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AQUACULTURE SYSTEMS RESEARCH IN AFRICA

PROCEEDINGS OF A WORKSHOP HELD IN
BOUAKE, CÔTE D'IVOIRE,
14-17 NOVEMBER 1988

RECHERCHES SUR LES SYSTÈMES AQUACOLES EN AFRIQUE

COMPTE RENDU D'UN ATELIER TENU À
BOUAKÉ, CÔTE D'IVOIRE,
DU 14 AU 17 NOVEMBRE 1988

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Aquaculture systems research in Africa

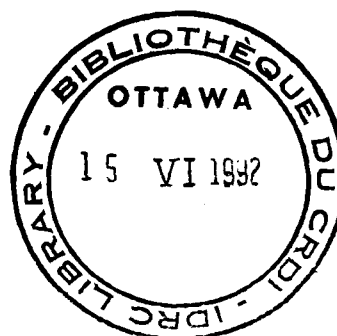
**Proceedings of a workshop
held in Bouake, Côte d'Ivoire,
14-17 November 1988**

Recherches sur les systèmes aquacoles en Afrique

**Compte rendu d'un atelier tenu à
Bouaké, Côte d'Ivoire, du
14 au 17 novembre 1988**

Editors/Rédacteurs

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**EFFECT OF SUPPLEMENTAL FEED ON THE GROWTH OF
OREOCHROMIS NILOTICUS IN PONDS IN LIBERIA**

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Abstract An attempt was made to formulate a suitable combination of locally obtainable and processed ingredients as supplementary feed for Oreochromis niloticus. The ingredients used included rice bran, ground corn, cassava powder, ground rubber seeds, fish meal, and blood meal, with oyster shells being used as roughage and palm oil as a carrier. Six treatment combinations were served daily, except on sampling dates, at a rate of 5% of total body weight, to 2 week old fry stocked at a density of 1 fry/m² in 100 m² ponds, with two replications, for 6 months. Samples were taken fortnightly to evaluate weight and body length parameters. These parameters were used as a measure of the response of the fry to the various treatments. Although comparison of mean weight gain appears to indicate differences among treatment means, statistical analysis of the data failed to show any significant differences among treatments at the 5% level.

Résumé Nous avons cherché à déterminer une combinaison adéquate d'ingrédients disponibles et transformés sur place pour la complémentation du régime de Oreochromis niloticus. Les ingrédients utilisés comprenaient notamment le son de riz, le maïs moulu, la poudre de manioc, les graines d'hévéa moulues, la farine de poisson et la farine de sang, des coquilles d'huîtres servant d'aliments de lest et de l'huile de palme servant d'excipient. Six combinaisons différentes ont été servies quotidiennement, sauf les jours d'échantillonnage, à raison de 5 % du poids corporel total, à des alevins de deux semaines élevés dans des étangs de 100 m² (1 alevin par m²) pendant 6 mois. Tous les essais étaient répétés. Les échantillons ont été prélevés tous les 14 jours pour la détermination du poids et de la longueur. Ces paramètres nous ont servi d'indices de la réaction au traitement. Même si la comparaison du gain de poids moyen laisse deviner des différences entre les traitements, l'analyse statistique des données n'a laissé conclure à aucune différence significative entre les traitements utilisés, au seuil de probabilité de 5 %.

Introduction

An increase in interest in pond fish culture in Liberia, coupled with the high price and scarcity of commercially formulated feed, has created a need to find alternative feed sources for this growing sector of agriculture.

The objective of the present study, therefore, was to determine the nutritive value of six treatment diets, formulated from locally available agricultural by-products, as supplementary feed for Oreochromis niloticus.

Materials and methods

Diet composition and preparation

Five plant and two animal by-products were tested as feed ingredients in this study (Table 1). Corn, cassava, and rubber seeds were considered to be the principal ingredients. The other ingredients were considered to be essential additives and, therefore, were added as constants in all rations. Corn was obtained from a local milling company, already ground and ready for use. A bitter variety of cassava was obtained from the Central Agricultural Research Institute's research plots, chopped into chunks, and dried over fire for 3 weeks, after which it was ground into powder. Rubber seeds, obtained from local farmers, were sun dried and stored for a minimum of 6 months to expel excess hydrocyanic acid. They were then cracked and the kernels were ground into powder before being used. Rice bran was obtained as a by-product of rice milling from a local mill and was utilized without further modification. Blood meal was collected from a slaughterhouse by absorbing it on rice bran. The blood was dried on metal sheets for 7 days and the blood - rice bran mixture was repulverized by grinding. Fish meal was obtained as scraps from local dried-fish vendors, oven dried at 60°C for 1 week, and ground. Oyster shells were collected from riversides, sun dried, and ground into powder. Palm oil was obtained as sold for human consumption and was used without further modification.

