Growth and Feed Utilization of *Oreochromis niloticus* Fingerlings Fed with Diets Containing Cassava Peelings and Mango Seeds

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Introduction

Carefully formulated and well-presented fish feeds play a very significant role in fish culture. With the rising cost of some feed ingredients (especially fishmeal), researchers are investigating less expensive substitutes and the scope for increasing carbohydrate levels. For example, successful feeds have included spoiled maize and processed cassava (FAO 1970), and corn and potato (Onwuka 1980).

Cassava peel and mango seeds are abundant resources in the tropics. Cassava peel has a high cyanide content, but this problem can be partly solved by sundrying (Brandt 1979). This paper presents results of trials in which cassava peel and mango seeds were fed to Nile tilapia (*Oreochromis niloticus*) fingerlings.

Materials and Methods

Mixed-sex *O. niloticus* fingerlings (mean weight 5.00 ± 0.9 g) were obtained from the Panyam Fish Farm, Plateau State, Nigeria, and acclimatized for two weeks to laboratory conditions: 10 fingerlings per tank, five tanks with three replicates each. Dried cassava peel and mango seeds (ground, sundried for 24 hours and then used immediately) were incorporated into four experimental pelleted feeds (Table 1). The control diet (D5) contained fishmeal (tilapia meal, obtained from the local market). The feeds were analyzed using standard methods of AOAC (Hartwitz 1980) (Table 2). The fish were fed 3% of their body weight thrice daily (0800, 1200 and 1800 hours) for 56 days. All fish were anesthesized every week and weighed, after which the amount of feed given was adjusted.

Feed conversion ratios (FCR) (dry weight of food consumed : wet weight ground up fish) were computed weekly. Specific growth rates (SGR), protein efficiency ratio (PER) and apparent net protein utilization (ANPU) were computed using methods described by Brown (1957), Osborne et al. (1919) and Miller and Bender (1955), respectively. Duncan's multiple range test was used for statistical comparisons among treatments.

Table 1. Percentages (by weight) of ingredients used in experimental feeds.

Ingredients	Diets				
	D1	D2	D3	D4	D5 (Control)
Cassava peel	0	25.0	55.0	80.0	0
Mango seeds	80.0	55.0	25.0	0	0
Soyabean (roasted and blended	10.0	10.0	10.0	10.0	10.0
Groundnut oil	6.5	6.5	6.5	6.5	6.5
Carboxyl-methyl cellulose (binder)	1.5	1.5	1.5	1.5	1.5
Vitamin premix	1.0	1.0	1.0	1.0	1.0
Mineral premix	1.0	1.0	1.0	1.0	1.0
Fishmeal		-	-	-	80.0
Total	100	100	100	100	100

Results

Table 3 summarizes the results. The greatest mean weight gain and SGR with feeds containing cassava peel and/or mango seeds were obtained with D2. However, the control (fishmeal) feed gave significantly better results than all such feeds. The worst results were obtained with D4.

The best FCR, with the exception of the control diet, was obtained with D3. This was significantly better than D1 and D2, whereas that for D4 was significantly worse. The PERs were not significantly different among D1, D2 and D3, but D4 and D5 were significantly different from these. D4 had low protein while D5 was lower in carbohydrate than D1, D2 and D3. There were significant differences among the ANPU values for the various treatments with the exception of D1 and D2.

Discussion

From these findings, feeds of *O. niloticus* fingerlings can contain limited amounts of cassava peel and mango seed. Sundrying the cassava peel is essential to reduce the HCN content (Brandt 1979). The better FCRs obtained with diets D2 and D3 might reflect their higher carbohydrate content. However, FCRs

Table 2. Percentage chemical composition (by weight) of experimental feeds. NFE = nitrogen-free extract (computed as the difference between subtotal for other components and 100).

Components	Diets				
	D1	D2	D3	D4	D5 (Control)
Moisture	7.01	6.02	6.08	6.48	6.19
Protein	9.30	12.91	12.06	7.17	29.19
Fat	12.04	8.34	6.11	5.56	5.30
Ash	2.28	4.81	6.07	6.50	6.17
Subtotal	31.58	32.62	31.48	26.16	46.85
NFE (carbohydrate)	68.47	67.38	68.52	73.90	53.15

Table 3. Growth and feed utilization of *Oreochromis niloticus* fed with diets containing cassava peel and mango seeds. Figures in the same row with the same superscript are not significantly different: Duncan's multiple range test (P>0.05).

