Short-Term Intake and *"in sacco"* Degradability of Mixtures of Two Tropical Legumes

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Summary

Two experiments were conducted using four mixtures of Arachis hypogaea *and* Adenodolichos paniculatus *in the ratios 100:0, 90:10, 80:20 and 70:30.*
In the first study, sheep were subjected to short-term intake trials for a period of three days. In the second study, in sacco *dry matter (DM) degradability during 48h of the four mixtures was determined.*
Although no significant (P > 0.05) differences among treatments were observed, short-term intake tended to increase with increasing inclusion level of A. paniculatus*, which was accompanied by a decrease in % refusals.*
In sacco *DM degradation decreased significantly (P < 0.05) and linearly with higher levels of* A. paniculatus.

Résumé

Ingestion à courte durée et dégradabilité "in sacco" de mélanges de deux légumineuses tropicales.
Deux essais ont été réalisés en utilisant quatre mélanges de Arachis hypogaea *et* Adenodolichos paniculatus *dans les proportions de 100:0; 90:10; 80:20 et 70:30. Dans le premier essai, l'ingestion pendant trois jours a été mesurée chez des moutons. Dans le deuxième essai, la dégradabilité de la matière sèche (MS) a été déterminée 'in sacco" pendant 48 heures.*
Bien que les différences entre traitements ne soient pas significatives (P > 0,05), l'ingestion à courte durée tentait d'augmenter au fur et à mesure que le niveau d'incorporation de A. paniculatus *augmentait. Cela était accompagné d'une diminution du % des refus. La dégradabilité de la MS* in sacco *diminuait significativement (P < 0,05) et linéairement avec des niveaux montants de* A. paniculatus.

Introduction

Legumes are largely being used in farming systems in northern Nigeria for the dual purpose of grain for human consumption and forage for livestock feeding. In this regard, particularly groundnut has been used intensively (14). Groundnut haulms are of high nutritive value (4, 6) and have been used to supplement poor quality cereal stover during the dry season. In recognition of the value of groundnut haulms, some farmers grow groundnut solely for haulms. Such varieties appear to contain higher leaf portion than those planted for grain and haulms.
In addition to high quality grain legumes, browse plants also play an important role in supplementing the low quality feed of rangeland and in the case of scarcity caused by overgrazing and occasional bush fires. Browse legumes are very important in the latter part of the dry season when feed scarcity becomes more severe.

The fruits of some browse legumes form an important part of dry season diet of stock particularly in the Sudan and Sahel zones of Nigeria. Pods of *Piliostigma reticulata, P. thonningii, Acacia albida, A. nilotica, Tamarindus indica* and *Parkia clappertoniana* are among the ones that are readily eaten (1). Also, fresh leaves of *Gmelina arborea*, a non-leguminous browse, are greatly relished by both sheep and goats (Omokanye 1998, personal communication).
The purpose of this work was to assess the short-term intake and *in sacco* dry matter degradability of mixtures of groundnut (*Arachis hypogaea*) and a browse legume (*Adenodolichos paniculatus*). Short-term intake was determined as a preliminary trial to further experimentation.

Material and methods

Leaves and twigs of an indigenous shrub legume (*Adenodolichos paniculatus*) were randomly collected from a field within the National Animal Production Research Institute (Nigeria) in November 1996. The field with a surface of about 1350 m^2 was established in 1980 (2); after which its re-growth potential following different cutting regimes (9) and seed production capability as influenced by shoot density (8) had been examined. The material was dried in a forced-air laboratory oven at 60°C for 48 h (about 90% DM).

Hay of RMP 12 variety of groundnut (*Arachis hypogaea*) and leaves and twigs of *A. paniculatus* were milled separately to pass through a 2.5 mm screen. The chemical contents of the two feeds were determined by

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official methods of proximate analysis (3). The two feeds were mixed in four proportions of 100:0 (feed 1), 90:10 (feed 2), 80:20 (feed 3) and 70:30 (feed 4). Rumen degradation was determined at the International Livestock Research Institute (ILRI), Ibadan, Nigeria using the nylon bag technique as described by Orskov *et al.* (10) using three fistulated N'dama steers of about 250 kg liveweight. The animals grazed on a grass/legume pasture of *Panicum maximum* and *Centrosema pubescence* and were fed 2 kg wheat bran (15% CP) per day. The steers had free access to multi-nutrient block and water. Samples weighing 3 g from the above mixtures, were put into nylon bags of 13 x 6 cm and about 45 mesh size. These samples were incubated and withdrawn after 48 h, washed, dried and re-weighed. Dry matter degradation was calculated as the difference in weight before and after incubation and expressed as %. A one-way least-squares analysis of variance (ANOVA) of the *in sacco* dry matter degradation was carried out using the generalised linear model procedure (12). The analytical model included the fixed effect of treatment and differences between treatment means were tested ($P < 0.05$) using Ducan's Multiple Range Test as spelt out in (12).

