The Effects of Different Dietary Fibre Levels in the Diet of Growing Snails (*Archachatina marginata)* on Performance Characeristics

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Abstract: Fiber is very important factor in feed formulation for livestock because high level of fiber in the diet has been reported to affect digestibility and nutrient utilization hence this study assessed the effect of different levels of fibre in the diet of growing snails. Four diets were formulated to contain fibre level of at 6% (F_1) Control, 8% (F_2), 10% (F_3) and 12% (F_4). Each treatment was replicated thrice with 8 growing snails per replicate in a Completely randomized design. The snails were reared in a cage of 12 compartments. Feed intake, weight gain, shell length and width were measured. Feed conversion ratio, nutrients digestibility and dressing percentage were calculated. The results showed that no significant difference was observed in snails fed diet containing F_1, F_2 and F_3 ($P>0.05$) while the lowest weight gain was recorded in diet containing 12% crude fibre. The mean monthly feed intake followed the same trend with the monthly weight gain ($P<0.05$). The feed was efficiently utilized in F_1, F_2 and F_3. The highest dressing percentage were recorded in diet containing 6 and 10% crude fibre levels. The highest dry matter, crude protein digestibility were observed in diet containing 6% crude fibre level which was similar to F_2 and F_3. The results established that snail could tolerate up to 10% crude fibre in the diet. [Journal of American Science 2009;5(6):27-31]. (ISSN: 1545-1003).

Keywords: Digestibility, dietary fibre, feed conversion ratio, Nigeria, weight gain, snails.

Introduction

Snail meat is a good source of protein, rich in iron and calcium but low in fat and cholesterol level compared to other protein sources like poultry and pigs (Radrizzani, 1992; Gbadamosi, 1998 ;Oji, 2000 ; Omole *et al.*,2000).The cost of production or the cost of setting up the business is relatively low compared with other conventional livestock (Imevbore,1990 ; NRC, 1991; Malik, 2009) hence there need to increase the production through appropriate research into all aspect involve in production and most especially feeding management feed quality, quantity and cost of feed are very important factor for efficient and profitable livestock production. Nutrient such as carbohydrate, fat and oil, protein minerals and vitamin are essential for better performance of livestock. Fiber is a polysaccharide or complex carbohydrate. The dietary fiber includes the cellulose, hemi cellulose, protein, gum, lignin and mucilage. Fiber requirement determination is very important because high level of fiber in the diet has been reported to affect digestibility and nutrient utilization (Arthur, 1975). Crude fiber has the function of maintaining micro-ecological balances of gut, promoting digestive system development, low level of fiber in the diet will lead to diarrhea (Fraga, 1990; Gidenne, 1992). The sources of fiber in the diet include brewer dry grain, rice bran, wheat offal, etc. Snail farming is new and there is no information on the Fiber requirement of snail in the tropic hence the study was designed to determine the effect different levels of fibre in the diet of growing snails weight gain, feed conversion ratio, dressing percentage and nutrient's digestibility.

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. Four diets were formulated to contain fibre level of at 6% (T_1) Control, 8% (T_2), 10% (T_3) and 12% (T_4). The diets were formulated to contain about 24% crude protein and energy of 2400 – 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, width and aperture were measured on weekly basis with Venier calliper. Feed conversion ratio were calculated as the ratio of feed intake to weight gain. Feed cost and cost per weight gain were also calculated. Two snails from each replicate were randomly selected for the digestibility trial for seven days according to the method of Omole, 2003. 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 using Duncan Multiple Range Test [SAS 1999].

Table 1 . Gross Composition Of Experimental Diet.

Ingredient (%)	F_1 (6%)	F_2 8%)	F_3 (10%)	F_4 (12%)
Maize	26.00	22.45	21.45	22
GNC	10.00	16	14	12.65
Soyabean meal	24.2	18	15	13
Brewer dry grain	15	18.7	22	27.3
Rice bran	14.60	15.00	16.5	20
Fish meal	4.00	4.00	5	5
Bone meal	2.15	2.00	2.00	2.00
Oyster shell	3.5	3.3	3.5	3.5
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 (%)	24.55	24.62	24.70	24.88
Fibre content (%)	6.19	8.24	10.30	12.02
Energy (Kcal/kgME)	2544.43	2512.68	2499.02	2485.04

Results and Discussion

There were no significant differences (P>0.05)in the mean initial weight of the snails as shown in Table 3. The values varied between 85.8 and 88.3g. The mean monthly weight gain was significantly influenced by different level of fibre in the diet (Table 2). No significant difference was observed mean monthly weight gain of snails fed diet containing 6% (F_1), 8% (F_2) and 10% (F_3) crude fibre level while the lowest weight gain was recorded in diet containing 12% (F_4) crude fibre. The mean monthly feed intake followed the same trend with the monthly weight gain (P<0.05). The highest mean monthly feed intake was recorded in F_1 which was relatively similar to F_2 and F_3 (Table 3). The lowest feed intake and weight gain recorded in F_4 could be due to increase in fibre content of the diet. It has been observed that feed intake tends to reduce when the fibre content in the diet of livestock increase (Fraga, 1990; Wilfart *et al.,* 2007). High fibre content in the feed reduces the movement of ingested feed in the gut (Gidenne,1992). The lowest weight gain recorded in F_4 could also be due to lowest feed intake reported. The mean feed conversion ratio which is the ratio of feed intake to weight gain was influenced by different level of fibre in the diet (P<0.05). The feed was efficiently utilized in F_1, F_2 and F_3 as observed in Table 3. There were no significant differences in the mean monthly shell length, width and thickness increment as shown in Table 3. It has been confirmed that high fibre level above tolerant level has adverse effect on absorption of calcium and phosphorus etc. (Fraga, 1990). From the result observed, it could be inferred that the level of fibre content in the diets was still within the range of level of tolerance because the shell growth in all the treatments was not significantly influenced by different level of fibre in the diet. There were significant

