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Short-Term Intake and *in Sacco* Degradability of Mixtures of Groundnut Haulms and *Gliricidia sepium* by Ruminants in the Northern Guinea Savanna Zones of Nigeria

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Abstract: Two separate studies were conducted using mixtures of groundnut haulms and *Gliricidia sepium* in the proportions of 100:0, 90:10, 80:20 and 70:30 to study short term intake and degradability of the mixtures. In the first trial, short-term intake of the mixtures was evaluated for a period of 6 days using sheep while, in the second trial the mixtures were subjected to *in sacco* degradation for 48 hours using Ndama steers to determine dry matter degradability. The proximate analysis of the mixtures was also carried out. Crude protein and lignin concentrations in the mixtures increased with increasing level of *Gliricidia sepium*. Intake of the mixtures decline significantly ($p<0.05$) as the level of *Gliricidia sepium* in the mixture increased, the highest intake (9.70 g DM $kg^{-4w^{0.75}}$ h^{-1}) was recorded for groundnut haulms alone, this was similar ($p>0.05$) to those containing 10% *Gliricidia sepium*. Refusal rates of the mixtures also increased significantly ($p<0.05$) as the proportions of *Gliricidia sepium* increased the mixtures. In sacco dry matter degradability (%) of the mixtures increased significantly ($p<0.05$) as the level of *Gliricidia sepium* increased in the forage mixtures. There was no significant ($p>0.05$) differences in dry matter degradability between forage mixtures containing 0 and 10% *Gliricidia sepium*.

Key words: Groundnut haulms,gliricidia sepium, degradability, northern guinea savanna-Nigeria

INTRODUCTION

Groundnut haulms (15-18% CP) is a good protein source for livestock, especially during the 5-7 months of dry season in the Northern Guinea Savanna zone of Nigeria[1] and is easily incorporated within the farming systems. However, the high cost and availability of this feedstuff during the latter part of the dry season are major limitations to its widespread utilization. A cost- reduction strategy without jeopardizing the quality of the diet can be achieved by combining groundnut haulm with other browse plants.

Gliricidia sepium is one of the browse plants considered suitable for ruminant feeding in the tropical areas[2,3]. Recently, dietary preference studies involving different browse species offered in different forms of post harvest treatments within the sub humid Nigeria have shown that *Gliricidia sepium* was completely rejected by goat[4] and sheep[5]. *Gliricidia sepium* is a fast growing; medium-sized tree with high CP concentration (20-28%) in leaves and it is known to be palatable. However, the utilization of the browse is limited by the presence of some anti-nutritional factors and characteristic smell[2,6]. which may make it unattractive to ruminants[7]. Combining groundnut haulm with *Gliricidia sepium* may improve both the nutritive value of groundnut haulm which may have been reduced during storage and also improve the consumption of *Gliricidia sepium*. This is important since the value of forage feed whether mixed or not is determined by its acceptability, digestibility and eventual utilization by the animal.

This paper reports the results of preliminary studies assessing the effect of combining groundnut haulms and *Gliricidia sepium* on the intake, acceptability by sheep and dry matter degradability.

MATERIALS AND METHODS

Leaves and twigs of *Gliricidia sepium* used for these trials were collected from already existing stands within

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National Animal Production Research Institute (NAPRI), Ahmadu Bello University. Shika, Nigeria. The area is located within the Northern Guinea Savanna ecological zone (Latitude of 11 and 12° N and longitudes 7 and 8°E). It is about 640 m above the sea level and the mean annual rainfall is 1100 mm.

The stands were established in 1980[8]. The leaves and twigs were collected at random in November and dried in a forced-air laboratory oven at 60°C for 48 h (about 90% DM).Hay of RMP12 variety of groundnut (*Arachis hypogeae*) and oven dried leaves and twigs of *Gliricidia sepium* were milled to pass through a 3 mm sieve. These were mixed in the proportions of 100:0, 90:10, 80:20 and 70:30 of groundnut and *Gliricidia sepium* respectively. (Treatments 1 to 4). Rumen degradation studies were carried out at International Livestock Research Institute (ILRI), Ibadan, Nigeria using the nylon bag techniques using 3 rumen fistulated Ndama Steers of about 250 kg liveweight each. The animals grazed grass-legume pastures of *Panicum maximum* and *Centrosema pubescence* and received 2 kg wheat bran (15%CP) per head per day. The steers were allowed free access to mineral salt lick and water. About 3g of each milled forage mixture was weighed into nylon bags of 13 x 6 cm and 45u mesh. There were 3 replicates. After 48 h of incubation, the contents were washed and rewashed and Dry Matter Degradability (DMD) determined as the difference in weight before and after incubation expressed as a percentage. One-way least-square analysis of variance (ANOVA) of the in sacco dry matter degradation was carried out using the General Linear Model (GLM) procedure[9]. The differences between the means were tested using the pair-wise differences procedure as contained in[9].

In the second trial, short-term intake of the same forage mixtures was determined at the National Animal Production Research Institute (NAPRI), Ahmadu Bello University, Shika-Zaria, Nigeria Six adult Yankassa rams of about 26.8kg liveweight were separated into 2 groups and allowed to feed on each forage mixture for 60min for 6 days as shown in the order given below after allowing a four day adjustment period.

Day 1. feed 1 and feed 4
Day 2.feed 2 and feed 3
Day 3 Feed 3 and feed 1
Day 4feed 4 and feed 2
Day 5 feed 1 and feed 2
Day 6feed 3 and feed 4

The animals were fasted over night before being allowed access to the forage. The amount of each mixture consumed was the differences between 1.01 weight of feed offered and weight refused, the result is expressed as short- term intake of dry matter per hour and expressed as metabolic body weight.

