds.

### **Water quality**

Minimum temperature was 28.0°C and maximum temperature was 29.0°C in experimental tanks and the dissolved oxygen ranged from 6.31 to 6.47 mg/l. The pH ranged from 7.97 to 8.31. Water pollution was at a minimum level due to daily water exchange. Hence the water quality was within acceptable ranges in the experimental tanks.

## Efficiency of growth and feed utilization

The highest survival rate was observed in fish fed with feed T1 (95.55%) and lowest in fish fed with feed T5 (71.11%). The highest mean final weight ( $397.24 \pm 12.24$ mg) of experimental fish was observed in fish fed with feed T1 and the lowest in fish fed with feed T5. The weight of fry fed with feed T1, T2 and T3 were significantly higher ( $p < 0.05$ ) than that of T4 and T5 feeds (Figure 1). Highest weight gain was observed in fish fed with T1 feed and lowest ( $281.99 \pm 3.15$ mg) in fish fed with T5 feed. The final length of fry ranged from  $22.03 \pm 1.51$ mm to  $27.09 \pm 1.84$ mm. The final length of fish fed with feed formula T1, T2 and T3 were significantly higher ( $p < 0.05$ ) than those of other feeds (Figure 2). Highest length gain was represented by fish fed with T1 feed and the length gain decrease comparatively in fish fed with feed T4 and T5. According to the length weight relationship, the fish fed with feed T1, T2 and T3 showed isometric growth and fish fed with feed T4 and T5 showed allometric growth. There were no significant differences ( $p > 0.05$ ) of Specific Growth Rates related to the weight in fish fed with T1, T2 and T3. Specific Growth Rate related to the length was highest in fish fed with T1 feed and lowest in fish fed with T5 feed. This can be attributed to the unpalatable nature of T5 feed as it contained high percentage of fiber. There were no significant differences ( $p < 0.05$ ) in Feed Conversion Efficiency among fish fed with feed T1, T2 and T3. Feed Conversion Ratio in fish fed with feeds T1, T2 and T3 was significantly lower ( $p < 0.05$ ) when compared to T4 and T5. The result revealed that the Feed Conversion Ratio is favorable for T1, T2, T3 feed and unfavorable for T4 and T5 feed.

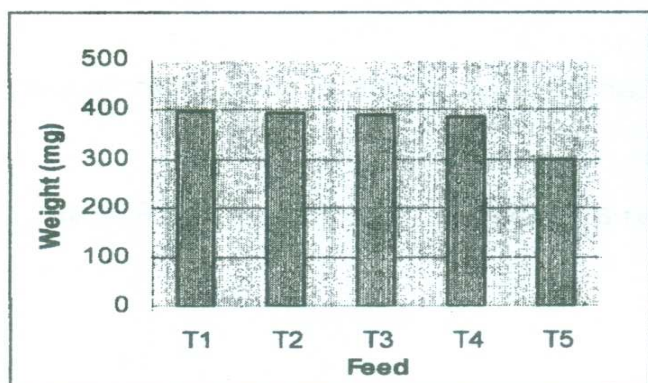


Figure 1- Mean final weight of fish

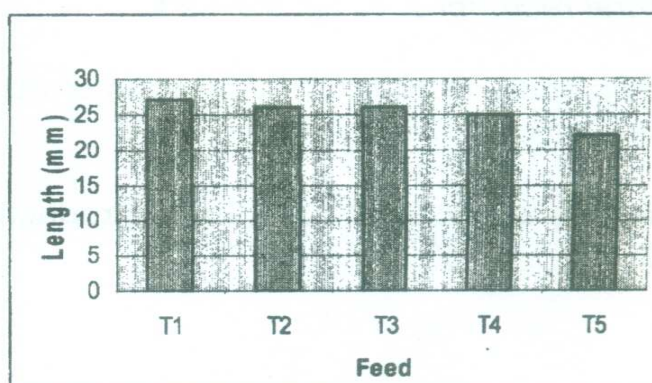


Figure 2- Mean final length of fish

## Cost analysis of experimental feeds

As raw feathers were collected free of charge, when the fraction of fermented feather meal in test feeds was increased, total raw material cost has been reduced. Cost of feeds of control (T1): Rs.46.80/kg, T2: Rs.43.80/kg,

T3:Rs.40.80/kg, T4: Rs.37.80/kg and T5: Rs.34.80/kg. Replacement of fish meal with fermented feather meal by 25%, 50%, 75% and 100% in fish feed reduced the cost by Rs.3.00, Rs.6.00, Rs.9.00 and Rs.12.00 per kilogram respectively. These values are considerably high due to the high price of commercial fish feed (Rs.230.00/kg) and high demand for discarded fish meal in animal feed industry of Sri Lanka. When consider the cost of experimental feeds, 50% of fish meal replaced with fermented feather meal in test feed T3 was the most effective feed, because there were no significant differences ( $p>0.05$ ) in growth rate with control feed and feed that contained 25% fermented feather meal.

### **CONCLUSIONS**

Fermented feather meal can be used to replace the fish meal up to 50% without decreasing the growth performances. Twenty five percent of fermented feather meal replacement for fish meal reduces cost by Rs 3.00 and 50% replacement reduces cost by Rs 6.00. Most effective feed was T3 feed (50% replacement of fish meal by fermented feather meal) and 75% and 100% replacement of fish meal by fermented feather meal can not be used for GIFT fry due to decrease of growth performances.

### **REFERENCES**

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