Enhancement of grassland production through integration of forage legumes in semi-arid rangelands of Kenya

P.N. MACHARIA[1], J.I. KINYAMARIO[2], W.N. EKAYA[2] AND C.K.K. GACHENE[2]
[1] *KARI-Kenya Soil Survey, PO Box 14733, 00800 Westlands, Nairobi, Kenya, E-mail: pnmacharia@hotmail.com,* [2] *University of Nairobi, PO Box 30197, 00100 GPO, Nairobi, Kenya*

Introduction

Livestock production in semi-arid rangelands of Kenya is limited by the seasonal quantity and quality of fodder. Kirkman and Carvalho (2003) stated that these inter- and intra-seasonal quality and quantity fluctuations result in nutrient deficits that severely limit livestock production potential. The objective of this experiment was to study the effect of three forage legumes on the production of natural pastures in semi-arid rangelands of Kenya.

Materials and methods

The study was conducted in Kajiado District in semi-arid south-eastern Kenya, which has a low and erratic annual rainfall of about 500 mm which occurs in two distinct seasons. The long rains (LR) season occurs between March and May while the short rains (SR) season occurs between October and December each year. A legume and grass integration experiment was set up in 2002 with the treatments *Neonotonia wightii* (glycine), *Macroptilium atropurpureum* (siratro) and *Stylosanthes scabra* (stylo) planted as pure stands as well as in mixed stands with the natural grass. The dominant grasses in the pasture were *Dichanthium insculpta*, *Chloris roxburghiana*, *Themeda triandra* and *Eragrostis superba.* Dry matter (DM) yield was measured by cutting at 0.15 m height on a bi-monthly basis. Excavation of whole plants to determine their root depths was done after five months of growth, while stem counts and length measurements were done after two seasons of growth.

Results and discussion

By the third season, glycine in monoculture produced more (P = 0.0021) DM than the other treatments (Table 1). It produced more than three times the DM of siratro, even though both species have the same prostrate growth habit. This can be explained by the fact that, after two seasons of growth, glycine produced 14 stems/plant which were 2.55 m long, while siratro produced 8 stems/plant which were 1.85 m long.

Further, the three forage legumes were self-seeding, with new seedlings spontaneously germinating at the onset of the rainfall season in March and October each year. The taproots of glycine, siratro and stylo were to 0.80, 0.95 and 0.85 m depths, respectively, well beyond the rooting depth of the grasses, which had about 80% of their roots located between 0–0.3 m depth.

Table 1. Seasonal dry matter production (t/ha) of three tropical legumes, alone or in combination with native grasses.

Treatments	Seasons			Mean
	LR 2003	SR 2003–4	LR 2004	
Grass	3.3	3.2	3.0	3.2b[1]
Glycine	4.5	11.2	9.5	8.4a
Siratro	0.8	3.8	2.7	2.4b
Stylo	2.7	2.8	4.3	3.3b
Grass + glycine	3.2	4.9	3.3	3.8b
Grass + siratro	4.2	4.1	4.0	4.1b
Grass + stylo	2.3	3.4	2.2	2.6b
Mean	3.0	4.8	4.1	
s.e. (Treatments) = 0.997: s.e. (Seasons) = 0.653				

[1]Means followed by the same letter are not significantly different (P=0.05).

Conclusions

The results demonstrate that glycine, siratro and stylo contributed to the DM production of the natural pasture. The DM yield of glycine (8.4 t/ha) in monoculture indicates its suitability for hay production and also as fodder in a cut-and-carry feeding system, especially for lactating and sick cows left around the homesteads during the dry seasons, when the bigger herds move away in search of pasture and water. This is the time when the natural pasture is at its lowest level in terms of quality and quantity. The three forage legumes are also difficult to uproot and are deep-rooted. These are desirable attributes with respect to propagation and naturalisation within pastures. For the legumes to germinate and establish into the natural pasture, there is a need to accord them a competitive advantage over the grasses at least during the first season, to allow the roots of the legumes to penetrate the 0.3 m depth reached by most fibrous roots of the grasses.

Reference

KIRKMAN, K.P. and DE FACCIO CARVALHO, P.C. (2003) Management interventions to overcome seasonal quantity and quality deficits of natural rangeland forages. *Proceedings of the Seventh International Rangelands Congress.* pp. 1289–1297.