Seven diets, including a control (diet T-1), were studied. Diets T-2, T-3, and T-4 consisted of 40% corn, 40% cassava, and 40% rubber seeds by weight respectively. Because these were considered to be principal ingredients, these diets were designed to evaluate the effect of each in the absence of the other two. Diets T-5, T-6, and T-7 combined two of the principal ingredients together at 20% by weight each. The rest of the ingredients were added to each ration as listed in Table 1.

The ponds used in the study measured 100 m² each. They were supplied by a rain-filled reservoir that was maintained throughout the duration of the study.

Table 1. Percent composition of ingredients in experimental diets fed to *Oreochromis niloticus*.

	Treatment						
	T-1*	T-2	T-3	T-4	T-5	T-6	T-7
Corn	-	40	-	-	-	20	20
Cassava	-	-	40	-	20	20	-
Rubber seed	-	-	-	40	20	-	20
Rice bran	-	9	9	9	9	9	9
Fish meal	-	25	25	25	25	25	25
Blood meal	-	25	25	25	25	25	25
Oyster shells	-	1	1	1	1	1	1
Palm oil (mL)	-	2	2	2	2	2	2

*Control treatment.

A mixed-sex population of 100 fry, averaging 2.0 g per fry, was stocked in each pond. The fish were given daily rations corresponding to 5% of their body weight, except on sampling dates. The amount of feed was adjusted fortnightly in proportion to the average weight at each sampling. During sampling, approximately half of the stocked population was captured to record weight and length. The fish were released promptly afterwards. Sampling was carried out fortnightly.

Results and discussion

Analysis of variance failed to show significant differences among treatments. However, mean weight gain plotted against feeding time indicates that fish fed diets T-2, T-3, and T-4, which contained 40% corn, 40% cassava, and 40% rubber seeds, respectively, nearly doubled the weight of those fish in the control group (Fig. 1). Diets T-5, T-6, and T-7 produced up to 40% larger fish compared with the control group (Fig. 2).

This study, though preliminary in nature, shows that tilapia culture can be improved simply by the addition of crudely formulated, supplementary feed made entirely from plant and animal by-products that, in most cases, are otherwise discarded as refuse.

Problems and constraints

The Department of Fisheries of the Central Agricultural Research Institute lacks the basic equipment needed for aquaculture research. This report would be more complete if proximate analyses of the ingredients utilized in the study had been conducted. The importance of such analyses in a study of this nature is recognized, but the analyses could not be carried out because the apparatus required was not available.

