EFFECT OF FEEDING VARYING LEVELS OF *Leucaena leucocephala* AND *Gliricidia sepium* ON THE PERFORMANCE OF WEST AFRICAN DWARF GOATS

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ABSTRACT

Sixteen West African Dwarf (WAD) goats of 8.3kg average weight were used for the study which was designed to evaluate the effect of feeding varying levels of leucaena and gliricidia on the growth rate, feed intake and digestibility of WAD goats. The animals were randomly allocated to four treatments. In the first treatment, the animals were fed 25% leucaena while in the second, third and fourth treatments they were fed 50%, 75% and 100% leucaena respectively complimented with gliricidia. Data were taken on feed intake, body weights and digestibility. Urine samples of individual animals were also collected to determine the toxicity level of the leucaena inclusion in diets. The data were analysed using one-way analysis of variance. The results of the study showed that feed intake, body weight gain and dry matter digestibility increased with increase in % leucaena in the diet up to 75% without any deleterious mimosine effects on the animals. Animals on treatment III had the highest growth rate of 28.57 ± 0.06 g/head/day while treatment II had the lowest 15.31 ± 0.04 g/head/day). From the study, it can be concluded that WAD goats can consume up to 75% leucaena in the diet for optimal feed intake and growth rate.

Keywords: Feeding levels, *Leucaena*, *Gliricidia*, WAD goats

INTRODUCTION

Nutrition is perhaps the most important consideration in livestock management. Supplying feed in inadequate amount and

quality are responsible for the low livestock productivity in the tropics (Peters, 1988). It has been reported that ruminants cannot meet their maintenance needs on grass alone (Adegbola, 1985). These reports led to the introduction of more leguminous forages which are more palatable, well accepted by ruminants and are available throughout the whole year (Topps, 1992). The foliage of leguminous forages improve the utilization of low quality forage, provide for browsing by livestock and game during the dry season and also provide critical nutrients lacking in the diet (Alm *et al.*, 1989).

The utilization of the legume mixtures depends on their chemical composition, digestibility; and presence of anti nutritive factors and also on their acceptance. Some of the most important shrubs in Nigeria are *Leucaena Leucocephala* and *Gliricidia sepium*. *Leucaena* is very rich in protein and several studies have been conducted on its utilization and toxicity (NAS, 1977) Megarrity and Jones (1983), Jones and Megarrity (1986), Teniola (1990) and Hammond (1995). *Gliricidia* also has nutrient-rich foliage and its use has also been reviewed Chadlokar (1982), Smith and Van Houtert (1988). Jones (1994) reported the results of screening urine from ruminants for the presence of 2, 3, DHP and 3, 4 – DHP. He indicated that ruminal DHP – degrading ability was not present in ruminants from Ethiopia, Kenya, Nigeria, South Africa, Tanzania, Zaire and Zimbabwe. The study was therefore designed to determine at what levels leucaena could be safely incorporated into the diet of WAD goats without adverse effects on the performance of the goats.

MATERIALS AND METHODS

Sixteen WAD goats (fourteen of which were females and two males) were used for the experiment. The goats were randomly allocated to four treatments depending on the levels of leucaena offered. The goats in the first group were fed 75% gliricidia plus 25% leucaena while the second, third and fourth groups were given 50% gliricidia plus 50% leucaena, 25% gliricidia plus 75% leucaena and 100% leucaena respectively. The feed offered was calculated on 5% of their body weights (Jansen and Burg, 1995; Jansen and Burg, 1995; Steele, 1996). The design of the experiment was a complete randomized design. Each of the animals was kept in an individual metabolism cage and was fed freshly cut forages after their leaves had been stripped off. The experiment was for a period of 9 months (February 19th to November 19th, 1997). All treatments took place concurrently, that is, 9 months/treatment. Samples of gliricidia and leucaena leaves plus petioles (which were the parts fed) were taken to determine their proximate components using the method of AOAC (1975).

The data collected include the dry matter contents of the forages offered, feed intake, digestibility and growth rate. Urine samples of individual animals were also collected to determine the toxicity level of the leucaena inclusion in their diets. A solution of acidified Ferric Chloride, made up of 0.6g. $\text{FeCl}_3 \cdot 6\text{H}_2\text{O}$ dissolved in 1 litre of water, to which 3 mls of

conc. HCl had been added, was prepared. 2 mls of the solution was measured into small test tube of 0.2ml. The individual urine sample was added and colour change activity test (Jones, 1994) was performed. Data were collected on dry matter intake, weight gain and digestibility. The data were analyzed using one – way analysis of variance and significant differences were detected using the Duncan's multiple range test (Steel and Torrie, 1980).

