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Feeding wilted cassava foliage to growing goats in smallholder production systems

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Summary

A feeding trial was carried out in Lao PDR during the period of 15th July to 30th October 2003 to study the effect of different levels of wilted cassava foliage in a diet based on Gamba grass. The experiment included 32 male local breed goats, weighing 14.6±0.42 kg, and average age of 5-6 months. The goats were randomly allocated to each of four treatments, consisting of 4 levels (0, 20, 30 and 40%) of wilted cassava foliage in the diet based on expected dry matter (DM) intake. Increasing the amount of wilted cassava foliage resulted in increasing intake of total DM, CP, NDF and ADF. The highest total DM intake, approaching 3.1% of body weight was obtained in the diets with 40% of wilted cassava foliage. The highest daily weight gain was 54 g/day in the 40% wilted cassava foliage treatment, but this was not significantly different from the diet with 30% foliage (52 g/day). The inclusion of wilted cassava foliage into a diet based on Gamba grass improved the quality of the diet, which resulted in higher intake and better growth rate.

Keywords: wilted cassava foliage, Gamba grass, intake, live weight gain.

Introduction

Livestock is a very important source of protein food and family cash income of farmers in the rural areas of Laos, where livestock contribute to more than 50% of the total family income. More than 70% of the total livestock production comes from smallholders, but with poor management technologies. Most of the goat production in Laos is in a free range system, integrated with the cropping system through the use of crop residues, agriculture by-products and fodder grown on uncultivated or fallow and forest land. The production is characterised by poor growth rates and time to reach slaughter weight is long, often due to poor nutrition.

One possibility to improve feed quality is to use foliage of cassava (*Manihot esculenta*, Crantz). Wanapat (2001) described cassava hay as a good protein source for lactating dairy cows. Van et al. (2001) concluded that cassava foliage is a potentially valuable small ruminant feed in the hilly and mountainous area of North Vietnam. Cassava foliage has a high protein content, and can yield as much as 4 tons dry matter (DM) per hectare annually (Preston, 2001). Protein content in cassava leaves ranges between 16 and 25 % on DM basis, and with almost 85% of the crude protein (CP) fraction as true protein (Ravindran, 1993).

The objective of the present study was to determine the effect of inclusion of different levels of wilted cassava foliage in the diet on feed intake and growth performance of growing goats fed a basal diet of Gamba grass (*Andropogon gayanus*).

Materials and methods

The feeding trial was carried out at the Livestock Research Centre (LRC), Nam Souang about 40 km north of Vientiane during the period 15th July to 30th October, 2003. A randomised complete block design was used with a total of 32 local growing goats, with 8 animals weighing 14.6±0.42 kg and 5-6 months old randomly assigned to each of the 4 treatments. The treatments were based on the amount of wilted cassava foliage in the diet (0%, 20%, 30% and 40% of an expected intake of 3% of body weight (BW)). Cassava foliage was wilted for around 12 h before feeding, Gamba grass was fed fresh *ad libitum* in the amount of 120% of the grass consumed in the previous week.

Samples of feed were taken once every week and were pooled for two weeks. The feeds offered and refused were recorded daily for individual animals. DM content of the feeds offered and the refusals were checked using a microwave oven in order to be able to feed the correct amount of DM and calculate DM intake. The dried feed refusals were pooled for one week and for one treatment group and a sample was taken for chemical analysis. The recording of feed consumption and refusals was done every morning before feeding. The animals were weighed individually every week during the 2 weeks of the experiment.

The samples were analysed for DM, ash and crude protein (CP) according to standard methods of AOAC (1980). Neutral detergent fibre (NDF) and acid detergent fibre (ADF) were determined by the methods of Van Soest and Robertson (1985). All analyses were made in the feed lab at the Livestock Research Centre in Namsouang, Laos.

The data from the experiment was analysed statistically by variance analysis using the General Linear Model (GLM) of Minitab Software version 12.21 (Minitab, 1998). Treatment means showing significant differences at the probability level of $P<0.05$ were compared using Tukey's pairwise comparison procedures. The model was effect of level of cassava inclusion in the diet, and initial weight was used as a covariate.

Results and discussion

Data on chemical composition of the diet is shown in Table 1. The DM content of the wilted cassava foliage was slightly higher than for the Gamba grass. There was only a low variation in DM content for Gamba grass, while there was high variation for wilted cassava foliage during the experiment. CP in DM was high in wilted cassava, 21%. The HCN content in the wilted cassava foliage was lower (145 mg/kg) than in the fresh cassava foliage (978 mg/kg) reported by Man (2001). The present results concerning chemical composition of Gamba grass are similar to those reported by Phengsavanh (2003).

