EFFECTS OF *Gliricidia sepium* AND NEEM LEAVES SUPPLEMENTATION ON NITROGEN METABOLISM IN SHEEP

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ABSTRACT
The effects of *Gliricidia sepium and* neem tree leaves supplementation on nitrogen metabolism were determined in sheep. A total of twelve (12) ewe-lambs with mean weight of 7.00 ± 0.65kg were allotted to three dietary treatments with four (4) animals per treatment in a completely randomised design. Dietary treatments comprised; 1(50% guinea grass + 20% *Gliricidia sepium* foliage + 30% concentrate diet which served as control group), 2(45% guinea grass + 25% *Gliricidia sepium* foliage + 30% concentrate diet) and 3(40% guinea grass + 30% *Gliricidia sepium* foliage + 30% concentrate diet). Animals in treatment diets 2 and 3 received 3 and 6 grams of neem leaves meal per animal per day as supplement respectively. The results showed that ewe-lambs on Diet 1 had higher ($P < 0.05$) faecal and total nitrogen output (4.33 & 5.21g/day respectively) than those on Diet 2 or 3. Nitrogen intake (20.93g/day), nitrogen balance (17.33g/day) and nitrogen retention (81.47%) were higher ($P < 0.05$) in animals on Diet 3 compared with those on Diets 1 or 2. It can be concluded that 40% guinea grass + 30% concentrate diet with 30% *Gliricidia sepium* foliage + 6 grams neem leaves supplementation has the potential to improve nitrogen metabolism in sheep.
Keywords; Forage, foliage, neem leaves, nitrogen retention, ewe-lambs.

INTRODUCTION
Feed scarcity has been the major hindrance to effective sustainability of sheep production to maximize their productivity rate in small ruminant industry in Nigeria. Though natural pasture provides the cheapest source of nutrient for sheep production, their insufficient supply has affected sheep performance in the greater parts of the year due to seasonal variation. However, the competition between man and other livestock for most of the available feed ingredients is posing additional constraint to the challenges of irregular feed supply in sheep nutrition. Thus, the strategies to reduce feed shortage without interfering negatively in sheep production have been constantly researched and this bring across the need for using native pasture with multipurpose tree leaves in the feeding regime of sheep. *Gliricidia sepium* foliage and neem (*Azadirachta indica*) leaves can be potentially useful in this regards. *Gliricidia sepium* foliages occur in abundance in the tropics. It has suitable feeding values, which sheep can consume in large quantities without deleterious effect on their performance (Aye and Adegun, 2010). Neem leaves used as supplement in ruminants feeds yield double benefits; as it improves the health status and feed efficiency of the animals (Ogbuewu *et al.*, 2011). The major limitation to their feeding value in sheep production lies on their acceptability because of the smell of *Gliricidia sepium* foliages and the bitter taste of neem leaves caused by their anti-nutritional factors. Thus, they need to be harnessed before feeding to sheep in order to improve their intake, utilization and nutrient retention. The objective of this study was to determine nitrogen metabolism in sheep fed guinea grass and concentrate diet supplemented with *Gliricidia sepium* foliage and neem leaves.

MATERIALS AND METHODS
The study was conducted at the Sheep and Goat Unit of the Teaching and Research Farm at the Ambrose Alli University, Ekpoma, Nigeria. Guinea grass and *Gliricidia sepium* foliage were obtained within the Teaching and Research Farm allowed wilting for 12 to 24hours before being chopped into small sizes. The neem leaves that were obtained within Ekpoma were air-dried under shade for about 7days before milled into leaves meal. The concentrate comprised 70.00% wheat offal, 20.00% dried brewery grain, 8.00%

rice bran, 0.75% limestone, 0.25% bone meal, 0.50% salt and 0.50% vitamin premix.

The three experimental diets that were prepared consisted of guinea grass, *Gliricidia sepium* foliage and concentrate diet in the following ratios respectively; treatment diets 1(50:20:30), 2(45:25:30) and 3(40:30:30). Diet 1 served as a control group in this experimental study.

A total of twelve (12) growing West African Dwarf ewe-lambs, aged between 7 and 8 months with average body weight of 7.00 ± 0.65kg were allotted to the three experimental diets of four replicates with one animal per replicate in a completely randomized design. The ewe-lambs were housed in individual pens and offered the treatment diets at 5% of their body weight daily at about 8:00am in the morning. Animals in treatment diets 2 and 3 received 3 and 6 grams of neem leaves meal per animal per day as supplement respectively. The animals also had unrestricted access to clean fresh water. They were allowed out for exercise early in the morning (7:00am) on days with favourable weather. During the trial, recommended vaccinations and medications were adequately administered to the ewe-lambs.