	Diets				
	D1	D2	D3	D4	D5 (Control)
Initial fish weight (g)	5.12[a]	5.23[a]	5.03[a]	5.08[a]	5.10[a]
Final fish weight (g)	7.56[b]	8.56[a]	7.79[b]	6.57[c]	9.04[a]
Mean weight gain (g)	2.43[b]	3.33[a]	2.77[b]	1.51[c]	3.94[a]
SGR (%)	0.75[b]	1.06[a]	0.79[b]	0.55[c]	1.33[a]
FCR	5.10[b]	5.00[b]	4.20[b]	9.20[a]	3.20[b]
PER	0.73[a]	0.76[a]	0.68[a]	0.59[a]	0.40[a]
ANPU	10.52[a]	10.15[a]	8.19[b]	6.71[b]	18.90[a]

for D1 and D2 were not significantly different. Ufodike and Matty (1983) found that common carp requires over 4% digestible carbohydrate in its diet.

Further work is required to determine whether different proportions of fishmeal and these two cheaper ingredients (e.g., marginally increasing the former) would result in growth performance comparable with that achieved on fishmeal-based feeds.

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Méthode simple de reproduction de *Clarias gariepinus* tout au long de l'année[1]

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Introduction

L'élevage de *Clarias gariepinus* est largement pratiqué au Nigéria. Cette espèce se reproduit facilement en captivité mais les fingerlings sont en trop faibles quantités pour répondre à la demande des éleveurs. La capture d'alevins trouvé en milieu naturel a constitué une source appréciable de fingerlings mais cette solution n'est pas fiable dans la mesure où les pontes de *C. gariepinus* sont saisonnières (Bruton, 1979 ; van Oordt et Goos, 1987), et qu'on ne peut obtenir ces alevins et fingerlings que pendant la saison des pluies de mai à octobre.

Ceci s'applique également à la reproduction en captivité. L'induction de la ponte donne des résultats uniquement pendant la saison des pluies (Huisman et Richter, 1987). Des tentatives pour reproduire en captivité les conditions qui favorisent la ponte de *C. gariepinus* ont été réalisées dans le but d'obtenir une production de semences tout au long de l'année. Ces travaux comprennent la manipulation de la photopériode et des températures (Huisman et Richter, 1987) et la simulation d'inondations et de pluies, telle que suggérée par Bruton (1979) et telle que réalisée avec succès chez *C. batrachus* par Areerat (1987).

Cette communication décrit une méthode simple de reproduction de *C. gariepinus* tout long de l'année dans des bassins cimentés. Ces travaux ont fait partie d'un programme de formation pour des étudiants de l'Ecole fédérale des pêches de l'Institut nigérian de recherches océanographique et marine (NIOMR) passant un diplôme supérieur.

Méthodes

Les installations comprenaient neuf bassins cimentés dont six rectangulaires (5 x 4 x 1 m), deux circulaires (12,6 m³) et un bac (8 x 5 x 1,5 m). Les bassins circulaires ont été aménagés sur deux rangs, reliés à un canal central de vidange. Quatre centimètres de sable fin ont été déversés dans les bassins A, B, C et D d'un des deux rangs et les bassins ont été remplis à environ 60 cm de profondeur d'eau courante (eau de canalisation ayant séjourné pendant 72 heures dans le bac avant d'être versée dans les bassins d'alevinage).

Des *C. gariepinus* du milieu naturel et d'élevage ont été choisis selon leur taille : 120 mâles et 240 femelles mesurant entre 29 et 42 cm de LS et pesant entre 237 et 619 g. Quatre vingt dix poissons (30 mâles et 60 femelles) ont été placés dans chaque bassin rectangulaire et nourris à volonté d'un mélange de poissons de prises fortuites et d'aliments artificiels (formule NIOMR). Les aires de pontes ont été aménagées en forme de "kakabans" faits de fibres de polyéthylène.

Les inondations et les pluies ont été simulées deux fois par semaine dans les bassins B et D. Les bassins A et C ont servi de témoins. La pluie a été fournie

[1]Voir illustration page 3.