African Journal of Biotechnology Vol. 11(15), pp. 3709-3712, 21 February, 2012
Available online at http://www.academicjournals.org/AJB
DOI: 10.5897/AJB11.3103
ISSN 1684–5315 © 2012 Academic Journals

Full Length Research Paper

Effects of feeding sweet potato (*Ipomoea batatas*) leaves on growth performance and nutrient digestibility of rabbits

F. O. Abonyi[1]*, E. O. Iyi[1] and N. S. Machebe[2]

[1]Department of Animal Health and Production,Faculty of Veterinary Medicine,University of Nigeria, Nsukka, Enugu State, Nigeria.
[2]Department of Animal Science,University of Nigeria, Nsukka, Enugu State, Nigeria.

Accepted 24 January, 2012

Forty-five (45) weaner rabbits were randomly allotted to five dietary treatments (T) to evaluate the effects of graded levels of sweet potato (*Ipomoea batatas*) leaves (SPL) and pelletized concentrate feed (PCF) on growth performance and nutrient digestibility of rabbits. The treatments were: T1 (0% SPL; 100% PCF); T_2 (25% SPL; 75% PCF); T_3 (50% SPL; 50% PCF); T_4 (75% SPL; 25% PCF) and T_5 (100% SPL; 0% PCF), respectively. Significant differences (P<0.05) in final body weight, total weight gain, daily weight gain, daily feed intake and feed conversion ratio were observed. Rabbits on T_1 and T_3 had higher values for final body weight (1542.13 and 1518.62 g), total weight gain (899.12 and 877.30 g) and daily weight gain (16.03 and 15.47 g), respectively. Also, they had the least feed conversion ratio and consumed less feed when compared with those on diets T_2, T_4 and T_5. Apparent nutrient digestibility results showed significant differences (P<0.05) in dry matter (DM), crude protein (CP), crude fibre (CF) and energy among the dietary treatment groups. From the result of this study, it was concluded that diet having 50% SPL and 50% PCF should be fed to rabbits for optimum growth performance and subsequent reduction in the overall cost of rabbit production in the humid tropics.

Key words: Sweet potato, digestibility coefficient, crude protein.

INTRODUCTION

There has been an increasing pressure on the livestock sector to meet the growing demand for high-value animal protein. However, the high cost of feed had been a militating factor affecting animal production in most African country including Nigeria. According to Ayinde and Aromolaran (1988) there has been continuous rise in the cost of production of sheep, cattle and poultry which has implored researchers to explore other less common but potential sources of animal protein to man. Taiwo et al. (2005) indicated several advantages rabbit has over other livestock in the tropics and advocated for its increased production in Nigeria. On the other hand, Ayinde and Aromolaran (1988). showed that feed accounted for as much as 65.7% of the total cost of rabbit production in Nigeria and recommended that researches should use cheap and available sources of rabbit feed. Emphasis have been laid on the use of leaf meals in animal diet as a possible means of reducing cost of animal feed (Bairagi et al., 2004; Adewolu, 2008). Sweet potato *(Ipomoea batatas)* is a herbaceous creeper plant which resists draught, has short generation interval of about four months, and can therefore be planted twice a year; hence its availability throughout the year is not in doubt (Hong et al., 2003). The leaves of this plant have been used in the tropics as a cheap protein sources in ruminant feeds probably as a result of its high protein contents (An, 2004; Ekenyem and Madubuike, 2006). For instance, reports from several authors (Ali et al., 1999; Ishida et al., 2000; Ekenyem and Madubuike, 2006; Adewolu, 2008) indicated that the leaf has high protein content (26 to 35%) with high amino acid content in

*Corresponding author. E-mail: festus.abonyi@unn.edu.ng. Tel: +2348035078356.

Table 1. Dietary treatments ratio of pelletized concentrate feed (PCF) and sweet potato leaves (SPL).

Diet	Treatment				
	T_1	T_2	T_3	T_4	T_5
SPL (%)	0	25	50	75	100
PCF (%)	100	75	50	25	0
Total	100	100	100	100	100

addition to its good mineral contents including vitamins A, B2, C and E. Despite the good nutritive content of the leaf meal, it has been reported to contain some amount of antinutritive factors namely invertase and protease inhibitor (Oyenuga, 1968; Tacon, 1993). Earlier, Oyenuga (1968) on observing the rich nutrient qualities of sweet potato leaves and stem recommended their use as source of feed for livestock in the tropics. Using concentrates alone for raising rabbits would not be cost effective. Similarly, sweet potato leaves may not have a good balance of nutrients that can support their optimal performance. The objective of this study was therefore to evaluate the effects of graded levels of sweet potato *(Ipomoea batatas)* leaves (SPL) and pelletized concentrate feed (PCF) on growth performance and nutrient digestibility of rabbits.

