THE EFFECT OF DIFFERENT COMBINATIONS OF INDUSTRIAL AND AGRICULTURAL WASTES AS SUPPLEMENTARY FEEDS ON TILAPIA FINGERLINGS PRODUCTION IN FLOATING NET-HAPAS

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ABSTRACT

Fry of tilapia (*Oreochromis niloticus*) (average initial weight, 0.04g) were stocked at a density of 100/m³ in floating net-hapas and fed different combinations of agro-industrial wastes under the following treatments: I, Corn bran only; II, Corn bran + Rice bran (1:1) and III, Corn bran + Rice bran + Brewer's waste (1:1:1). Each treatment was replicated twice, using completely randomised design. The combination of corn bran and rice bran (1:1) gave the best average final weight/fish, (1.260g); best average daily weight gain, (0.029g/day); best feed conversion ratio (FCR) 4.38; and specific growth rate (SGR), 3.59%/day.

Keywords: Agro-industrial wastes combinations, tilapia, floating net-hapas.

INTRODUCTION

Under intensive rearing conditions at high stocking densities, the natural food available for the cage fish becomes inadequate and a complete efficient artificial food is required. Coche (1978, 1979) observed that cost of feeding in intensive cage culture can account for more than 50% of the production costs. According to data published by Aquaculture Development and Coordination Programme (ADCP, 1983) it was further confirmed that feed represents 40-60% of the total operating costs in intensive aquaculture.

In an earlier result in the systematic approach in evaluating the readily available agro-industrial by-products for formulating

practical feeds for tilapia in cages, Otubusin (1999) observed that corn bran (fed singly) gave the best specific growth rate, 1.63%/day; best feed conversion ratio, 6.53; highest average final weight, 1.60g; and fastest growth rate, 0.0302g/day. The other feed ingredients fed singly in the earlier study were brewer's waste and rice bran. This paper reports on a follow-up study on the effect of combining the three agro-industrial wastes (i.e. corn bran, rice bran and brewer's waste in different ratios) as supplementary feeds on tilapia (*Oreochromis niloticus*) fingerlings production in floating net-hapas.

MATERIALS AND METHODS

The experiment was carried out in a fresh water reservoir. A module consisting of a 6m x 6m bamboo raft with 16, 1.5m x 1.5m apartments fittable with 1m x 1m net-hapas was used. The corn bran and rice bran were collected free of charge from corn starch processors and rice miller respectively in New-Bussa, Nigeria. While the brewer's waste was obtained *ex gratia* from a Brewery at Ilesha, South West Nigeria. Proximate composition of the feedstuffs was analyzed using the methods of AOAC (1990): corn bran, 12.2% crude protein; 64.4% carbohydrate and 8.6% fat; rice bran, 8.7% crude protein, 56.9% carbohydrate and 3.8% fat while brewer's waste contained 18.3% crude protein, 45.9% carbohydrate and 0% fat.

The feedstuffs: corn bran, rice bran and brewer's waste (all in powder form) were

TABLE 1. RANGE AND MEAN OF SOME PHYSICO-CHEMICAL PARAMETERS OF THE FRESHWATER RESERVOIR DURING THE PERIOD OF EXPERIMENT

Measurements	Range	Mean
Temperature (°C)		
Water	24.0 – 34.0	29.0
Air	24.0 – 39.5	31.8
PH	7.2 – 7.5	7.4
D.O (ppm)	4.5 – 6.0	5.3
Conductivity (µmhos/cm)	245 – 260	253

combined according to the following treatments:

Treatment I – Corn bran only

Treatment II – Corn bran + Rice Bran (1:1)

Treatment III – Corn bran + Rice Bran + Brewer's waste (1:1:1)

Each treatment was replicated twice in a completely randomized design. The fry of tilapia (*Oreochromis niloticus*, mean weight, 0.04g) were stocked at the rate of 100/m³ in all the net-hapas early morning. The fish were fed twice daily (09.00 and 16.00h) at the rate of 20% of their biomass per day. Sampling for fish growth was done every two weeks by randomly scooping out 30% of the total stock per hapa. During the culture period, physico-chemical parameters like pH, dissolved

oxygen, temperature and conductivity of the water within the culture system were monitored using standard methods of APHA (1980). The study lasted for 42 days.

RESULTS

The range and mean values of some physico-chemical parameters monitored during the experiment are shown in Table 1. The summary of result from the feeding experiment is presented in Table 2.