differences (P<0.05) in the mean dry matter, crude protein, crude fibre and ash digestibility as shown in Table 4. The highest dry matter, crude protein and crude fibre digestibility were observed in diet containing 6% crude fibre level which was similar to F_2 and F_3. The better nutrients digestibility observed in F_1 could be due to low fibre content in the diet which result into highest feed intake recorded. The results were relatively similar to the report of (Gidenne,1992) who recorded low digestibility of nutrients as the fibre level of the diet increase in rabbit. The low digestibility of nutrients observed n F_4 was due to high fibre content of the feed. The results of carcass analysis showed that the foot weight (edible portion) of the snails was significantly (P<0.05) influenced by the levels of fibre in the diets as shown in Table 5. The dressing percentage was also significantly influenced (P<0.05) by different levels of fibre in the diet. The highest dressing percentage was recorded in diet containing 6% which was relatively similar to F_2 and F_3. The dressing percentage observed in F_1, F_2 and F_3 were 41.3% and 41.1% was relatively similar to the report of Omole, 2003. It could be concluded that mean feed intake and weight gain were relatively similar in diet containing 6, 8 and 10% level of fibre. The lowest feed intake and weight gain were recorded in diet containing highest fibre content (12% CF). The efficiency of feed utilization was best in the diet containing 6% crude fibre level (CFL) but relatively similar to diet with 8 and 10% crude fibre level. The feed was poorly utilized in diet containing 12% crude fibre level. The dressing percentage of the snails was relatively the same in F_1 , F_2 and F_3. Snails could tolerate up to 10% on crude fibre in the diet.

Table 2: Chemical Composition Of The Experimental Diets.

%	F_1 (6%CF)	F_2 8%CF)	F_3 (10%CF)	F_4 (12%CF)
Dry matter	87.15	86.47	87.01	86.65
Crude protein	24.03	24.18	24.21	24.30
Crude fibre	6.01	7.92	10.05	12.11
Ash	8.14	8.10	7.92	7.86
Ether extract	4.86	4.81	4.74	4.70
Nitrogen free extract	56.96	54.99	53.08	51.03

Table 3 Performance Of Snail Fed Different Levels Of Fibre.

Parameters	F_1 (6%CF)	F_2 8%CF)	F_3 (10%CF)	F_4 (12%CF)	± SEM
Initial weight (g)	86.2	88.3	85.8	86.9	4.5
Final weight (g)	235.64 [a]	236.4 [a]	230.08 [a]	214.46 [b]	12.9
Total weight gain g	149.44 [a]	148.12 [a]	144.28 [a]	126.36 [b]	10.6
Monthly weight gain (g)	37.36 [a]	37.03 [a]	36.09 [a]	31.59 [b]	4.7
Total feed intake (g)	866.88 [a]	862.0 [a]	841.2 [a]	749.2 [b]	23.7
Monthly feed intake (g)	216.7 [a]	215.5 [a]	210.3 [a]	187.3 [b]	8.5
Feed conversion ratio	5.8 [a]	5.82 [a]	5.83 [a]	5.93 [b]	0.05
Mortality/snail	0	1	1	0	
Shell length increment (mm)	11.84	11.82	11.80	11.74	0.08
Shell width increment. (mm)	9.76	9.75	9.75	9.66	0.06
Shell thickness increment. (mm)	0.15	0.15	0.14	0.14	0.02

a & b = means with different superscripts along the same row are significantly different (P<0.05).

SEM =standard error of means.

Table 4. Digestibility Of Nutrients By Snail Fed Different Level Of Fibre In The Diet.

Parameters	F_1 (6%CF)	F_2 8%CF)	F_3 (10%CF)	F_4 (12%CF)	± SEM
Dry matter digestibility %	77.91 [a]	77.8 [a]	76.38 [a]	71.42 [b]	4.6
Crude protein dig. %	70.28 [a]	69.95 [a]	69.01 [a]	62.12 [a]	4.1
Crude fibre dig. %	67.80 [a]	67.10 [a]	66.81 [ab]	62.1 [b]	3.7
Ether extract dig. %	78.21 [a]	77.9 [a]	76.35 [a]	71.4 [a]	5.3
Ash digestibility %	70.45 [a]	70.15 [a]	69.3 [a]	64.5 [b]	4.8
Nit. Free extract dig%	69.4 [a]	69.1 [a]	68.2 [a]	62.7 [b]	4.6

a & b = means with different superscripts along the same row are significantly different ($P<0.05$).

Table 5. Carcass Analysis Of Snail Fed Different Level Of Fibre In The Diet

Parameters	F_1 (6%CF)	F_2 8%CF)	F_3 (10%CF)	F_4 (12%CF)	± SEM
Live weight (g)	234.3 [a]	232.3 [a]	230.2 [a]	213.5 [b]	12.8
Shell weight (g)	49.91 [a]	49.25 [a]	46.7 [ab]	41.42 [b]	4.4
Offal weight (g)	45.22 [a]	43.44 [a]	42.12 [a]	36.7 [b]	3.8
Foot weight (g)	96.7 [a]	95.47 [a]	91.53 [a]	82.65 [b]	5.8
Dressing percent %	41.3 [a]	41.1 [a]	39.76 [a]	38.71 [b]	3.1
Offal/live weight%	19.3	18.7	18.3	17.2	2.8
Shell/live weight%	21.3	21.2	20.3	19.4	2.9

a & b = means with different superscripts along the same row are significantly different ($P<0.05$).

SEM =standard error of means.

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