

Digestibility of nutrient content of Vetiver grass (*Vetiveria zizanioides*) by goats raised in the Mekong Delta, Vietnam

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Summary

Two experiments were conducted to evaluate the feeding value of Vetiver grass (*Vetiveria zizanioides*) as a feed for goat. Experiment 1 was a nutritive value determination using four goats and four diets in a 4 x 4 Latin square design. Four basal diets with different levels of Vetiver, *Brachiaria multica* grass (DM basis) and a supplement of 1.5 % urea (DM basis) were applied to the goats. Intakes of fresh and dry matter were similar among diets (P = 0.11 and 0.36 respectively). There were no significant differences in apparent digestibility of dry matter (P = 0.74) in all treatments. The second experiment was carried out by applying a two 3 x 3 Latin square design with 6 goats and 3 kinds of foliage from *Sebania grandiflora*, *Leucaena leucocephala*, *Trichanthera Gigantea* as supplements and Vetiver grass. The results showed that DM, OM and CP intakes were highest for *Sebania* and *Leucaena*. Digestibility followed the same pattern as DM intake with highest values for *Sebania* foliage and lowest for leaves of *Trichanthera*.

Key words: goats, Vetiver grass, *Brachiaria multica*, feed intake, digestibility

Introduction

Vetiver is a perennial grass that is widely distributed in the tropics. Recently, it has been discovered to play an important role in erosion and sediment control, as well as highly tolerant to extreme soil conditions (Truong and Baker, 1998). The use of Vetiver as a dual-purpose forage by smallholder farmers in the rainfed upland areas of the Philippines was mentioned by Lapar and Ehui (2003). In addition, Vetiver grass was also reported to be an edible herbage of high quality for cattle and goats particularly in the growing stage (Liu et al., 2003a). Vetiver grass may also be a promising feed resource because of its various advantages including high quality, fast growth rate and easy adaptation to the environment and can therefore bear repetitive mowing without occupying farming land. However, so far, little is known on the application of Vetiver grass as feed for ruminants. Thus, the objective of this study was to evaluate the nutritive value of mature Vetiver grass as forage for goats supplemented with small amounts of energy and protein.

Materials and methods

Location and period of the study

Two trials were carried out at the Cantho University Research Farm from 2003 to 2004.

Animals and housing

Teen growing goats with an average body weight of 13 – 2 kg and aged 4-5 months were used in two trails. These animals were accustomed to feeding on grass and *Sebania grandiflora* since weaning. The goats were vaccinated against foot and mouth disease and dewormed before the initiation of the experiments. They were individually fed in metabolism cages with free access to water.

Treatments and design

Experiment 1: Four growing goats were allocated to four treatments according to a 4*4 factorial design. Four basal diets with different levels of Vetiver, *Brachiaria multica* grass (DM basis) and a supplement of 1.5 % urea (DM basis) were applied to the animals. The rumen supplement contained 1.5% sulphur, 5% salt, 5% bone meal, 73.5% rice bran.

Table 1. Allocation of goats to the experimental diets.

Grass (% DM basis)	Treatments			
	I	II	III	IV
Vetiver	100	75	50	25
<i>Brachiaria</i>	0	25	50	75

Experiment 2: the trial was designed according to a double Latin square (3*3) with three treatments and three experimental periods. Fresh Vetiver grass was fed at 75 % of DM basis. *Sebania grandiflora* (SG), *Leucaena leucocephala* (LL) and *Trichanthera Gigantea* were supplied to create the three treatments.

Individual treatments were:

VSG: Vetiver (75% DM basis) plus *Sebania grandiflora* (25% DM basis)

VLL: Vetiver (75% DM basis) plus *Leucaena leucocephala* (25% DM basis)

VTT: Vetiver (75% DM basis) plus *Trichanthera Gigantea* (25% DM basis)

Measurements

Experimental periods consisted of 14 days in which faeces samples were individually collected (twice per day at 8h and 16h) from days 8 to 14. Each goat was also supplied daily an equal amount of diet in meals basing on their average *ad libitum* feed intake during the transition period. Measurement data of feed offer and residue was obtained. For further analysis, about 10% of faeces (fresh weight) from each goat was taken daily and accumulated in a deep freezer at -20°C until the end of the experiment. Faeces from the 7 days were thoroughly mixed and then samples were taken and dried at 60 °C for 12 hours. Dried samples were ground with a mortar and pestle, the determination of dry matter (DM) was done by drying at 105 °C for 24h, ash content was assayed by incinerating samples at 550°C, and organic matter (OM) could therefore be obtained. Nitrogen (N) was determined by the Macro Kjeldahl technique (AOAC, 1990) and crude protein calculated as N*6.25. Neutral detergent fiber (NDF) and acid detergent fiber (ADF) were analyzed followed the procedure described by Van Soest and Robertson (1985).

Statistical analysis

Data on feed intake and digestibility were subjected to analysis of variance using the least squares General Linear Model (GLM) procedure of the Minitab Statistical Software Release 13.2 (2000). When differences in treatment means were significant at the probability level of P<0.05 the means were compared using the Tukey's test (Minitab Statistical Software Release 13.2 (2000)).

Results and discussion

Chemical composition

Data on chemical composition of the feeds are presented in Table 2. There was a wide range in nutritive values from foliage to grass and legume. Generally, tree foliages had higher crude protein content and much less fiber than grass.

Table 2. Chemical composition of the diet components.

