

Utilization of *Ipomea asarifolia* Hay in the Diets of Weaner Rabbits II: Digestibility and Carcass Characteristics

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ABSTRACT: The study was conducted to evaluate the feeding value of *Ipomea asarifolia* hay on nutrient digestibility and carcass characteristics of rabbits. Twenty five (25) weaner rabbits of mixed breeds and sexes, with an average live weight of 750g were used for the study. The rabbits were divided into five groups and allocated to five dietary treatments designated as I, II, III, IV, and V. The forages were mixed at different ratios of 0:100, 25:75, 50:50, 75:25, and 100:0 *Ipomea asarifolia* hay to groundnut haulms. Concentrate feed was fed once daily at the rate of 10g/rabbit before feeding the basal diets in which *I. asarifolia* hay was used as a replacement for groundnut haulms. Water was offered *ad-libitum*, while vitamin premix was added in water. The experiment lasted for eleven (11) weeks. At the end of the eleventh week feeding trial the same experimental animals and diets were used for the digestibility trial. Faecal samples were collected for seven days. Prior to collection of faecal samples, the pens were cleaned thoroughly. Faecal samples were collected and weighted immediately. Three (3) animals were selected randomly from each group for the carcass analysis. Slaughtering was done by severing the jugular vein and blood was drained. The slaughtered animals were skinned; eviscerated and whole carcasses weighed. The internal organs were weighed individually and recorded. The results showed no significant ($P>0.05$) differences in the treatment means of dry matter, crude protein, ether extract and ash digestibility. However, significant differences ($P<0.05$) were recorded between the treatment means of crude fibre and nitrogen free extracts digestibilities. Similarly, no significant ($P>0.05$) differences were observed between the treatment means of the carcass weight, dressing percentage, lung, heart, kidney, abdominal fat, head skin and feet weights. The result of this experiment therefore suggested that *I. asarifolia* hay could be used to replace groundnut haulms as source of forage for rabbit especially in the dry season. It could therefore be recommended that farmers can mix up to 75% *I. asarifolia* hay in the diets of rabbit to replace groundnut haulms.

Keywords: Nutrient, Digestibility, Carcass, *Ipomea asarifolia*, hay

INTRODUCTION

In Nigeria, feeding constitute the single biggest problem in animal production. Rapid increase in animal production could only be successful through the utilization of alternative feedstuffs, in order to cut down feed prices and make them more affordable to livestock owners. Forage legumes are extensively used in rabbit production as supplements and they supply fibre to aid proper digestion in addition to supply of protein and energy. Rabbits can be raised on diets consisting entirely of forages, leguminous crop residues and cereal by-products as main sources of protein and energy with high levels of production (Cheeke, 1986). Intensive rabbit production in Nigeria has however been greatly affected by high cost of feed and feeding ingredient like soybean cake, groundnut cake and maize (Ani and Adiegwu, 2005). Madubuike (1984) suggested the use of non-conventional feedstuffs to achieve lower feed cost. Esonu *et al.* (2002) advocated the use of cheap and indigenous sources of protein and energy preferably those not competed for between man and his livestock and therefore suggested the

leaves of tropical legumes and browse plants. One of such non-conventional feed is Morning Glory (*Ipomea asarifolia*). The plant is drought tolerant and survives in the field throughout the year no matter the level of drought (Ekenyem, 2006). The plant grows on clay, loamy and fine sand soils, and is used for erosion control by the farmers in Northern Nigeria. In Nigeria, *I. asarifolia* leaves have no known food value and thus, popularly used as a compost material, mulch, as well as constituting weed in farms (Ekenyem, 2006). Evaluation of the nutrient digestibility and carcass characteristics of rabbits fed *I. asarifolia* hay as a replacement for groundnut haulms will provide information for its usage as feed resource. Therefore the present study is designed to achieve this formidable objective.

MATERIALS AND METHODS

Experimental Location

The study was conducted at the Livestock Teaching and Research Farm, Kano University of Science and Technology Wudil, Kano State, located at longitude 8°25'E and latitude 12°58'N. The area receives an

average annual rainfall of 850mm, with an average annual temperature of 26°C (Olofin *et al.*, 2008).

