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Effect of Dietary Incorporation of Gliricidia Maculata Leaf Meal on Growth and Feed Utilization of Cirrhinus Mrigala Fingerlings

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Abstract- An eight week feeding trial was conducted to evaluate the potential of Gliricidia maculata leaf meal as dietary protein source in the diet of Cirrhinus mrigala fingerlings. Four experimental diets were formulated to contain 20%, 30%, 40% and 50% G. maculata leaf meal (Diets 1 – 4) to partially replace other protein ingredients in the C. mrigala diet. The diet containing 0% leaf meal served as the control. Each dietary treatment was tested in triplicate groups of 10 fingerlings. The results of the growth and feed utilization responses show that there were no significant differences among the fish fed diets 1 – 3 but were significantly different from fish fed on diet 4 which had lower growth and feed utilization values. The present findings show that G. maculata leaf meal has good potential for use as one of the protein sources in C. mrigala diet up to 40% level without compromising growth.

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Effect of Dietary Incorporation of *Gliricidia Maculata* Leaf Meal on Growth and Feed Utilization of *Cirrhinus Mrigala* Fingerlings

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I. INTRODUCTION

The current trend in fish culture is towards increased intensification of culture systems whereby provision of feeds becomes necessary and success therefore depends significantly on the availability of well-balanced, nutritionally complete and cost-effective feeds. For many years, fish nutritionists has done considerable research on the nutrient requirements of fish, assessment of nutritive value of available ingredients and development of simple and appropriate feeding technology. These are all important factors towards the development of cost-effective feeds and feeding strategy. There is a need, however, for these feeds to be continuously refined, improved and tested for technical and economic feasibility.

In order to reduce the cost of a balanced fish diet, locally available ingredients such as agricultural by-products and plant proteins should be included in the diet or substituted for expensive protein sources. Research interest has been focused on different leaf meals as protein sources in animal feeds (Wouters, 1994; Agbede and Aletor, 2003).

The aim of the current study was to assess the potential of *Gliricidia maculata* leaf meal as an ingredient in practical feeds for freshwater fish, *Cirrhinus mrigala*. The *G. maculata* is extensively used for social forestry. This plant grows faster and in some parts of India its leaves are used as feed for goat.

II. MATERIALS AND METHODS

The feeding experiment was conducted in triplicate for 8 weeks. Fingerlings of *Cirrhinus mrigala* were used for the experiment. Four types of pelleted feeds were formulated using different ingredients such as rice bran, groundnut oilcake, fishmeal, guar gum binder, Vitamin – Mineral mixture, fine leaf powder of *Gliricidia maculata* in different proportions (diet 1 - 4). A diet with all above ingredients except leaf powder is kept as control (Table 1). The diets were analyzed for their proximate nutrient composition.

Fishes were fed at the rate of 5% body weight in two equal rations daily. At fortnightly intervals a minimum of 50% of fishes were sampled to record the growth. At the end of experiment, the growth parameters like mean body weight, specific growth rate (SGR), feed conversion ratio (FCR) and protein efficiency ratio (PER) were estimated. Difference between means of treatments was tested to find out the level of significance by ANOVA.

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Table 1 : Formulation and proximate composition of fish diets containing increasing levels of *Gliricidia maculata* leaf meal

	Control	Diet 1	Diet 2	Diet 3	Diet 4
Ingredients (%)					
Groundnut oilcake	43	35	29	24	19
Rice bran	36	27	23	18	13
Fishmeal	10	09	09	09	09
Guar gum Binder	10	08	08	08	08
Mineral – Vitamin mixture	01	01	01	01	01
<i>G. maculata</i> leaf powder	00	20	30	40	50
Nutrient content (%)					
Moisture	7.05	6.32	6.93	7.27	7.75
Total Ash	12.13	12.26	11.59	11.38	10.89
Protein	26.24	28.30	29.93	30.42	31.10
Fat	3.81	7.33	6.40	6.26	5.56
Fibre	10.54	9.21	10.78	11.76	11.60

III. RESULTS AND DISCUSSION

The growth study in regard with body weight, specific growth rate (SGR), feed conversion ratio (FCR)

and protein efficiency ratio (PER) were given detailed in the Table 2.