MATERIALS AND METHODS

Management of experimental animal

Forty five (45) mixed bred weaner rabbits which were progeny of eight does and one buck, with ages between 45 and 48 days were used for the study. They were housed in 4-tier rabbit hutches measuring 50 m x 50 cm x 30 cm and made of metallic frame with wire gauze of 0.3 mm covering the side and base of the hutches. Animals were given two weeks of acclimatization period before the onset of the actual experiment. During this period, the rabbits were dewormed with Endovef® (Ivermectin) at the dose of 0.3 mg/kg subcutaneously and also treated prophylactally against coccidiosis with Amprole 200® according to the manufacturer's prescription.

Source of sweet potato leaves (SPL)

SPL used in this study were obtained from two farms located within Nsukka Urban, close to the experimental site and were identified at the Department of Botany, University of Nigeria, Nsukka prior to use. The SPL were harvested fresh and fed to the rabbits at the predefined ratio with the commercial pelletized consented feed (PCF) (Vital feed). (Vital Feed; Grand Cereals Nigeria, Ltd, Vom Plateau State Nigeria.)

Experimental design

The rabbits were randomly assigned to 5 dietary treatment groups: T_1, T_2, T_3 T_4 and T_5 with each treatment group having three replicates of three rabbits per replicate. The experimental diets consisted of five dietary treatments of SPL to PCF ratios in percentages as shown in Table 1. The chemical composition of SPL and PCF used for the study were analyzed for proximate composition using the procedure of A.O.A.C (1990) (Table 2). The rabbits were fed 300 g/rabbit/day for each replicate, while clean drinking water was provided *ad-libitum.* Weekly live weights (g) of the rabbits were determined by weighing the animals individually using an electronic weighing balance (G and G group INC USA). This was done early in the morning prior to feeding. Daily fed intake was determined by weighing the left over feed from the quantity of feed offered the previous day. Data on weekly weight gain, feed conversion ratio and daily weight gain were also computed. Nutrient digestibility study was carried out at the 10^{th} week of the experiment.

Digestibility determination

Faecal samples were collected from the animals for 10 days. All the faeces for each experimental unit were collected, bulked and analyzed for their proximate contents according to the methods of A.O.A.C (1990). Dry matter (DM) was determined after drying faecal samples at 60 to 70°C for 2 h and later at 100 to 105°C for the next four hours in a memmert fan convention oven. Crude protein (CP) was determined by the Micro Kjaldahl technique, while ether extract (EE) was found using SOXHLET Fat extraction method. Crude fiber (CF) component was determined by the Weende method, while calcium (Ca) and phosphorus (P) contents were determined using atomic absorption spectrophotometer. Gross energy (GE) was determined using Gallenkamp Ballistic bomb calorimeter. Data collected were subjected to statistical analysis of variance using the PROC ANOVA statement as found in the SAS computer software (SAS, 1999). Significant differences in means were separated using Duncan method as found in the computer package.

RESULTS AND DISCUSSION

The proximate composition of SPL and commercial concentrate (pellet) diets are presented in Table 2. Results show that SPL contained high level of crude protein, crude fiber and gross energy when compared with the commercial diet. The proximate compositions of SPL recorded in this study were in line with the works of Oyenuga (1968). The results of the effect of treatments on the performance of rabbits are presented in Table 3. Observation of the result showed that final body weight, total weight gain, daily feed intake and feed conversion ratio were significantly affected ($P<0.05$) by dietary treatments. Rabbits on T_1 and the T_3 had significantly higher ($P<0.05$) final body weight, total weight gain and daily weight gain which differed from values obtained for T_2, T_4 and T_5. This agrees with the report of Oyawole and Nelson (1998), Taiwo et al. (2005) and Akinmutimi et al. (2008). Decrease in the final body weight of the rabbits were noted as the ratio of SPL to concentrate increased.

Table 2. Proximate composition of PCF AND SPL.

Parameter	CP (%)	EE (%)	CF (%)	Ash (%)	DM (%)	P	Ca	GE (Kcal)
PCF	14.50	4.80	7.20	8.00	91.65	0.62	0.80	2.30
SPL	28.75	2.81	20.20	10.86	13.20	0.04	0.56	1.50

Table 3. Performance of weaned rabbits fed varying SPL : concentrate diets.

