

INTAKE AND NUTRIENT DIGESTIBILITY OF ENSILED CASSAVA WASTE AND ALBIZIA SAMAN POD MIXTURE BY WEST AFRICAN DWARF SHEEP

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ABSTRACT

This study was conducted to determine the effect of ensiling on feed intake and digestibility by WAD sheep. The nutritive value of cassava wastes (CSW) and Albizia saman pod (ASP) silage as indicated by chemical constituents were also determined. Fifteen yearling ewes with an average live weight of 17.10 kg were randomly assigned to five treatments with three (3) replicates each comprising: 100% CSW, 75% CSW + 25% ASP, 50% CSW + 50% ASP, 25% CSW + 75% ASP, 100% ASP to determine feed intake and nutrient digestibility. The result of the feeding trial showed that there were significant differences ($p < 0.05$) in DM intake (284.25 – 469.14 g/day), weight gain (-0.62 – 4.80 g/d), apparent digestibility of crude protein (CP) (35.48 – 75.21 %), nitrogen balance (-1.04 – 16.71 g/d) and nitrogen retention (-11.59 – 71.01 g/d). Ewes fed with 25% CSW + 75% ASP had highest feed intake and the least for those on sole CSW. Weight gain of ewes fed 25% CSW+75%ASP silage increased significantly while those fed 100% CSW lost weight and 100% ASP was maintained. Nitrogen balance was apparently highest in ewes consuming 100% ASP and the least for 100% CSW. The Nitrogen retention of the ewes on 100% ASP diet was significantly higher ($p < 0.05$) than that for 100% CSW diet. It can be concluded that ensiling cassava wastes or Albizia saman pod solely as a dry season feed for sheep may be unsuitable, but when in combination will give a good feed resource for sheep productivity.

INTRODUCTION

One of the major problems of feeding ruminants in Nigeria is the seasonal variation in the availability and nutritional value of native pasture. This problem can be solved through preservation of feedstuffs (Obua, 2005). Cassava wastes (CSW) generated through processing pose a disposal problem with the increase in production of cassava products due to the renewed interest by the Federal Government of Nigeria (Otukoya and Babayemi, 2008). The CSW constitute an important feed resource if properly harnessed biotechnologically though mainly carbohydrate and low in protein content (Llano *et al.* 2008). Tree legume species have become more important as feed resources for ruminants, with several studies carried out on their inclusion in silage preparation in the tropics since they could be used as an additional protein source. *Albizia saman* is considered a multipurpose tree with its leaves and pods forming a natural part of the diet of many animals. However the pod contains hard seeds, not easily broken down by ruminants after ingestion (Jolaosho *et al.* 2006) hence the need for proper utilization of the pod through fermentation. The present study was thus designed to investigate the chemical composition, intake and digestibility of cassava wastes ensiled with *Albizia saman* pod as a alternative for feeding ruminants in the tropics.

MATERIAL AND METHODS

Experimental site/ Collection of silage materials / Silage preparation

The experiment was carried out at the small ruminant unit of the Teaching and Research Farm, University of Ibadan, Nigeria. Cassava wastes (CSW) were collected from Mokola in Ibadan and the pods were hand picked from the *Albizia saman* trees within the campus of the University of Ibadan. The CSW and ASP were mixed for silage in a 30 kg plastic capacity silo lined with polyethylene. Salt was added at 0.25%.

Experimental animals and diets

Fifteen yearling ewes with mean weight 17.20 ± 0.08 kg were used. The ewes were divided into 5 groups of three animals per treatment based on body weight and were randomly allocated to the experimental diets in a completely randomized design. The five treatments were: 100%CSW, 75%CSW+25%ASP, 50 % CSW + 50 % ASP, 25 % CSW + 75 % ASP and 100 % ASP. The feeds offered and refused by the animals were weighed in order to determine feed intake. The animals were weighed weekly before morning feed to ascertain weight change throughout the period of 56 days. Faeces and urine collected were sampled, bulked and then stored with 5 drops of diluted H₂SO₄ until ready for analysis.