The feed intake is presented in Table 2. There were significant differences in total DM intake among treatments. Animals fed 20%, 30% and 40% of wilted cassava had significantly higher intakes than those offered only Gamba grass. However, there was no significant difference in feed intake of animals fed 20% or 30% of wilted cassava in the diet. Inclusion of wilted cassava to diets based on Gamba did not result in any changes in intake of Gamba, which was not significantly different between treatments. There was, however, a tendency of increasing total DM intake when level of wilted cassava foliage in the diets was increased. The animals fed the highest levels of wilted cassava had the highest total DM intake. This was probably an effect of the higher CP intake, which would create a better rumen environment for the digestion of feed. Ho Quang Do et al. (2003) supplemented different ratios of cassava leaves to green grass and found that increasing the proportion of cassava leaves in the diet had marked positive effect on feed intake, N retention and digestibility. Similar results were reported by Phengsavanh (2003) supplementing Gamba grass with different levels of a legume *(S. guianensis*). The actual intake of wilted cassava in each group did not meet the expected target. The actual intakes for the groups 20%, 30% and 40% wilted cassava foliage were 85%, 81% and 69%, respectively, of foliage offered

Table 3 shows the effect of level of inclusion of wilted cassava foliage in the diet on live weight gain (LWG) during the experimental period, which follows the same pattern as the daily DM and CP intake. Animals fed wilted cassava showed significantly higher growth rates in comparison to those fed only Gamba grass (42.6 (20%), 52.0 (30%) or 54.0 (40%) g/day in comparison to 28.9 g/day for animals fed only Gamba). This was probably a result of the fact that the CP intake was higher for those diets then for the diet of Gamba grass only. The highest weight gain was obtained from the goats fed 40% of wilted cassava, 54 g/day, lower than goats fed Gamba grass as a basal feed and supplemented with the same level (40%) of *S. guianensis*, 70.5 g/day (Phengsavanh, 2003). The daily live weight gain increased as the level of inclusion of wilted cassava increased up to about 30%, but there was no further significant increase in growth rate when the inclusion of wilted cassava was increased to 40%.

Conclusions

Cassava wilted foliage can be used as a protein source to growing goats, and supplementing with wilted cassava foliage to low or medium quality grasses will result in significant increases in feed intake and weight gain. The inclusion level of wilted cassava in the diet can be up to 30-40% in a diet based on Gamba grass.

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Table 1. Chemical composition of the dietary components (means and SE)

	Wilted cassava foliage	Gamba grass
DM g/kg	337 ± 4.9	215 ± 2.7
g/kg DM		
Ash	51 ± 0.3	50 ± 0.4
CP	211 ± 3.0	99 ± 2.2
ADF	307 ± 2.6	418 ± 6.6
NDF	403 ± 2.5	724 ± 3.9
HCN, mg/kg	145 ± 2.4	-
No of samples	21	21

Table 2. Feed offered (means) and feed intake (least squares means (LS-means) and standard error (SE))

	Treatment (% of wilted cassava foliage)				
	0	20	30	40	SE
Feed offered, g DM/day					
Cassava foliage	0	104	156	211	
Gamba grass	537	560	571	581	
Total	537	765	819	897	
Feed intake, g DM/day					
Cassava foliage	0	89^{c}	127^{b}	146^{a}	10.1
Gamba grass	472^{a}	457^{a}	457^{a}	470^{a}	3.6
Total	472^{c}	546^{b}	584^{b}	616^{a}	11.4
Nutrient intake, g/day					
CP	46.9^{d}	64.1^{c}	72.1^{b}	77.5^{a}	2.15
NDF	342^{c}	367^{b}	382^{ab}	399^{a}	4.76
ADF	197^{d}	218^{c}	230^{b}	241^{a}	3.40
Intake (% of BW)	2.50^{c}	2.81^{b}	2.96^{a}	3.10^{a}	0.04
Intake (g/ kg $W^{0.75}$)	62.2^{c}	70.4^{b}	76.4^{a}	78.5^{a}	1.24
Intake of cassava foliage % of total DM intake	0	16.3	21.7	23.8	

$^{b, c, d}$ Means within rows with different superscripts differ significantly (P<0.05)

Table 3. Effect of level of wilted cassava foliage in the diet on daily weight gain of the goats (LS means and SE)

Items	Treatment (% of wilted cassava foliage)				
	0	20	30	40	SE
Initial weight	14.4	14.7	14.5	14.9	0.13
Final weight	16.9^{c}	18.4^{b}	18.9^{a}	19.7^{a}	0.20
Live weight gain (g/day)	28.9^{c}	42.6^{b}	52.0^{a}	54.0^{a}	2.00

$^{a, b, c}$ Means within rows with different superscripts differ significantly (P<0.05)