

Influences of Plant Species and Conservation Methods on Voluntary Intake and Digestibility of Dry Matter and Organic Matter of Ruzi grass (*Brachiaria ruziziensis*) and Streblus Leaves (*Streblus asper* Lour) in Goats under the Humid Tropical Climate in Southern Part of Thailand

O. Insung¹, T. Vearasilp², U. ter Meulen³ and S. Chakeredza³

1 Rajamangala Institute of Technology (RIT), Nakhonsithammarat Campus, Thailand

2 Chiang Mai University, Department of Animal Science, Thailand

3 Georg-August- Universität Göttingen, Institute of Animal Physiology and Animal Nutrition, Germany

ABSTRACT

This study was conducted to evaluate the influence of plant species and conservation method on voluntary intake of dry matter and organic matter in goats. Four male goats weighing 33.75 ± 4.11 kg were used. Two plant species, Ruzi grass (*Brachiaria ruziziensis*) and Streblus leaves (*Streblus asper* Lour) sun dried or ensiled with 5% cane molasses were used as the four feeds. The animals received the 4 different feed types in sequence in 4 periods in 4x4 Latin square design. Each period lasted for 14 days with 9 days adaptation 5 days for data collection. The animals were fed *ad libitum*. The feed offered and refused was recorded daily. Feed samples and the animal's dung were collected daily during the collection period and analysed for dry matter and the organic matter content. The voluntary intake of the ensiled Streblus leaves expressed either on dry matter ($p < 0.01$), percentage body weight ($p < 0.01$) and metabolic body weight ($p < 0.01$) basis was highest. The goats fed on ensiled Ruzi grass has the lowest voluntary feed intake ($p < 0.01$) on all parameters assessed. The trend in organic matter intake was similar to that of dry matter intake. Ensiled Streblus leaves had the highest organic matter intake ($p < 0.01$) whereas ensiled Ruzi grass had the lowest ($p < 0.01$). The digestibility of both dry matter and organic matter were not significantly different across treatments ($p > 0.05$). However, the D-value of feed was significant different across treatments ($p < 0.01$). Dry Ruzi grass had the highest D-Value ($p < 0.01$). This research implies that the proper method for conservation of feed resources used for ruminant animal feeding is crucial.

Key words: Conservation method, Dry matter digestibility, Organic matter digestibility; Ruzi grass; Streblus leaf, Voluntary intake.

Introduction

The main objective in preservation of any crops is to keep it at the optimum stage of growth for using during the seasons when the crop is unavailable (Mc Donald *et al.*, 1991). Generally, there are two methods for preserving animal feed, haymaking and silage making. Haymaking has long been the traditional technique in preserving forage. In the tropical region, haymaking seems to be the most suitable technique for preserving forage crops because of the longer photoperiod and the higher light intensity in this region. Haymaking in some areas of the tropical and sub-tropical regions was, however, limited due to either longer rain-fall period or higher relative humidity. In general; haymaking has some advantages over other preservative methods such as no need of sophisticated technology, low moisture content, easier to handle and higher vitamin D- content. On the other hand, there are some disadvantages of haymaking such as more leaf shattering, moldy and spoilage by thermophilic bacteria, over heated and may cause of fire. These disadvantages may affect hay quality on lower feed intake, increase nutrient loss, decrease feeding value and hazard to human health (lung and allergies). Therefore farmers in some countries, especially, in Europe, prefer to preserve their crops instead as silage. In Western Europe, silage making is significantly increased in the last 30 years (Mc Donald *et al.*, 1991). There are many species of grass and tree leaves that can be used for goat's feed in the tropical region. Among of such species of grass, Ruzi grass seems to be the most popular than that of others. The information from the Department of Livestock Development (DLD) of Thailand showed that the DLD provided the farmers more Ruzi grass seed than any other grasses seed (<http://WWW.dld.go.th>). This might mean that Ruzi grass is the most popular exogenous grass species in Thailand. The reason might ground on the fact that it has moderate high production potential and can be planted in low quality soil type. Moreover, some other information on Ruzi grass had been elucidated. However, the information on it intake and digestibility of the preserved Ruzi grass in goats under the tropical climate is very limited. Streblus is a medium sized-erected tree of 10-20 m in height, and can be found mostly in lowland areas. It has the single leaf type, alternate, oval shape with 2-4 cm in width and 4-8 cm in length. It is also used for landscape gardening because of the belief that, it is a lucky plant (<http://WWW.paisarn.com/tree/tree14.htm>). This plant species is a leafy plant that can be used for ruminants' feed. The previous research result showed that goats had higher dry matter intake for Streblus leaves than Rambutan, Jackfruit and Rose apple leaves (Insung, 2000). However, the information on the impact of the preservative methods of its leaves on voluntary intake and digestibility is very limited. Therefore, to obtain the base line data on the utility of both plant species as the animal feed resources, it is reasonable to evaluate the impact of the preservative method of Ruzi grass and Streblus leaves on voluntary intake and digestibility in the ruminants.

