NUTRIENT COMPOSITION, DIGESTIBILITY AND INTAKE OF PANICUM COLORATUM HAY OR MIXED WITH EITHER *STYLOSANTHES GUIANENSIS* OR *TRIFOLIUM PRANTESE* BY LAMBS

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Abstract

Growing of P. coloratum in combination with S. guianensis resulted in a higher (P < 0.05) crude protein and lower (P < 0.05) fibre contents of the hay mixture than the sole grass and with T. prantese. Feeding of mixtures of Panicum coloratum with either Stylosanthes guianensis or Trifolium prantese as hay improved (P < 0.05) nutrient composition, apparent digestibility of the dry matter and nutrients and their intakes by lambs.

Key words: digestibility, hay mixture, nutrient intake, *P. coloratum, S.guianensis, T. prantese*

INTRODUCTION

The major constraints of sheep production in the highlands of Ethiopia include nutrient deficiency and poor digestibility of tropical feed resources. Sheep derive most of their feed from natural pastures that cannot provide nutrients beyond the maintenance requirement. The diets of sheep in particular are severely deficient in protein but this could be improved by feeding of grass and legume mixtures of higher protein concentrations. Grass-legume species grown in mixtures contain higher crude protein contents than that of the sole grass due to transfer of nitrogen from the associated legume to non-legume species (Russelle and Hergrove, 1989). Consequently, grass-legume mixtures could be used as cheap sources of protein supplements for higher intake and performance of animals. The major determinant for sheep production is dry matter intake, which in turn is influenced by chemical composition of the diet and form of feeding. Sheep production could be improved through incorporation of legume species into grass-based diets.

Panicum coloratum grass in sole stand and in a mixture with the legumes *Stylosanthes guianensis* and *Trifolium prantese* have been evaluated for their yield and economic viability as the potential pasture species for either grazing or haymaking (Berhan, 2005 and 2006). However, information on nutrient composition, digestibility and intake of sole *P. coloratum* hay and/or in a mixture with either of *S. guianensis* or *T. prantese* by sheep is inadequate.

This study concerned the nutrient composition, digestibility and voluntary dry matter and nutrient intake by lambs fed with sole *P. coloratum* hay and grown in mixtures with either *S. guianensis* or *T. prantese*.

MATERIALS AND METHODS

The experiment was conducted at Haramaya University, 1980 m.a.s.l, 9°26'N and 42°3'E. *P. coloratum* was established as a sole stand and in mixtures with *S. guianensis* and *T. prantese*. A seed rate of 10 kg/ha was used for sole *P. coloratum,* whereas the mixtures were sown at equal seed rate proportions (50: 50%), considering a seed rate of 14 kg/ha for both the legume species (Berhan, 2005 and 2006). The forages were harvested at full flowering stage of the grass and dried in the field for haymaking. The grass-legume mixed hay was chopped to a size of approximately 3–5 cm long for a digestibility trial.

Fifteen yearling male lambs (Blackhead Somali sheep breed) with initial body weight of 17.61 ± 0.013 kg were used. Lambs were de-wormed and sprayed against internal and external parasites. They were grouped into five blocks of three animals each and penned individually. Three treatment feeds were randomly allotted to each animal in the blocks, and lambs were fed the respective treatment feeds *ad libitum*, offering 15 to 20% more than they could consume. Animals were adapted to the respective feeds for about 15 days and to the faecal collection bags for another 3 days before the actual data collection, in which feed intake and faecal output were collected for seven consecutive days.

The treatments consisted of feeding of *P. coloratum* hay alone as a control diet (T1) and mixtures of *P. coloratum*

with *S. guianensis* (T2) or with *T. prantese* (T3). Treatment feeds were given at 0800 and 1600 h, and animals had free access to water and mineral licks at all times.

The feed offered and refused was recorded daily and samples of each were pooled over the trial period for each feed and animal and stored in plastic bags for laboratory analysis. Sub-samples of the feed offered and refused were dried at 60°C to constant weight and ground to pass a 1 mm mesh screen for determination of nutrients. Similar samples were dried at 105°C to constant weight to determine the dry matter (DM) content. The DM and nutrient intakes were determined as a difference between the amounts offered and refused for each feed and treatment.