The growth curves of the fish receiving the different combinations of agricultural and industrial wastes in floating net-hapas are shown in Figure 1. Fry under treatment II fed

TABLE 2. MEANS OF RESULTS OF TILAPIA FRY RECEIVING DIFFERENT COMBINATIONS OF AGRO-INDUSTRIAL BY-PRODUCTS AS FEEDS FOR A PERIOD OF 42 DAYS

Measurements	TREATMENTS		
	I CB only	II CB + RB	III CB + RB + BW
Average initial wt. (g)	0.043	0.039	0.046 ^a
Average final wt. (g)	0.930 ^b	1.260 ^a	1.140 ^a
Average daily wt. gain (g/day)	0.021 ^a	0.029 ^b	0.026 ^c
Feed Conversion Ratio	5.67 ^a	4.38 ^b	4.44 ^{ab}
Specific Growth Rate (% per day)	3.18 ^b	3.59 ^a	3.32 ^a
Survival Rate (%)	87.0 ^a	72.8 ^a	89.0 ^a

Means in a row with the same superscript are not significantly different ($P > 0.05$)

CB: Corn bran. RB: Rice bran. BW: Brewer's waste

with a mixture of corn bran and rice bran (in ratio 1:1) maintained the lead as from day 14 till the end of the experiment, followed by those under treatment III (corn bran + rice bran + brewer's waste, in ratio 1:1:1) while those under treatment I (corn bran only) lagged behind. Likewise, fish under treatment II had the best growth rate, 0.029g/day, then followed by treatment III, 0.026g/day and least in treatment I, 0.021g/ (Table 1). Following the same trend, the feed conversion ratio (FCR) for treatments II, III and I were 4.38, 4.44 and 5.67 respectively. A similar trend was also observed in the specific growth rate (SGR, %): 3.59, 3.32 and 3.18 for treatments II, III and I respectively (Table 2).

DISCUSSION

Generally, the survival rates were high in this experiment but the means were not significantly different ($P>0.05$). The high survival rates were partly attributable to the tolerable range of the physico-chemical measurements (Table 1) recorded during the experimental period (Balarin, 1979; Boyd, 1979).

The fish under treatments II and III which involved combinations of feed ingredients (i.e. more than one feed ingredient), generally, recorded higher growth rates than those that under a single feed ingredient, treatment I (corn bran only). Considering the mean final weight (g) there were significant differences ($P<0.05$) between them (treatments II and III and treatment I, Corn bran only). These observations confirm the report of IDRC/SEAFDEC (1979) that the use of simple diets, either single ingredient or formulated from locally available sources, was practised in many developing countries. In Nigeria, Falaye (1998) using glass aquaria culture system reported appreciable fish (tilapia, *O. niloticus*) growth and nutrient utilization with maize bran replacing different proportions (0 to 100%) of whole maize in the diet (30% crude protein). He obtained a mean fish growth rate (g/d) that ranged from 0.042

to 0.057 which can be compared to the range 0.02 to 0.03 in this experiment. Even though the crude protein contents (%) of the feed ingredients under treatments I, II and III were 12.0, 11.5 and 12.9 respectively, the fish in the hapas also benefitted from the natural food in the reservoir where the hapas were placed. There were significant differences in the mean growth rates (g/d) between all the three treatments ($p<0.05$).

The range of FCR (4.38 to 5.67) recorded in this experiment was better than the range 6.53 to 9.12 obtained from feeding the ingredients singly to tilapia fry (Otubusin, 1999), so also the FCR range (4.38 to 5.67) was better than the range 5.0 to 8.0 reported by FAO (1976) for cereals and rice hulls respectively fed to Tilapia.

Tilapia are principally herbivores but for enhanced growth of both the fry and fingerlings supplementary feeding is given. Falaye (1992) reported on the utilization of agro-industrial wastes as fish ingredients in Nigeria and concluded that such useful by-products included poultry feathers, ricebran, soyabean hulls and cocoa husks which are discarded as wastes. A combination of corn bran and rice bran (1:1) (treatment II) in powder form for fry/fingerlings is therefore recommended based on the fact that it gave the highest final (average) weight/fish, best average daily weight gain, best FCR and SGR. Above all, the feed cost (Naira) per kg in 1999 for treatments I, II and III were 14.00, 8.9 and 8.6 respectively. In the Philippines, Guerrero (1980) reported on the profitable and beneficial use of rice bran and other farm by-products as ingredients in Nile tilapia (*O. niloticus*) rations in floating cages. Incidentally, these two by-products (rice bran and corn bran) are in large supply in Nigeria (Falaye, 1992) and not competed for as food for humans except for poultry and livestock.

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FIG 1: GROWTH CURVES OF *Oreochromis niloticus* FED DIFFERENT COMBINATIONS OF AGRO-INDUSTRIAL WASTES IN HAPAS FOR 42 DAYS.