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Research Paper

EFFECT OF LEVELS (0, 5, 10 AND 15%) OF CASSAVA BY-PRODUCTS INCLUSION IN THE DIETS OF SNAILS (*Archachatina marginata* SWAISSON) ON GROWTH, NUTRIENTS DIGESTIBILITY AND COST

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Abstract

A 16 week feeding trial was carried out with seven hundred and twenty growing snails of mean weight of 65±2.00g, They were randomly allotted to 16 dietary treatments. The formulated diets were almost isocaloric and isonitrogenous, Cassava by-products, such as Cassava peel (CPL), leaf (CL), Seviate (CS) and Chaff (CC), were each included at 0,5,10 and 15%. The diets were tagged T_1-T_{16}, T_1-T_4 contained cassava peel, T_5-T_8 cassava leaf, T_9-T_{12} cassava seviate and T_{13}-T_{16} cassava chaff. Feed and water were given to the snails in the treatments ad libitum and parameters, such as growth performance, carcass analysis, cost per weight gain and digestability of dry matter were evaluated. All data collected were analyzed at Linear Quadratic and Cubic Probability. In the factorial trial, inclusion level had no significant effect at P:L, P:Q and P:C on feed intake, weight gain, increment in shell length, thickness and width. Carcass yield 43.22% (CPL), 42.98% (CL), 43.11% (CS), and 42.16% (CC) were highly affected ($P<0.01$) by the diets. Dry matter digestibility were significantly ($P<0.05$) varied. Three parameters, dressing percentage, cost/g weight gain and dry matter digestibility were affected by dietary inclusion levels of cassava by-products.

Key words: Snails, inclusion, Growth and digestibility.

INTRODUCTION

Nigerians livestock resources is traditionally managed and characteristically dominated by cattle in population, value, animal protein and biomass, Tewe (1997). The industry due to neglect, could not provide affordable protein for the teaming population in the country, which has plagued the country with some challenging developmental statistics (kehinde, 2007).

Atsu (2002), opined that with the huge livestock resources in Nigeria, the country is not supposed to suffer from protein malnutrition. In order to improve on the present situation, the agriculture industry should be given the attention it deserves in terms of funding.

Food is an important factor in human existence and there is general under feeding in most developing countries, there is general decline in food of plant and animal sources, especially protein, this was supported by Omole (2002), when he asserted that there was decline in protein consumption in Nigeria.

To alleviate the protein deficiency being experienced, concerted efforts should be made to ensure that alternative animal protein sources are explored to provide cheaper and affordable protein. The greatest problem which remained unsolved in the livestock sector is that of escalating cost of feed for animals.

Feed accounted for about 70% of the cost of animal production (kehinde 2012). In view of the escalating prices of conventional feedstuffs and the high demand for grain in the human nutrition. It is therefore necessary to explore other sources of carbohydrate for use in animal nutrition. Feed components that are cheaper and available should be sought among tropical and subtropical cultivated plants.

Researchers are now busy on the use of alternative ingredients to replace the conventional ones. Agunbiade et al., (2002), reported Nigeria as the world leading producer of cassava, he also stated that cassava processing is associated with bulk of wastes. The wastes generated in the cassava processing industry, such as cassava leaf, peel, sievate and chaff can be adopted for snails feeding.

MATERIALS AND METHODS

Experimental Site

The feeding trial was conducted at the Wildlife section of the Forestry Research Institute of Nigeria, Ibadan, Oyo State, Nigeria.

Experimental Design

A 4×4 factorial design was used for this experiment that lasted for sixteen weeks. The growing snails (720) of mean weight 65±2.00g were allotted to 4 cassava by-products based diets with cassava Leaf (CL), cassava chaff (CC), cassava seviate (CS), and cassava peel (CPL) incorporation at 0,5,10 and 15% each. Each treatment was replicated three times, with 45 snails per treatment.

Housing and Feeding

The Snails were reared in cages of $0.25 \times 0.25 \times 0.5m^3$/15 snails. Feed and water were given to the Snails ad libitum. The snails were fed around 17.00-18.00 hour, due to their nocturnal nature. The feed intake and weight gain were measured on a daily basis and weekly basis respectively, with the use of electric weighing balance, while shell length and width were measured on a weekly bases, with the use of vernier caliper. The shell thickness was measured with a micrometer screw gauge on a weekly basis. Record of feed conversion ratio and mortality were also taken.

Nutrient Digestibility Studies

The digestibility trial was carried out at the end of the feeding trial, 3 Snails were randomly selected per replicate and housed in a metabolic cage of dimension $0.02 \times 0.02m^2$ compartments. The box was lined with foam of 0.5cm thickness for easy collection of excreta.

The snails were fed with the same feed used during the feeding trial. Records of feed intake and excreta voided were taken on a daily basis, with the use of electric weighing balance. The excreta collected from each treatment were dried to constant moisture of at 105^0C in hot air oven. The dried samples were dried and ground and stored at room temperature for eventual proximate analysis.

