The Feeding Value of Biscuit Waste as Replacement for Maize in the Diet of Growing Snails (*Archachatina marginata*)

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Abstract Maize is a major source of energy and it is expensive because of competition between man and animal. Biscuit waste (BW) which attract little cost was used to replace maize fraction of the diet of snail in order to reduce cost. Four diets were formulated to contain BW at 0% (B_1) which served as the control, 50% (B_2), 75% (B_3) and 100% (B_4) as replacement for maize fraction in the diets of growing snails. Completely randomized design was used for the trial and each treatment was replicated thrice with 8 snails per replicate. The parameters taken were feed intake and weight gain. Feed conversion ratio, total feed cost and cost per weight gain were calculated. The results showed that there were no significant difference in the weight gain between the control diet B_1 and B_4 ($P<0.05$). The feed conversion ratio was relatively similar in B_1 and B_4. The dressing percent of the snails was relatively the same in all the treatments ($P>0.05$). The results of cost analysis showed that cost /kg feed and total feed cost reduced as the level of BW in the diet increased. The lowest cost per weight gain was recorded in B_4 while the highest cost per weight gain was observed in the control treatment with zero level of BW. The results indicated that the feed cost of snail diet could be reduced by replacing the maize fraction of the diet partially or wholly with biscuit waste. [Journal of American Science 2010;6(2):1-5]. (ISSN: 1545-1003).

Keywords: Biscuit waste, maize, feed utilization, dressing percentage, Cost/weight gain.

Introduction

Animal protein is very important in the diet of man for growth, repair of the body tissue and it is major constituent of the organ of the body, It has high biological values and contains all essential amino acid in the right proportion (Arthur, 1975). Beef, pork, mutton and poultry meat have been the major source of animal protein in Africa and Nigeria in particular. Recently, there is increase in production of snail and grass-cutter as alternative sources of animal protein (Cobbinah, 1993; Begg,2003; Malik and Dikko 2009; King, 2008). Snail meat contains low fat and low cholesterol level which makes the meat a good antidote for fat related diseases. The cost of production in terms of housing and feed is relatively low compared to other conventional livestock (Ejidike, 2001;Adelekan and Taiwo 2004 ; Malik and Dikko 2009). The cost of the feed forms the major part of cost of production and performance of snail in terms of growth and egg lying depends on the quantity and quality of the feed. Maize is the main source of energy and account for 40-60%of the whole diet (Payne, 2000). The cost of maize is relatively high compared to other sources hence there is need to look for alternative sources. Biscuit waste is another source of energy with protein and energy content relatively close to that of maize. The cost of biscuit waste relatively low compared to that of maize and it is considered as a waste product. Biscuit waste has been included in the diet of broiler which has resulted in reduction in the cost of feed without any adverse effect. This study was conducted to determine the effect of feeding snail with biscuit waste as replacement for maize fraction of the diet on performance characteristics and cost benefits.

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 Southwestern Nigeria with mean annual rainfall of 1220 mm and mean temperature of 26°C. A total of ninety six growing snails of mean weight 91.23±2.4g were used for the feeding trial. The snails were acclimatized for one week before the commencement of the feeding trial. Biscuit waste (BW) was collected from Efco energy company, Ibadan, Oyo state, Nigeria. The biscuit waste was later incorporated with other feedstuffs. Four diets were formulated to

contain BW at 0% (B_1) Control, 50% (B_2), 75% (B_3) and 100% (B_4) as replacement for maize fraction in the diet of growing snails. The diets were formulated to contain about 24% crude protein and energy of 2500 kcal/kgME (Table 1). 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 measured the shell thickness on weekly basis. Feed conversion ratio were 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 eight snails from each treatment 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 chemical composition of the experimental diets and the foot were done according to the method of A.O.A.C. (1990). All data were subjected to statistical analysis using analysis of variance and the means were separated if they are significantly different using Duncan Multiple Range Test (SAS, 1999).

Based on relatively the same mean feed intake, weight gain, feed conversion ratio, dressing percentage obtained in the control diet and B_4 and the fact that the least cost/weight gain was obtained in diet containing 100% BW as replacement for maize fraction of the diet, it could be concluded that biscuit waste could partially or wholly replace maize in the diet of growing snails.

Table 1. Gross Composition of Experimental Diet

Ingredient (%)	**B_1 (0%)**	**B_2 (50%)**	**B_3 (75%)**	**B_4 (100%)**
Maize	22.00	11.00	5.5	0.0
Biscuit waste	0.0	11.00	16.5	22.0
GNC	10.00	10.00	10.00	10.00
Soyabean meal	24.00	24.00	24.00	24.00
Brewer dry grains	12.8	12.8	12.8	12.8
Rice bran	14.60	14.60	14.60	14.60
Fish meal	4.00	4.00	4.00	4.00
Bone meal	2.15	2.15	2.15	2.15
Oyster shell	9.70	9.70	9.70	9.70
Lysine	0.10	0.10	0.10	0.10
Methionine	0.10	0.10	0.10	0.10
Salt	0.10	0.10	0.10	0.10
Premix	0.25	0.25	0.25	0.25
Total	**100.0**	**100.0**	**100.0**	**100.0**
Crude protein (%)	24.02	24.39	24.48	24.08
Metabolizable energy (kcal/KgME)	2605.2	2598.7	2589.23	2578.34

