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Short Communication

Effect of stocking rate on Rhodes grass-stylo pasture in Northern Guinea Savanna zone of Nigeria 3. Chemical composition

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Abstract

A grazing trial was conducted to evaluate the effect of five stocking rates 12,18,24,30 and 36 sheep/ha) on the chemical composition of Rhodes grass (Chloris gayana)- Stylo (Stylosanthes guianensis) pastures in Nigeria. The pastures were set stocked for 154-210 days over five grazing veriods. Stocking rate had no significant (P>0.05) effect on the crude protein (CP), phosphorus (P), potassium (K), calcium (Ca) and magnesium (Mg) contents of the pasture components. The concentrations of CP, K and Ca declined as plants matured while the levels of CP, P and Ca in the stem were short of the recommended levels for rams. Acid detergent lignin (ADL) and fibre (ADF) were not affected by stocking rate but the neutral detergent fibre (NDF) of the components increased with stocking rate. The non -persistence of Stylo beyond one grazing period lowered the chemical composition of the pasture thus the need to incorporate more persistent legume(s) with the grass.

Keywords: Rhodes grass, Stylo, stocking rate, sheep, chemical composition.

Introduction

Improved grass - legume mixtures, among other feed resources, can support year round grazing as they produce nutritious herbage for most of the year (Adegbola and Onayinka, 1966). In grazing trials, factors which affect the productivity of such mixtures are the plant species, climatic condition, stage of maturity, number of animals and levels and types of fertilizer among others. Rhodes grass and stylo were found to produce nutritious and high fodder yield in cutting trials (Haggar, 1971; Onifade and Akinola, 1986). Similarly, indoor feeding trials with sheep on hay from these two species have been documented (Brinckman, 1974; Adu *et al* 1977). Grazing trials to determine the productivity of these species with Nigerian sheep are not available. An evaluation of mixed grass-legume pastures aimed at increasing mutton production will provide basic information to aid optimum planning and feeding of livestock by farmers in Nigeria. This study investigates the effect of stocking rate (SR) on chemical composition of Rhodes grass (cv. Callide) - stylo (cv. Cook) mixtures over five grazing periods.

Materials and Methods

The Rhodes grass-stylo pastures used during the first grazing period (GP1) and GP2 to GP5 (Table 1) were sown in 1985 and 1986 respectively at the National Animal Production Research Institute (NAPRI), Shika, Nigeria. The pastures received 30 kg P/ha annually while 200 kg N/ha was incorporated before GP1 and GP5. Descriptions of site and procedures for the planting have been reported (Onifade *et al*, 2002).

Table 1: *Crude protein contents (%) of stem and leaf of Rhodes grass grazed by sheep over four grazing periods.*

	Grazing Period							
	1		2		3		4	
Grazing	(168 days)		(210 days)		(196 days)		(154 days)	
days	Stem	Leaf	Stem	Leaf	Stem	Leaf	Stem	Leaf
0	5.6[a]	11.0[a]	6.80[a]	9.50[a]	6.82[a]	10.51[a]	6.9[a]	9.7[a]
42	4.6[b]	7.0[b]	ND	ND	ND	ND	4.7[b]	7.0[b]
84	3.7[c]	6.4[c]	4.81[b]	8.60[ab]	5.75[ab]	8.26[b]	ND	ND
126	3.3[c]	ND	4.29[b]	7.59[b]	4.36[b]	6.68[c]	3.3[c]	ND
168	ND	ND	ND	ND	2.40[c]	ND	-	-
210	-	-	3.52[b]	ND	-	-	-	-
SEM[z]	0.30	0.15	0.34	0.13	0.30	0.17	0.34	0.21

[abc] -Values in the same column with different superscripts are different, $P<0.05$.
z - Standard error of the mean (12 observations per mean)
ND, Not determined

The trial was set out as a randomized block design in two replicates and set stocked with rams at 12, 18, 24, 30 and 36/ha. Forage samples (stem and leaf of grass during GP1 to GP4, shoots of Stylo during GP2 and GP3 and grass shoots(stem +leaf) during GP5 were taken pregrazing and at six-week intervals thereafter from the grazed and ungrazed (control) plots. These were oven dried at 80°C for 48h, milled and analysed for CP (AOAC, 1975). The procedures for determining ADF, NDF, ADL and cellulose as developed by Van Soest (1967) were used. The samples were subjected to the wet digestion method of IITA (1979). Phosphorus was determined colorimetrically while the Standard flame Photometric method (EEL, flame Photometer Model A) was used to determine the concentration of K. Calcium and Mg were obtained with an atomic absorption Specto-Photometer. Data for each grazing period (GP) were subjected to ANOVA and the Duncan's New Multiple Range Test (Steel and Torrie, 1980) was used to compare means of stocking rate (SR) and grazing days (GD).

Results and Discussion

Crude protein content.

There were no significant differences in the CP contents of the grass components between the SRs over the GPs. The leaf CP content ranged from 8.70 to 8.90 % for SR 30 and SR 24, in GP1 whilst in GP2, the values ranged from 8.24 (SR 30) to 8.82% (SR 24). The CP contents of grass shoots in GP 5 were 6.5, 7.3 and 6.9 % at SR 12, SR 24 and SR 36, respectively. This finding could be ascribed to similar physiological stages of development of the pasture at the time of observation (Bryan and Evans, 1973). Other contrasting reports have been those of Winter *et al.* (1977) and Chacon *et al.* (1978) who recorded increased levels of CP during the growing season.

