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NUTRITIONAL EVALUATION OF BREAD WASTE AS A REPLACEMENT FOR MAIZE IN THE DIET OF GROWING SNAILS

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Abstract

The effect of replacing maize fraction of the diet of growing snails partially or wholly with bread waste (BW) on performance characteristics and cost benefits was studied for 12 weeks. A total of 120 growing snails (*Archachatina margi*nata) of mean weight 83.67 ± 3.5g of about 3 months of age were randomly allotted to 4 dietary treatments, BW_1, BW_2, BW_3 and BW_4 in which maize fraction of the diet was replaced at 0, 50, 75 and 100% with BW respectively, in a completely randomized design replicated 3 times. The parameters measured were feed intake, weight gain, shell length, width and thickness. Feed conversion ratio and cost/weight gain were calculated. The results showed that significant differences were not observed in the mean total feed intake, weight gain and shell increment (P>0.05). The results also revealed that dietary treatments had no significant influence on the dressing percentage (P>0.05) which varied between 41.25 and 41.28%. The total feed cost and cost per weight reduced as the level of BW in the diet increased from 0 to 100%. The highest cost/ weight gain (CW) of N223.2 was recorded in diet containing 0% BW while the lowest CW was recorded in diet containing 100%BW. Based on the present results maize fraction of snail's diet could be replaced with bread waste up to 100% at reduced cost without any adverse effect on performance of growing snails.

KEYWORDS: *Archachatina marginata,* bread waste, feed efficiency, maize, snail

Introduction

The animal protein intake of average Nigerian is low compared to other developed nations of the world [9]. In order to increase the animal protein intake, there is need for expansion of livestock industry which is the main source of the protein. One of the challenges facing livestock industry in Nigeria is high cost of feed which has led to closure of some farms. The use of agro-industrial by-products (AIBs) has been one of the panacea to high feed cost. Several authors have used different (AIBs) such as pineapple waste, Bambara groundnut, poultry waste (chicken offal, rice bran, castor oil bean, kolanut husk, rumen context, blood rumen, sunflower seed cake, shrimp waste meal, etc. [2,3,5,8,11]. Bread waste, a by-product of bakery industry is rich in energy, low in fibre but high in vitamins has been used to replace maize in the diet of broiler [1,7] which has led to reduction in feed cost. Bread waste is cheap and

available in bakery industry in Nigeria. There is paucity of information on the use of bread waste in the diet of snails hence this study was conducted to assess the performance and cost benefits of replacing maize fraction of the diet of growing snails (*Archachatina margi*nata) with bread waste.

Materials and Method

The experiment was carried out at the Snailery Unit of the Institute of Agricultural Research and Training (I.A.R.& T.), Moor Plantation, Ibadan which is located on Longitude 03°51E, Latitude 07°23N and Altitude 650" lies in the humid zone of the rainforest belt 0703.25 of South-Western Nigeria with mean annual rainfall of 1220 mm and mean temperature of 26°C. Bread waste (BW) was purchased from a bakery cottage industry in Ibadan, Oyo state, Nigeria. It was ground before incorporated with other feedstuffs. A total of 120 growing snails (*Archachatina margi*nata) of mean weight 83.67 ± 3.5g of about 3 months of age were used for the feeding trial. Four diets were formulated to contain BW at 0% (BW_1) Control, 50% (BW_2), 75% (BW_3) and 100% (BW_4) as replacement for maize fraction in the diet of growing snails in a completely randomized design replicated 3 times with 10 snails per replicate. The diets were formulated to contain about 24% crude protein and energy of 2400 kcalkg/ ME (Table 1) The snails were reared in a cage of 12 compartments and each compartment had a dimension of 0.5x 0.5m^2. All management practices were adhered to as suggested by [6]. Feed intake and weight gain were measured on daily and weekly basis with the use of sensitive weighing balance. Feed intake was calculated by subtracting the left-over feed from the feed given while the weight gain was calculated by deducting the initial weight from the final weight. Shell length and width were measured on weekly basis with vernier caliper. Micrometer screw gauge was used to measure the shell thickness on weekly basis. Feed conversion ratio was calculated as the ratio of feed intake to weight gain. Feed cost and cost per weight gain were also calculated. Carcass analysis was carried out at the end of the feeding trial by randomly selecting 4 snails from each replicate and weighed separately. Each snail was killed by striking the shell with a club. The shell, foot and viscerals were separated and weighed separately. The feeding trial lasted for 12 weeks. The chemical composition of the experimental diets and the foot were done according to the method of [4]. All data were subjected to statistical analysis using analysis of variance and the means were separated if they were significantly different using Duncan Multiple Range Test [14]

Table 1: Gross Composition of Experimental Diet.

