Supplementation of cassava leaf and chip to rice straw based-dietsfor growing cattle

239

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Summary

This study was designed to test the effects of different levels of cassava leaf (CL) on average daily gain (ADG) and dry matter intake (DMI) of growing American Brahman cattle fed typical village dry season rice straw diets. The effects of the addition of cassava chip (CC) to the different levels of CL was also investigated Supplementation of rice straw diets with cassave chip did not improve average daily gain and depressed dry matter intake. In contrast cassava leaf which is high in crude protein (25.7% DM) contributed to the efficiency of rice straw utilization in terms of ADG and was able to maintain comparable level of DMI as compared to the unsupple mented group.

It is conclude that the addition of only 600 g of sundried cassava leaf each day to the village ruminant diet will enable the animals to gain weight without increasing the rice straw intake over the four month dry season in the northeast of thailand.

Introduction

In the past few years research amphasis has been placed on the improvement of low quality forages and crop residues as ruminant feed in tropical countries (wanapat and Devendra, 1985) Many of these residues can potentially inprove the diet of research in this area are still insufficient or not practical for the small farmer to use high protein crop residues are still not being utilized in the rural areas.

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During the dry season village ruminants in northeast Thailand are fed a rice straw diet along with what little grass there is available to graze of "cut and carry". To improve this situation the collection and storage of cassava leaf which is grown widely in nothest Thailand and is available at the cost of personal labour only would greatly increase the nutritional value of the diet. In the trial set up in Northeast Thailand 30 American Brahman cattle were individually fed for 16 weeks different proportions of sun dried cassava leaf and root chips as a supplement to the rice straw diet. In addition to the trial results information on methods of collection leaves drying time in the field and storage were also recoredd to be used later in developing an extension program.

Materials and Methods

(a) Experimental Procedure

Thirty female American Brahman cattle (approx 140 kg.) were divided into 6 groups of 5 and individually fed diets according to a 2x3 factorial arrangement in a completely randomized design. During the first 2 weeks of the trial the animals were adjusted to the rice straw diet after which the respective supplements were fed and data were recorded for 16 weeks

(b) collection of cassava leaf

Harvesting

The best time for cassava leaf harvestion in the northeast of thailand is in the month of November. This is a free period for the farmers before the rice harvest begins at which time all family labour will be concentrated on the harvest. This is also the end of the wet season when the rains have ended thus provideng an opportunity to dry the leaves properly before storage.

The leaves may be collected either at the time the roots are harvested or while the cassava plant is still growing. If collected during the root harvest all the leaves of the plant may be used. Usually at this time however few leaves are left on the plant to be havested if the leaves are harvested while the plant is still in the growing stage however a good harvest may be obtained. By collection only the leaves from the bottom one half to two thirds of the plant as much as 75 kg of fresth cassava leaf p.r. rai (469 kg/ha) or 25 kg. after sun drying (156 kg/ha) may be collected without affecting root yield (personal communication with farmers). If the leaves are harvested every 60-75 days (Montaldo, 1977) the leaves may be collected twice over the length of the dry season resulting in the collection of 150 kg of fresh leaf per rai (938 kg/ha) or 50 kg of sun dried leaves per rai (313 kg/ha). This weight constitutes the leaf only without the petiole.

Drying

Because of the high concentration of hydrocyanic acid the leaves must be dried first to inactivate the enzyme responsible for activating this toxin. Simple sun drying will render the leaves safe enough for ruminants to consume. It also allows the leaves to be easily stored for relatively long periods without worry of fermentation or mold growt sun drying in an open field for one full day is adequate. A thin layer of leaves with as little overlapping as possible will give best results however if there is a shortage of space and the leaves are spread out in a thicker layer they must be truned at least once throughout the day in order to ensure that all of the leaves are properly dried.

Storage

After the leaves are dried enough so as they crumbel when crushed with one hand they are collected into fertilized bags lined bamboo baskets or whatever is available and stored in a sheltered area preferably nea the cattle pens. The longer the leaf is stored the more palatable it seempto become for the ruminant. In this trial some of the leaf was stored for as long as 6 months which is more than adequate for the length of the dry season without affecting crude protein content.