The forage mixtures were sampled daily and at the end of the sixth day, the proximate composition of the representative sample was determined using the procedure described by Association of Official Analytical Chemist[10] and the Acid Detergent Fibre (ADF) was determined using the procedure of Van Soest[11]. Data were analyzed using SAS[9] procedures as described earlier.

RESULTS AND DISCUSSION

Table 1 and 2 show the chemical composition of the feedstuffs and the forage mixtures. The CP content in the mixtures increased significantly ($p<0.05$) from 11.13 to 19.50% as the percentage of *Gliricidia sepium* in the mixture increased from 0% to 30%. Although, ADF content of the mixtures showed an increase with increasing level of *Gliricidia sepium* in the mixtures, there were no significant ($p>0.05$) differences in the ADF content of forage mixtures containing 10, 20 and 30% G. sepium.. The lignin content of the mixtures also showed an increase with increasing levels of G. sepium in the forage mixtures, the differences are not significant ($p>0.05$). Short-term intakes and percent refusals of the forage mixtures are presented in Table 3. Intake of groundnut haulms alone was highest (9.70 g DM kg^{-1} $w^{0.75}$ h^{-1}), this was however similar ($p>0.05$) to intake of mixture containing 10% *Gliricidia sepium*. Intake of the mixtures declined to 2.40 g DM $kgw^{-10.75}$ h^{-1} as the percentage of *Gliricidia sepium* in the mixture increased to 30%. This poor acceptance of *Gliricidia sepium* at higher levels by sheep is consistent with the findings of Karbo[7]. This may be a reflection of the characteristic smell associated with the forage, which makes it unattractive to ruminants. Similarly, Chadhokar[12] reported a slight taint (smell only) of the milk of cow fed *Gliricidia sepium*. Another contributing factor could be the presence of the anti-nutritional factor, Coumarin[6] which interferes with normal blood clotting. There are conflicting reports in the literature on intake of this browse; Smith[13] reported low intake by cattle, while Vearaslip[14] and Chadhokar[12] reported high intake by cattle that are accustomed to gliricidia. The high refusal rates reported in our study might be because *Gliricidia sepium* is a new forage to the animals and they needed some period to become accustomed to the forage. Whether or not *Gliricidia sepium* (when accustomed to animals) would increased animal productivity (in terms of milk and meat) and or be used in maintenance ration during the 5-7 months dry spell of this environment warrants a long term study.

Table 1: Chemical composition (%) of *Gliricidia sepium* and groundnut haulms

	Gliricidial sepium	Groundnut haulms
Dry matter	94.11	95.03
Crude protein	23.69	15.75
Crude fibre	7.89	30.35
Ash	7.12	10.65
Ether extract	4.58	4.12
Nitrogen free extract	56.70	39.13

Table 2: Chemical composition (%) of the forage mixtures

Proportions of groundnut haulms and gliricidia sepium

Components	100:0	90:10	80:20	70:30	SEM
Crude protein	11.13^{c}	16.19^{b}	16.93^{ab}	19.50^{a}	0.24
ADF	36.30^{b}	38.77^{a}	38.91^{a}	39.21^{a}	0.48
Lignin	7.91^{b}	8.76^{a}	9.61^{a}	11.63^{a}	3.53

^{abc}Means along the same column having different superscript differ significantly ($p<0.05$)

Table 3: Intake, refusal rate and dry matter degradability (DMD) of the forage mixtures

Proportions of groundnut haulms and *Gliricidia sepium*

Components	100:0	90:10	80:20	70:30	SEM
Intake(g kg^{-1}W$^{0.75}$ hr^{-1})	9.70^{a}	8. 85^{a}	6.09^{b}	2.40^{c}	1.00
Refusal rate (%)	54.17^{c}	59.43^{bc}	59.43^{bc}	92.03^{a}	5.65
DMD (%)	68.15^{c}	70.40^{bc}	70.40^{bc}	74.00^{a}	2.43

^{abc}Means along the same column having different superscript differ significantly ($p<0.05$)

In sacco dry matter degradability (DMD %) of the mixtures increased significantly ($p<0.05$) as the level of *Gliricidia sepium* in the forage increased Table 3. There is no significant ($p>0.05$) differences in DMD between forage mixtures containing 0 and 10% *Gliricidia sepium*. Although, DMD of forage normally decreases with increasing lignin concentration[15] however, the results obtained in the present study was in contrary, this is as a result of low intake of forage observed at higher levels of *Gliricidia sepium* inclusion which might have counteracted any effects of lignin since low intake of feed is inversely related to degradability[16]. Also, the increasing protein concentration per unit weight as *Gliricidia sepium* levels increased in the mixtures, could have provided more substrate for smicrobial growth/multiplication and consequently higher degradability[17,18].

CONCLUSION

In conclusion, incorporating *Gliricidia sepium* in mixtures with groundnut haulms for feeding sheep in the late dry season reduce feed intake after 10% inclusion. This become very important during the late dry season when groundnut haulms becomes scarce and expensive, *gliricidia sepium* which could be planted as edges and it remain green longer into the dry season could replace up to 10% of the very expensive groundnut haulms. This would play a prominent role in supplementing sheep at a reduced cost in the Northern guinea savanna zone of Nigeria. Additional work is warranted to increase the acceptability of *Gliricidia sepium* as forage for ruminant in the Northern Nigeria.

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