Chemical and statistical analysis

Dried and ground samples of the silage and faeces and urine were analysed for dietary nutrients according to the methods of A.O.A.C. (1990) and Van Soest *et al.* (1991). Data collected were

Table 1: Chemical composition of the silage mixture (g/100g)

	100% CSW	75%CSW+ 25%ASP	50%CSW+ 50%ASP	25%CSW+ 75%ASP	100% ASP	SEM
Dry Matter(DM)	31.78 ^b	28.44 ^c	46.36 ^b	53.44 ^{ab}	60.53 ^a	1.65
Crude Protein(CP)	4.81 ^d	10.06 ^c	16.19 ^b	16.63 ^b	24.50 ^a	0.10
Crude Fibre(CF)	10.00 ^c	12.00 ^a	8.00 ^d	10.00 ^c	11.00 ^b	0.13
ASH	6.00 ^{ab}	7.00 ^a	5.00 ^b	5.00 ^b	5.00 ^b	0.30
Ether Extract(Ee)	14.00 ^b	14.00 ^b	12.00 ^d	13.00 ^c	15.00 ^a	0.16
Neutral DetergentFibre(NDF)	40.00 ^d	38.00 ^d	46.00 ^d	49.00 ^b	53.00 ^a	0.50
Acid Detergent Fibre(ADF)	27.00 ^c	30.00 ^b	24.00 ^d	27.00 ^c	42.00 ^a	0.34
Acid Detergent Lignin(ADL)	11.00 ^c	11.00 ^c	8.00 ^d	14.00 ^b	20.00 ^a	0.26

a,b,c, = means on the same row bearing different superscripts differ (p<0.05) significantly.

Table 2: Performance characteristics of WAD sheep fed ensiled cassava waste with *Albizia saman* pod

Parameter	100%CSW	75%CSW+ 25%ASP	50%CSW+ 50%ASP	25%CSW+ 75%ASP	100%ASP	SEM
Initial Wt.(Kg)	17.30 ^a	17.20 ^a	17.20 ^a	17.00 ^a	17.00 ^a	0.083
Final Wt.(Kg)	16.50 ^c	20.83 ^b	21.01 ^b	22.00 ^a	17.00 ^c	0.127
Wt. gain(g/d)	-15.38 ^c	73.65 ^b	73.08 ^c	92.31 ^a	0.00 ^d	0.152
Silage DMI	284.25 ^d	405.65 ^c	408.32 ^b	469.14 ^a	406.25 ^c	0.164
P. max DMI	294.81 ^a	292.36 ^{ab}	289.55 ^b	282.85 ^c	219.35 ^d	0.816
Total Intake DMI	579.06 ^d	698.01 ^b	697.87 ^b	751.99 ^a	625.60 ^c	0.877
FCR	-1.38	5.49	5.45	6.38	0	nd

a,b,c= means on the same row bearing different superscripts differ (p<0.05) significantly.

subjected to a one-way analysis of variance (ANOVA) using SAS (1999).

RESULTS AND DISCUSSION

Table 1 presents the chemical composition of the ensiled cassava wastes with *Albizia saman* pod.

There was a significant ($p < 0.05$) difference in CP content as the ASP inclusion increased except for the 50% and 75% inclusions. The increase in CP value is in agreement with Oboh and Akindahunsi (2003). Values obtained for CP in the silages were higher than the critical value of 70g/kg recommended for small ruminants (NRC, 1981), except for cassava wastes only. The addition of ASP also enhanced the crude protein of the cassava wastes. Table 2 presents the performance characteristics of WAD sheep fed ensiled *Albizia saman* pod with cassava waste silage. Dry matter intake increased significantly ($p < 0.05$) with increasing inclusion of ASP. The highest weight gain (4.8 kg), intake and FCR (469.14g and 6.38) was recorded in the 25%CSW silage. This is attributed to CP in the diet (Otukoya and Babayemi, 2008) and total intake of DM, and was similar to the report of Ngwa *et al.* (2002) that an increase in the DM and OM intakes improve weight gain as the levels of ensiled *Acacia* pods increased in the diet of sheep. The FCR for the sheep on the 100% CSW was negative, due to the low level of CP (Otukoya and Babayemi, 2008). Table 3 shows the apparent

