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Short Communication

THE NUTRIENT COMPOSITION AND *IN VITRO* RUMINAL DEGRADABILITY OF SELECTED LOCAL PLANTS USED AS GOAT FEED IN MALAYSIA

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SUMMARY

A comparative study of nutrient composition and *in vitro* ruminal degradability of selected local plants, *Macaranga* sp.and *Mallotus* sp.was carried out and Napier grass (*Pennisetum purpureum*) was used as control.The results obtained from proximate analysis revealed that there were significant difference (P<0.05) of all nutrient composition for each local plant species against Napier grass. Dry matter content in *Macaranga* sp., *Mallotus* sp. and Napier grass were 50.92%, 45.41% and 13.04%, respectively. The crude protein content in *Macaranga* sp., *Mallotus* sp. and Napier grass were 7.18%, 6.78% and 3.88%, respectively. *Mallotus* sp. has the highest crude fat content (5.22%) followed by *Macaranga* sp. (4.85%) and Napier grass (2.84%). Crude fibre content in Napier grass, *Mallotus* sp.and *Macaranga* sp. were 25.38%, 15.47% and 12.00%, respectively. For the *in vitro* ruminal degradability, total gas produced by Napier grass, *Macaranga* sp. and *Mallotus* sp. were 31.00 ml, 28.67 ml and 23.33 ml, respectively. Acetic acid production in *Mallotus* sp., Napier grass and *Macaranga* sp. were 733.49 mM/ml, 605.61 mM/ml and 599.85 mM/ml, respectively. Propionic acid production was highest in *Mallotus* sp. (28.61 mM/ml) followed by Napier grass (24.45 mM/ml) and *Macaranga* sp. (24.23 mM/ml). As for butyric acid production, Napier grass showed the highest value (11.26 mM/ml), followed by *Macaranga* sp. (11.19 mM/ml) and *Mallotus* sp. (10.36 mM/ml). However, there was no significant difference shown in acetic, propionic and butyricacids production. Thus, based on the nutrient composition and *in vitro* ruminal degradability results, it shows that these local plants could be used as an alternative feed source for goats.

Keywords: Macaranga sp., Mallotus sp., Napier grass, proximate analysis, ruminal degradability

INTRODUCTION

Local plants had supported grazing animals even before domestication as these local plants are abundant and easily accessible. Even till now, most of smallholder farmers in Malaysia are still feeding local plants to goats especially during the shortage of primary feed supply such as grass (FFTC, 2002). Indeed, this can help to reduce the dependence on concentrates and supplements in total mix ration subsequently reducing the cost of feed and feeding. There are also farmers practicing a combination of local plants with the primary feed stuffs (e.g. concentrate; grass) to feed their livestock. In addition, the availability of the local plants in Malaysia has derived the small holder goat farmers to integrate these local plants into the total feed ration of the livestock. Local plants such as *Macaranga* sp. and *Mallotus* sp. are mostly used to feed the goats but the study on their potential or benefits as goats feed is limited. Thus, this study was done to assess the potential of these local plants to be included in total mix ration for goat diet in which the nutrient composition and *in vitro* ruminal degradability were determined.

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Meanwhile, Napier grass was harvested manually from pasture at the farm at the age of 8 weeks. Napier grass was used as a control group as it is commonly fed to goats. All samples were dried at 60°C for 48 hours and ground using a laboratory blender (Waring®) to pass through 2 mm sieve screens and kept in labelled air-tight plastic containers at room temperature for further laboratory analysis. Nutrient composition (dry matter; crude protein; crude fibre; crude fat) for all samples was determined by proximate analysis following procedures of AOAC (1990). *In vitro* ruminal degradability was performed according to the method described by Hassim *et al.* (2012). A mixture of 0.25 g sample, 10 ml of rumen fluid and 25 ml of phosphate-bicarbonate buffer was inserted into 100 ml plastic syringes and placed in an incubator 39°C for 24 hours. The volume of the gas produced at 0, 2, 4, 6, 8, 10, 12 and 24 hours of incubation period were recorded. After 24 hours, the incubation content was collected and analysed for volatile fatty acids (acetic; propionic; butyric) production using gas-liquid chromatography. All data were statistically analysed by ANOVA and means were tested with Dunnett Test using SPSS version 20.