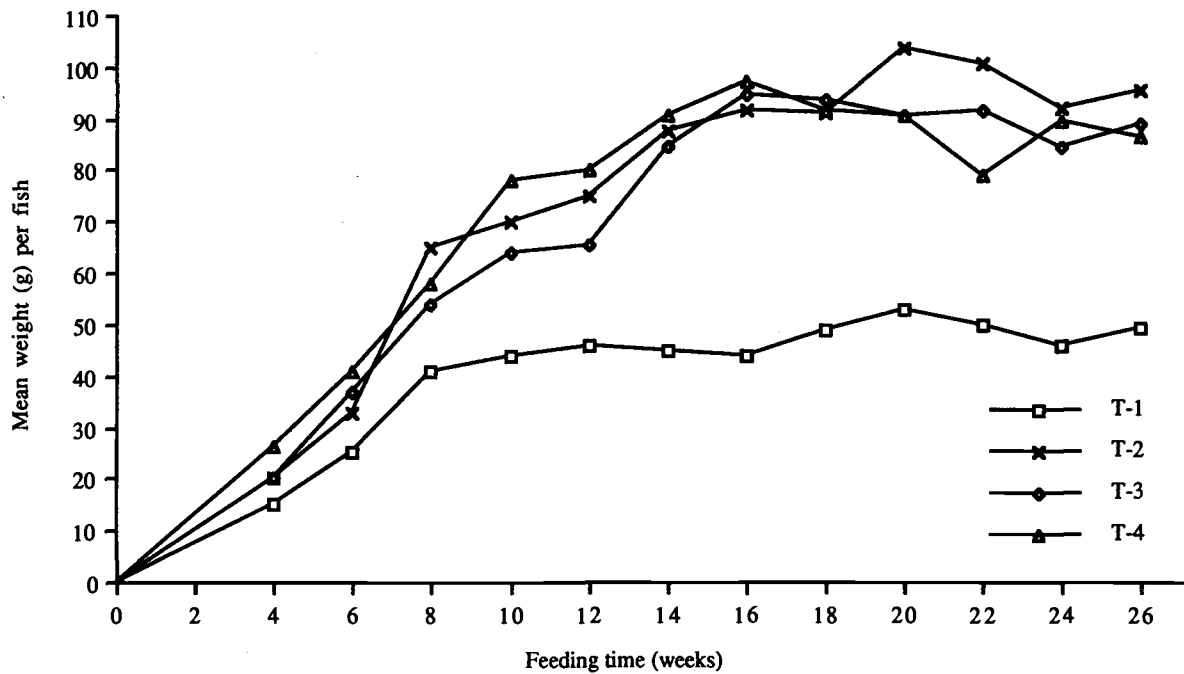


Fig. 1. Performance of *O. niloticus* fed supplementary diets T-2, T-3, and T-4.

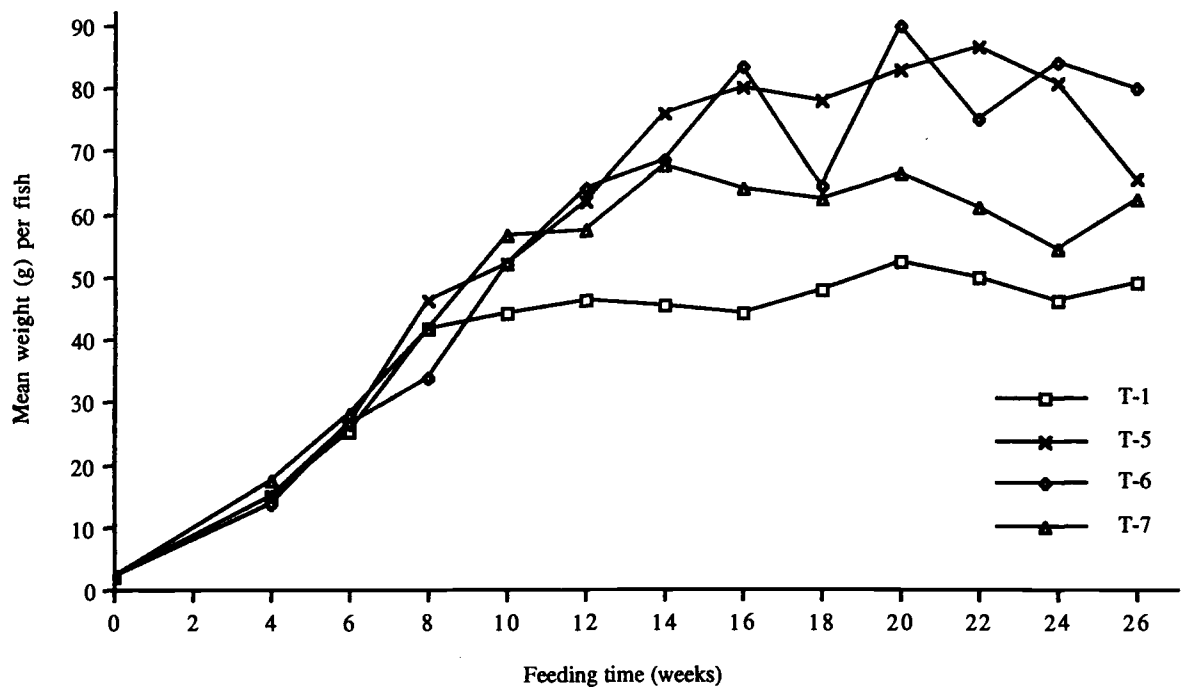


Fig. 2. Performance of *O. niloticus* fed supplementary diets T-5, T-6, and T-7.

Eighteen weeks into this study, weight loss was observed in all treatments, except the control. Two constraints were probably responsible for this observation. The first was a shortage of feed. During this period, feed ingredients became scarce due to a shortage of funding. The second problem was a biological factor that should have been taken into consideration - reproduction. Reproduction in the ponds could not be avoided because of the mixed population of males and females used in the experiment. A mixed population was used because it was difficult to identify the sexes for a monosex culture population due to the small size of the fingerlings (between 1 and 2 g) at the beginning of the study. The alternative of producing an all male population (through hybridization and/or sex reversal) was not possible because the facilities required were not available.

Future research

In subsequent studies, attempts will be made to improve on materials and methods by ensuring reliable logistical support prior to commencing an experiment, and by conducting such tests with a monosex culture in strictly controlled ponds and/or aquaria.