Ensiling pasture grass with pod of browse plant is potential to solving dry season feed for ruminants in rural settlements of Nigeria

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Abstract

The study was undertaken to assess the performance of WAD sheep fed ensiled Guinea grass (GG) with *Albizia saman* pod (ASP). GG and ASP were ensiled as 10% ASP + 90% GG, 20% ASP + 80% GG, 30% ASP + 70% GG and 40% ASP + 60% GG. Quality and chemical composition of silage were verified. Twenty four rams were allotted to the silages for determination of intake, growth and digestibility by WAD rams. pH of silage ranged between 4.2 and 4.8. Silage structure was observed to be firm and in-destructive. The colour ranged from olive green in 10% to yellow in 40% ASP inclusions. Smell of silage was characterized by nice in 10%, pleasant in 20% and 30% and fruity in 40%. Crude protein contents (ranged 14-17.5 g/100 g) significantly increased with increasing level of ASP but decreased the proportion of CF. Values for NDF, ADF, ADL and cellulose increased with increasing level of ASP. Hemicellulose decreased with increasing amount of ASP. DM intake (g/d), weight gain (g/d) and nutrient (CP, CF, NDF, ADF, ADL and cellulose) intake increased significantly ($p < 0.05$). Digestibility of DM (DDM), organic matter (DOM), crude protein (DCP), crude fibre (DCF), ether extract (DEE), NDF (DNDF), ADF (DADF), ADL (DADL), cellulose (DC) and hemicellulose (DH) respectively ranged from 65.5-70.2, 65-69.4, 54.8-70.1, 59.9-68.1, 74.0-80.1, 59.8-65.3, 55.8-65.8, 47.4-70.5, 14.8-82.9 and 43.3-68.7. It is concluded that *Albizia saman* pods can replace Guinea grass up to 40% for silage as dry season feed and without detrimental effects on performance of WAD ram.

Introduction

Inadequate nutrition is one of the main causes of low ruminant production in Nigeria. The animals live on unimproved native pasture and crop residues of high fibre, low protein and deficient minerals. Tropical forages are characterized by rapid growth during wet season with preponderant yield exceeding livestock requirements which, if not harvested and fed, continue to grow and quickly become fibrous and lignified (Osakwe, 2006). Therefore, there is need for conservation and improvement of the nutritive values of the tropical forages. Excess forages available during the wet season can be conserved as silage to tide over the period of scarcity and prevent the loss in weight of animals associated with this period. Du Ponte *et al.* (1998) demonstrated that Guinea grass can be successfully ensiled, maintaining nutritive quality and minimal spoilage under tropical climatic conditions. Silages made from tropical grasses alone are poor in nutrient because of the low protein content, suggesting a rich protein source as additive. In this way, sufficient fermentable carbohydrate for lactic acid bacteria is provided and simultaneously the protein content of the silage is increased (Asefa and Ledin, 2001). The present study was designed to ensile grass with pod of *Albizia saman* as dry season feed.

Materials and methods

Albizia saman pods (ASP) were colleted as hedge rows and sun-dried. Eight week old regrowth Guinea grass (GG) was air-dried under shade for 2 hrs and then chopped into 2-3 cm lengths. GG and ASP were mixed for silage as treatments A (10%ASP + 90%GG), B (20% ASP + 80%GG), C (30%ASP + 70%GG) and D (40%ASP + 60%GG). The silos were opened after 40 days for the determination of silage quality. 24 rams aged 8-12 months weighing 18.3±0.5 kg were used. Crude fibre, ether extract and ash in silage and faeces were determined according to methods of

AOAC (1990). NDF, ADF and ADL were determined in silages and faeces using procedure of Van Soest *et al*. (1991). All data were subjected to a one way analysis of variance (ANOVA).

Table 1: Quality of ensiled Guinea grass with Albizia saman pods

	Level of pod inclusion (%)			
Parameters	**10**	**20**	**30**	**40**
Colour	Olive-green	Yellow- green	Light-yellow	Yellow
Smell	Nice	Pleasant	Pleasant	Fruity and pleasant
Taste	Vinegar	Vinegar	Vinegar	Vinegar
pH	4.7	4.7	4.8	4.2
Structure	Separable	Visible	Visible	Visible
Temperature	25	20	20	19

Table 2: Chemical composition (%)of ensiled Albizia saman pods with Guinea grass

	Level of pod inclusion (%)				
Parameters	**10**	**20**	**30**	**40**	**SEM**
Dry Matter	27.6^{c}	35.5^{b}	37.2^{a}	37.4^{a}	0.064
Organic Matter	85.3^{b}	84.7^{b}	83.7^{b}	91.3^{a}	0.509
Crude Protein	14.0^{d}	16.1^{c}	17.1^{b}	17.5^{a}	0.053
Crude Fibre	21.5^{a}	19.7^{ab}	18.7^{ab}	17.7^{b}	0.533
Ether Extract	17.0^{a}	17.1^{a}	17.1^{a}	15.2^{b}	0.068
Neutral detergent fibre	56.3^{d}	58.3^{c}	61.3^{b}	65.0^{a}	0.240
Acid detergent fibre	39.0^{d}	45.0^{c}	53.3^{b}	57.0^{a}	0.304
Acid detergent lignin	29.6^{c}	31.3^{b}	32.3^{a}	30.7^{b}	0.139
Cellulose	9.4^{d}	13.7^{c}	21.0^{b}	26.3^{a}	0.332
Hemicellulose	17.3^{a}	13.3^{b}	8.0^{c}	8.0^{c}	0.313

a,b,c,d means on the same row with different superscripts differ ($p<0.05$)

