IMPROVED FLOATING DIETS FOR AFRICAN CATFISH AND NILE TILAPIA

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ABSTRACT

Flotation potentialities of diets bound with Polymethylo-cabarmide and other local starches and *Saccharomyces cerevisiae* floater were investigated in the laboratory. The binders and floater were fixed at 10 and 4% respectively in isonitrogenous 30% crude protein diets for catfish and Tilapia. Flotation were significantly ($P<0.05$) highest (100.00 – 96.67%) in Polymethylo-cabarmide based binder. Wheat grains starch (WGS) was highest ($P>0.05$) among the local agents in the first 10 minutes. Cassava tuber starch (CTS) significantly ($P<0.05$) succeeded WGS from 15 minutes till end of immersion. The least effective was maize grain starch (MGS).

INTRODUCTION

The conventional sinking fish feeds (pellets, crumbles and mashes) are prone to instability and disintegration to the bottom waters at feeding. The resultant effects include significant losses in aquaculture input management and water pollution (Lopez-Alverado *et al,* 1994, Falayi *et al*, 2003). Extruded (floating) fish feed type reduces water pollution and enables fish culturists to observe how much and how actively their fish eat (Mgbenka and Lovell, 1984). Extruded feed is usually imported into the country and this is a drain in Nigeria foreign exchange. It is very expensive and much of the heat labile nutrients (proteins and vitamins) are lost to high temperature and pressure of the heated barrels which subsequently denatures the proteins and vitamins and made them unavailability to fish. The objective of this study is to evaluate the effects of different binding agents and *Saccharomyces cerevisiae* floater in fish diets flotation in waters.

MATERIALS AND METHODS

Four binding agents - starch derivatives from wheat grains (WGS), cassava tuber (CTS), cane molasses (CMS), yellow maize grains (MGS) were produced and fixed at 10 % in diets. Baker's yeast (*Saccharomyces cerevisiae)* (floating agent) was mixed dried with dough at 4%. Whole-wheat grains were de-hulled, milled and sieved to fine particulates and as wheat flour meal (WWM), a carbohydrate feedstuff. Cassava tubers was peeled, washed, tied in sac and soaked in water for 5 days. The left over was rid of the inner stem, pressed in the sac, to reduce water content and sun-dried for 3 days in March at New Bussa, Nigeria. The product obtained was milled and sieved to fine particulates and used as Cassava flour meal (CFM), another carbohydrate source of nutrient. Raw soybean was extruded at 121-130°C and 30 bar pressure gauge following Eyo *et. al*, 2003 methods. Groundnut cake was produced locally. Fresh clupeids (*Pellonula afzeluiisi*) fish was purchased at Fakun, New Bussa. The fish was sun-dried and later toasted at 55-60°C for 5 minutes in electric oven to obtain fragrance flavour, milled and sieved to fine particulates, used as fish meal (FM) fixed at 15%. Blood meal, Vitamins and minerals mix, common salt, methionine-DL and lysine- L supplement were fixed at 5, 2, 0.3, 0.5 and 0.5 % respectively. The carbohydrate and plant protein feedstuffs were formulated by equation methods (Halver, 1989) with the former in ratio 2:1 and the latter ratio 1:1 respectively as in Table 1 to obtain is caloric 37kcal/g is proteic 30% crude protein diets for *O. niloticus* fingerlings and *Clarias gariepinus* juveniles (Ayinla and Akande, 1988, Eguia *et. al,* 2004). All the milled ingredients were weighed and first mixed dried by hand in a plastic container. The floating agent was added and remixed. The binding agent was added and mixed. Vegetable oil was added last before thoroughly hand kneading was observed to obtain homogeneous hard paste texture (dough). The dough was placed in a hand pelletizer and rolled out in wet form via 4mm die holes in different lengths, into a flat waiting tray. The strands were cut into 2cm each after measuring with a pair of callipers. The wet strands were rolled into ball shapes and put in a tray with oil film, covered with lids and wrapped in cellophane sac for 2 hours to undergo maturation. The lids were removed and the expanded diets were put in electric oven and dried at 105oC for 3 hours. Samples (100g) of diets were put in sealed sampling bottles and sent for the proximate analysis following AOAC (1990) methods. Three replicate samples (20 balls) of each diet were dropped in aquarium measuring

60x30x30 cm3, filled to ¾ of it holding capacity with pond water. Aeration was done by electric acrators and air stones. The samples were allowed to remain in the medium for the period of test, which covered one hour, and observation were conducted every 5 minute interval. At end of every observation, the numbers of diets remained afloat is recorded as floating diets. The mean numbers of the floating diets were expressed as % of the initial numbers.

Data obtained from the chemical analysis of diets, feed stability and flotation were subjected to ANOVA and the differences between the means tested for significant using the Duncan multiple range test at 95% confidence level (Duncan, 1955).