Experimental Animals and their Management

Twenty-five (25) mixed breeds and sexes of weaned rabbits with an average weight of 750g were purchased from local farmers in and around Wudil. The animals were kept in the farm for two weeks prior to the commencement of the experiment in which they were fed wheat offal alone. The animals were treated with antibiotics Neo – Terramycin and given Ivomec injection against external and internal parasites before the commencement of the experiment. The rabbits were housed individually in wire mesh cage located on open side building which was designed for easy faecal sample collection. Daily routine management such as cleaning and washing were maintained during the experiment. The experimental pens, water troughs and feeders were cleaned daily before feeding and watering

Experimental Diets

The gross composition of feed ingredients used in the concentrate formulation and experimental diets are

presented on Table 1. The groundnut haulms used as a source of forage was purchased from Wudil market, while *I. asarifolia* plant was obtained from farm lands within and around the main campus of the Kano University of Science and Technology Wudil. Fresh whole part of *I. asarifolia* were harvested and dried for 3-4 days and used for the feeding trial.

Experimental Design and Data Collection

The experimental design was Randomized Complete Block Design (RCBD). Rabbits were balanced for weight and housed individually in wire mesh cages located on an open side building which was designed for easy faecal sample collection. A total of 25 weaner rabbits were used in the experiment. The concentrate was fed at 10g per animal and was offered once daily before feeding the basal diet. Water was offered *ad-libitum*, while vitamin premix was added in water at 5g/liter of water. The basal diet which consisted of *I. asarifolia* hay and groundnut haulms combinations (Table 1) was offered *ad-libitum*. Feed intake was recorded daily during the experimental period, which lasted for 11weeks (77days).

Table 1: Gross Composition of the Experiment Diets

Ingredient %	Experimental Diets					Concentrate
	I	II	III	IV	V	
<i>Ipomea asarifolia</i> hay	-	25	50	75	100	-
Groundnut haulms	100	75	50	25	-	-
Maize	-	-	-	-	-	30.0
Maize offal	-	-	-	-	-	24.0
Palm kernel meal	-	-	-	-	-	24.3
Groundnut cake	-	-	-	-	-	16.0
Salt	-	-	-	-	-	0.25
Vitamin premix	-	-	-	-	-	0.25
Limestone	-	-	-	-	-	2.50
Bone meal	-	-	-	-	-	2.50
Lysine	-	-	-	-	-	0.1
Methionine	-	-	-	-	-	0.1
Total	100	100	100	100	100	100
Calculated CP (%)	16.00	16.25	16.50	16.75	17.00	19.00
Cost/kg diet (₦)	32.50	24.38	16.25	8.13	0	72

Digestibility Trial

At the end of the eleventh week feeding trial the same experimental animals and diets were used for the digestibility trial. Faecal samples were collected for seven days of the trial. Prior to collection of faecal samples, the pens were cleaned thoroughly. The rabbits were housed individually in wire mesh cage with faecal collection tray underneath which was designed for easy faecal sample collection. Faecal samples were collected and weighted immediately. Five (5%) of the total faecal output was oven dried at

60°C for dry matter determination and then stored for chemical analysis.

Carcass Analysis

Three animals were selected from each group for the carcass analysis. Prior to slaughter feeds were withdrawn from the animals overnight but were allowed access to water, to make evisceration easier. The animals were randomly selected and weighed before slaughter. The slaughtering was done by severing the jugular vein and blood was drained. The

slaughtered animals were skinned; eviscerated and whole carcasses were. The internal organs were weighed individually and recorded according to Aduku and Olukosi (1990).

Chemical Analysis of Feeds and Faeces

Representative samples of the concentrate diet, groundnut haulms, *I. asarifolia* hay and faecal samples were analyzed for proximate composition (dry matter, crude protein, crude fibre, ash, ether extract and nitrogen free extract) using the methods of AOAC (1990). Gross energy of the diets was determined in the laboratory using ballistic bomb calorimeter.

Statistical Analysis

Analysis of variance (ANOVA) of data generated was conducted using the General Linear Model (GLM) available in Statistical Analysis System (SAS 1990). The differences in means were determined using the

Fisher's Least Significance Difference (LSD) test as described by Steel and Torrie (1980).