Objectives

1. To investigate the influence of two preservative methods, hay and silage, on intake and digestibility in goats.
2. To assess the influence of two plant species, Streblus leaves and Ruzi grass, on its acceptability and digestibility in goats.
3. To determine the ruminal degradation parameters of preserved feed obtained from two species of plants in cows.

Materials and Methods

The research consists of two consecutive experiments. The first experiment dealt with the evaluation of feed intake and digestibility of the dry matter and the organic matter of Ruzi grass and Streblus leaves preserved by two different methods, haymaking and silage making. Four male anglonubian - Thai indigenous crossbred goats of an average 33.75 ± 4.11 -kg of live body weight were used. The animals were allocated to receive 4 different feed types, dry Ruzi grass, dry Streblus leaves, Ensiled Ruzi grass and ensiled Streblus leaves in 4 periods alternately according to a 2x2 factorial experiment in a 4x4 Latin square design. Each period was extended for 14 days with 9 days for the preliminary period and 5 days for collecting period. The animals were fed *ad libitum*. Offered and Refusal feeds were measured daily using for calculation of net feed intake. Feed samples and animal's dung were collected dailies during the collecting period using for analysis and calculation for the dry matter and the organic matter content. The second experiment coped with the ruminal digestion parameters. Feed samples obtained from the first trial were used. The nylon bag technique, introduced by Ørskov and McDonald (1979) was used to evaluate the rumen degradation parameters of the feed samples. The Neway excel, an application program, written by Chen (1997) was used to generate the degradation parameters. The data obtained was analyzed using the analysis of variance (ANOVA) procedure (SAS, 1988).

Results and discussions

1. Voluntary intake and digestibility(Table1)

The goats fed on Strublus leaves had higher voluntary intake than those fed on Ruzi grass ($P < 0.05$). The animals fed on dried roughage had higher voluntary intake, expressed either on dry matter ($P < 0.01$), percentage body weight ($P < 0.05$) as well as on metabolic body weight ($P < 0.01$). The results of this research could confirm the result of the previous trial conducted by Insung (2000), which is carried out on the evaluation of dry matter and organic matter intake and digestibility of fresh tree leaves obtaining from four species, Streblus, Rambuton, Jackfruit and Rose apple leaves. It was found that Strublus leaves had higher voluntary intake than that of others ($P < 0.05$). Therefore, if the result of the previous research was considered together with this research out come, it might conclude that, Streblus leaves had better acceptability and digestibility than both of Ruzi grass and other tree foliage for goats.

Although the reason of the higher intake for Strublus leaves than grass as well as other tree foliage does not clear elucidated, in human food, it is known more than two thousand years before present that Streblus leaves had the synergism effect on the digestibility of consumed food. It is known since the Buddhist era that drink tea of Streblus leaves and barks result in easier digestibility of consumed food (<http://www.meetingmall.com>). Therefore with the better digestibility, the voluntary intake can be higher for Streblus leave than Ruzi grass. Moreover, for the livestock, especially in the ruminants, it is well elucidated that the voluntary intake of roughage has the positive correlation with its digestibility (Balch and Campling, 1962; Baile and Forbes, 1974). Therefore, from the voluntary intake point of view, It can be concluded that Streblus leaves had higher preference for goats than that of Ruzi grass ($P < 0.01$) and the preference of goats for roughage preserved by haymaking was higher than those of ensiling ($P < 0.05$). However, the digestibility of the dry matter

Table 1 Voluntary intake and digestibility of dry matter and organic matter of Ruzi grass and Streblus leaves preserved by drying or ensilage in goats

Item	Plant species (A)		Preservative methods (B)		A*B	SEM
	Ruzi	Streblus	Dried	Ensiled		
Feed intake						
DM intake(g/d)	414.21 ^D	575.60 ^C	519.87 ^A	469.94 ^B	P<0.01	11.36
DM intake(%BW)	1.23 ^D	1.72 ^C	1.55 ^A	1.40 ^B	P<0.05	0.04
DM intake(g/Kg ^{0.75})	29.73 ^D	41.39 ^C	37.37 ^A	33.75 ^B	P<0.01	0.92
OM intake(g/d)	371.88 ^D	460.48 ^C	428.72	403.65	P<0.01	8.98
OM intake(%BW)	1.11 ^D	1.37 ^C	1.28	1.20	P<0.01	0.03
OM intake(g/Kg ^{0.75})	26.69 ^D	33.11 ^C	30.81	28.99	P<0.01	0.69
Digestibility						
DM (%)	67.81	68.40	68.87	67.33	P>0.05	1.52
OM (%)	71.41	71.67	70.84	72.23	P>0.05	1.28
DOMD: D-value (%)	64.15 ^C	57.37 ^D	58.92	62.60	P<0.05	1.07

