THE EFFECTS OF THE LEVELS OF FEED OFFER ON THE INTAKE, DIGESTIBILITY AND GROWTH RATE OF WEST AFRICAN DWARF GOATS FED *Gliricidia sepium* and *LEUCAENA LEUCOCEPHALA*

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ABSTRACT

The study evaluated the effects of level of feed offer on dry matter intake (DMI), digestibility, the parts of plants selected and on the growth rate of West African dwarf (WAD) goats without resulting in toxicity. Seven different levels of feed offer ranging from 40g/kg^{0.75}/day to 130g/kg^{0.75}/day in increments of 15g/kg^{0.75} were fed to two groups of goats. The first group was fed 100% *Gliricidia* while the while the second was fed 50% *Gliricidia* and 50% *Leucaena* diet (50/50). The level of feed offer had significant effect on the DMI and digestible DMI (DDMI) of the goat ($P < 0.01$). The *Leucaena* intake in a 50/50 diet was always higher than the *Gliricidia* intake except at 55g/kg^{0.75} offer level. The level of feed offer had significant effects on the parts of plants selected ($P < 0.01$) and on the growth rate. The leaf intake was statistically higher than the stem intake ($P < 0.01$). All the goats on 40g/kg^{0.75} and 55g/kg^{0.75} on a 100% *Gliricidia* diet lost weight while only those on 40g/kg^{0.75} lost weight on a 50/50 diet. There was no significant difference in the growth rate of goats on feed offer levels of 70g to 130g/kg^{0.75} ($P > 0.05$). The study indicate that goats performance was higher on a mixed browse diet than on *Gliricidia* alone. Goats performed best at 100g/kg^{0.75} offer level.

Key Words: Feed offer, Dry matter intake, Digestibility and growth rate

INTRODUCTION

Leucaena leucocephala and *Gliricidia sepium* have great potentials as sources of high quality nutrients for ruminants and are suitable as all year-round feed because of their drought resistance, persistence, strong growth regrowth and Palatability (Reynolds and Adeoye, 1986). They have high crude protein of high

digestibility and are also high in minerals and vitamins (Jones, 1979; Smith and Van Houtert, 1988). Generally, feed are not of equal value in supporting the animal for maintenance and production. Animal performance is the deciding factor in assessing the nutritional value of a feed or combination of feeds (Charter 1986). Secondly plant compounds complicate the prediction of this value from routine laboratory analysis, which in the past has placed too much emphasis on the cursory analysis of crude protein and fibre contents. Because of their variable effects on feed intake and conversion, merely screening for the presence of such compounds may not be enough.

Selective feeding on morphological fractions of plants has probably contributed to the success of goat; this is seen in combination with other idiosyncracies of goats' feeding behaviour (Lu, 1988). It has also been observed that the fractions which goats most often select are buds, leaves, fruit and flowers as these parts contain less fibre and more protein. Thus they are more digestible than stems and petioles. Goats therefore showed preference for leaves over stems and green over non-green forage.

To optimize the advantages of *Gliricidia* and *Leucaena* as all-year round feed for goats, it will be necessary to find out the part the animals will consume first and to establish the level of offer. This experiment was therefore designed to investigate the effect of the browse offer on the type and part of the browse selected.

MATERIALS AND METHODS

Fourteen West African dwarf (WAD) goats were divided into two groups of seven each. One group was fed 100% *Gliricidia* and the other was fed 50% *Gliricidia* plus 50%

Leucaena diet. The 50:50 ratio was adopted to find out the browse species to be eaten first. Each of the seven WAD goats in each group was fed on seven feed offer levels ranging from 40 to 130g/kg^{0.75} per day. It was a 7x7 latin square design and each group of seven animals underwent 7 metabolic periods. Feed intake was determined and faeces voided were weighed daily to determine the digestibility of the browses and hence the digestible dry matter intake of the goats. Weighed quantities of the fresh browse were offered each morning and evening, and before the morning offer, feed refusals of the previous day's feeding were collected; weighed and separated into leaflets and petioles. Fresh browse were fed to the animals. Feed offer was calculated based on the dry matter of the fresh browse and the offer were thoroughly mixed to prevent fluctuation in dry matter of the feed offered. Prior to the start of the experiment, the goats were routinely dewormed, sprayed against ecto-parasites and the animals were weighed initially and thereafter weekly. Samples of feed offer and feed refusals were taken during each collection period for dry matter, ash and crude protein determinations using the methods of AOAC (1975). Data from the experiment were analysed using the analysis of variance. All significant mean differences were compared by Duncan's Multiple Range Test (Steel and Torrie, 1980).