Time Used for Collection

From the collection of over 3,000 kg of fresh cassava leaves over the length of the trial it was estimated that one person could collect on the average 6 kg of fresth leaf in one hour (2kg of sun dried leaf)

If we apply this to the village situation a farmer with his wife and 3 children could harvest enough cassava leaf in one eight hour/day to provide a daily feed supplement for one young ruminant to last over the 4 month dry season

(c) Diet Preparation and Feeding

Each animal was fed rice straw ad lib and 1 kg. of fresh grass per day to simulated dry season cut carry conditions in the villages of northeast Thailand. The rice straw (CV. Homalie) was collected in the province of Mahasarakam northeastern Thailand and was fed in a long form. Fresh grass was collected from the read sides and fed every day at 15.00 h. Sun dried cassava leaf was fed from a feed supplement trough at 09.00 and 14.00 h. Cassava root was chipped (2mm.-4mm.) and sun dried for 48 to 72 hours. It was fed in chip form a feed supplement box mixed with the cassava leaf in the diets. No mineral supplement was used.

(d) Chemical Analysis

Feed samples were taken every day and analysed every 2 weeks for dry matter content (DM). crude protein content (CP). Ash (AOAC.1975) acid detergent fiber (ADF) and neutral detergent fiber (NDF) (Goering and van Soest 1970)

(e) Measurements

Rice straw consumption was measured bi weekly and supplement intake was measured daily. Feed and water were restricted for 24 houre before weighing. Weight change was recorded every 2 weeks.

(f) Data Analysis

All data were subjected to the analysis of covariance and treatment means were tested by using Duncan's multiple range test (Steel and Torrie 1960)

Results and Discussion

Chemical compositions of feedstuffs used wetre reported in Table 1 crude protein content of cassava leaf 25.7% was relatively high where the NDF and ADF contents were reasonable.

When the average daily gain (ADG) each group were compared. (Table 2) the ADG of the groups supplemented with 0 and 300 g of cassava leaf (CL) were not significantly different (.181 and 108 g/d respectively). However with the supplementation of 600 g of CL. the ADG increased signifecantly to 58 g/d.
The addition of cassava chip (CC) to the diet did not increase ADG as compared to untreated straw only. Again, the ADG of the groups supple mented with 0 and 300 g of CL wete not significantly different from each other (184 and 83 g/d respectively), or from the groups on the same diets without CC supplementation. The group supplemented with 600 g (L and CC significantly gained 59 g/d. At this level of supplementation there was no significant difference in the ADG between the groups fed the diets with or without CC.
When DM intakes were expressed aa g/kg W75 the values obtained were significantly different (P < .05). These intakes were at a satisfactory level except in the groups that received 600 g CC. Supplementation of an energy source such as CC would have attributed to lower intake of fibrous feed. However, com parable levels of intake of only untreated straw did not yield similar ADG as treatments supplemented with CL since untreated straw was deficient in crude protein and readily available carbohydrate.
When the supplementation of CL with and without CC were compared there was no sicnificant difference in the ADG (Table 3). The g.kg w75 for the dry matter intake (DMI) of rice straw was significantly different between the two groups with the groups fed the diets containing CC having the lower value of 63 g/kg w.75. However when the total DMI as a% of body weight (BW) was compared there was no significant difference with both groups consuming 2.62% on a dry matter (DM) basis.
When the effects of different levels of CL with and without CC. Supplemented to the rice straw diet were compared (Table 4).the ADG of the group fed 600 g. of CL was 59 g/d but the groups fed 0 and 300 g. CL had an ADG of -182 and -96g/d respectively.
The g/kg W 75f the DMI of rice straw was not significantly different but the total DMI as a % of BW highes for the group supplemented with

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600 g. CL (2.71%). The group supplemented with 300 g. CL had a DMI of 2.54% and the group not supplemented with CL had a total DMI of 2.36%.