RESULTS AND DISCUSSION

Proximate Composition of Experimental Diets

The results of proximate composition of experimental diets are presented in Table 2. From the results, it can be seen that the dry matter in basal diets varied from 94.90% to 95.80%. The crude protein content increased from 13.00% in treatment I to 13.80% in treatment III. Crude fibre ranged between 34.90 to 35.90%. Ash content values ranged from 7.80 to 9.90%. Ether extract content increased from 2.60% in treatment I to 5.5% in treatment V. Nitrogen Free Extract ranged from 40.20% to 59.30% and energy ranged between 296.5 to 352.4 kcal/g. The concentrate diet contained 92.80, 15.50, 7.00, 10.25, 4.00 and 53.23% dry matter, crude protein, crude fibre, ash, ether extract and nitrogen free extract, respectively.

Table 2: Proximate Composition (%DM) of Experimental Diets

Parameter (%)	Treatments					Concentrate
	I (0%)	II (25%)	III (50%)	IV (75%)	V (100%)	
Dry Matter	95.10	95.30	95.4	94.9	95.8	92.80
Crude Protein	13.00	13.50	13.8	13.70	13.40	15.5
Crude Fibre	35.70	35.30	35.60	34.90	35.90	7.00
Ash	7.80	9.90	7.80	8.50	8.00	10.25
Ether extract	2.60	3.50	5.2	4.5	5.5	4.00
NFE	55.40	56.40	51.20	59.30	40.20	53.23
Energy kcal/g	296.50	324.90	336.80	344.30	352.4	2500.00

Also energy in the concentrate diet was about 2500 kcal/g. The crude protein content of the basal diets obtained in this study ranged from 13.00 - 13.8%, which is below the range of 16-18% recommended by NRC (1990) for growing rabbits. However, the shortages were met by the concentrate diet that contains 15.50% CP. The crude fibre levels of 34.90% to 39.90% obtained in the basal diets (*I. asarifolia* hay and groundnut haulms combinations) in this study were similar to those reported by Maigandi and Abdullahi (2003) and Adamu *et al.* (2009) when they used *I. asarifolia* forage in the diets of rabbits. The effect of the higher levels of crude fibre in the forage diets of the present experiment might be neutralized by the lower value of crude fibre content of 7.00% in the concentrate diet. Ether extract content in a diet indicates the fat content is high. This subsequently contributes to volatile fatty acids and therefore, high energy value of the diet. The ether extract contents of the diets (2.60 - 5.50%) used in the present study were higher than the range of 3.95 - 4.5% reported by Maigandi and Abdullahi (2003) and lower than 5.40 - 6.20% reported by Adamu *et al.* (2009) in the forage diet of weaned rabbit.

Nutrient Digestibility of Rabbits Fed *I. Asarifolia* Hay

The nutrients digestibility of the experimental animals is presented in Table 3. There were no significant differences ($P > 0.05$) between the treatments means of dry matter, crude protein, ether extract and ash digestibilities. However, significant differences ($P < 0.05$) were observed between the treatment means of crude fibre and nitrogen free extracts digestibilities. There were significant differences ($P < 0.05$) in the crude fibre digestibilities of treatment means I and IV. Nitrogen free extracts digestibility followed the same pattern with crude fibre digestibility. The dry matter digestibility of rabbits on the various treatments of the experiment were relatively high (77.25 - 78.27%) and were close to values (70.11 - 72.18) reported by Adamu *et al.* (2009) for rabbits fed morning glory as replacement for groundnut hay. Igwebuikwe *et al.* (2008) reported lower values (66.67 - 75.69%) for rabbits fed graded levels of *Acacia albida* pods. The crude protein digestibility was high (87.31 - 88.65%), indicating efficient utilization of forages and concentrate diets by

the rabbits, since the forage and concentrate crude proteins contents were high. The range of crude fibre digestibility (75.22 – 81.72%) is in agreement with the values (79.18 – 80.66) reported by Adamu *et al.* (2009). McDonald *et al.* (1998) reported that digestibility could also influence due to the digestibility of other food consumed. The ash digestibility recorded in this study that ranged from 70.35- 71.81% were in agreement with the previous observation of Igwebuike *et al.* (2008), that diet with adequate minerals hardly vary in their total minerals digestibility. The high ether extract digestibility (94.21 – 95.97%) obtained in this study attest to the ability of rabbits to utilize dietary fats as earlier reported by Igwebuike *et al.* (2008). The nitrogen free extract digestibility (40.20 – 59.40%) of the diets clearly indicated is efficient utilization of forage and

concentrate, which is similar to the values reported by Igwebuike *et al.* (2008).