RESULTS AND DISCUSSION

Dry Matter Intake (DMI)

The level of feed offer had significant effect ($P < 0.01$) on DMI of a 50% *Gliricidia* plus 50% *Leucaena* diet. DMI increased with the level of offer. There were significant differences in the DMI among offer levels of 40, 55, 70, 115 and 130g/kg^{0.75} ($P < 0.01$) (Table 1). DMI at 100 and 115g/kg^{0.75} were comparable ($P > 0.05$). The *Leucaena* intake in a 50% *Gliricidia* plus 50% *Leucaena* diet was always higher than *Gliricidia* intake and *Gliricidia* and *Leucaena* intake increased with the level of feed offer. The level of feed offer also had significant effect on DMI of a 100% *Gliricidia* diet ($P < 0.01$) (Table 1). There

were no significant differences in DMI of goats offered 70g to 100g/kg^{0.75} and among goats offered 85g to 100g/kg^{0.75} on a 100% *Gliricidia* diet (Table 1). On the two diets, there was no significant difference ($P > 0.05$) between 100g per kg^{0.75} and 130g per kg^{0.75} in all the parameters studied. This could suggest that when goats are fed 100% *Gliricidia* or 50/50 *Gliricidia/Leucaena* diets there is no economic justification to feed them more than 100g per kg^{0.75}.

The goats on 50/50 *Gliricidia/Leucaena* diet had higher dry matter intake than those on 100% *Gliricidia* diet at all levels of feed offer except feed offer level of 55g per kg^{0.75} (Table 1) but the differences were only significant at feed offer levels 100g to 130g per kg^{0.75}. The higher DMI of a 50/50 diet was as a result of the ability of the goats to select out of the two browses and because *Leucaena* is generally preferred to *Gliricidia*. The results on dry matter intake digestibility (Table 2) agree with that of Ademosun *et al* (1985) with mixed browse, and was around 60% for all combinations tested. As a sole feed, a dry matter digestibility of 54% to 57% has been reported while the addition of an energy source such as cassava tubers (Ademosun *et al*, 1985) raised dry matter digestibility.

Effect of the level of feed offer on the part of the diet selected

Table 3 shows that *Leucaena* leaf intake increased steadily with the level of feed offer ($P < 0.01$) up to 100g/kg^{0.75}. At the lowest level of feed offer, the goats ate up all the leaves and stems since the offer was lower than maintenance ration. Also, the level of feed offered had significant effect on *Leucaena* stem intake ($P < 0.05$). Increase in the level of feed offer produced a lower increase on *Leucaena* stem intake and the *Leucaena* stem intake was lower than *Leucaena* leaf intake at all levels of offer (Table 3). In the 50/50 diet, *Gliricidia* leaf intake increased with the level of offer but was always lower than *Leucaena* leaf intake at all levels of offer except at offer level of 40g/kg^{0.75}. The browse species were not offered separately in the mixture so as to prevent the problems of mimosine toxicity

TABLE 1: EFFECT OF THE LEVEL OF FEED OFFER ON FEED INTAKE OF GOATS OFFERED 100% GLIRICIDIA AND THOSE OFFERED 50% GLIRICIDIA PLUS 50% LEUCAENA DIETS.*

Levels of feed offer (g/kgMW)	Dry matter intake (g/kgMW) 100% Gliricidia diet	S.E. mean	Dry matter intake (g/kg MW) 50/50 diet **	S.E. mean
40	37.10 ^a	2.57	39.64 ^a	0.49
55	48.37 ^b	3.05	48.37 ^b	1.39
70	55.05 ^c	2.27	58.57 ^c	1.70
85	56.97 ^{cd}	3.68	60.28 ^c	3.00
100	58.85 ^{cd}	4.16	69.60 ^{de}	0.75
115	60.85 ^d	6.93	68.59 ^d	4.12
130	61.66 ^d	4.41	73.93 ^e	4.72

* Within the same column, means with different superscripts are significantly different ($P < 0.01$).

** 50% Gliricidia plus 50% Leucaena.

TABLE 2: EFFECT OF LEVEL OF FEED OFFER ON DRY MATTER INTAKE DIGESTIBILITY OF GOATS FED 100% GLIRICIDIA AND 50% GLIRICIDIA PLUS 50% LEUCAENA DIETS.*

Diet	Level of feed offer (g/kgMW)	DM Intake (g/kgMW)	S.E. mean	DDMI (g/kgMW)	S.E. mean	DM digestibility %	S.E. mean
100% Gliricidia	40	37.10 ^a	2.57	20.39 ^a	1.18	56.88 ^a	1.24
	70	55.05 ^b	2.27	28.92 ^b	1.30	58.34 ^a	2.64
	100	58.85 ^{bc}	4.16	32.28 ^b	3.12	58.23 ^a	2.16
	130	61.66 ^c	4.41	33.56 ^b	2.86	59.35 ^a	2.17
50% Gliricidia + 50% Leucaena	40	39.64 ^a	0.49	23.01 ^a	1.22	63.21 ^a	2.09
	70	58.57 ^b	1.70	32.61 ^b	1.85	62.73 ^a	2.56
	100	69.60 ^c	0.75	43.54 ^c	3.50	67.19 ^a	2.45
	130	73.93 ^d	4.72	46.56 ^c	6.02	69.62 ^a	3.67

* Means within the same column with different superscripts are significantly different ($P < 0.05$).