RESULTS AND DISCUSSION

The proximate analysis of the diets is shown in Table 1. The little variations in diets composition may have resulted from the differences in the nutrients available in those levels of inclusions of feedstuff in diets. The results of the flotation are shown in Figure 1. The highest percentage flotation (100%) was seen in Polymethylo-cabarmide based diet (Aquatec-II). Higher flotation was recorded in WGS at 10 minutes and was significantly ($P<0.05$) lost to CTS from the 25th minute to end of test among the starches. CMS ranked 3rd from 5-15 minutes but became the poorest from 20th minutes to end of trial. MGS recorded the least in flotation at every time of trial. The general floating tendency of diets may possibly be that during the dough preparation and oven drying processes, between 30-70% of non-polar lipids and practically all polar lipids in ingredients interact with gluten in diets, and to a lesser degree, with other cereal proteins (Pomeranz and Chang, 1978) by both hydrophobic and hydrophilic bonds. The reaction of polymer on starch particles in forming complexes with amylases (Greveland, 1973) also help the sealing of air passages in the diets and subsequent buoyancy and flotation for longer time since the gas cannot escape. Results revealed fish diet can be suspended on water for some of time by involving Bakers yeast as floater at 4% inclusion and when good binders are involved. This could replace the high cost involved in importation of extruded feed and equipments and save foreign exchange earnings.

Table 1: Diets formulation and their proximate composition.

Ingredients g^{-100} Dry wt.	DT1 WGS	DT2 CTS	DT3 CMS	DT4 Aquatec-II	DT5 MGS
Whole wheat meal (WWM)	27.53	25.31	25.36	24.64	26.66
Cassava tuber meal (CTM)	13.77	12.62	12.68	12.32	13.33
Fish meal (Clupeids)	15.00	15.00	15.00	15.00	15.00
Groundnut cake (GNC)	8.70	10.37	10.33	10.87	9.36
Extruded soybean meal (ESBM)	8.70	10.37	10.33	10.87	9.36
Binding agent	10.00	10.00	10.00	10.00	10.00
Blood meal	5.00	5.00	5.00	5.00	5.00
S. cerevisiae	4.00	4.00	4.00	4.00	4.00
Vegetable oil	3.00	3.00	3.00	3.00	3.00
*Vitamin & mins. Mix	2.00	2.00	2.00	2.00	2.00
Bone meal	1.00	1.00	1.00	1.00	1.00
Methionine-DL	0.50	0.50	0.50	0.50	0.50
Lysine –L	0.50	0.50	0.50	0.50	0.50
Salt	0.30	0.30	0.30	0.30	0.30
Proximate analysis					
Moisture %	7.85	6.90	7.00	5.50	6.65
Crude protein	30.10[a]	30.05[a]	30.04[a]	30.03[a]	30.08[a]
Crude fibre %	3.20[b]	3.12[b]	3.26[b]	3.36[b]	3.16[b]
Crude lipid %	8.53[c]	8.47[c]	9.48[c]	8.30[c]	8.64[c]
Ash %	8.55[d]	9.00[d]	8.55[d]	8.20[d]	8.00[d]

*Vitamin and Minerals premix contain the following per 100g:- Vit.A. 400,000 (IU), Vit. B_1, 002, B_2, 0.16; Nicotinic acid 0.8, B_{12}, 0.0$_2$,D_3 80,000 (IU) K3,0.8, E, 0.8, Folic acid, 0.12, Choline chloride, 0.1, Cobalt 0,16, Copper 0.32, Ion 0.28, Iodine 0.32, Manganese 2.56, Selenium 0.0064, BHT 0.02.

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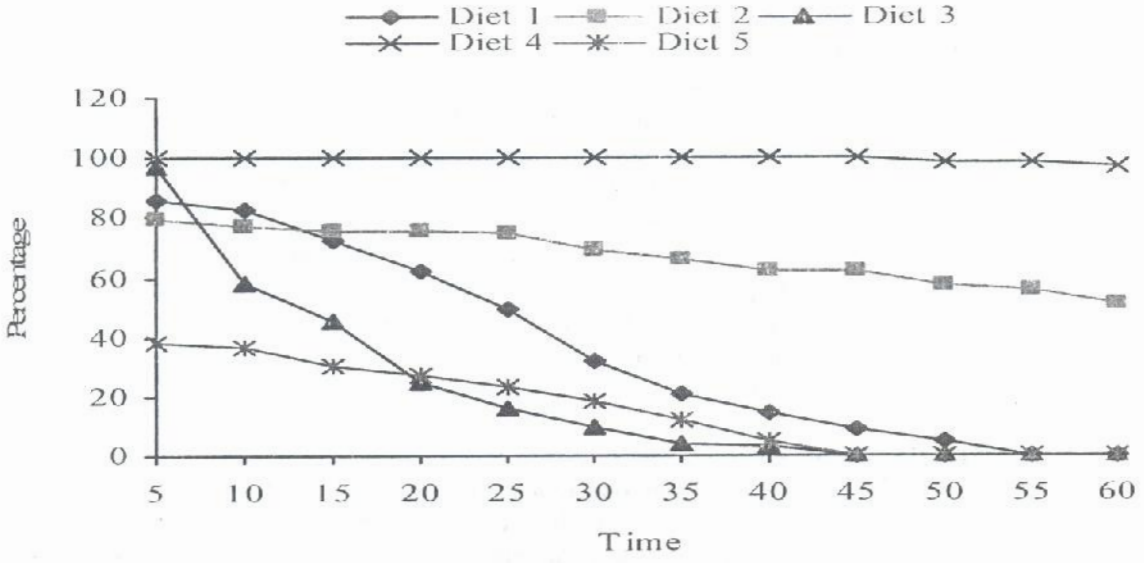

Figure 2: Percentage flotation of diets bound with different agents and *Sacharomyces cerevisiae*