^{A, B,} and ^{C, D} Means in the same row of the same parameters not having the same superscript differ significantly ($p<0.05$) and highly significantly ($p<0.01$), respectively. DM intake = dry matter intake, DM intake (g /Kg^{0.75}) = dry matter intake as metabolic body weight: BW^{0.75}, DM = dry matter, OM = organic matter, DOMD = digestibility of the organic matter in the dry matter.

and the organic matter of both plant species and of any preservative methods was not significantly different ($p>0.05$). The reason might ground on the fact that Streblus leaves may contain more alkaloid, cardiac glucoside flavonoid and saponin (<http://WWW.rb.ct.th/org/research/rajabhat/risurin/15102.htm>) as well as some anti-nutritional factors such as condensed tannin than Ruzi grass. It is known that the digestibility of feed will be decreased when tannin appear (Leng, 1997). Nevertheless, although the voluntary intake of the dry matter between plant species and conservative methods was significantly different ($P<0.05$), while the digestibility was not significantly different ($P>0.05$), the correlation coefficient (r_{xy}) and the coefficient of determination (r^2) between intake and it's digestibility of the dry matter ($r_{xy} = 0.968$, $r^2 = 0.936$) and the organic matter ($r_{xy} = 0.967$, $r^2 = 0.935$), was very high.

2. Rumen degradation parameters (Table 2)

The figures on ruminal degradation parameters of two plant species preserved by two different methods were clearly indicated that ensiled Ruzi grass has the highest the water-soluble fraction (a), the effective degradation at 0.02(ed1), at 0.05 (ed2) and at 0.08(ed3) fraction/hours passage rate as well as the potential degradation (PD) of the dry matter ($p<0.01$). This might ground on the fact that Ruzi grass has higher water-soluble fraction than that of Streblus leaves. However, the not water soluble fraction but potentially degrade within time 't' in the rumen of the dry matter (b) for dry Streblus leaf was highest ($P<0.05$). This might mean that Streblus leaves

Table2. Rumen degradation parameters of dry matter of dried Ruzi grass (DR), ensiled Ruzi grass (ER), dried Streblus leaves (DS) and ensiled Streblus leaves (ES) incubated in the nylon bags in rumens of cows (%)

Item	Plant species with different preservative methods				SEM
	(DR)	(ER)	(DS)	(ES)	
a	17.60 ^C	48.70 ^A	13.08 ^D	19.58 ^B	0.55
b	60.98 ^B	40.80 ^C	65.68 ^A	58.60 ^B	1.14
c	0.06 ^B	0.08 ^A	0.09 ^A	0.06 ^B	0.004
ed1	61.35 ^D	81.08 ^A	66.13 ^B	63.48 ^C	0.37
ed2	48.98 ^D	73.58 ^A	54.65 ^B	51.80 ^C	0.52
ed3	42.27 ^D	68.95 ^A	47.45 ^B	45.15 ^C	0.57
PD	78.58 ^B	89.50 ^A	78.75 ^B	78.18 ^B	1.20
Lag Time (hr)	0.37 ^{BC}	0.22 ^C	0.88 ^A	0.68 ^{AB}	0.10

A, B, C, D Means in the same row not having at least a common superscript differ significantly ($p < 0.01$). Degradation constants derived from the Ørskov and McDonald (1979) equation $P = a + b(1 - e^{-ct})$ where P is degradability at time 't'; 'a', the rapidly soluble fraction; 'b', the potential degradability of dry matter within time 't', be degraded; 'c', the degradation rate of the 'b' fraction, PD = Potential degradability (a + b). Effective degradation in the rumen at 0.02, 0.05 and 0.08 fraction/hr passage rate is represented by ed1, ed2 and ed3, respectively and is calculated by using the Excel application programs for processing feed degradability data written by Chen (1997). SEM = Standard error of mean, DR: dried Ruzi grass, ER: ensiled Ruzi grass, DS: dried Streblus leaves, ES: ensiled Streblus leaves.

contain higher the effective fiber than that of Ruzi grass. It is well accepted that the effective fiber is crucial for normal rumen function and development. Therefore, offering the goats with dry Streblus leaf might promote better rumen development and might has healthy rumen papillae.

Conclusions

Preserving plant by haymaking provided higher feed intake than by silage making. The voluntary intake of the DM and the OM of Streblus leaves was higher than Ruzi grass. The digestibility of the dry matter and the organic matter of Ruzi grass and Streblus leaves preserving by haymaking and silage making was not significantly different. The correlation coefficient (r_{xy}) and the coefficient of determination (r^2) between intake and its digestibility of the dry matter and the organic matter of the feed sample were very high. This research result implied that each plant species is suitable for each preservative method. Therefore, the proper method for conservation of feed resources used for ruminant animal feeding is crucial.

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