The Rhodes grass had started seeding by the time grazing commenced in each period, thus further declines were expected into the dry season. The CP value of Stylo shoots during GP2 prior to grazing and by the 126th day were 12.27 and 7.45%, respectively. The non persistence of Stylo beyond GP2 (Onifade *et al,* 2002) caused a

decrease in the CP content of the herbage where the values for the grass stems were below the critical 7.0% recommended by Milford and Minson (1966).

Phosphorus.

Stocking rate did not exert any influence on the P contents of the pasture components during any of the five GPs. The similar physiological state of the pasture at the times of sampling proffered by Bryan and Evans (1973) for CP might hold true for P content in this pasture. On the other hand, Winter *et al.* (1977) reported higher P contents with increased SR during the growing season. The P level in the pasture remained the same ($P>0.05$) during GP2 to GP4 (Table 2). This could be attributed to the greater resistance of P to leaching of all elements in plant tissues (Turkey, 1970), mature stage of the species and grazing mainly in the dry season. However, the reduction observed in GP1 and GP5 for N based pastures agrees with the report of Tierney and Coward (1983). Except in GP4 and GP5 the initial P content in the grass stems fell short of the 0.16% recommended for sheep (NRC, 1975).

Potassium.

The differences observed due to SR in GP1 and GP5 were significant but similar in GP2 to GP4. The values ranged from 0.76 (SR 24) to 1.07% (SR 12) for grass stems in GP1 and from 1.60 (SR 12) to 1.80 (SR 36) for whole grass shoots in GP5. This result is not in agreement with those of Tierney and Coward (1983) and Chen and Othman (1986) who reported no effect of SR on the K contents of grazed grass herbage. Potassium content declined as season progressed (Table 2) during all but GP2 and GP4 which is similar to the report of McCosker (1987). The values were above 0.5% required for growth in sheep (NRC, 1975).

Calcium.

There was no clear effect of SR on Ca content of the herbage on offer. However, the content declined with advanced grazing days except for the stems in GP2 and GP4 (Table 2). Reid *et al* (1979) associated such decline to a reduction in leaf: stem ratio, advanced stage of maturity and unfavourable weather for growth. The contents in stems were below 0.21% required for rams (NRC, 1975) especially during the dry season.

Magnesium.

Its contents did not vary with the SRs. Similarly, no difference was observed (Table 2) in the Mg content of the grass species during the five GPs. The average level of Mg in the pasture was higher than 0.04% recommended for non lactating sheep (NRC, 1975).

Structural components.

The mean ADF contents were 44.6 and 55.7 % for the leaf and stem of Rhodes grass respectively at day 0 in GP3. There was no response in ADF content as SR and grazing days increased due to absence of new tillers and the non significant deposition of lignocellulose in plant organs (Colburn and Evans, 1967).

NDF content in GP2 increased with increasing SR and grazing days. However, there were no significant effect in GP3. The contents reported for grass stems ranged from 78.2 to 80.6%. There were no changes in ADL contents in grass stems as SR and grazing days increased; suggesting that lignification process is relatively slow in the stems of the grass species after seed formation. The levels of cellulose for grass stems in this study ranged from 43.9 to 49.0%. The high values could be ascribed to the component sampled (stem) and absence of N fertilizer during the two periods (GP2 and GP3) when the analyses were carried out (Blake and Richards, 1970).

Table 2: *Mean contents (%) of phosphorus, potassium, calcium and magnesium in rhodes grass-stylo pasture over five grazing periods*

Mineral		Day	Grazing period 1 Stem	1 Leaf	2 Stem	2 Leaf	2 Stylo	3 Stem	3 Leaf	4 Stem	5 Leaf
Stem+Leaf											
P		0	0.13[a]	0.18[a]	0.13	0.21	0.16	0.14	0.22	0.23	0.30
	0.30[a]										
		126[y]	0.03[b]	0.09[b]	0.14	0.16	0.20	0.11	0.15	0.14	ND
	0.20[b]										
		SEM[z]	0.007	0.009	NS	NS	NS	NS	NS	NS	-
	0.008										
K		0	0.91[a]	1.23[a]	1.12	1.56	1.54[a]	1.75[a]	2.09[a]	0.81	1.09
	1.70[a]										
		126	0.45[b]	0.70[b]	1.00	1.29	1.12[b]	0.98[b]	1.08[b]	0.82	ND
	1.19[b]										
		SEM	0.03	0.04	NS	NS	0.06	0.15	0.10	NS	-
	0.01										
Ca		0	0.17[a]	0.45[a]	0.21	0.38[a]	0.22[b]	0.21	0.38[a]	0.26[a]	0.30
	0.31[a]										
		126	0.11[b]	0.40[b]	0.30	0.25[b]	0.37[a]	0.22	0.26[b]	0.15[b]	ND
	0.22[b]										
		SEM	0.006	0.02	NS	0.03	0.03	NS	0.02	0.02	-
	0.008										
Mg		0	0.08	0.13	0.06	0.06	0.06[b]	0.09	0.10	0.11	0.14
	0.11										
		126	0.06	0.13	0.08	0.08	0.10[a]	0.08	0.09	0.10	ND
	0.09										
		SEM	NS	NS	NS	NS	0.009	NS	NS	NS	-
	NS										

y - Day 84 for GP5 only, a,b- Values in the same column with different superscript are different, $P<0.05$
z - Standard error of the mean (12 observations per mean), ND, Not determined, NS, not significant, ($P>0.05$)

With ample supply of edible green leaves of grass and persistent legume(s) in the pasture, there may not be any need to supplement grazing sheep with any minerals, especially P and Ca during the periods examined in this study.

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