The digestibility trial lasted for 8 days, this was 3 days for acclimatization and 5 days for excreta collection. The proximate composition of the diets and excretion was done according to the method of A.O.A.C (1990). The gross energy of the feeds was determined using ballistic bomb calorimeter.

Table 1 shows the gross composition of experimental diets. There were sixteen cassava by-products based diets used for the trial, they were tagged T_1-$T_{16.}$ The cassava by-products were included at 0,5,10 15%. The resultant diets were almost isocaloric and isonitrogenous. Diets $T_{1,}$ T_2, $T_{3,}$ and T_4 contained 0,5,10 and 15% cassava peel, T_5, T_6, T_7 and T_8 contained 0,5,10 and 15% cassava leaf, T_9, T_{10}, T_{11}, and T_{12} contained 0,5,10 and 15% cassava seviate, while T_{13}, $T_{14,}$ T_{15} and T_{16}, contained 0,5,10 and 15% cassava chaff.

Table 2 elicited the proximate composition of experimental diets. This this showed the values for crude protein, crude fibre, ether extract, nitrogen free extract and ash. Highest dry matter was obtained in T_{11} (94.15%), while the highest crude fibre was obtained in the diet with 15% cassava leaf inclusion. Dry matter digestibility was not significant at 5% inclusion.

Effects of levels (0, 5, 10 and 15%) of cassava by-products inclusion in the diets of snails on the growth performance, carcass yield, shell morphology and economy of production is on Table 3. It reveals that the initial body weight, final body weight and weekly weight gain in the treatments had a non-significant trend for (C:L, P:Q and P:C). Optimal feed conversion ratio of 5.41 obtained for snails fed diet that contained 5% CBPS was significant (P:Q<0.01). the dressing percentage of 43.22%, 42.98%, 43.11% and 42.16% obtained for snails fed with 0,5,10 and 15% CBPS inclusion respectively were highly significant (P<0.05) for (P:L, P:Q and P:C), the same trend was obtained for the offal weight.

The inclusion levels (0, 5, 10 and 15%) of cassava by-products in the diets of snail had significant (P<0.05) effect on the final body weight of snails. The body weight gain was enhanced as the inclusion levels increased, with the control having the least value, indicative of the ability of Achachatina marginata to utilize cassava by-products up to 15%, which agrees with the findings of Ejidike (2004). Marginal increase in the voluntary feed intake was recorded as the level of cassava by-products increased in the diets. This showed that the inclusion of CBPS did not depress feed intake by Hamzat (2002) and also confirmed the observation of D'mello (1995), that cassava based diets fed to pigs, enhanced voluntary feed intake, he however was of the opinion that there could be depression of feed intake at higher level of inclusion.

The increased feed intake as the inclusion level increased was attributed to increased feed volume, which reduced nutrient density and prevented the animal from consuming the requisite nutrient for growth (Fabey et al., 1990), this reflected in the highest value for feed conversion obtained for snail on diets with 15% inclusion of cassava by-products.

Based on the feed conversion ratio CBPS could be utilized, without any adverse effect, up to 10%. All the values for dressing percentage were within the standard of 40-45% recommended by (Kehinde and Adeola 2017). Offal weight compared up to 10% inclusion level increased significantly (P<0.05) at 15% level, which could be linked with the increased level and of CBPS, which has been implicated in the increased weight and length of gastro intestinal tract. The shell morphological parameters were not adversely affected by the level of CBPS inclusion, which showed that snails utilized the by-products effectively for growth and mineral deposition. Feeding of CBPS based diets to snails hold a great potential, due to the reduction in the cost of gramme weight gain obtained as the level of Inclusion of CBPS increased and was optimized at 5% inclusion level.

The digestibility of nutrients was significantly, (P<0.05) affected by the levels of inclusion of cassava by-products. Nutrients digestibility was depressed as inclusion levels increased. The inclusion of CBPS at 5% resulted in similar (P>0.05) values for the digestibility of dry matter as the control. The reduced digestibility of nutrients as inclusion level increased could be due to dilution of nutrients and not the level of cyanide, which was lower than 100ppm in all the treatments, this same trend was reported by Ogbonna and Adebowale (1993), when cassava peel was included in the diets of cockerels. The observation also agreed with the finding of Halimani et al., (2005), that higher levels of agro by-products depress digestibility of nutrients in monogastrics, several reasons have been suggested for the trend observed, such as high level of fibre. In the submissions of whittemore (1998), non-starch polysaccharides reduced the digestibility of nutrients through coating and protecting effect.

It could be concluded from this trial that levels of inclusion of cassava by-products had highly significant (P<0.01) effect on dressing percentage and offal weight, while the other growth parameters were not significantly affected at (P:L, P:Q, P:C). Cost per programme weight gain (#) was significantly varied (P<0.05). Farmers can adopt cassava by-products in Snail nutrition.

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Table 1: Gross Composition of Experimental Diets Fed to Growing Snails.

