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Effect of Three Species of *Stylosanthes* on The Performance of West African Dwarf Sheep

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Abstract

An experiment was conducted to determine the effect of feeding three species of *Stylosanthes* as supplements to a basal diet consisting of *Cyonodon dactylon* on the performance of West African dwarf sheep. The three treatments imposed were: Treatment 1, a basal diet consisting of poor quality grass (*Cyondon dactylon*) and *Stylosanthes scabra* in the ratio of 70:30. Treatment 2, the basal diet added with *Stylosanthes guianensis* (70:30); and Treatment 3,the basal diet with *Stylosanthes hamata* (70:30). The study lasted for 24 days, a 10 day adjustment period and a 14- day data collection, using 3 rams of comparable age and weight. Data were analyzed as a 3 x 3 Latin square. Animals supplemented with *S. guianensis* had the highest DM intake while *S. scabra* was least consumed by sheep ($p<0.05$). Digestibility of crude protein and DM however showed that animals on *S. guianensis* performed better. It could be concluded that sheep can be supplemented with *Stylosanthes guianensis* in the savannah zone of Nigeria.

Keywords: *Stylosanthes guianensis; Stylosanthes scabra; Stylosanthes hamate;* West African Dwarf sheep; crude protein digestibility

Introduction

Sheep grown in West Africa and Nigeria are adapted to humidity and graze road sides and villages. They are prolific and can subsist on a wide range of feed materials (Silankove, 2000). They lived unconfined and almost essentially on grass and forages. Sheep still play an important role for smallholders in terms of income generation, function as a bank, and as a meat or protein source. Sheep have the ability to select and consume a wide range of forages, tree leaves and crop residues. When they are left to browse freely, they will select the best diet that includes more fresh tender shoots and other more nutritious parts of the vegetation (Chate, 2001).

However, in many areas, especially where there is intensive cropping, sheep are tethered or confined in limited grazing lands. Recently, in addition to problems with parasites that seriously affect small ruminants, there is also a problem of feed shortage, which occurs especially in intensive crop production areas. Feed resources that were plentiful in the past do not exist any longer on many farms. Farmers have to spend more time finding feed for their animals (Horne and Stur, 1999).

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The seasonal effect of native forage is another problem that leads to feed shortage since feeds are abundant only during the wet season and will dry out in the dry season (Phengsavahn, 1997). During the dry season, grass and crop residues are in short supply, so there is deficiency in energy, protein and essential minerals and vitamins (Akinlade *et al*, 2002). Herbaceous forage legumes such as *Stylosanthes* species have been identified as potential protein supplements for ruminants since they contain high crude protein (150 -300 g/kg DM), minerals and vitamins that are needed for the growth of ruminal microbes (Norton and Poppi, 1995). Stylo is a perrennial legume for warm humid tropics. It is fairly drought tolerant and also very tolerant of low fertility and acid soils. It is self-fertile and predominantly self-pollinating. *Stylosanthes* is a short-lived perennial legume (2 to 3 years) that grows into a small shrub with some woody stems. It is usually grown as a cover crop, which is cut every 2 to 3 months. It effectively suppresses weeds and is a good feed supplement for most animals, including chickens, pigs and fish. *Stylosanthes* can be fed fresh or dried for hay and leaf meal. It does not tolerate being cut close to the ground since there are few buds on the lower stem for regrowth. This can be improved by making the first cut at 10 to 20 cm to encourage branching close to the ground. Subsequent cuts must be made higher (>25 cm) to ensure good regrowth (Horne and Stür 1999). N concentrations of *Stylosanthes guianensis* range from 1.5 to 3 % in DM. DM digestibility of young plant material lies between 60 to 70%, but with increasing age and lignification, this may be reduced to below 40% (Mannetje and Jones 1992). The range of photoperiod response in the genus is wide, short day, long day, day neutral and long -short day. *Stylosanthes spp*. differs from most tropical pasture legumes in other general because of their non climbing growth habit. Growing points are often close to the ground, and this is advantageous under grazing.

Several improved forages can be brought into the systems, and these include *Cyonodon dactylon* and variety of *Stylosanthes spp* which are mostly used in cut and carry systems (Said and Tolera, 1993).

Materials and Methods

Location

The experiment was carried out at Ladoke Akintola University of Technology Teaching and Research Farm. The area is located within the derived savanna ecological zone.

Land Preparation and Planting

The plot had been established 2 years earlier, regular manual weeding of the plots and surroundings were carried out.

Preparation of experimental diets

The three *Stylosanthes species* were cut at a height of 10 cm above the ground level to allow for good regrowth, at 50% flowering of the regrowth, the legumes were harvested and airdried under the shade manually chopped to 5-10cm length and stored in a cool dry place. *Cyonodon dactylon* was harvested daily (Zero grazing) and chopped manually into 3-5 cm height before feeding.

