

Utilization of *Melastoma* (*Melastoma affine*, D. Don) foliage as a forage for growing goats with cassava (*Manihot Esculenta*, Crantz) hay supplementation

Bui Phan Thu Hang¹ & Inger Ledin²

¹Cantho University, Campus II, 3/2 Street, Cantho city, Vietnam, ²Swedish University of Agri-cultural Sciences, P.O. Box 7024, 750 07, Uppsala, Sweden

Summary

Twenty-four weaned crossbred male goats (Bachthao x local female) with initial weights of 9.9 (0.73) kg and ages of 3-4 months were used in an experiment to evaluate the effect of feeding *Melastoma affine* foliage and cassava hay on intake and live weight gain in goats. The goats were fed *Melastoma* foliage *ad lib*, 70 g dry matter (DM) cassava chips and cassava hay at four levels: 0%, 15%, 30%, 45% of estimated DM intake (3% of body weight). Feed intake, crude protein intake, and also live weight gain for the diet without cassava hay supplement was significantly lower than for the diets with cassava hay. The highest feed intake and daily weight gain were obtained for goats fed 30% *Melastoma* of total DM in the diet (2.8% of body weight and 48g/day, respectively). The foliage of *Melastoma* seems to be sufficient for low growth rates only, but can have some importance in solving the shortage of grass on poor soils and in the dry season.

Key words: Vietnam, *Melastoma affine* foliage, cassava hay, feed intake, growth, goats.

Introduction

Shortages of feed resources are often a constraint for the development of animal production in the tropics and subtropics (Aregheore, 2000). *Melastoma affine* (a shrub that can grow to about 2 m height) is abundant in natural conditions and has promising properties for goat feeding. According to McDonald et al. (1992), evaluating intake of tropical forages is important when deciding the feeding value, as a high feed consumption creates the necessary conditions for an increase in production. *Melastoma* foliage has a low nutritive value, with 108 g crude protein (CP)/kg dry matter (DM), but has a high DM content (347 g/kg) and 249 g crude fibre/kg DM (Dung, 1996). Cassava (*Manihot esculenta* Crantz) hay made by sun drying contained a high level of CP (250 g/kg DM) and low levels of HCN (Wanapat, 1997). Cassava root chips are used as an energy source in animal diets.

The objective of this study was to determine whether *Melastoma* foliage as a basal diet with a cassava hay supplement can satisfy the requirements for goats of 10-12 kg growing 50 g/day.

Materials and methods

The study was carried out at Cantho University Research Farm, Cantho City, Vietnam. Twenty-four weaned crossbred male goats (Bachthao x local female) with an initial weight of 9.9 (0.73) kg and ages from 3 to 4 months were used.

The feeds used in the experiment were foliage of *Melastoma affine* (Me), cassava hay (CH) and cassava chips (CC). *Melastoma* foliage was hung in bunches above the fodder trough. CH and CC were fed in plastic troughs for goats to choose freely. Feed offered for each goat was weighed every morning and the animals were given with 50% of their daily ration at 08:00 h in the morning and 50% at 14:00 h in the afternoon. Fresh water and a mineral lick were supplied *ad libitum*. The animals were weighed at the start of the experiment and then weekly, on the same day of the week and before feeding in the morning. The experiment lasted for 90 days.

The experiment was a Completely Randomized Design (CRD) with 4 treatments (diets), 6 replicates and 1 goat per unit. All diets contained Melastoma foliage *ad lib* and 70 g CC. The diets were supplemented with 0, 15, 30 or 45% CH (% of estimated DM intake, which was 3% of BW).

Feeds, refusals and faeces were analyzed for DM, CP and ash and urine for N according to AOAC (1990). Neutral detergent fibre (NDF) and acid detergent fibre (ADF) were determined according to Van Soest and Robertson (1985) and condensed tannins according to AOAC (2000). The data of the experiment were analyzed statistically by analysis of variance using the General Linear Model (GLM) procedure of Minitab Software Release version 13.0 (2000).

