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INTAKE AND DIGESTIBILITY OF *GLIRICIIDIA SEPIUM* BY BUNAJI BULLS

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ABSTRACT

A study was conducted to evaluate the feeding value of *Gliricidia sepium* (GS) for growing cattle. Twenty Bunaji bulls of average weight 110.5kg between 1-2 years of age were used in a feeding trial which lasted 90 days. The bulls were randomly allotted to four treatment groups in which GS replaced Cotton Seed Cake (CSC) at 25, 50 and 75% w/w in a Completely Randomized Design consisting of five animals per treatment. The results showed that intakes of concentrate and total DM increased (P<0.05) as proportions of *G. sepium* increased in the diets up to 50% inclusion level and declined afterwards. The variation in the inclusion levels had no significant (P>0.05) effect on nutrient digestibility across the treatments except on crude fibre digestion. There were significant (P<0.05) differences in nitrogen retention but it was positive for all diets. It is concluded that *Gliricidia sepium* leaves can be successfully utilized at 50% level of inclusion as a protein source for cattle

KEYWORDS: *Gliricidia sepium*, Intake, Digestibility, Bunaji Bulls

INTRODUCTION

Gliricidia sepium, often simply referred to as Gliricidia is a medium size leguminous tree belonging to the family Fabaceae. It is considered as the second most important multi-purpose legume tree, surpassed only by *Leucaena leucocephala* (Ran, 2007). *Gliricidia sepium* is a medium-sized tree which grows to about 10 to 12 meters high. The tree grows well in acidic soils. It can however, also grow on sandy, clay and lime soils. The tree is used in many tropical and sub-tropical countries for various purposes such as live fencing, fodder, coffee shade, firewood, green manure and rat poison. Live fences can be grown from 1.5 m to 2.0 m stakes of *Gliricidia sepium* in just a month (Elevitch, 2005) *G. sepium* is also used as insect repellent. Farmers in Latin America often wash their livestock with a paste made of crushed *G. sepium* leaves to remove external parasites.

Because of its ease of propagation and growth, it has been suggested that this species may be planted to reduce topsoil erosion in the initial stages of reforesting denuded areas, an intermediate step to be taken before introducing species that take longer to grow. The World Agroforestry Centre stated that this species is becoming an important part of farming practices in Africa. Being a legume *G. sepium* fixes nitrogen in the soil, which boosts crop yields significantly without the expense of chemical fertilizers. In addition, it is tolerable of being cut back to crop height year after year which offers a good potential as fodder crop. This study is therefore carried out to determine the intake and digestibility of *G. sepium* in the diet of cattle

MATERIALS AND METHODS

The study was conducted at the experimental pens of the Beef Research Programme at the National Animal Production Research Institute (NAPRI), Shika (11 12’N, 7’33’E), Fresh and dried samples of GS were taken to the Food Science Laboratory, Institute of Agricultural Research for anti-nutritional factors determination while proximate analysis was conducted at the Central Laboratory NAPRI using AOAC (2000) procedures. Neutral Detergent Fibre (NDF) and Acid Detergent Fibre (ADF) were also analyzed (Van Soest *et al.*, 1991).

Feed Intake and Digestibility Studies

Twenty growing Bunaji bulls with an initial live weight range of 109-113kg and an average weight of 110.5kg were used for the feed intake study. They were divided into four groups of five animals each in a completely randomized design. The bulls were housed in open concrete stalls. Each group was assigned a dietary treatment in which GS replaced Cotton Seed Cake (CSC) component in the concentrate w/w. Other components were: maize offal, poultry litter, rice offal, bone meal and salt. Bracharia hay, water and mineral salt lick were provided *ad libitum* while concentrate was offered at 2% of body weight.

Four bulls per treatment were randomly selected for the digestibility study. They were housed in individual metabolism crates and fed their respective rations as in the feed intake study. An adjustment period of fourteen days was allowed before a 7-day collection period of total urine and faeces (AOAC, 2000). Each animal was fed 1% body weight of concentrate and 1% body weight of hay. The daily feacal outputs were dried for initial determination of dry matter (DM). Water and mineral lick was provided *ad libitum*.