Table 3: Performance of WAD sheep fed ensiled Albizia saman pods with Guinea grass

	Level of pod inclusion (%)				
Parameters	**10**	**20**	**30**	**40**	**SEM**
Initial weight (kg)	18.3	18.5	18.3	18.3	
Final weight (kg)	22.10	22.23	22.30	22.43	1.668
Weight gain (kg)	3.77	3.73	3.97	4.10	0.221
Weight gain (g/d)	67.26	66.67	70.83	73.21	3.948
Weight (kg/d$W^{0.75}$)	2.68	2.69	2.81	2.87	0.117
Dry matter intake (g)					
Silage	349.60^{b}	501.53^{a}	523.77^{a}	529.27^{a}	21.45
Concentrate	404.80	387.50	378.20	412.03	29.36
Total intake	754.40	889.0	902.0	941.4	48.46
Feed efficiency	5.02	4.29	4.45	4.41	0.285

a,b means on the same row with different superscripts differ significantly ($p<0.05$)

Table 4: Intake and digestibility (%) by sheep fed ensiled Albizia saman pod with Guinea grass

Parameters	Level of pod inclusion (%)				
	10	20	30	40	SEM
		Feed Intake			
Dry Matter	447.95^{d}	566.87^{b}	612.63^{a}	555.14^{c}	1.107
Organic matter	398.2^{c}	510.55^{b}	545.30^{a}	533.70^{a}	3.161
Crude protein	68.21^{d}	103.93^{c}	118.33^{a}	107.44^{b}	0.349
Crude fibre	104.48^{c}	126.21^{ab}	129.42^{a}	108.66^{bc}	3.23
Ether extract	82.79^{d}	109.70^{b}	118.56^{a}	93.69^{c}	0.399
Neutral detergent fibre	273.49^{d}	374.23^{c}	425.23^{a}	399.83^{b}	1.762
Acid detergent fibre	189.58^{d}	288.66^{c}	369.77^{a}	350.62^{b}	1.894
Acid detergent lignin	143.87^{d}	200.81^{b}	224.18^{a}	188.84^{c}	1.102
Cellulose	45.70^{d}	87.88^{c}	145.59^{b}	161.78^{a}	2.018
Hemicellulose	83.9^{a}	85.6^{a}	55.5^{b}	49.2^{b}	2.065
		Apparent digestibility of nutrients			
Dry matter	66.92^{c}	70.16^{a}	68.13^{b}	65.54^{d}	0.156
Organic matter	67.42^{b}	69.40^{a}	65.51^{c}	65.03^{c}	0.281
Crude protein	68.14^{b}	70.05^{a}	59.79^{c}	54.79^{c}	0.612
Crude fibre	59.9^{b}	68.0^{a}	68.1^{a}	61.8^{b}	0.674
Ether extract	74.02^{c}	80.14^{a}	79.65^{a}	76.68^{b}	0.218
Neutral detergent fibre	59.78^{c}	65.27^{a}	63.51^{b}	61.23^{c}	0.304
Acid detergent fibre	55.78^{b}	64.35^{a}	65.75^{a}	63.76^{a}	0.478
Acid detergent lignin	68.61^{b}	70.50^{a}	56.31^{c}	47.36^{d}	0.297
Cellulose	14.84^{c}	50.11^{b}	80.33^{a}	82.91^{a}	2.19
Hemicellulose	68.71^{a}	68.37^{a}	47.84^{b}	43.25^{b}	1.59

a,b,c,d means on the same row with different superscripts differ significantly ($p<0.05$)

Results and discussion

Table1 shows the colour, pH, smell, taste, structure and temperature of silage made from *Albizia saman* pods (ASP) and Guinea grass (GG) combinations. The olive green and other different yellow colours obtained in the present study were in order. The olive green was closer to the original colour of the grass which was in line with the findings that good silage usually preserves well the original colour of the standing plant (Oduguwa *et al*. 2007). The increased inclusion of ASP may have impacted yellowish colour on the silage as evident in silage with 40 % ASP. The general aromatic smell observed was interesting and it was actually a typical smell of high concentration of lactic acid bacteria, suggesting that the ASP-GG mixture ensiled was well conserved. The pH value in the present result was within the range of 4.5-5.5 as classified to be pH for good silage by Menenses *et al*. (2007). Structure of the silages were firm and indestructible, implying that there were no viscous or slimy appearances of the material. The taste of the silage was vinegar-like, indicating a well made silage. The temperature was noticed to be reducing with increasing amount of the pods in the silage. The chemical composition of ensiled

ASP with GG fed to WAD sheep is shown in Table 2. Crude protein contents (ranged 14-17.5 g/100 g) significantly increased with increasing level of ASP but decreased the proportion of CF. Values for NDF, ADF, ADL and cellulose increased with increasing level of ASP. Hemicellulose was noticed to decrease with increasing amount of ASP. The performance characteristics of WAD sheep fed ensiled ASP with GG is presented in Table 3. DM intake for silage increased with increasing pod inclusion. The least intake (349.6 g/100 g) by the sheep was on silage with 10% pod and was probably due to the low crude protein content in it. The improved weight gain from 66.67 g/d to 73.21 g/d as the levels of pods increased was an indication that the silage conferred a beneficial effect on the sheep. Also shown in Table 4 are values for apparent digestibility of the nutrients. There were significant ($p<0.05$) variations for all the parameters among the treatment means such that pod inclusions obtained trend 20%>30%>10%>40%. Kim *et al.* (2006) reported that increased inclusion of wormwood silage as substitute for rice straw in the diet of sheep increased digestibility of crude protein from 55.7 to 60.8.

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