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COMPARATIVE RUMINAL NITROGEN DEGRADABILITY OF TROPICAL BROWSE AND TEMPERATE FORAGES,

TOURE-FALL S. and MICHALET-DOREAU B.[1]

ISRA LNERV BP 2057 DAKAR, SENEGAL

[1]INRA CRZV-THEIX 63122 CEYRAT, FRANCE

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COMPARATIVE RUMINAL NITROGEN DEGRADABILITY OF TROPICAL BROWSE AND TEMPERATE FORAGES.

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ABSTRACT

The nitrogen (N) distribution of 2 tropical browse leaves (*Balanites aegyptiaca* and Guiera *senegalensis)* and of 2 temperate legume forages (Alfalfa hays) was determined and the ruminal degradation of total N and fiber N fractions (NDSN, AFN, ADFN) was measured with nylon bag method.

The average N degradability of temperate forages was not different, 77.1, but that of the browse forages varied from 27.5% *(Guiera)* to 85.1% (*Balanites*). The neutral-detergent-soluble N degraded rapidly in the rumen, whereas the acid-detergent-fiber N remained undegraded for all samples. The available fiber N was not high, except for the 3rd growth alfalfa (28% total N) in which 63.3 was degraded. The lowest N degradability of *Guiera* leaves can be explained by N content in cell wall and lignocellulose.

KEYWORDS: alfalfa hays, ruminal N degradation, tropical browse forages.

INTRODUCTION

Trees and shrubs represent an important food resource for ruminants in dry African tropical regions. Their high nitrogen (N) content expressed in terms of crude protein is well known. Although crude protein is a first and common indicator of N content of forages, it does not give their real N status, represented by their true availability related to N cell wall components and antiquality factors like tanins (Mc Leod, 1974)

The N distribution in the plant cell provides an usefull criteria of feedstuffs nitrogen quality evaluation. Total N can be divided into neutral, acid-detergent soluble and insoluble parts which roughly estimate the rapid, slow degradable and undigestible N (Krishnamoorthy et al., 1982). To explain

the variations in forages N quality, we intended to describe the N location in plant cell. The ruminal degradation profile of the different N portions was investigated with nylon bag method. We compared native west African fodder tree leaves, *Guiera senegalensis* and *Balanites aegyptiaca* with two temperate Alfalfa hays, *Medicago sativa*

MATERIAL AND METHODS

Tree leaves, sampled in the sudanian and sahelian area of Sénégal and dried at 60°C, and Alfalfa hays, harvested at the INRA station of Theix (France), were ground through 0.8 mm screen. In *situ* measurements of degradation (10 incubation times between 1 and 96 h) were carried out by using 3 non lactating cows receiving 7 kg DM /animal/day of a hay and concentrate diet (70/30). After incubation, the bags were washed, beaten during 7 mn in a "stomacher" and washed again, to minimize the bacterial contamination of the bag residues (Michalet-Doreau and Ould-Bah, 1989). Substrate and bag residues were analysed on N, neutral-detergent-fiber (NDF) and acid-detergent-fiber (ADF). Residues of NDF and ADF were analysed on N in order to determine neutral- and acid-detergent fiber N (NDFN and ADFN). Available fiber N (AFN) was calculated as NDFN minus ADFN for both substrates and residues. Neutral-detergent-soluble N (NDSN) was calculated as total N minus NDFN.

The degradation kinetics of total N, NDFN and AFN were fitted to an exponential model with and without lag time. To compare forages degradability, a turnover rate in rumen of .04 per hour was used. The data were analysed using a GLM procedure (SAS Institute) with 2 main effects, feedstuff and animal. The feedstuff effect means were separated by Duncan's test.

RESULTS AND DISCUSSION

N content in the forages varied from 1.48 to 5.19% DM, whereas the N distribution in cell wall was different. The average N in NDFN as a

proportion of total N represented 30% in the temperate forages (Table 1). Sanderson and Wedin (1989) and Krishnamoorthy et al. (1982) reported 18% and 36% respectivly. Most (>50%) of Guiera N was NDFN while it represented only 20% for Balanites. Differences between the 2 tree leaves were evev larger in ADFN, 37% *Guiera* N and 5% Balanites N. ADFN was high in fodder trees (Koné et al., 1989), but the variations were less pronounced than in our results.

As a consequence of their chemical composition, there were large differences in degradation profiles of the browse forages. *Guiera N* degradability was lower than that of Balanites (Table 2). This low degradability is due to an important undegradable N fraction, the degradation is slow and begins after a lag time. Ho Ahn et al. (1989) reported a large variation in ruminai N degradation of 12 browse legumes. Whatever the forage, ADFN fraction is not degraded and NDSN degradability is high. 50% of AFN was degraded, except *Guiera* in which that fraction was completely undegraded. However the AFN content is low, thus its influence on total N degradability is low, except for the 3rd growth alfalfa (Figure 1). So N degradability is nearly equal to NDSN fraction, expressed in total N.

The N distribution is more homogenous in the temperate forages than in the studied browse forages. Consequently, the variations in N degradability are more important for these forages than for the temperate forages. In our study, the lowest N degradability of *Guiera* leaves can be explained by the N distribution in plant cell.

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Table 1 : Chemical composition of forages % DM) (*% total N*)

Forages	Composition				
	Total N	NDFN	ADFN	AFN	NDSN
Guiera	*1.48*	.83 *56.0*	.55 *37.1*	.28 *18.9*	.65 *44.0*
Balanites	5.19	.89 *17.1*	.28 *5.4*	.61 *11.7*	*4.30* *82.1*
Alfalfa (2)	*2.20*	.51 *23.1*	.18 *8.1*	.33 *15.0*	1.69 *76.1*
Alfalfa (3)	*2.85*	1.04 *36.5*	.23 *8.1*	.81 *28.4*	1.81 *63.5*

Table 2 : N degradation profiles of forages

Forages	Kinetic degradation Parameters					Degradability (%)
	a (%)	b (%)	c (h^{-1})	lag time (h)	Undegradable	
Guiera	15.7[b]	26.0"	.024[b]	4.3[b]	58.3[b]	27.5[b]
B alanites	69.2"	22.7"	.096[a]	.0[a]	8.0"	85.1"
Alfalfa (2)	37.4"	51.6[b]	.115[a]	.0[a]	10.9"	75.1"
Alfalfa (3)	42.8"	50.4[b]	.121[a]	.0[a]	6.8"	79.1"

Different letters in a same column correspond to a significative difference between means.

Figure 1 : Degradable N of forages (%) and its partitioning into degradable NDSN, AFN and ADFN