Table 1. Chemical composition of feedatuffs[a] (% of dry matter)

Item	DM	Ash	CP	NDF	ADF
Rice Straw	92.4	17.1	3.2	71.3	51.1
Cassava Leaf	91.8	8.6	25.7	48.8	30.4
Cassava Chip	89.4	2.9	1.4	-	4.1
Fresh Grass (Elephant grass)	93.8	14.1	8.6	73.2	42.4

[a] Each value is based on 6 collected samples.

Table 2. Effects of several level of cassava leaf and/or cassava chip supplementation of rice straw on weight change and dry matter intake.

Item	RS	RS + 300CL	RS + 600gCL	RS + 600gCL	RS + 300g CL + 600g CC	RS + 600g CL + 600g CC
Item	T1	T2	T3	T4	T5	T6
Avg. Int wt.kg	145.2	146.7	134.6	145.1	146.7	141.8
Avg. final wt.kg.	130.8	135.6	140.9	130.6	137.5	148.0
ADG g/d	-181^{a}	-101^{a}	58^{b}	-184^{a}	83^{a}	59^{b}
Dry matter intake						
Rice straw kg.d	2.8^{ac}	3.2^{b}	2.8^{a}	2.1^{d}	2.6^{c}	2.8^{ac}
% BW	2.14^{a}	2.19^{a}	2.06^{a}	1.69^{b}	1.75^{b}	1.82^{b}
g/kgW^{75}	72^{a}	76^{a}	71^{a}	57^{c}	61^{bc}	64^{b}
cassava leaf kg/d	-	0.28	0.56	-	0.28	0.56
cassava chip kg/d	-	-	-	0.54	0.54	0.54
Fresh grass kg/d	0.26	0.26	0.26	0.26	0.26	0.26
Total DMI kg/d	3.06	3.74	3.62	2.90	3.68	4.16
Total DMI% BW	2.35^{a}	2.57^{b}	2.67^{bc}	2.36^{a}	2.50^{ab}	2.74^{c}

RS = rice straw CL = cassava leaf CC = cassava chip

abcd Means in the same row with different superscripts differ ($P < .05$)

Table 3 Effects of supplementation of sassava chip in straw based diets on weight change and intake.

Item	Without cassava chip (T2+T3)	With cassava chip (T5 + T6)
ADG g/d	-25[a]	-12[a]
Dry matter intake		
Rice straw		
kg/d	3.0[a]	2.7[b]
% BW	2.13[a]	1.79[b]
g/kg $w^{.75}$	74[a]	63[b]
cassava leaf kg/d	0.42	0.42
cassava chip kg/d	-	0.54
Fresh grass kg/d	0.26	0.26
Total DMI kg/d	3.68	3.92
Total DMI %BW	2.62[a]	2.62[a]

T2 = Rice straw + 300 g. Cassava leaf

T3 = Rice straw + 600 g. Cassava leaf

T5 = Rice straw + 300 g. Cassava leaf + 600 g. cassava chip

T6 = Rice straw + 600 g. Cassava leaf + 600 g. Cassava chip

ab Means in the same row with different superscripts differ (P .05)

Table 4. Effects of several levels of cassava leaf supplementation in straw based diets.

Item	Level of cassava leaf supplement (g)		
	0 (T1 + T4)	300(T2 + T5	600(T3 + T6)
ADG g/d	-182^{a}	96^{a}	59^{b}
Dry matter intake Rice straw			
kg/d	2.5^{a}	2.9^{b}	2.8^{b}
% BW	1.92^{a}	1.97^{a}	1.94^{a}
Cassava leaf kg/d	0	0.28	0.56
Cassava chip kg/d	0.27	0.27	0.27
Fresh grass kg/d	0.26	0.26	0.26
Total DMI g/d	3.03	3.71	2.99
Total DMI %BW	2.36^{a}	2.54^{b}	2.71^{c}

T1 = Rice straw

T2 = Rice straw + 300 g. cassava leaf

T3 = Rice straw + 600 g. cassava leaf

T4 = Rice straw + 600 g. cassava chip

T5 = Rice straw + 300 g. cassava leaf + 600 g. cassava chip

T6 = Rice straw + 600 g. cassava leaf + 600 g. cassava chip

abcd Means in the same row with different superscripts differ ($P < .05$)