THE GROWTH AND SURVIVAL RATE OF *Oreochromis niloticus* Fries Fed with Varying Percentages of *Leucaena leucocephala* Leaf Meal Based Diets

By

FALAYE, A. E., OLANIRAN, T. S. AND AROSO B. O.

Department of Wildlife and Fisheries Management
UNIVERSITY OF IBADAN, IBADAN.

ABSTRACT

A ten-week feeding trial was carried out to evaluate the growth and survival rate of *Oreochromis niloticus* fed with varying percentage levels of *Leucaena leucocephala* leaf meal based diets. The substitution rates of *L. leucocephala* leaf meal for groundnut cake in the various diets were 0% - Diet 1, 25% - Diet 2, 50% - Diet 3 and 75% - Diet 4.

Ten fries with an average weight of 0.44g were stocked at the rate of 10 fish per bowl and fed at 5% body weight.

Diet 1 with 0% inclusion of *leucaena* leaf meal gave a significant difference ($P<0.05$) in growth and survival rate compared with diets 2, 3 and 4.

The water quality parameters recorded were appropriate for fish culture.

INTRODUCTION

The incessant soaring costs of conventional fish feed ingredients in Nigeria is a major cause of increase in the production cost and reduction in the profit margin of commercial aquaculturists. Hamat and Jafri (1948) reported that between 40 - 60 percent of the variable costs is expended on feeding in an intensive fish culture system. Agricultural by-products and unconventional feed stuffs can be used as alternative to the very expensive conventional feed stuff in fish feed (Falaye, 1992). Falaye (1988) stressed the need to consider the nutrient composition, relative cheapness and availability of the feedstuff to be selected in fish feed.

*Leucaena leucocephala* is a vigorous and drought resistant leguminous tree whose high-protein leaves have been widely used in animal feeds, particularly for ruminants in the tropics. Huwanyaka (1986) reported 20 percent crude protein level in the leaves of 3 years old stands of *leucaena*. Ekpenyong (1984) recorded 25.05 and 23.33 crude protein levels in the fresh and dry leaves of *leucaena* respectively. However, caution should be taken in the use of unconventional dietary ingredients in fish food due to the presence of some toxic anti-nutritional factors as well as their deficiencies in certain amino acids.

This study aimed at assessing the growth and survival rate of *O. niloticus* fed with varying percentages of *L. leucocephala* leaf meal based diets.

Materials and Method

The feeding trial was conducted for 10 weeks in experimental plastic bowls with a flow-through system. *Oreochromis niloticus* fries with average weight of 0.44g were stocked at the rate of 10 fish per bowl.

The *leucaena* leaves collected from University of Ibadan research farm were processed by soaking in water for 48 hours and sun-drying for about 24 hours. The dried leaves were ground and incorporated into the formulated experimental diets at 0% (diet 1), 25% (diet 2), 50% (diet 3) and 75% (diet 4) replacement levels for groundnut cake.
Water temperature, pH and dissolved oxygen concentration were monitored and analysed throughout the period of the experiment according to the techniques of Boyd (1980) to maintain desirable level for freshwater fish. The fish were weighed every week and the food offered was adjusted accordingly.

Computations at the end of the feeding trial were made for the following:

\[
\text{Mean wet weight gain (g)} = \text{Initial mean wet weight 9g} - \text{Final mean wet weight (g)}
\]

Total percentage weight gain (\%) = Total wet weight gain (g) x 100/Initial wet weight.

Specific growth rate (\%/day) = \(\ln (\text{Final wet weight}) - \ln (\text{Initial wet weight})/\text{time in days}\)

Protein efficiency ratio = Net wet weight gain (g) x 100/protein intake (g)

Food conversion ratio = Food intake (g)/wet weight gain (g)

Results from all calculations were subjected to analyses of variance (ANOVA) and Duncan’s multiple test as described by Steel and Torrie (1960).

**Results and Discussion**

The results of proximate analysis of leucaena leaf meal are presented in Table 1. While Table 2 shows the growth performance, nutrient utilization and survival rate of *O. niloticus* fed increasing levels of leucaena leaf meal based diets.