Daily feacal output of each animal was bulked, weighed, thoroughly mixed and sub-sampled. The sample was treated with 20% formaldehyde to stop further bacterial activity and stored in the freezer at $-4^{o}C$. Total urine production was collected daily into graduated plastics containing 50ml of 0.1N HCl. A 5% aliquot of total urine output was taken each day and stored in the freezer until required for the analysis of urinary nitrogen.

At the end of the 7-day collection period, both urine and feacal output were bulked, thoroughly mixed and sub-sampled. Proximate analysis was carried out on the faecal samples according to procedures of the AOAC (2000). Neutral Detergent Fibre and ADF were determined according to the procedure of Van Soest (1991). Urine samples were analyzed for nitrogen content using the Kjeldahl procedure (AOAC, 2000).

Data Collection and Statistical Analysis

Initial body weight of the animals was taken at the commencement of the feed intake study using a walk-in weigh bridge. Feed and water intake was determined by the difference between quantity offered and the orts. Evaporative loss was subtracted from water provided to determine actual water intake. All data collecated were subjected to Analysis of Variance (ANOVA) using the Statistical Analysis System (SAS, 2005). Significant levels of differences among means were separated using the Duncan Multiple Range Test.

RESULTS AND DISCUSSIONS

The ingredient and nutrient composition of the experimental diets is presented in Tables 1 and 2 respectively. *Gliricidia sepium* leaves have a high feeding value, with crude protein comprising 20-30% of the dry matter, a crude fibre content of only about 15%, and in *vitro* dry matter digestibility of 60-65% (Adejumo and Ademosun 1985). Panjaitan (1988) found that in Indonesia, *Gliricidia* leaves had higher crude protein content in the wet season than in the dry season. Perera *et al.* (1991) reported high digestibility of *Gliricidia* in the rumen relative to other multipurpose tree forages. Moreover, the dry matter digestibility was increased by the addition of energy sources such as cassava to the diet (Ademosun and Ademosun, 1985). Conversely, the digestibility of low quality feeds can be increased by the addition of legume leaves (Ivory, 1990).

The apparent high quality of *Gliricidia* leaves, combined with high and sustainable biomass production, should make it an important forage crop. However, its utilisation is severely limited by palatability, as well as toxicity concerns.

The result of the feed intake study is presented in Table 3. Concentrate intake increased (P<0.05) as the level of *Gliricidia* increased up to 50% inclusion level in the diet. The high concentrate intake could be attributed to palatability and lower NDF. Animals on 50% replacement level were always the first to finish eating. The reduction in hay intake at 0% may be attributed to bulkiness in of the concentrate due to higher level of the legume. The low intake of hay by animals on diets 0 and 25% may be because of higher fibre due to CSC in the concentrates.

The lower DMI observed with the cattle on higher CSC content in diet agrees with the findings of Coppock *et al* (1985) who also reported a decrease in dry matter intake with increasing level of whole CSC during the hot season. He attributed this to the fluffiness of the diet. The result of water intake of cattle did not agree with the report of Hicks *et al* (1998), they indicated that water consumption increase with increase in DMI. The higher water intake observed with animals on 0% inclusion level compared to 75% could be attributed to the need to digest higher levels of fibre contributed by CSC. The result of nutrient digestibility and nitrogen retention is presented in Table 4.The results showed that *G. sepium* inclusion levels had no significant (P>0.05) effect on the digestibility of nutrients except on Crude fibre digestion. Crude protein digestion however increased as the level of *G. sepium* leaves increased in the diet. The poor digestibility of protein in animals on the control diet may not be unconnected to the high amount of CSC in the diet.

CONCLUSIONS AND RECOMMENDATON

This study has highlighted the potential of *gliricidia sepium* as a possible replacement for cotton seed cake for cattle it has also established that *G. sepium* is accepted by cattle when wilted before feeding. It is recommended that planting *G. sepium* as fodder banks be strongly encouraged and demonstrated by subject matter specialists and/or extension officers for its multiple uses and specifically as fodder especially during the dry season.