Parameter	Treatment					
	T_1	T_2	T_3	T_4	T_5	SEM
Initial body weight (g)	650	649	650	645	650	10.93
Final body weight (g)	1542.13^{a}	1446.21^{b}	1518.62^{a}	1198.71^{d}	1191.2^{d}	12.05*
Total weight gain (g)	899.12^{a}	796.4^{b}	877.30^{ab}	560.80^{c}	540.31^{d}	4.32*
Daily weight gain (g)	16.03^{a}	14.20^{b}	15.47^{ab}	10.12^{c}	9.63^{c}	0.82*
Daily feed intake (g)	38.40^{c}	44.83^{b}	42.09^{bc}	46.05^{ab}	47.61^{a}	0.92*
Feed conversion ratio	2.41^{c}	3.01^{b}	2.75^{bc}	4.55^{a}	4.95^{a}	0.31*

^{a,b,c,d}Means within the rows with different superscripts are statistically significant at 5% (*P<0.05). SEM: Standard error of the mean.

Table 4. Apparent nutrient digestibility of rabbit fed varying SPL :concentrate diets.

Parameter	Treatment					
	T_1	T_2	T_3	T_4	T_5	SEM
Dry matter	73.11^{c}	78.05^{b}	76.60^{b}	89.14^{a}	90.30^{a}	3.21*
Crude protein	87.89^{ab}	86.31^{b}	85.22^{b}	90.32^{a}	90.12^{a}	1.15*
Crude fiber	37.41^{b}	37.08^{b}	49.35^{a}	46.32^{ab}	48.14^{a}	0.98*
Ether Extract	84.51	86.32	89.16	86.34	86.14	2.41^{NS}
Ash	88.93	90.50	87.94	90.01	92.60	0.23^{NS}
Energy	86.84^{a}	87.71^{a}	66.43^{c}	71.24^{b}	73.80^{b}	1.21*

^{a,b,c}Means within the rows with different superscripts are statistically significant at 5% (*P<0.05); NS: Not significant. SEM: Standard error of the mean.

In addition, rabbits on treatments T_4 and T_5 consumed more feed but gained less weight. This may be due to the high crude fiber content, suggesting that the metabolizable energy probably decreased as the level of inclusion of SPL in the diet increased. This finding is in agreement with the reports of Agunbiade et al. (2001). Therefore, the rabbits on T_4 and T_5 probably consumed more feed in order to satisfy their energy needs. Similarly, the poor performance of rabbits on T_4 and T_5 despite the high amount of feed consumed may be due to the presence of protease inhibitor which had been reported to decrease proteolytic enzyme activity, thereby reducing nutrient absorption (Olivera-Novoa et al., 2002; Eusebio et al., 2004). It was observed that the performance of rabbits on T_4 and T_5 were similar (P>0.05). Rabbits on T_1 and T_3 were similar (P>0.05) with respect to daily weight gain, daily feed intake and feed conversion ratio, respectively. Feed conversion ratios (2.41 and 2.75) favoured those on T_1 and T_3 but were poorest (4.55) for rabbits on T4. This indicates better utilization of feed by the rabbits on T_1 and T_3 when compared with other treatment groups since they had the least FCR. Generally, values recorded in this study for daily weight gain, total weight gain and feed conversion ratio fall within ranges reported by other authors (Agumbiade et al., 2001; Adegobla and Okonkwo, 2002; Aduku, 2005; Akinmutimi et al., 2008) for rabbits fed conventional rabbit diets.

Results of apparent nutrient digestibility of the experimental animals presented in Table 4 shows significant differences (P<0.05) in DM, CP, CF and energy values among the treatment groups. There were no significant (P>0.05) dietary treatments effect on the nutrient digestibility of ether extract and ash. The nutrient digestibility of DM, CP and CF increased as the level of inclusion of SPL in the diets increased. Notwithstanding, rabbits on T_4 and T_5 had higher (P<0.05) DM, CP and CF which differed from those on T_1, T_2, and T_3, respectively. Despite the high digestibility of nutrients in T_4 and T_5, they showed poor weight gain and FCR, probably as a result of poor nutrient retention. This finding is reminiscent to the reports of Taiwo et al. (2005) who

opined that weight gain is a function of degree of nutrient retention. The digestibility coefficients recorded in this study is comparable with values reported by Adegobla and Okonkwo (2002) and Taiwo et al. (2005) who did similar work but in a different climatic environment.

Conclusion

From the results of the present findings, the authors recommend the use of 50:50% sweet potato leaves (SPL) to pelletized concentrate feed (T_3) in the diets of weaner rabbits in the humid tropical environment in general and Nsukka area in particular.

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