Table 1  **Proximate Composition of *L. leucolephala***

<table>
<thead>
<tr>
<th>Parameter</th>
<th>% Dry weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>Moisture</td>
<td>7.50</td>
</tr>
<tr>
<td>Ash</td>
<td>11.00</td>
</tr>
<tr>
<td>Fat</td>
<td>2.05</td>
</tr>
<tr>
<td>Crude protein</td>
<td>24.05</td>
</tr>
<tr>
<td>Crude fibre</td>
<td>20.20</td>
</tr>
</tbody>
</table>
Table 2: Growth performance, nutrient utilization and survival rate of O. niloticus fed increasing dietary levels of L. leucocephala leaf meal

<table>
<thead>
<tr>
<th>Treatments</th>
<th>Parameters</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of fish stocked</td>
<td>10</td>
<td>10</td>
<td>10</td>
<td>10</td>
<td></td>
</tr>
<tr>
<td>Survival rate % Initial mean wet</td>
<td>90a</td>
<td>80a</td>
<td>40c</td>
<td>60b</td>
<td></td>
</tr>
<tr>
<td>Weight (g)</td>
<td>3.55a</td>
<td>2.62b</td>
<td>2.03b</td>
<td>2.05b</td>
<td></td>
</tr>
<tr>
<td>Final mean Wet Weight (g)</td>
<td>3.08a</td>
<td>2.09b</td>
<td>2.03b</td>
<td>2.05b</td>
<td></td>
</tr>
<tr>
<td>Mean wet weight gain (g)</td>
<td>65.53a</td>
<td>39.43b</td>
<td>38.33b</td>
<td>38.81b</td>
<td></td>
</tr>
<tr>
<td>Total percentage</td>
<td>1.25a</td>
<td>0.95b</td>
<td>0.98b</td>
<td>0.98b</td>
<td></td>
</tr>
<tr>
<td>Specific growth rate</td>
<td>2.44a</td>
<td>3.41b</td>
<td>3.42b</td>
<td>3.41b</td>
<td></td>
</tr>
<tr>
<td>Protein efficiency ratio</td>
<td>1.21a</td>
<td>0.83b</td>
<td>0.73b</td>
<td>0.82b</td>
<td></td>
</tr>
</tbody>
</table>

Figures in the same row with different superscripts are significantly different (P<0.05).

Leucaena has spectacularly increase in popularity over the last ten years among agronomists, foresters and animal nutritionists. Its usefulness lies in its availability during the drought high crude protein (CP) content and digestibility. The proximate analysis of leucaena leaf meal in this study gives 24.05 cp level.

Diet 1 with 0% inclusion of leucaena leaf meal gave the best growth performance and survival rate followed closely by diet 2 (25% replacement of GNC) while lowest value was recorded for diet 3 (50% replacement of GNC). Observation from this study indicates that substitution of leucaena leaf meal for GNC in this diet of O. niloticus leads reduction in growth performance and nutrient utilization without significant difference (P>0.05). We and Wang (1987) in a similar trial using O. niloticus and substituting leucaena for fish meal stated that it is possible to include soaked leaf meal up to 25% of the dietary crude protein level with no adverse effects on the growth. The significant difference (P>0.05) in the survival rate of fish in treatment 1, 2, 3 and 4 is probably due to effect of anti-nutritional factors. The presence of mimosine in L. leucocephala has been major factor that limits its usefulness in fish nutrition. The level of anti-nutritional factor can be brought to minimal level using appropriate method of treatment such as soaking in water, sun-drying and heating.

Growth of fish does not depend on nutrition only but also on suitable environmental variable like temperature, dissolved oxygen and pH. Failure to maintain optimum water quality parameters in ponds may result in poor growth or death of fish. However, the mean dissolved oxygen concentration (6.9 mg/l), pH 97.3 and temperature (28 c) appeared suitable for fish culture as recommended by Boyd (1980).
REFERENCES


Huwanyakpa, M. (1986). Initial (lab.) screening of 70 cultivates of agronomical promising forage and browse legumes in Ethiopia - as supplements to cereal crop residue (LLCA Research report, being prepared for publication).