	TREATMENTS															
Ingredients (%)	**T_1**	**T_2**	**T_3**	**T_4**	**T_5**	**T_6**	**T_7**	**T_8**	**T_9**	**T_{10}**	**T_{11}**	**T_{12}**	**T_{13}**	**T_{14}**	**T_{15}**	**T_{16}**
Maize	22.60	21.60	21.10	21.10	22.50	22.50	19.50	17.50	23.50	22.25	21.10	20.75	22.50	22.25	21.10	21.10
Maize offal	10.00	9.00	9.00	17.00	13.50	13.50	13.50	13.50	10.00	8.35	7.50	4.50	10.00	8.35	7.50	4.50
Wheat offal	10.60	7.10	4.10	1.10	10.60	8.60	6.60	6.80	9.60	7.10	2.10	1.10	10.60	7.10	2.10	1.10
Palm kernel cake	5.00	5.00	3.50	1.10	5.00	5.00	8.00	8.00	5.00	5.00	5.50	2.00	5.00	5.00	5.50	2.00
Soyabean cake	25.70	22.10	22.10	22.00	22.20	18.70	15.20	13.00	25.70	22.10	25.10	14.95	25.70	222.10	25.50	25.50
Groundnut cake	10.00	12.10	14.00	16.50	10.00	11.00	11.50	10.00	14.00	12.10	12.10	14.95	10.00	14.00	12.10	14.60
Fish meal	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00
Oyster shell	9.70	9.70	9.70	9.70	9.70	9.70	9.70	9.70	9.70	9.70	9.70	9.70	9.70	9.70	9.70	9.70
Bone meal	2.15	2.15	2.15	2.15	2.15	2.15	2.15	2.15	2.15	2.15	2.15	2.15	2.15	2.15	2.15	2.15
Grower premix	2.15	2.15	2.15	2.15	2.15	2.15	2.15	2.15	2.15	2.15	2.15	2.15	2.15	2.15	2.15	2.15

Table 2: Gross Composition of Experimental Diets Fed to Growing Snails.

PARAMETERS PARAMETERS %	CASSAVA PEEL				CASSAVA LEAF				CASSAVA SIEVIATE				CASSAVA CHAFF			
	T1	T2	T3	T4	T5	T6	T7	T8	T9	T10	T11	T12	T13	T14	T15	T16
Dry Matter	92.15	92.83	92.45	93.01	90.49	90.14	90.26	89.68	94.92	93.34	94.15	93.20	89.42	87.64	89.01	88.41
Crude Protein	23.98	23.45	23.34	23.38	23.62	23.65	23.36	23.38	23.95	23.85	23.80	23.92	23.84	23.04	23.56	23.89
Crude Fibre	6.45	6.62	6.91	6.97	6.84	9.98	10.04	11.82	7.88	7.95	8.01	10.11	8.34	8.38	8.41	8.48
Ether Extract	3.48	3.31	3.26	3.18	0.46	0.76	1.18	1.07	4.98	4.92	4.89	4.81	4.96	4.80	4.71	4.62
Ash	8.94	8.96	8.71	8.65	4.28	10.86	16.13	16.89	10.98	10.98	10.79	10.74	11.47	11.38	11.25	11.08
Nitrogen Free Extract	57.15	57.86	57.78	57.84	55.29	44.89	39.55	36.52	53.01	53.19	53.51	53.72	51.39	52.40	52.07	51.65

TABLE 3: EFFECTS OF LEVELS (0, 5, 10 AND 15%) OF CASSAVA BY-PRODUCTS INCLUSION IN THE DIETS OF SNAILS (*ARCHCHTINA MARGINATA* SWAINSON) ON THE GROWTH PERFORMANCE, CARCASS YIELD, SHELL MORPHOLOGY, AND ECONOMY OF PRODUCTION.

PARAMETERS			TREATMENTS			PROBABILITY		
	T_1(CPL)	T_2(CL)	T_3(CS)	T_4(CC)	SEM	L	Q	C
Initial body weight	65.00	67.00	66.00	66.50	2.51	NS	NS	NS
Final body weight	144.44	151.12	150.12	150.38	1.02	NS	NS	NS
Weekly body weight	6.62	7.01	7.01	6.99	1.36	NS	NS	NS
Weekly feed intake	35.75	38.21	38.08	42.00	7.81	NS	NS	NS
Feed conversion ratio	5.53	5.41	5.44	6.01	0.10	NS	xx	NS
Dressing percentage	43.22	42.98	43.11	42.16	0.03	Xx	xx	xx
Offal weight	26.02	25.97	25.87	27.22	0.50	Xx	xx	xx
Shell weight	30.76	31.17	31.05	30.62	0.02	NS	x	NS
Shell thickness increment	0.11	0.12	0.11	0.11	0.01	NS	NS	NS
Shell length increment	0.21	0.21	0.20	0.20	0.02	NS	NS	NS
Shell width increment	7.80	7.97	7.77	7.74	1.33	NS	NS	NS
Mortality	-	-	-	-	-	-	-	-
Cost/g weight gain (#)	0.38	0.34	0.36	0.37	0.10	X	X	x
Dry matter digestibility	65.00	69.00	64.00	64.5	10.00	X	X	x