digestibility of WAD sheep fed ensiled cassava wastes and *Albizia saman* pod. The DM digestibility of 100% ASP silage was higher ($p < 0.05$) than all other treatments. Digestibility in CP increased tremendously as ASP inclusion level increased. The least nutrient digestibility was observed for the parameters (DM, OM, CF, EE and NDF) in the 100% CSW. Batista *et al.* (2002) reported that the DM digestibility by two steers fed barley silage – concentrate containing mesquite pod was 66.7, while the CP digestibility was 76.4, and this was close to the values obtained in the present study. Nitrogen utilization of WAD sheep fed ensiled cassava wastes and *Albizia saman* pod is shown in Table 4. The nitrogen intake and balance were significantly ($p < 0.05$) different among treatment combinations. The values for nitrogen retention increased significantly ($p < 0.05$) as the level of pod inclusion increased. Igbekoyi (2008) reported that nitrogen retention increases with increasing inclusion of pods in an *Albizia saman* pod-Guinea grass silage fed sheep ranging from 57.6 in 10% to 64.6 in 40% pod inclusions which was inline with the result of the present study. The increased retained nitrogen in the body was not only by an increase in the digested protein but also by the improved utilization of the absorbed proteins. This means that more protein for anabolism and less for oxidation (Osakwe, 2006).

Table 3: Apparent digestibility (%) by WAD Sheep fed the ensiled cassava waste- *A. saman* pod

Parameter	100%CSW	75%CSW+ 25%ASP	50%CSW+ 50%ASP	25%CSW+ 75%ASP	100%ASP	SEM
Dry matter	36.15 ^e	56.25 ^c	48.44 ^d	61.57 ^b	68.47 ^a	0.11
Ash	79.98 ^a	6.50 ^e	44.35 ^b	23.13 ^d	36.92 ^c	0.07
Crude Protein	55.92 ^c	35.48 ^e	50.98 ^d	70.68 ^b	75.21 ^a	0.16
Crude Fibre	17.96 ^c	27.29 ^b	22.43 ^d	23.13 ^c	51.25 ^a	0.93
Ether extract	45.59 ^e	68.83 ^b	57.04 ^d	67.48 ^b	76.87 ^a	0.10
NDF	49.22 ^c	49.48 ^c	34.99 ^d	51.37 ^b	68.46 ^a	0.12
ADF	27.10 ^d	47.65 ^b	24.82 ^e	43.06 ^c	66.95 ^a	0.07
ADL	15.41 ^e	7.10 ^e	41.76 ^a	9.41 ^d	30.60 ^b	0.11

a,b,c= means on the same row bearing different superscripts differ (p<0.05) significantly.

Table 4: Nitrogen utilization by WAD sheep fed ensiled cassava waste with *Albizia saman*

Parameter	100%CSW	75%CSW+ 25%ASP	50%CSW+ 50%ASP	25%CSW+ 75%ASP	100%ASP	SEM
Nitrogen intake(g /d)	1.12 ^e	7.46 ^d	12.01 ^c	14.22 ^b	23.53 ^a	0.06
Faecal nitrogen (g/d)	1.75 ^d	4.81 ^b	5.85 ^a	4.17 ^c	5.83 ^a	0.05
Urinary Nitrogen (g/d)	0.41 ^b	0.43 ^b	0.49 ^b	0.63 ^b	0.99 ^a	0.04
Nitrogen balance (g/d)	-1.04 ^e	2.22 ^d	5.67 ^c	9.42 ^b	16.71 ^a	0.08
Nitrogen retention (%)	-11.59	29.77	47.20	62.95	71.01	17.75

a,b,c= means on the same row bearing different superscripts differ (p<0.05) significantly.

CONCLUSION

The chemical composition, apparent digestibility, nitrogen utilization and other parameters showed that *Albizia saman* pod/cassava waste mixture silage has the potential of meeting the nutritional needs of sheep in terms of protein and energy needs. The positive response in terms of improved weight gain and digestibility of nutrients by the ewes indicated that *Albizia saman* pod included silage can serve as a sustainable feedstuff for ruminants during the off-season.

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