Results and discussion

Melastoma leaves and cassava chip (Table 1) had a similar CP content, only 44 g/kg DM, while the leaves of Melastoma had higher level of CP, 114 g/kg DM. The DM content of Melastoma leaves was slightly higher than Melastoma stems. There were only low variations in DM and CP content during the experiment. The DM and CP contents of Melastoma foliage were lower than those found by Dung (1996).

Table 1. Chemical composition of the experimental feeds (means and standard deviation (SD))

Item	Melastoma stems	Melastoma leaves	Cassava chips	Cassava hay
DM, g/kg	271 (22)	280 (21)	872 (8)	849 (9)
<i>g/kg DM</i>				
Ash	72 (11)	89 (8)	25 (0.5)	87 (3)
CP	44 (4)	114 (9)	44 (1)	241 (2)
NDF	539 (27)	290 (21)	75 (3)	12 (46)
ADF	407 (22)	246 (18)	47 (1)	263 (43)
Tannin	63 (7)	98 (8)	2 (0.1)	37 (14)
No. of samples	10	10	6	6

Most of the cassava root and the cassava hay offered was consumed, even in the group with the highest level of supplementation. The effect of different levels of cassava hay supplement on feed intake is given in Table 2. Total DM intake, average DM intake in percent of BW and also intake of DM related to metabolic body weight ($W^{0.75}$) were significantly lower for the diet without CH supplement than for the diets containing CH, probably due to high level of tannins in Melastoma. There were no significant differences in DM consumption between the different levels of cassava supplement. According to Devendra and McLeroy (1982) DM intake seldom exceeds 30 g/kg BW for meat goats in the tropics. The CP intake, both total and per kg $W^{0.75}$, increased significantly with increasing levels of CH supplement.

Changes in live weight gain (LWG) during the experiment are presented in Table 3. The treatments with 620 and 790 g/kg DM of Melastoma resulted in a significantly lower daily weight gain as compared to 300 g and 450 g/kg DM of Melastoma. The goats fed the diet with 300 g/kg DM of Melastoma showed the significantly highest daily gain and the lowest feed conversion ratio (FCR) for protein. This live weight change was still lower than compared to goats fed *Leucaena leucocephala*, *Hibiscus rosa-sinensis*, and *Ceiba pentadra* according to Nhan (2000). Devendra (1993), and Stewart (1994), reported that, when used as supplements, the optimum dietary level of fodder trees and shrubs should be about 300 g to 500 g/kg DM of the ration.

Conclusions

Using Melastoma foliage for feeding growing goats at the level of 300 g/kg DM of the diet can improve the intake and performance of goats if complemented with a high protein and possibly

even low fibre supplement. The foliage of *Melastoma affine*, although only sufficient for low growth rates, can still play an important role in solving the shortage of grass on poor soils and in a dry zone.

Table 2. Feed offered and feed intake during the experiment (least squares means and SE)

Item	Experimental diets				SE
	CH0	CH15	CH30	CH45	
<i>Feed offered, g DM/day</i>					
Cassava hay	0	54	109	163	
Cassava chip	70	70	70	70	
Melastoma					
Leaves	238	202	166	131	
Stems	155	132	109	86	
Total	464	459	454	449	
<i>Feed intake, g DM/day</i>					
Cassava hay	0 ^d	52 ^c	104 ^b	153 ^a	0.5
Cassava chip	60 ^c	68 ^{ab}	69 ^a	67 ^b	0.5
Melastoma					
Leaves	179 ^a	158 ^b	123 ^c	90 ^d	0.9
Stems	48 ^a	35 ^b	19 ^c	8 ^d	0.6
Total	288 ^b	313 ^a	314 ^a	317 ^a	1.3
% Me of total DM cons.	79 ^a	62 ^b	45 ^c	30 ^d	0.3
<i>Nutrient intake, g/day</i>					
OM	266 ^b	290 ^a	291 ^a	293 ^a	1.2
CP	26 ^d	36 ^c	43 ^b	52 ^a	0.2
NDF	67 ^c	71 ^a	70 ^{ab}	68 ^{bc}	0.6
ADF	57 ^c	61 ^a	60 ^{ab}	60 ^b	0.4
DM intake, % of BW	2.5 ^b	2.7 ^a	2.8 ^a	2.8 ^a	0.1
DM intake, g/kg W ^{0.75}	46 ^b	50 ^a	51 ^a	51 ^a	0.2
CP, g/kg W ^{0.75}	4.1 ^d	5.7 ^c	6.9 ^b	8.3 ^a	0.1

