

UTILIZATION OF HIGH LEUCAENA DIET BY WEST AFRICAN DWARF SHEEP AND GOATS

S. M. ODEYINKA

Dept of Animal Science, Faculty of Agriculture
Obafemi Awolowo University,
Ile-Ife, Nigeria
E-mail: sodeyink@oauife.edu.ng

Target Audience: Animal scientists and livestock farmers

ABSTRACT

The study was designed to determine the performance of West African Dwarf (WAD) sheep and goat on high Leucaena diet and to study the effect of inoculation on the utilization of leucaena. Eighteen (18) WAD goats were randomly divided into three groups and twelve (12) WAD sheep were divided into two groups based on whether they were given rumen inoculum (inoculated) or not (non-inoculated) and on the percentage of leucaena in the diets (50% and 74%). This was studied for five months.

Inoculation and level of leucaena in the diet did not have significant effect on dry matter intake and digestibility of the animals. The DM digestibilities of the inoculated goats was 66.55% while that of the non-inoculated was 67.65%. The DM digestibilities of the inoculated and non-inoculated sheep were 65.34% and 67.14% respectively. There was significant difference in the growth rate of inoculated and non-inoculated goats ($P < 0.01$). The non-inoculated goats had higher growth rate (56.36 g/day) than the inoculated ones (23.17 g/day) throughout the duration of the experiment. The growth rate of the non-inoculated sheep was 132.50 g/day while that of the inoculated ones was 69.61 g/day.

The level of leucaena in the diet did not have significant effect on the growth rate of the animals ($P > 0.05$). The results of this study suggested that the inoculation was not effective and that leucaena should not constitute up to 50% of the diet of West African dwarf sheep and goats.

Keywords: Utilisation, leucaena, sheep and goats

DESCRIPTION OF PROBLEM

The high nutritional values of leucaena and gliricidia are widely recognised and reviewed (1, 2, 3, 4). Gliricidia and Leucaena grow luxuriantly and maintain good quality yield even during the peak of the dry season in Nigeria. The plants therefore have good potential for sustaining small ruminant production especially in the dry season when there is decline in the yield and nutritive value of grasses and legumes. However, there is the presence of antinutritional factor, mimosine, a toxic, non-protein amino acid that causes low weight gain, general

poor condition and hair loss in ruminants and non-ruminants (5, 6)

One way of reducing mimosine toxicity is by inoculum transfer from adapted to non-adapted animals (7). Under normal grazing conditions, the rumen bacteria are able to move readily from one animal to another (6) resulting in the rapid transfer throughout the herd, thus, having the ability to utilize high levels of potentially toxic leucaena. The study was therefore designed to determine the effect of the level of leucaena in the diet and of rumen inoculation on the performance of West African dwarf goats and sheep.

MATERIALS AND METHODS

Animals:- Eighteen WAD goats whose ages ranged from 4-9 months were randomly distributed over three treatments such that there were six animals per treatment. The animals in the first treatment were fed 50% gliricidia plus 50% leucaena and were not given rumen inoculum (non-inoculated). In the second treatment, the goats were fed 50% leucaena plus 50% gliricidia and were given rumen inoculum (inoculated). In the third treatment, the goats were given rumen inoculum and were fed 75% leucaena and 25% gliricidia. Twelve WAD sheep aged between 5-7 months were also randomly distributed over two treatments. The first treatment involved six sheep that were not given rumen inoculum and were fed 50% gliricidia and 50% leucaena while the second group was fed the same (50% gliricidia plus 50% leucaena) but were not inoculated.

The animals were treated against ecto and endo parasites at the beginning of the experiment before being put into metabolism cages. The duration of the study was five months.

The animals were weighed weekly throughout the duration of the experiment to determine liveweight gains and hence their growth rates.

The inoculum was obtained from three already sheep from International Livestock Research Institute (ILRI), Ibadan. The inoculum was obtained via a stomach tube by electric pump and was collected into a conical flask. Ten (10) mls of inoculum was immediately given to each animal by mouth through a syringe.

Feeding: The animals were fed the different levels of gliricidia and leucaena twice daily at 0900 h and 0160h. Each of the animals was fed $90 \text{ g/w}^{0.75} \text{ kg}$ per day. Water was provided *ad-libitum* throughout the feeding period. The uneaten feeds were collected and recorded daily. Each animal was put into an individual metabolism cage with a feeding trough, a drinking bowl and devices for separate collection of urine and faeces. Feeds and faeces were collected daily during the metabolic period, weighed and dried to determine the dry matter. Urine samples were also collected during the digestibility trials.

Chemical analysis: A known quantity of the fresh forage and faeces were dried in the oven at 70°C to compute their dry matter. The samples were analysed using the method of (8); Urine samples were analysed colorimetrically at ILRI, Addis Ababa, Ethiopia for dihydroxy pyridone (DHP) content.

RESULTS AND DISCUSSION

There were no significant differences in the digestibility and digestible dry matter intake of inoculated and non-inoculated sheep and goat (Table 1). The effect of inoculation on growth rate is shown on Table 1. There was significant differences ($P < 0.01$) in the growth rate of the inoculated and non-inoculated goats and sheep. The non-inoculated sheep and goat had a higher growth rate than the inoculated ones.

Table 1: Effect of Inoculation on DM digestibility, Digestible DM intake and Growth rate to sheep and goat.