RESULTS AND DISCUSSION.

Table 1 shows the average feed intake per treatment while Table 2 shows the growth rate of the experimental animals and urinary colour changes. The goats in treatment III had the highest average body weight gain of $28 \pm 0.06\text{g/day}$. This agrees with the work of Teniola (1990) where the highest growth rate of 27.01g/day was obtained in WAD goat's fed 75% leucaena. Treatment III had the highest total feed intake of $2022\text{g} \pm 60.62$ followed by Treatment IV (1788 ± 129.06) and by treatments II and I (1472 ± 60.62 and $1421 \pm 84.72\text{g/day}$) respectively. The intake levels were high and comparable to what was obtained in a similar trial including leucaena and Panicum (Ademosun *et al.* 1984). Intake level increased with increased in level of leucaena up to 75% level of incorporation. This confirms the work of Teniola (1990) where the highest daily weight gain and intake were recorded for the animals on 75% leucaena. The animals in Treatment II and III

TABLE 1: EFFECT OF LEVEL OF LEUCAENA ON FEED INTAKE AND DIGESTIBILITY

Treatment	Feed intake (g/head/day)			
	Leucaena	Gliricidia	Total	Digestibility %
I	366 ± 29.77	1055 ± 139.71	1421 ± 84.72^a	68.2g^a
II	732 ± 49.48	720 ± 71.76	1472 ± 60.62^a	72.06^{ab}
III	1477 ± 101.16	545 ± 23.85	2022 ± 62.51^b	76.19^c
IV	1788 ± 129.08	-	1788 ± 129.08^{ab}	70.08^a

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

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consumed the leucaena first before starting on gliricidia and it was observed that the animals preferred the leaves to the stems and in fact there were cases when all the residues found were pieces of stems whose leaves had been eaten off. This further confirms the selective feeding habits of goats. It also agrees with the work of Lu (1988) which showed that the fraction which goats most often select are buds, leaves, fruit and flowers and these parts contain less fibre and more protein and are thus more digestible than stems and petioles. Animals in treatment III had a significantly ($P<0.05$) higher digestibility. Ademoseun *et al.*, (1984) got a similar result. The incorporation of leucaena generally increased digestibility.

The results of the proximate components of both gliricidia and leucaena showed that the CP was higher in leucaena (27.23%) than gliricidia (18.10%) but crude fibre content was higher in gliricidia with a value of 16.90% for gliricidia and 9.7% for leucaena (Table 3). This might explain why WAD goats usually

consumed leucaena first and more of it than gliricidia.

The results of the urine analysis showed different colour changes (Table 2). The result showed that mimosine of 3, 4 DHP was present in the samples. The colour changes of urine of animals in treatments II and III showed that DHP degrading bacteria were in the process of establishing in the rumen. Some of the animals in treatments III and IV showed initial signs of mimosine toxicity such as alopecia and excessive salivation from the 7th week of the commencement of the experiment but these signs disappeared as the experiment progressed (after three months). This might be due to the gradual establishment of the DHP – degrading bacteria in the rumen and might explain why animals on 100% had the second higher growth rate per day suggesting that as the ruminant population establishes in the rumen, the animals themselves started to gain weight.

TABLE 2: EFFECT OF LEVEL OF LEUCAENA ON GROWTH RATE (g/head/day) AND COLOUR OF URINE

Treatment	Growth rate g/head/day	Urinary colour changes
I	19.38 ^a ± 0.05	No colour change
II	15.31 ^a ± 0.04	Brownish pink
III	28.57 ^b ± 0.06	Pink
IV	20.41 ^a ± 0.05	Dark blue

Means with different superscripts are significantly different ($P<0.05$)

TABLE 3: CHEMICAL COMPOSITION OF *Leucaena leucocephala* and *Gliricidia sepium* (g/kg DM)

Component	Leucaena	Gliricidia
Crude protein	222.3	181.0
Crude fibre	97.0	169.0
Ether extract	37.0	31.5
Ash	69.3	88.5
Nitrogen free extract	574.4	530

CONCLUSION

WAD goats on 75% and 100% leucaena showed initial signs of mimosine toxicity. Toxicity signs disappeared as feeding trial progressed; WAD goats consumed more leucaena than gliricidia on a 50/50 diet and preferred leaves to stems while on the two diets. WAD goats can tolerate up to 75% leucaena in their diet without complications arising from mimosine toxicity. This will go a long way to alleviate inadequate feed supply in the dry season when problem of feeding becomes critical since leucaena is available throughout the year.

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