Two ewe-lambs per treatment (totally, 6) were allocated to the three dietary treatments in metabolic cages fitted with facilities for separate collection of urine and faeces before the termination of the experiment. The quantity of feeds offered and leftover as well as faeces and urine were determined by weighing daily for 7 days after a 7-day adjustment period. Thereafter, fractions of faecal and urinary samples were frozen in -20 ^{0}C until they were required for laboratory analysis.

Nitrogen balance of the animals was calculated as the difference between nitrogen intake and nitrogen output from faeces and urine, while nitrogen retention was computed from nitrogen balance expressed as percentage of nitrogen intakes. The trial lasted 84 days excluding the 14-days adjustment period.

The proximate composition of the feeds, experimental diets, faeces and total nitrogen from urinary samples were determined using the procedures of AOAC (1990). Data that were obtained from nitrogen metabolism parameters were subjected to analysis of variance and where significant different occurred means were separated using Duncan multiple range test (SAS, 2000).

RESULTS AND DISCUSSION

Presented in Table 1 is the proximate composition of feeds and experimental diets, while Table 2 shows the influence of *Gliricidia sepium* foliage and neem leaves supplementation on nitrogen metabolism in sheep. The significantly ($P < 0.05$) higher nitrogen intake observed in diets 2(19.55g/day) and 3(20.93g/day) compared with diet 1(17.24g/day) could be a reflection of *Gliricidia sepium* foliage with neem leaves inclusion in the diets. The faecal and total nitrogen output that ranged from 3.44 to 4.33g/day and 3.81 to 5.21g/day respectively, were higher significantly ($P < 0.05$) in ewe-lambs on diet 1 compared with diets 2 and 3. This observation might be connected with the degree of crude protein in the feed intake and their level of utilization with the rapid breakdown of dietary protein to ammonia which increase faecal and total nitrogen output rather than contributing to the animal nutrient requirement (Okoruwa *et al.*, 2014). Urinary nitrogen output ranged between 0.37 and 0.88g/day. Yusuf *et al.* (2013) reported that nitrogen excreted in urine depends on urinary recycling and the efficiency of utilization of ammonia produced in the rumen by microbes for protein synthesis.

Nitrogen balance and retention highest values on diet 3(17.33g/day and 81.47%) might be influenced by the presence of optimum nitrogen retained and antimicrobial effect of diet 3 which delay ruminal protein degradation (Okoruwa and Adewumi, 2010) with dietary protein which were not denatured due to suppression of bacterial population that responsible for the rapid protein degradation.

CONCLUSION

Base on the results obtained in this study, it can therefore be concluded that *Gliricidia sepium* foliage with neem leaves could be used as a good source of feeds supplement for sheep. However, the supplementation of 30% *Gliricidia sepium* foliage with 6 grams neem leaves meal to 40% guinea grass and 30% concentrate diet was more enhanced efficiently on nitrogen metabolism in ewe-lambs than other dietary treatments.

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Table 1. Proximate composition of neem leaves, *Gliricidia sepium* foliage, guinea grass, concentrate diet and experimental diets.

Constituent (%)	Neem leaves	*Gliricidia sepium*	Guinea grass	Concentrate diet	Diets		
					1	2	3
Dry matter	92.42	67.03	78.43	86.48	88.57	86.03	85.99
Crude protein	19.68	28.31	7.00	20.03	15.87	16.92	17.43
Crude fibre	16.61	20.06	37.00	14.01	26.74	25.98	25.11
Ash	7.10	6.67	10.00	7.99	8.77	8.66	8.34
Ether extract	4.16	3.00	0.90	1.90	1.28	1.50	1.60
NFE	44.91	49.02	45.11	56.92	35.91	33.00	33.42

NFE = Nitrogen free extract

Table 2. Influence of *Gliricidia sepium* foliage and neem leaves supplementation on nitrogen metabolism in sheep.

Parameters	Treatment diets			
	1	2	3	SEM ±
Nitrogen intake (g/day)	17.24^{b}	19.55^{a}	20.93^{a}	0.21
Faecal nitrogen output (g/day)	4.33^{a}	3.60^{b}	3.44^{b}	0.06
Urinary nitrogen output (g/day)	0.88	0.74	0.37	0.12
Total nitrogen output (g/day)	5.21^{a}	4.34^{b}	3.81^{b}	0.04
Nitrogen balance (g/day)	12.13^{c}	15.21^{b}	17.33^{a}	0.18
Nitrogen retention (%)	70.03^{c}	77.86^{b}	81.47^{a}	0.15

$^{a,b,c.}$ Means on the same row with different superscripts differ significantly ($P < 0.05$).