Parameters	Specie	Inoculated	Non-inoculated
DM digestibility(%)	Goat	66.55±0.79	67.65±0.75
	Sheep	65.34±0.49	67.14±0.88
Digestible DM intake (g/kgmw)	Goat	42.84±2.21	42.89±2.72
	Sheep	49.85±1.36	50.39±1.97
Growth rate (g/day)	Goat	23.17 ^a ±6.33	56.36 ^b ±9.14
	Sheep	69.6 ^a ±5.62	132.50 ^b ±2.63

Row mean with different superscripts are significantly different ($P < 0.01$)

The level of leucaena in the diet did not have significant effect on the growth of the animals. The growth rate (g/day) for 50% and 75% leucaena were 23.17 and 18.94 respectively (Table 2). The level of leucaena in the diet did not have any significant effect on digestibility and on the digestible dry matter intake. The animals on 50% leucaena had a digestibility of 66.55 ± 0.79 while that of animals on 75% leucaena was 63.89%±2.59. The goats on 50% leucaena had 42.84% + 2.21 while those on 75% leucaena had 38.25%+3.50 digestible dry matter intake (Table 2).

Table 2: Effect of the Level of Leucaena in the diet on the DM digestibility, Digestible DM intake and Growth rate of goats

Parameters	Percent Leucaena in the diet	
	50%	75%
DM digestibility (%)	66.55 ± 0.79	63.89 ± 2.59
Digestible DM intake (g/kgmw)	42.84 ± 2.21	38.25 ± 3.50
Growth rate (g/day)	23.17 ± 6.33	18.94 ± 3.60

The results of the dry matter intake and digestibility did not agree with those of other workers who found dry matter intake and digestibility to improve with increasing leucaena in the diet up to 30% level of leucaena. (9, 10). This

might be due to the fact that the percentage of leucaena in those diets was not as high as the 50% and 75% in this study. The result of the growth rate in this study was rather low because the animals were adversely affected by pneumonia. The fact that digestibility, digestible dry matter intake and growth rate of the non-inoculated animals were always higher than inoculated ones might suggest that the inoculation was not effective most especially when the urine samples contained high levels of Dihydroxy Pyridone (DHP). In addition to poor health conditions, the overall poor performance of the animals could also be due to the toxic effect of mimosine at more than 30% level of intake (11, 12). It is impossible for animals to suffer chronically with few or no overt symptoms but an equally harmful effect on their productivity (13). The subclinical expression of leucaena toxicity could result in greater loss in weight than might result from the acute expression of the toxicity (14). This assertion is by the fact that manifestation of toxicity ranges from simple reductions of food and nutrient utilisation to central neurological disorders. (15).

CONCLUSION AND APPLICATIONS

1. Level of leucaena did not have significant effect on DM digestibility and growth rate of West African dwarf sheep and goat.
2. Inoculation was not effective in this experiment. It will be necessary to import the frozen rumen inoculum from adapted animals which can then be given directly to our own local goats and sheep since the local sheep and goat still suffer from mimosine toxicity when on leucaena diet. Once this is done, the DHP-detoxifying bacteria can then be passed from animal to animal through drinking and eating from the same troughs.

REFERENCES

1. Jones, R.J. 1979. The value of *Leucaena leucocephala* as a feed for ruminants in the tropics. *World Anim. Rev.* 13:23.
2. Bloom, P.S. 1981. Leucaena, a promising versatile leguminous tree for the tropics. *Int. Tree crops Journal* 1:221-236.
3. Smith, O.B. and M.F.J. Houtert 1988. The feeding value of *Gliricidia sepium* a review. *World Anim. Rev.* 62: 57-68.
4. Hammond, A.C. 1998. Leucaena toxicosis and its control in ruminants. *J. Anim. Sc.* 73:1587-1492.
5. Hegarty, M.P., C.P. Lee, G.S. Christie, R.O. Chert and K.P. Hajdock 1979. The 3-hydroxy 4 (IH) pyridone, a ruminant metabolite from *Leucaena leucocephala* *Aust. J. Biol. Sci* 32:27-40.
6. Hammond, A.C. 1987. Chemical, anatomical and other antiquality factors limiting forage utilisation pages 56-59. In: workshop held at Tampa, USA.
7. Jones, R.J. 1985. Leucaena toxicity and ruminant degradation of mimosine. In: pages 111-119. *Australia-USA poisonous Plants symposium*, Brisbane, Australia.

8. A.O.A.C. 1975. Association of Official Analytical Chemists. Official Methods of analysis (12th edition). Washington D.C.
9. Adenuga, M.K. 1983. The value of *Leucaena leucocephala* as a supplementary feed for ruminants B.Sc. Thesis, University of Ife, Nigeria.
10. Cochran, R.C., A. Del Carpio; C.E. Parker; D.M. Hallford; R.W. Van Keuven B.A. Dehority; H. Vidal and R. Carcexo 1984. Growth response of Peruvian Criollo goats consuming varying levels of *Acacia macrantha*, *Leucaena leucocephala* and Corn stalks. Nutrition reports Int. 29:295-503.
11. NAS, 1977. *Leucaena*. Promising forage and tree crop for the tropics. Washington D.C. National Academy of the Sciences.
12. Jones, R.J. and M.P. Hegarty 1984. The effect of different proportions of *Leucaena leucocephala* in the diet of cattle on growth, feed intake, Thyroid function and Urinary excretion of 3-hydroxy (1H)-Pyridone. Aust. J. Agric. Res. 35:317-325.
13. Charter, S. 1986. Feeding African Livestock. Newsletter 5(2): 1-2. International Livestock Centre for Africa, Addis Ababa, Ethiopia.
14. Jones, R.J. and R.J. Megarrity 1986. Successful transfer of DHP - degrading bacteria from Hawaiian goatd to Australian ruminants to overcome the toxicity of leuceana. Aust. Vet. J. 62: 259-260.
15. D'Mello, J.P.F. 1992. Chemical constraints to the use of tropical legumes in animal nutrition. Animal Feed Sci and Tech, 38: 237-261.