Results and Discussion

Table 1 shows the chemical composition of maize and biscuit waste. The crude protein of biscuit waste was slightly higher than that of maize while the ash content of biscuit waste was also higher than that of maize moreover the fibre content of maize was higher than that of biscuit waste. Low fibre and high protein levels in the have positive effect on feed intake and weight gain (Arthur, 1975).The total weight gain of the snails in all the treatments was not significantly influenced by increased level of biscuit waste in the diet ($P>0.05$) as shown in table 2. Numerically the total weight gain increased from 209.72g in B1 to 213.6g in B_4. The mean feed intake was significantly influenced by increased level of biscuit waste in the diet ($P<0.05$). The highest feed intake was recorded in the diet containing 100% biscuit waste as replacement for maize B_4 while the lowest feed intake was recorded in diet

containing 0% biscuit waste B_1. The highest feed intake recorded in B_4 could be as a result of sweet nature of biscuit waste BW coupled with low fibre content moreover the protein content of BW was a bit higher than that of maize. The weight gain recorded in all the treatments compared favourably with the report (Ejidike, 2001; Omole 2008). The feed conversion ratio which is the ratio of the feed intake weight was not significantly influenced by the varying levels of biscuit waste in the diet which implies that maize could be partially or wholly replaced by BW in the diet of growing snails. The shell length and width increased numerically as the level of BW in the diet increased though no significant differences were observed (P>0.05). The shell growth depends on the level of minerals content of the feed vis-à-vis ash content (Amusan and Omidiji; 1998). As shown in table 1 the ash content of BW was a bit higher than that of maize. The shell thickness in all the treatment was relatively the same (P>0.05). As shown in table 4, The dressing percent of the snails was relatively the same in all the treatments (P>0.05). The values varied between 41.3 in B_4 to 40% in B_1. The dressing percent observed in this study compared favourably with the reports of other researchers (Bright 1996; Amusan and Omidiji 2008). The relatively the same dressing percentage observed in all the treatments also signifies that BW could be used as replacement for maize in the diet of growing snails. The results of cost analysis shows that cost /kg feed and total feed cost reduced as the level of BW in the diet increased and this could be due to the fact that the cost of maize was higher than that of BW as shown in table 3.The lowest cost per weight gain was recorded in B_4 while the highest cost per weight gain was observed in the control treatment with zero level of BW.

Table 2. Determined Proximate Composition of the Maize, Biscuit waste and Experimental diets

Parameters	**Maize**	**Biscuit waste**	**B_1 (0%)**	**B_2 (50%)**	**B_3 (75%)**	**B_4 (100%)**
Dry Matter	96.78	95.67	95.92	94.38	94.89	93.80
Crude Protein	9.56	10.36	23.44	23.57	23.84	24.12
Crude Fibre	5.62	4.67	4.88	4.85	4.48	4.43
Ether Extract	4.56	5.98	4.79	4.89	4.94	5.08
Ash	8.94	10.21	10.34	10.56	10.78	10.94
Nitrogen Free Extract	71.32	68.78	53.01	53.19	53.51	53.72

Table 3. Performance of Snail fed Biscuit Waste as Replacement for Maize

Parameters (Means)	**B_1 (0%)**	**B_2 (50%)**	**B_3 (75%)**	**B_4 (100%)**	**± SEM**
Initial weight (g)	65.7	64.7	63.7	65.9	4.89
Final weight (g)	292.01	292.4	293.2	297.8	8.46
Total weight gain (g)	226.31	227.7	229.5	231.9	8.97
Total feed intake (g)	784.35	785.7	789.3	799.3	8.76
Feed conversion ratio (g)	3.46	3.45	3.44	3.45	0.31
Shell length increment (g)	13.38	13.39	13.45	13.44	1.87
Shell width increment	11.59	11.60	11.61	11.71	0.4
Shell thickness increment	0.15	0.15	0.15	0.16	

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

Table 4 Carcass Analysis of Snail fed Different Levels of Biscuit Waste

Parameters (Means)	B_1 (0%)	B_2 (50%)	B_3 (75%)	B_4 (100%)	± SEM
Live weight (g)	291.51	292.8	292.9	298.6	9.65
Shell weight (g)	65.01	67.05	62.39	61.24	3.9
Offal weight (g)	62.68	62.66	59.46	59.06	3.3
Foot weight (g)	120.24	120.66	120.24	118.13	5.98
Dressing percent (%)	41.25	41.21	41.05	39.56	2.97
Offal/live weight (%)	21.5	21.4	20.3	19.78	2.31
Shell/live weight (%)	22.3	22.9	21.3	20.51	2.41

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

Table 5. Cost Analysis Of Growing Snails Fed Levels Of Biscuit Waste

Parameters (Means)	B_1 (0%)	B_2 (50%)	B_3 (75%)	B_4 (100%)	± SEM
Cost/kg feed (g)	59.7 ^{a}	55.5 ^{b}	53.1 ^{bc}	50.03 ^{c}	4.1
Total feed intake (g)	0.78	0.79	0.79	0.80	
Total feed cost (N)	46.57 ^{a}	43.85 ^{ab}	41.95 ^{b}	40.02 ^{b}	3.6
Total weight gain (g)	0.226	0.228	0.230	0.221	
Cost/weight gain (N/kg)	206.06 ^{a}	192.33 ^{b}	182.39 ^{c}	181.09 ^{c}	9.9

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

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