Ingredient (%)	BW_1 (0%)	BW_2 (50%)	BW_3 (75%)	BW_4 (100%)
Maize	22.00	11.00	5.5	0.0
Bread waste	0.0	11.0	16.5	22.0
*Others	78.0	78.0	78.0	78.0
Total	100.0	100.0	100.0	100.0
Cost/kg feed (N/kg)	51.25	49.12	44.15	40.25

Calculated analysis				
Crude protein (%)	23.83	24.02	24.35	24.53
Metabolizable energy (kcal/KgME)	2448.1	2437.6	2419.3	2413.5

*Other fixed ingredients : Rice bran -15, B.D.G.- 12.8, Fish meal-4, Soya bean meal-24, Ground nut cake-10, Bone meal-2.15,Oyster shell-9.8, Premix-0.25

Results and Discussion

The chemical composition of the bread waste showed that the crude protein of bread waste (BW) was nearly the same with that of maize while the crude fibre of BW was lower than that of maize (Table 2). The crude protein for BW in this report was relatively similar to 9.76% reported by [1]. The chemical composition of the experimental diets revealed that the crude protein and crude fibre content were within the recommended values as reported by [10,13]. The mean total feed intake was not significantly different across the treatments ($P>0.05$) although numerically the feed intake increased as the level of BW in the diet increased.(Table 3) The numerical increase in feed intake could be due to sweet nature and low fibre content of BW as shown in Table 2 compared to maize. It has been reported that snails tend to eat more when the feed is low in fibre and palatable [6,12]. The mean initial weight was relatively the same in all the treatments ($P>0.05$). The mean total weight gain across the treatments was not significantly influenced by increased level of BW in the diet ($P>0.05$) also the feed conversion ratio was relatively similar in all the treatments ($P>0.05$) and varied between 4.32 in BW_1 to 4.33 in BW_3. The relatively the same feed intake and weight gain implied that bread waste could partially or wholly replace maize fraction of the diet. The weight gain recorded in all the treatments compared favourably with the report of [12]. The mean shell length, width and thickness were not significantly different from one another as the level of BW in the diet increased ($P>0.05$). It could be observed from Table 2 that the ash contents of the diets was relatively the same. The results of carcass analysis (Table 4) showed that the dressing percentage across the treatments was relatively the same ($P>0.05$) and it ranged between 41.25 and 41.30%, this implies that BW could be used as substitute for maize in the diet of snail. The results of the dressing percentage compared favourably with the reports of [10,12]. The results of cost analysis (Table 5) showed that the cost/kg feed reduced as the level of BW in the diet increased from 0 to 100%. The total feed cost also reduced from N55.8 in the control diet to N48.85 in diet containing 100%BW. The mean cost per weight was low in the diet containing 100% BW (N195) compared to N223.2 in the control diet. The low cost reported when maize was replaced by BW compared favourably with several authors that included alternative or non-conventional feed resources in the diet of livestock [5,8,11]. It could be concluded that bread waste could be used to replace maize wholly or partially in the diet of growing snails in order to reduce feed cost without any adverse effect on growth performance characteristics.

Table 2 : Determined Proximate Composition of the Maize, Bread waste and Experimental diets

Parameters	Maize	Bread waste	BW_1 (0%)	BW_2 (50%)	BW_3 (75%)	BW_4 (100%)
Dry Matter	97.66	98.77	95.92	94.38	94.89	93.80
Crude Protein	9.76	11.34	23.85	23.97	24.15	24.43
Crude Fibre	6.77	4.89	4.89	4.83	4.45	4.35
Ether Extract	5.18	7.36	4.82	4.92	4.99	5.16
Ash	7.98	10.98	11.34	11.44	11.56	11.87
Nitrogen Free Extract	70.31	65.45	55.1	54.9	54.85	54.19

Table 3 Growth performance of growing snails fed different levels of bread waste in the diet.

Parameters (Means)	BW_1 (0%)	BW_2 (50%)	BW_3 (75%)	BW_4 (100%)	±SEM
Initial weight (g)	83.41	82.14	83.01	84.23	3.15
Final weight (g)	331.51	331.65	332.79	334.35	4.21
Total weight gain (g)	248.1	249.51	249.78	250.12	4.59
Total feed intake (g)	1071.79	1077.88	1081.55	1083.01	12.5
Feed conversion ratio	4.32	4.32	4.33	4.32	0.21
Shell length increment (mm)	12.41	12.42	12.42	12.44	0.34
Shell width increment (mm)	10.23	10.23	10.25	10.26	0.21
Shell thickness increment (mm)	0.12	0.13	0.13	0.13	0.02
Mortality (Number)	0	1	1	0	-

Means along rows with different superscript are significantly different from each other ($P<0.05$)

Table 4 Carcass analysis of growing snails fed different levels of bread waste in the diet

Parameters (Means)	BW_1 (0%)	BW_2 (50%)	BW_3 (75%)	BW_4 (100%)	±SEM
Live weight (g)	330.12	331.4	331.9	332.15	4.5
Shell weight (g)	77.41	77.08	76.84	77.12	3.4
Offal weight (g)	69.49	66.71	67.21	70.48	3.9
Foot weight (g)	136.17	136.84	137.07	137.11	4.6
Dressing percent (%)	41.25	41.29	41.30	41.28	2.5
Offal/live weight (%)	21.05	20.13	20.25	21.22	1.6
Shell/live weight (%)	23.45	23.26	23.15	23.22	1.5

Means along rows with different superscript are significantly different from each other ($P<0.05$)

Table 5 Cost analysis of growing snails fed different levels of bread waste in the diet

.Parameters (Means)	BW_1 (0%)	BW_2 (50%)	BW_3 (75%)	BW_4 (100%)	± SEM
Cost/kg feed (g)	52.15[a]	50.14[a]	47.56[b]	45.23[a]	2.13
Total feed intake (kg)	1.07	1.08	1.08	1.08	
Total feed cost (N)	55.8[a]	54.15[a]	51.36[b]	48.85[c]	1.35
Total weight gain (kg)	0.25	0.25	0.25	0.25	
Cost/weight gain (N/kg)	223.2[a]	216.6[b]	205.44[c]	195.4[d]	4.16

Means along rows with different superscript are significantly different from each other ($P<0.05$)

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