The total daily faecal output from each lamb was weighed fresh and 10% of each day's collection for each lamb was stored in plastic bags at –20°C. At the end of the collection period, all faecal samples were thoroughly mixed for each lamb and sub-samples were dried for analysis as for the feed samples above. The contents of DM, ash, organic matter (OM) and nitrogen (N) of the feed offers and refusals were determined by the procedures of AOAC (1990). Crude protein (CP) was estimated as N x 25. The neutral detergent fibre (NDF), acid detergent fibre (ADF) and acid detergent lignin (ADL) were determined using the method of Van Soest et al. (1991). The apparent digestibility of DM, OM and the detergent fibres were taken as the proportion of the DM intake not recovered in the faecal residues.

Data were subjected to the analysis of variance using SAS (1998) and significant differences between means were checked using least significant difference.

Tab. 1: Chemical composition of *P. coloratum* grass hay and its mixtures either with *S. guianensis* or *T. prantese*

Chemical composition	Treatment		
	P. coloratum hay	P. coloratum + S. guianensis	*P. coloratum* + *T. prantese*
Dry matter (%)	89.54	90.22	89.60
Organic matter (% DM)	91.96	92.01	91.81
Crude protein (% DM)	6.23	7.89	7.44
Neutral detergent fibre (% DM)	68.57	64.89	65.58
Acid detergent fibre (% DM)	39.76	34.95	36.36
Acid detergent lignin (% DM)	5.73	4.69	5.01

Tab. 2: Dry matter and nutrient digestibility and intake of *P. coloratum* grass hay and its mixtures either with *S. guianensis* or with *T. prantese* by lambs

Nutrient digestibility and intake	Grass-legume mixture			SEM
	P. coloratum alone	P. coloratum + S. guianensis	P. coloratum + T. prantese	
Apparent digestibility (%)				
Dry matter	55.26^{b}	60.42^{a}	58.75^{ab}	0.818
Organic matter	60.73^{b}	63.36^{a}	61.43^{ab}	0.423
Crude protein	62.32^{b}	67.24^{a}	64.58^{a}	0.765
Neutral detergent fibre	54.65^{b}	58.96^{a}	56.73^{ab}	0.657
Acid detergent fibre	50.71^{b}	54.98^{a}	52.96^{ab}	0.663
Feed intake				
Dry matter intake, g/d	510.80^{b}	545.32^{a}	539.05^{a}	5.711
Dry matter intake, g/kg $W^{.075}$				
Nutrient intake, g/d				
Organic matter	469.73^{c}	501.75^{a}	494.90^{b}	5.236
Crude protein	31.82^{c}	42.86^{a}	37.95^{b}	1.718
Neutral detergent fibre	350.26^{a}	353.86^{a}	353.51^{a}	0.617
Acid detergent fibre	203.09^{a}	190.59^{b}	196.00^{b}	1.948
Acid detergent lignin	29.27^{a}	25.58^{b}	27.01^{ab}	0.578

Means in a row with different letters are significantly different at $P < 0.05$

RESULTS AND DISCUSSION

Growing of *P. coloratum* in mixture with either *S. guianensis* or *T. prantese* for haymaking at equal seed rates resulted in higher crude protein and lower NDF and ADF contents than sole *P. coloraturm* hay (Table 1). Feeding of *P. coloratum* hay grown in mixture with *S. guianensis* improved ($P < 0.05$) the digestibility of the DM and nutrients than feeding sole *P. coloratum* hay or grown in mixture with *T. prantese,* whereas feeding of *P. coloratum* hay grown in mixture with *T. prantese* only increased ($P < 0.05$) the CP digestibility, with no significant ($P > 0.05$) differences among other nutrients (Table 2). Feeding of *P. coloratum* hay in mixture with *S. guianensis* and *T. prantese* improved ($P < 0.05$) the DM and nutrient intakes of lambs compared with feeding of *P. coloratum* alone (Table 2). The intakes of the DM and nutrients including fibre components were highest ($P < 0.05$) when *P. coloratum* was mixed with *S. guianensis*. The increased DM and nutrient intake when *P. coloratum* was mixed with *S. guianensis* and *T. prantese* might be related to the enhanced microbial activity due to added nitrogen from the legumes, which was also reflected in improved ($P < 0.05$) digestibility of fibre fractions of the mixed feed.

The results on DM and nutrient intakes and digestibility of mixture diets of *P. coloratum* with either of *S. guianensis* or *T. prantese* show the potential for growing of *P. coloratum* in mixtures with *S. guianensis* and *T. prantese* for feeding of small ruminants. Such a mixture feed would be a cheap protein supplement for lambs in rural areas than conventional protein supplements.

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