Table 2 : Growth performance and feed utilization in *Cirrhinus mrigala* fed diets containing *Gliricidia maculata* leaf meal

	Control	20%	30%	40%	50%
Initial body weight (gm)	2.1 ± 0.05	2.4 ± 0.02	2.3 ± 0.06	2.3 ± 0.05	2.1 ± 0.04
Final body weight (gm)	14.64 ± 0.42	17.04 ± 0.49 NS	22.85 ± 0.65 ***	29.96 ± 0.86 ***	26.56 ± 0.76 ***
Weight gain	12.54 ± 0.36	14.64 ± 0.42 NS	20.55 ± 0.59 ***	27.66 ± 0.79 ***	24.46 ± 0.70 ***
Specific growth rate (SGR) % day ⁻¹	0.89 ± 0.02	0.91 ± 0.02 NS	1.05 ± 0.03 *	1.17 ± 0.03 ***	1.15 ± 0.03 ***
Food conversion ratio (FCR)	2.49 ± 0.07	2.49 ± 0.07 NS	1.98 ± 0.05 ***	1.58 ± 0.04 ***	1.36 ± 0.03 ***
Protein efficiency ratio (PER)	0.65 ± 0.01	0.48 ± 0.01 ***	0.66 ± 0.01 NS	0.85 ± 0.02 ***	0.71 ± 0.02 NS

Fish groups fed with 40% *Gliricidia* diet showed better growth performance as compared to other diet groups. The final body weight (29.96 ± 0.86), weight gain (27.66 ± 0.79) and SGR (1.17 ± 0.03) were highest in 40% diet group, whereas FCR was highest in control and 20% diet group (2.49 ± 0.07) and PER in 50% diet group (0.71 ± 0.02) (Table 2).

There was significant increase in case of weight gain in all diet groups except 20% compared with control. As compared to control, there was significant decrease in FCR in all diet groups except 20%. The fishes fed with 20% *Gliricidia* diet showed equal FCR value as control. The increasing SGR was observed at low level inclusion of *Gliricidia* and decreased SGR as *Gliricidia* inclusion level increased. The same observations were found for PER.

Utilization of *Gliricidia* leaf meal diet in the present study showed their effectiveness regarding fish

growth within the inclusion range of 20 – 40%. The best growth was recorded from 40% *Gliricidia* diet. The use of leaf meal in fish feed at higher inclusion rate always leads to fish growth reduction. A reduction of 60% weight gain at 40% inclusion of moringa leaf meal was reported by Richter et al. (2003) and Afuang et al. (2003). The inclusion of *Leucaena leucocephala* leaf meal (Wee & Wang, 1987; Santiago et al., 1988), cassava leaf meal (Ng & Wee, 1989), salt bush atriplex leaves (Yousif et al., 1994) and duckweed (Fasakin et al., 1999) at higher level in fish diet lead to significantly lower growth rates in fishes.

Higher inclusion of plant protein in formulated fish diet causes the retarded growth of fish. In the present study, it was observed that incorporation of *Gliricidia* above 40% impaired the overall growth of experimental fish, *Cirrhinus mrigala*. The data of the present study agree with the finding of Pereira & Oliva -

Teles (2003), who reported that significant decreases were found for both, growth and feed utilization with the highest replacement levels of dietary fish meal with plant proteins for gilthead sea bream.

IV. CONCLUSION

The present study confirmed that, *Cirrhinus mrigala* is able to utilize plant based formulated diet. An inclusion level of *Gliricidia maculata* leaf powder up to 40% in the practical diet for *C. mrigala* fingerlings had no adverse effects on growth and feed utilization of the fish. From the present work it is concluded that, *G. maculata* may be a promising source of plant protein; used for partial replacement of fishmeal in the formulated feed. It will definitely help to small scale fish farmers to overcome expenditure on traditional fish feed.

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