Animals and their management

Three West African dwarf sheep (rams) of comparable age and weight were randomly allotted to three treatment groups. The three *Stylosanthes species* were fed with *Cyonodon dactylon* as basal diet. The animals were dewormed and sprayed as a routine practice to control internal and external parasites before the start of the trial. The animals were confined to separate metabolism cages with facilities to collect both the urine and feaces separately by the arrangement of sieve. The basal diet and the supplement were offered in separate troughs at a ratio of 70:30 respectively. The feed was offered at the rate of 3% of individual animal live weight at 0800h daily, after removal of the feed refused the previous day. Practically, voluntary feed intake was mainly the estimation of the difference between the amount of feed offered to the animals and the quantity of feed refusals. Fresh drinking water and mineral salt block were provided to all animals at all times. The trial lasted for 24 days consisting of 10 days

adjustment and 14 days of data collection per periods. During the 14-days collection period, total feed offered and refusals, as well as total feaces were recorded daily. About 10% samples of the total daily output of feaces was taken and kept in a refrigerator until required for chemical analysis.

Chemical analysis

Sub samples of air-dried forage and sample of feed offered, feed refused and faeces were analyzed for total nitrogen (AOAC 1990), crude fibre (CF), ether extracts (EE) and ash analysis. Urine was analyzed for nitrogen by kjeldahl extraction method.

Statistical analysis

3 X 3 Latin square design was used to evaluate feed intake and nutrient digestibility of the three experimental diets. Data were collected for a period of two weeks with an initial adjustment period of ten days for each period of collection. Data were analyzed using SAS software (SAS, 1998).

Results

Chemical compositions of experimental feeds are presented in table 1. Crude protein content of *S. guianensis* was higher than that of *S. scabra. S. hamata* had the least crude protein level. Conversely, crude fibre of *S. guianenis* was the least compared with other species.

The results of effect of *Stylosanthes species* on dry matter intake by WAD sheep were presented in Table 2. Total dry matter intake was highest for *S. guianensis* and least for *S scabra* (P< 0.05). Table 2 also presents nutrient digestibility of the *Stylosanthes species* by WAD sheep, *S. guianensis* had the highest dry matter digestibility while *S. hamata* had the least dry matter digestibility. Crude protein and crude fibre digestibility followed the same pattern (P< 0.05).

Table 1: Chemical composition of experimental diets

Parameters	DM	CP	CF	EE	ASH	NFE
S. guianensis	96.00	14.23	12.00	10.00	4.00	56.00
S. hamata	98.00	13.13	20.00	12.00	2.00	50.87
S. scabra	92.00	14.00	22.00	24.00	8.00	24.00
C. dactylon	98.00	11.38	42.00	12.00	2.00	30.62

Table 2: Feed intake and nutrient digestibility of experimental diets by West African dwarf sheep

Parameters	*S. scabra*	*S. guianensis*	*S.hamata*	SEM
Feed intake (g/h/day)	0.119^{c}	0.128	0.120^{b}	0.015
Supplement (g/h/day)	0.094^{a}	0.006^{c}	0.054^{b}	0.003
Total	0.213^{a}	0.154^{c}	0.174^{b}	0.002
Digestibility (%)				
Dry matter (DM)	69.53^{a}	71.82^{a}	65.10^{b}	1.97
Crude protein (CP)	68.90^{b}	71.80^{a}	68.55^{b}	1.03
Crude fibre (CF)	69.42^{b}	70.79^{a}	63.16^{c}	2.35

Means in the same row with different superscripts differed (P< 0.05)

Discussion

The values of the crude protein reported in this study were above the minimum level of 8% recommended by the NRC (1998). This suggested that these *Stylosanthes species* could be useful in protein banks and as dry season feed resources. The crude protein values obtained for the three *Stylosanthes species* were above the minimum level of 8% below which intake of tropical forages is inhibited (Minson, 1980). The results of the low crude fibre content of *S. guianensis* from the chemical analysis is in line with work of Silva and Orskof, (1988) who reported that the rate of microbial colonization of a feed with high fiber content is lower compared to another with low fiber content.

The present result showed that inclusion of *Stylosanthes guianensis* to a basal diet of *Cyonodon dactylon* resulted in the highest dry matter intake compared with other species of Stylo used. This was probably an effect of the higher CP intake, which would create a better rumen environment for the digestion of the feed. This in turn has a positive effect in increasing microbial population and improves the rate of breakdown of digesta. When the rate of breakdown and passage of digesta increase, there is a corresponding increase in feed intake. This is in agreement with the works of Said and Tolera (1993) and Tolera and Said (1997) in which legumes were supplemented to a basal diet of maize stover and found that supplementation with *S. guianensis* resulted in significantly higher DM intake. Similar results were also reported by Ngwa and Tawah (1990) who supplemented a protein source to a basal diet of rice straw for sheep. The relatively higher CP in *S. guianensis* could be due to its comparably lower shedding of leaves during hay making. Practically, hay-making will result in unavoidable loss of leaf (Said and Adugna, 1993).

The correlation of dietary protein deficiencies can have two effects in ruminants; either the microbial degradation of food in the rumen will be increased or the animal's metabolic capacity to use energy will be improved both of which can lead to an increase in the voluntary intake of digestible organic matter and animal production. Metabolically, protein requirement of ruminants are met primarily from rumen microbial protein and from dietary protein that escapes the rumen undegraded (Robinson *et al.,* 1991).

Conclusion

The results from the study show that feeding of the three *Stylosanthes species* as feed supplements to WAD sheep increased the dry matter and crude protein intake. Based on the rate of digestibility and total dry matter intake, it is therefore recommended that *Stylosanthes guianensis* be used as supplement to poor quality basal diets (*Cyonodon dactylon*) for higher productivity and maintenance in derived savanna zone of Nigeria.

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