Carcass Characteristics of Rabbits Fed *I. asarifolia* Hay

The results of values for carcass characteristics of the experimental animals are presented in Table 4. From the results, there were no significant differences ($P>0.05$) between the treatments means of carcass weight, dressing percentage, lungs, heart, liver, kidneys, abdominal fat, head, skin and feet weights. The non significant differences obtained in the carcass characteristics agree with the findings of Adamu *et al.* (2009) reported for rabbits fed morning glory as replacement for groundnut hay.

Table 3: Nutrient Digestibility by Rabbits fed graded levels of *Ipomea asarifolia* hay

Parameter (%)	Treatments					LSD
	I (0%)	II (25%)	III (50%)	IV (75%)	V (100%)	
DM digestibility	78.14	78.27	77.45	77.40	77.25	3.703
CP digestibility	88.33	87.31	88.65	87.82	87.81	2.961
CF digestibility	81.72 ^a	76.96 ^b	76.17 ^b	75.22 ^b	80.69 ^a	2.042
ASH digestibility	70.35	71.80	71.22	71.24	71.81	3.535
EE digestibility	94.21	94.40	95.45	95.09	95.97	2.440
NFE digestibility	77.34 ^a	70.64 ^b	71.78 ^b	71.71 ^b	76.54 ^a	3.671

^{a,b} Means with different superscripts within the same row are significantly different ($P<0.05$).

DM = Dry Matter; CP = Crude Protein; CF = Crude fibre; EE = Ether Extract; NFE = Nitrogen free extract.

Table 4: Carcass Characteristics of Rabbits fed graded levels of *I. asarifolia* hay

Parameter	Treatment					LSD
	I (0%)	II (25%)	III (50%)	IV (75%)	V (100%)	
Liveweight (g)	1350.00	1500.00	1450.00	1400.00	1350.00	188.031
Carcass weight (g)	650.00	750.00	800.00	750.00	700.00	167.500
Dressing %	48.15	50.00	55.17	53.57	51.85	12.520
Lung weight (g)	14.00	14.00	16.00	14.00	14.00	3.161
Heart weight (g)	40.00	40.00	40.00	40.00	40.00	0.010
Liver weight (g)	36.00	42.00	36.00	35.00	42.00	8.300
Kidney weight (g)	8.00	8.00	8.00	10.00	10.00	2.045
Abdominal fat weight (g)	0.00	0.14	0.20	0.12	0.14	0.320
Head weight (g)	126.00	124.00	128.00	126.00	124.00	6.228
Feet weight (g)	25.00	28.00	25.00	25.00	26.00	3.791
Skin weight (g)	108.00	126.00	112.00	122.00	126.00	20.000

It was reported by Ijaiya and Fasanya (2004) that different dietary levels of protein have no significant effect on the carcass yield of rabbits. The dressing percentage values (48.15 – 55.17%) obtained in this study were comparable with values of (51.61 – 59.00%) reported by Dairo *et al.* (2005) who fed rabbits with varying levels of rumen content and blood rumen content mixtures. However, the values were higher than those (42.68– 49.92) reported by Adewumi *et al.* (2004) who fed *I. asarifolia* and groundnut haulms to rabbits as a source of fibre.

CONCLUSION

The result of this study suggested that up to 75% *Ipomea asarifolia* hay could be used as source of forage to replace groundnut haulms for rabbits without any effect on nutrient digestibility and carcass characteristics. Therefore it could be used for feeding rabbits especially in the dry season. It is recommended that farmers should mix *I. asarifolia* hay in diets of rabbit because of its availability throughout the year in semi arid zone.

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