a,b,c,d: Means within rows with different superscripts are significantly different ($P < 0.05$); CH0, CH15, CH30, CH45= 0, 15, 30 or 45% of 3% of BW of cassava hay on DM basis; Me: Melastoma foliage

Table 3. Effect of diet on daily live weigh gain (LWG) and feed conversion ratio (FCR) (least squares means and SE)

Item	Experimental diets				SE
	CH0	CH15	CH30	CH45	
Initial weight, kg	10.4	9.6	9.6	10.2	0.3
Final weight, kg	10.9 ^b	11.0 ^b	13.8 ^a	14.5 ^a	0.3
LWG, g/day	6 ^c	14 ^b	46 ^a	48 ^a	1.5
FCR, kg DM/kg LWG	54.1 ^a	22.3 ^b	6.9 ^c	6.7 ^c	0.3
FCR, kg CP/kg LWG	4.86 ^a	2.53 ^b	0.94 ^d	1.10 ^c	0.03

a,b,c,d: Means within rows with different superscripts are significantly different ($P < 0.05$); CH0, CH15, CH30, CH45= 0, 15, 30 or 45% of 3% of BW of cassava hay on DM basis; Me: Melastoma foliage

References

AOAC, 1990. Official Methods of Analysis, 15th edition. Association of the Official Analytical Chemists, Washington D.C.

AOAC, 2000. Official Methods of Analysis, 17th edition. Association of the Official Analytical Chemists, Washington D.C.

Aregheore, E.M., 2000. Chemical composition and nutritive value of some tropical by-product feedstuffs for small ruminants – in vivo and in vitro digestibility. *Animal Feed Science and Technology* 85, 99-109.

Devendra, C. and G.B. McLeroy, 1982. Goat and sheep production in the tropics. Intermediate Tropical Agriculture Series. Longman, London. pp 63-71.

Devendra, C., 1993. Trees and shrubs as sustainable feed resources. In: Proceeding VI Word Conference on Animal Production. Edmonton, Alberta, Canada. 1:119-136.

Dung, N. N. X, 1996. Identification and evaluation of noncultivated plants used for livestock feed in the Mekong Delta of Vietnam. MSc thesis in the programme “Tropical Livestock Systems”. SLU, Department of Animal Nutrition and Mangement, P.O. Box 7024, Uppsala, Sweden.

Minitab, 2000. Minitab Reference Manual, Release 13.1 for Windows. Minitab Inc., USA.

Nhan, N.T.H., 2000. Effect of *Sesbania gradiflora*, *Leucaena leucocephala*, *Hibiscus rosa-sinensis* and *Ceiba pentadra* on intake, digestion and rumen environment of growing goats. Proceedings National Workshop-Seminar “Sustainable Livestock Production on Local Feed Resources”. Ho Chi Minh City, Vietnam, January, 18-20th, 2000.

Stewart J.L., and A. J. Simons, 1994. *Gliricidia sepium* a multipurpose forage tree legume, In R. C. Gutteridge and H. M. Shelton (eds). Forage Tree Legumes in Tropical Agriculture. CAB International. pp 30-48.

Van Soest, P.J. and J.B. Robertson, 1985. Analysis of forages and fibre foods. A Laboratory Manual for Animal Science 613. Department of Animal Science. Cornell University. Ithaca, New York.

Wanapat, M., O. Pimpo, A. Petlum and U. Boonta, 1997. Cassava hay: A new strategic feed for ruminants during the dry season; Livestock Research for Rural Development. 9:2 <http://www.cipav.org.co/Irrd9/2/metha92.htm>.