RESULTS AND DISCUSSION

The nutrient composition of the *Macaranga* sp., *Mallotus* sp. and Napier grass (*Pennisetum purpureum*) is presented in Table 1. The result revealed that there were significant difference (P<0.05) for all nutrient

composition in each local plant species against Napier grass. Dry matter content was highest in *Macaranga* sp. (50.92%) followed by *Mallotus* sp. (45.41%) and Napier grass (13.04%). The crude protein content was highest in *Macaranga* sp. (7.18%) followed by *Mallotus* sp. (6.78%) and Napier grass (3.88%) whereas *Mallotus* sp. contain the highest crude fat content (5.22%) followed by *Macaranga* sp. (4.85%) and Napier grass (2.84%). As for crude fiber, Napier grass showed the highest content (25.38%) followed by *Mallotus* sp. (15.47%) and *Macaranga* sp. (12.00%). High dry matter content in *Macaranga* sp. and *Mallotus* sp. could be due to sample type (only leaves used) in which the goats only offered with leaf parts in normal feeding practice at the farm. Meanwhile, whole part of Napier grass that was used in this study contains lower dry matter as compared to the two local plants. This could be explained by a high water content of stem fraction that resulted in an increased of moisture content (Mohammed *et al*., 2015). In this study, low crude protein content of the Napier grass could be due to several factors including soil, species variety, maturity, pasture management and climate (Halim *et al*., 2013). Indeed, the Napier grass used was harvested during hot season and the pasture was poorly managed by the farmer with improper irrigation and inadequate fertiliser. In addition, crude protein and crude fat contents were higher in both local plants and this could be associated with leaf: stem ratio which contain high nutritive value (Tudsri *et al.,* 2002). The total gas and volatile fatty acids production of *in vitro* ruminal degradability is presented in Table 2. The highest total gas production was shown by Napier grass (31.00 ml), followed by *Macaranga* sp. (28.67 ml) and *Mallotus* sp. (23.33 ml). Acetic acid production was highest in *Mallotus* sp. (733.49 mM/ml) followed by Napier grass (605.61 mM/ml) and *Macaranga* sp. (599.85 mM/ml) whereas propionic acid production was highest in *Mallotus* sp. (28.61 mM/ml) followed by Napier grass (24.45 mM/ml) and *Macaranga* sp. (24.23 mM/ml).As for butyric acid production, Napier grass showed the highest value (11.26 mM/ml), followed by *Macaranga* sp. (11.19 mm/mL) and *Mallotus* sp. (10.36 mM/mL). However, there was no significant difference shown for total gas and volatile fatty acids production. Thus, as there was no significant difference observed between Napier grass with these local plants, it can be concluded that these local plants have similar degradability with Napier grass.

Table 1. Nutrient composition of Napier grass (*Pennisetum purpureum*) and local plants (*Mallotus* sp. and *Macaranga* sp.)

	Napier grass	*Mallotus* sp.	*Macaranga* sp.
DM (%)	13.04±0.04[a]	45.41±0.09[b]	50.92±0.67[c]
CP (% DM)	3.88±0.38[a]	6.78±0.25[b]	7.18±0.62[b]
CFa (% DM)	2.84±0.03[a]	5.22±0.09[b]	4.85±0.01[c]
CFi (% DM)	25.38±0.20[a]	15.47±0.20[b]	12.00±0.14[c]

DM=Dry matter, CP=Crude protein, CFa=Crude fat, CFi=Crude fibre. Value expressed as mean±standard error of mean (SEM)

Table 2.Total gas and volatile fatty acids production of Napier grass (*Pennisetum purpureum*) and local plants (*Mallotus* sp. and *Macaranga* sp.) after 24 hours *in vitro* incubation

	Napier grass	*Mallotus* sp.	*Macaranga* sp.
TG (ml)	31.00±2.65[a]	23.33±3.29[a]	28.67±4.56[a]
TVFA (mM/ml)	641.31±78.80[a]	772.46±122.07[a]	635.27±71.00[a]
Acetic acid (mM/ml)	605.61±75.77[a]	733.49±118.86[a]	599.85±68.26[a]
Propionic acid (mM/ml)	24.45±2.61[a]	28.61±3.80[a]	24.23±2.05[a]
Butyric acid (mM/ml)	11.26±0.76[a]	10.36±1.98[a]	11.19±1.33[a]

TG=Total gas, TVFA=Total volatile fatty acid. Value expressed as mean±standard error of mean (SEM)

CONCLUSION

The availability of local plants such as *Macaranga* sp. and *Mallotus* sp. in Malaysia has derived the small holder goat farmers to integrate these local plants into the total feed ration of the livestock. Thus, the potential of this local plants as animal feed was further studied and analyzed for their nutrient composition, as well as the *in vitro* ruminal degradability. Indeed, both local plants, *Macaranga* sp. and *Mallotus* sp. contained higher dry matter, crude protein and crude fat content compared with Napier grass. For the *in vitro* ruminal degradability, both local plants showed the same pattern with Napier grass in term of total gas and volatile fatty acids production, indicating that these local plants have similar degradability with Napier grass. Thus, based on the nutrient composition and *in vitro* ruminal degradability results, it shows that these local plants have good nutritive value and degradability and has a potential to be used as an alternative fibre source in goat diet.

CONFLICT OF INTEREST

No conflict of interest between the authors.

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