In another experiment, short-term intake of the unground feed mixtures by Yankasa sheep was determined at the National Animal Production Research Institute Shika, Nigeria in December 1996. Six adult rams averaging 26.8 kg liveweight were divided into two groups and allowed to each of the feed mixtures for 1h per day for three days (in the order given below) after allowing a four-day adjustment period.

Day 1 - feeds 1 and 4
Day 2 - feeds 2 and 3
Day 3 - feeds 3 and 1
Day 4 - feeds 4 and 2
Day 5 - feeds 1 and 2
Day 6 - feeds 4 and 3

Animals were fasted overnight. The amount of feed mixtures consumed was calculated by the difference between weight of feed offered and weight of feed refused and results expressed as short-term intake of DM per hour corrected to metabolic weight. Data analysis was also carried out using SAS procedures as described earlier.

Table 1
Proximate analysis of *Arachis hypogaea* and *Adenodolichos paniculatus* foliage (% on DM basis).

	CP(%)	EE(%)	Ash(%)	CF(%)	NFE(%)
A. hypogaea	15.75	4.12	10.65	30.35	39.13
A. paniculatus	22.88	1.94	7.07	37.87	30.24

Table 2
Short-term intake and refusal of mixtures of *A. hypogaea* (AH) and *A. paniculatus* (AP) fed to sheep.

Proportions (AH:AP)	100:0	90:10	80:20	70:30	
SED					
Intake (g DM/kg LW 0.75/hr)	10.91	10.81	11.63	12.51	0.95
Total refusal (%)	48.7	48.93	46.43	45.67	5.0
48h *in sacco* DM degradability (g/kg DM)	682	565	525	457	9.6

Results and discussion

The proximate analysis of the two forages *(A. hypogaea* and *A. paniculatus)* is presented in Table 1. Short-term intake showed no significant ($P > 0.05$) differences between the treatments (Table 2). The short-term intake was highest (12.5 g/kgW 0.75/hr) in the mixture with the highest inclusion (30%) of *A. paniculatus*, whereas the lowest intake (10.8 g/kgW 0.75/hr) was recorded with 10% inclusion of *A. paniculatus*. This is in agreement with the reports of Goodchild and McManieman (5) that indicated an increase in voluntary DM intake of sheep when nitrogen and minerals in the diet were increased. Other authors (13) also reported an increase in intake and weight gain of sheep when a basal diet of chickpea was supplemented with *Leucaena* leaf. Though they reported no significant difference ($P > 0.05$) in haulms intake, total DM intake and intake per kgW 0.75 increased linearly with increasing supplementation. Higher potential intake rates for feeds with high levels of protein nitrogen were reported by Kenny and Black (7). The feed refusals in this study tended to decrease with increasing intake (Table 2).

The *in sacco* DM degradation showed a clear decrease from 0% inclusion of *A. paniculatus* (682 g/kg DM) to 30% inclusion (457 g/kg DM), (Table 2). Differences between treatments were significant ($P < 0.05$). In the earlier reports mentioned (5, 13) where higher N levels increased digestibility, there were low fibre levels in such diets. In this study however, the increase in N level was accompanied by an increase in fibre level and a lowering of the NFE content, which could have led to the decrease in degradability *in sacco*. The presence of anti-nutritive factors can also cause such a response. This however needs to be investigated. The lowest degradation value (457 g/kg DM) in this study however, has a potential for supporting productive animals (11).

Conclusion

The short-term intake of the legume mixture tended to increase with increasing level of *A. paniculatus*. When *A. hypogaea* becomes more scarce and expensive in the latter parts of the dry season, *A. paniculatus* which stays longer into the dry season can play a prominent role in supplementation. The 30% level of *A. paniculatus* inclusion in this study proved adequate even for highly productive animals. Such levels could be used while supplementing in the dry season.

Further work on the loss of nutrients *in sacco* and presence of anti-nutritive factors needs to be carried out.

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AVIS

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Merci.

BERICHT

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Met uw hulp denken we dus een grote dienst te kunnen bewijzen aan de gemeenschap waarvoor u werkt.

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