Feeds	DM (g/kg)	g/kg DM			
		Ash	CP	NDF	ADF
Vetiver	239	90	113	711	330
<i>Brachiaria multica</i>	167	101	114	643	331
<i>Sesbania grandiflora</i>	194	85	236	304	210
<i>Leucaena leucocephala</i>	262	67	253	422	227
<i>Trichanthera gigantea</i>	147	234	208	420	315

Feed intake and diet digestibility

Study 1: feed intake and apparent digestibility of goats fed Vetiver and *Brachiaria multica* with urea as a supplement. The mean values for intake of dietary constituents are shown in Table 3. Vetiver grass tested in this study was grown through the dry season and was collected in the jointing stage. Even though the nutritive values of Vetiver grass was a little bit lower than those of *Brachiaria multica*, there was no significant difference in feed intake and apparent digestibility between goats fed 25% to 100% Vetiver.

Table 3. Mean values for intake of fresh grass, dry matter, organic matter and coefficients of apparent digestibility (%) of the feeds.

Items	Diets				SE	P
	I	II	III	IV		
Feed intake						
Fresh, kg/d	1.03	1.09	1.17	1.31	0.07	0.11
Dry matter, g/d	275	277	306	344	28.16	0.36
Organic matter, g/d	254	254	209	318	28.17	0.40
Apparent digestibility (%)						
Dry matter	77.68	78.87	75.59	77.81	2.509	0.83
Organic matter	79.60	80.58	77.21	79.38	2.178	0.74

Study 2: feed intake and apparent digestibility of goats fed Vetiver with a supplement from different tree foliages.

Table 4. Mean values for intake of fresh foliage, dry matter and crude protein and coefficients of apparent digestibility (%) of the feeds.

Items	Diets			SE	P
	Vetiver + S.grandiflora	Vetiver + Leucaena	Vetiver + Trichanthera		
Feed intake					
Fresh, kg/d	1.51	1.44	1.42	0.07	0.54
Dry matter, g/d	369 ^a	370 ^a	309 ^b	13.0	0.01
N*6.25, g/d	49 ^a	43 ^a	31 ^b	1.48	0.001
Organic matter, g/d	335 ^a	335 ^a	272 ^b	11.5	0.004
Apparent digestibility (%)					
Dry matter	76.11	74.48	75.48	0.09	0.59
Organic matter	77.45	74.88	75.15	1.16	0.25
Crude protein	66.91 ^a	63.81 ^b	62.04 ^b	0.68	0.002

^{a,b,c} Means within rows with different superscripts differ significantly at the probability level shown

The mean values for intake of dietary constituents are shown in Table 4. Fresh intake did not differ between treatments but goats fed basal diet of Vetiver with 25% supplementation of either *Sesbania* or *Leucaena* consumed more DM. The protein contents of *Sesbania* and *Leucaena* were much higher than *Trichanthera*, intake of protein was therefore significantly different being prone to a higher level.

Protein intake appeared to be a major determinant of DM intake as there was a close relationship between the two variables ($Y = 118.7 \times 5.68X$; $R^2 = 0.86$). The importance of protein intake as the determinant of performance in ruminants has been strongly emphasized by Preston and Leng (1987).

Results from apparent digestibility coefficients of DM and OM did not show any significant differences between foliages treatments. The DM digestibility values obtained for *Sesbania grandiflora* and *Leucaena* are considerably lower than those reported by Nhan et al., (1998) for *Leucaena* (79%) and *Sesbania grandiflora* (81.6%). The DM digestibility coefficients for *Trichanthera* (75.48 %) are similar to the value (70 to 79%) (66%) studied by Kouch et al., (2003) in young growing goats fed the leaves of the Mulberry. Apparent

digestibility of crude protein is higher ($P = 0.002$) for *Sesbania* (66.91%) compared with *Leucaena* (63.81%) and *Trichanthea* (62.04%).

There are few papers, to our knowledge, investigated the use of Vetiver grass for ruminant excepting for a study on digestibility of nutrient contents in Dongshan goats fed 60% concentrates and 40% Vetiver grass hay, Liu et al., 2003b reported that digestibility percentage of DM and CP were 63.0 and 77.9, respectively. However, when concerning only digestibility of nutrient content in Vetiver grass these values reduced to 46.09% for DM and 23.15% for CP.

Conclusions

The results from this study indicate that:

- Vetiver grass (*Vetiveria zizanioides*) can partial replace *Brachiaria multica* grass for growing goats.
- Vetiver grass used as a basal diet is encouraging especially when it is supplemented with leguminous trees like *Sebania* or *Leucaena*.
- Vetiver grass would be a promising feed source for goats.

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References

- AOAC., 1990. Official methods of analysis of the Association of Official Analytical Chemists (15th Edn.), Washington, DC. 1, 69-90.
- Kouch, T., T.R. Preston and J. Ly, 2003. Studies on utilization of trees and shrubs as the sole feedstuff by growing goats; foliage preferences and nutrient utilization Livestock Research for Rural Development 15 (7).
- Lapar, M.L.A. and S. Ehui, 2003. Adoption of dual-purpose forages: some policy implications. Tropical Grassland 37: 284-291.
- Liu, P., C. Zheng, Y. Lin, F. Luo, X. Lu and D. Yu, 2003a. Dynamic state of nutrient contents of Vetiver grass (China Vetiver Workshop).
- Liu, P., C. Zheng, Y. Lin, F. Luo, X. Lu and D. Yu, 2003b. Study on Digestibility of Nutrient Content of Vetiver Grass (China Vetiver Workshop).
- Nhan, N.T.H., 1998. Effect of *Sesbania grandiflora*, *Leucaena leucocephala*, *Hibiscus rosa-sinensis* and *Ceiba pentadra* on intake, digestion and rumen environment of growing goats. Livestock Research for Rural Development 10 (3).
- Van Soest, P.J. and J.B. Robertson, 1985. Analysis of forages and fibrous foods. A laboratory Manual for Animal Science 613. Department of Animal Science. Cornell University. Ithaca, Newyork.