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Table 1: Ingredient Composition of Experimental Diets Containing Graded Levels of *Gliricidia sepium*

Level of *Gliricidia sepium* Inclusion (%)				
Feed stuff	0	25	50	75
Cotton seed cake	10	7.5	5.0	2.5
G. sepium	0	2.5	5.0	7.5
Maize offal	40	40	40	40
Poultry litter	17	19	22	25
Rice offal	30	28	25	22
Bone meal	2	2	2	2
Salt	1	1	1	1
Total (kg)	**100**	**100**	**100**	**100**

Table 2: Nutrient Composition of Experimental Diets Containing Graded Levels of *Gliricidia sepium*

Level of *Gliricidia sepium* Inclusion (%)				
Nutrients (%)	**0**	**25**	**50**	**75**
DM	95.74	94.45	98.84	98.84
ASH	11.91	12.51	11.97	13.01
EE	18.33	1959	17.97	18.66
CF	19.69	20.08	19.88	17.58
NDF	40.15	42.41	40.79	35.02
ADF	23.75	22.83	20.77	21.53
CP	13.18	13.26	13.31	13.30

DM = Dry matter, EE = Ether extract, CF = Crude fibre, NDF = Neutral detergent fibre
ADF = Acid detergent fibre, CP = Crude protein

Table 3: Effect of Graded Levels of *Gliricidia sepium* Inclusion in the Diet on Feed Intake of Bunaji Bulls

Levels of *Gliricidia sepium* Inclusion (%)						
Parameter	**0**	**25**	**50**	**75**	**SEM**	**LOS**
Initial body weight (kg)	113	109	111	109	6.31	NS
Daily water intake (l)	20.39^{a}	19.62^{b}	20.59^{a}	19.33^{b}	0.24	*
Daily concentrate intake (kg)	2.54^{c}	2.70^{ab}	2.78^{a}	2.68^{b}	0.03	*
Daily hay intake (kg)	2.26^{b}	2.21^{b}	2.42^{a}	2.13^{c}	0.02	*
Total daily feed intake (kg)	4.80^{b}	4.91^{b}	5.20^{a}	4.81^{b}	0.08	*
Total daily DMI (kg)	4.59^{b}	4.64^{b}	5.14^{a}	4.75^{b}	0.08	*

a, b, c, d: Means within the same row with different superscript differ significantly (P<0.05),
SEM = Standard error of means, **LOS** = Level of significance, **NS** = Not significant, **DMI** = Dry matter intake

Table 4: Nutrient Digestibility and Nitrogen Balance of Bunaji Bulls Fed Graded Levels of *G. sepium* in the Diet

Level of *Gliricidia sepium* Inclusion (%)						
Nutrient	**0**	**25**	**50**	**75**	**SEM**	**LOS**
DM	98.43	98.27	98.31	98.23	0.20	NS
CP	7.98	8.13	8.40	8.68	0.28	NS
EE	9.79	9.20	11.72	11.31	1.18	NS
CF	37.83[a]	34.80[ab]	32.31[b]	35.22[ab]	1.60	*
NDF	66.48	64.20	67.39	66.88	2.20	NS
ADF	51.05	52.26	50.14	51.12	1.59	NS
Nitrogen Balance						
Nitrogen intake (g/day)	208	195	213	208	0.14	NS
Faecal nitrogen (g/day)	128	130	134	139	0.05	NS
Urinary nitrogen (g/day)	30	29	26	35	0.07	NS
Nitrogen retained (g/day)	50[b]	36[c]	53[a]	34[d]	0.12	*

a, b, c, d: Means within the same row with different superscripts differ significantly ($P<0.05$),
DM = Dry matter, **CP** = Crude protein, **EE** = Ether extract, **CF** = Crude fibre, **NDF** = Neutral detergent fibre, **ADF** = Acid detergent fibre, **SEM** = Standard error of means, **LOS** = Level of significance