FEED OFFER VS INTAKE, DIGESTIBILITY AND GROWTH BY GOATS

TABLE3: EFFECT OF THE LEVEL OF FEED OFFER ON THE PART OF PLANT SELECTED BY GOATS ON 50% GLIRICIDIA PLUS 50% LEUCAENA.*

Level of offer	Gliricidia D.M. intake (stem) g/kgMW	S.E. mean	Gliricidia D.M. intake (leaf) g/kgMW	S.E. mean	Total intake g/kgMW	S.e. mean	Leucaena D.M. intake (stem) g/kgMW	S.e. mean	Leucaena D.M. intake (leaf) g/kgMW	S.E. mean	Total intake g/kgMW	S.E. mean
40	3.26 ^a	0.15	17.58 ^a	0.37	20.17 ^a	0.41	2.57 ^a	0.09	17.13 ^a	0.66	19.47 ^a	0.57
55	3.57 ^{ab}	0.47	20.40 ^b	1.45	23.55 ^b	1.73	3.35 ^b	0.20	21.58 ^b	1.11	24.82 ^b	1.06
70	3.99 ^c	0.49	23.84 ^d	1.72	27.70 ^c	2.10	4.06 ^{bc}	0.18	26.86 ^c	1.33	30.79 ^c	1.29
85	3.19 ^a	0.92	21.22 ^c	3.43	24.01 ^b	4.15	4.73 ^{cd}	0.24	31.58 ^d	2.22	36.27 ^d	1.85
100	3.57 ^{ab}	0.91	25.19 ^{ef}	4.40	28.72 ^c	5.21	5.05 ^d	0.43	35.82 ^c	2.09	40.88 ^c	2.28
115	3.55 ^{ab}	0.80	24.03 ^{de}	4.49	27.58 ^c	4.21	4.42 ^{cd}	0.53	36.60 ^c	2.77	41.02 ^c	3.02
130	3.76 ^{bc}	1.31	26.27 ^f	4.67	30.03 ^c	5.63	4.62 ^{cd}	0.49	39.28 ^f	3.85	43.90 ^c	3.82

* Means within the same column carrying the different superscripts are significantly different. Small and capital letter superscripts denote significant differences at $P < 0.05$ and $P < 0.01$ respectively.

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TABLE 4: THE EFFECT OF FEED OFFER LEVEL ON THE PLANT OF SELECTED BY GOATS ON 100% GLIRICIDIA.*

Level of feed offer g/kgMW	Gliricidia intake stem (g/kgMW)	S.E. mean	Gliricidia intake leaf (g/kgMW)	S.E. mean	Total intake (g/kgMW)	S.E. mean
40	5.83 ^a	0.66	31.73 ^a	1.93	37.56 ^a	0.49
55	7.13 ^a	0.48	41.77 ^b	2.75	48.90 ^b	1.39
70	6.75 ^a	0.84	48.35 ^c	1.93	55.10 ^c	1.70
85	6.09 ^a	1.12	50.87 ^{cd}	3.32	56.86 ^{cd}	3.00
100	6.30 ^a	1.53	52.55 ^{cd}	2.83	58.85 ^{cd}	0.75
115	5.88 ^a	1.21	54.96 ^d	5.96	59.84 ^d	4.12
130	6.59 ^a	1.00	55.07 ^d	4.21	61.66 ^d	4.72

*Within the same column, means with different superscripts are significantly different $P < 0.05$.

TABLE 5: THE EFFECT OF DIET AND LEVEL OF FEED OFFER ON THE GROWTH RATE (g/DAY) OF GOATS FED 100% GLIRICIDIA PLUS 50% LEUCAENA DIETS.*

Diet	Levels of feed offer (g/kgMW)					
	40	55	70	85	100	115
100% Gliricidia	-39.99 ^a	-1.25 ^b	21.42 ^c	11.00 ^c	22.44 ^c	21.59 ^c
S.e. mean	40.00	11.44	7.90	6.78	6.87	11.23
50% Gliricidia	-32.30 ^a	12.75 ^b	34.51 ^b	26.86 ^b	36.04 ^b	16.32 ^b
50% Leucaena						
S.e. mean	11.60	4.00	4.29	4.55	4.38	4.03
						4.64

* Along the same row, means with different superscripts are significantly different ($P < 0.01$).