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Adaptation performance of various pasture legume species in Soroti and Lira districts

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Abstract

The experiment was to evaluate the agronomic performance and nutritive value of thirteen introduced forage legume accessions and identify the best forage legumes for overgrazed areas, clay and sandy soils. Four species namely: *Chaemocrista rotundifolia* (Sirani Wynn), *Macroptilium atropurpureum* (cv. Aztec), *Centrosema pubescens* and *Stylosanthes scabra* (c.v. Sirani) showed high agronomic performance and nutritive value. *Chaemochrista rotunfifolia* (c.v Wynn) showed good establishment, aggressiveness, high seed production, drought tolerance and is free from pests and diseases. *Macroptilium atropurpureum* (c.v. Aztec) established easily, is drought tolerant and was a good seed producer. Both *Chaemochrista rotundifolia* and Macroptilium atropurpureum were high in DM yields and in CP content . *Centrosema pubescens* establishes easily, was a high seed yielder, drought tolerant, high in DM yield and CP content. Stylosanthes scabra (c.v. Siran) establishes easily, was a good seed yielder, fairly drought resistant and fairly high in CP content. Basing on the overall performance, it is recommended that the four legumes, namely:- *Chaemocrista* rotundifolia (c.v Wynn), *Macroptilium atropurpureum* (c.v. Aztec); *Centrosema pubescens* and *Stylosanthes scabra* (c.v Siran) be in the first batch for on-farm trials.

Key words: Dry matter; Chemical composition; Different sites; Overgrazed areas; Clay and Sandy soils.

Introduction

Improvement of the livestock industry in Uganda is currently a major undertaking. Besides breeding programmes for more productive livestock breeds, efforts are also geared towards generating technologies for growing improved pastures with high feed quality. Pastures native to Uganda are predominantly grass-based and tend to fluctuate in feed quality and quantity due to seasonal changes (Sabiiti *et al.* 1994).

The importance of livestock as a means of sustenance, as a substantial source of nutrients for humans, for manure agriculture and as a means of hedging against risk and uncertainty in lives of people of Sub-Saharan Africa has been appreciated for centuries. The majority of Teso and Lango households keep various livestock (cattle, chickens, pigs, goats and sheep) to supplement income and food obtained from crop production.

Livestock production in Africa faces many constraints, among which the most widely spread is the shortage of feed supply (Winrock International, 1992). The farming system in the northeastern region is agro-pastoral, characterized by light and infertile soils, heavy precipitation in the two rainy seasons and a fairly prolonged dry season from December to March (Akwang *et al.* 1998). Land use is dominated by mixed smallholder rainfed agriculture, producing cereals, pulses and livestock.

Feed resource availability varies across the year, being inadequate in quality and quantity during the long dry season. The crude protein can be as low as 3% which is below the critical 7% CP level in the diet of ruminants (Tarawali *et al.* 1987). The pastures predominantly comprise of unpalatable grasses like *Imperata cylindrica (*spear grass), *Hyparrhenia spp.* (thatch grass) and *Cymbopogon* spp. and have very low (<10%) legume (and) content (Akwang *et al.* 1998), and this partly explains the low milk yields from cattle in the area. Hence the need to examine the role of pasture legumes in the region as an alternative to the use of expensive nitrogen fertilizers (Akwang *et al.* 1998; ICRA, 1999).

The study was carried out to address the nutritional deficiency in the local pastures by identifying the most

suitable pasture legumes for overgrazed areas, clay and sandy soils of Soroti and Lira districts.

Materials and Methods

Ten accessions of improved forage legume germplasm were received from CSIRO – Australia and three from CIAT – Cali, Columbia. The germplasm was evaluated at three sites: Serere, Ngetta and Kaberamaido. The experiments were laid out in a randomised complete block design. The treatments were replicated four times. Replicate samples of green leaf were taken for each of the accessions using a 1 m^2 quadrant. These were weighed after which their yields in kilogrammes per hectare were computed. Sub-samples were dried in an air-draught oven at 60°c to constant weight for DM determination. The dried materials were ground through a laboratory mill 1 mm screen and stored in plastic bottles till analysed.

Laboratory analysis

The samples were analysed for dry matter (DM) and crude protein (CP) by standard methods of the Association of Official Analytical Chemists (AOAC, 1980). Neutral detergent fibre (NDF) acid detergent fibre (ADF) and acid detergent lignin (ADL) were analysed using methods described by Goering and Van Soest (1970).

Data analysis

The statistical analysis was done using a two-factor analysis of variance on a MSTATIC programme on a computer and means were separated using Duncan's Multiple stage method.

Results and Discussion

The results on identification of the most suitable legumes for overgrazed areas, clay and sandy soils are shown in Tables 1, 2 and 3. Table 1 and 2 show the general growth attributes while Table 3 shows their nutritive value and D.M yields. Many of the species under the study showed good persistence. Apart from *Arachis pintoi* which formed seed underground, which also lost viability very fast, all other species showed a high ability of spreading naturally (Table 2). The results in Table 3 show that all species maintained high dry matter yields (1450 – 6920 kg DM/ha) at all the three sites.

Table1: Germination, flowering, podding, seeding and soil Cover

			Days after planting				
Species Name	Accesion No	Source	Germination	Flowering	Podding	Ripe seed	Soil cover
							over
Desmanthus virgatus (Cv Bayamo)	82285	89-27	4	70	97	104	40%
Sylosanthes scabra (cv. Seca)	L6-89	89-88	5	49	65	81	30%
Desmanthus virgartus (cv. Marc)	78373	93-07	4	35	62	71	40%
Stylosanthes hamata (cv. Verano)	L30-86	86-88	4	42	63	68	38%
Stylosanthes scabra (cv. Sirani)	L3-93	88-93	5	49	55	60	54%
Stylosanthes scabra (cv. Amarillo)	2-90	90-088	5	35	49	150	67%
Arachis pintoi (cv. Amigo)	L10-93	93-88	4	70	*	77	30%
Centrosema pubescens	S942	SAARI	4	70	80	94	62%
Chaemocrista pilosa	7503	84-41	3	35	40	46	48%
Stylosanthes guianesis	SR811	SAARI	4	35	62	67	53%
Macroptilium atropurpureum	S949	SAARI	3	33	47	54	59%
Macroptilium atropurpureum (cv.Aztec)	L9-94	94-86	4	36	48	56	48%
Chaemocrista rotundifolia (cv.Wynn)	L39-93	93-88	4	35	40	55	40%

* Pods were formed underground

Table 2: General observations made on the species at the 3 sites

Species Name	Accession No.	Source	Remarks
Desmanthus virgats(cv. Bayamo)	82285	89-27	Easy to establish, good growth, produces a lot of seed, high pod shattering, loses leaves during the dry season, attacked by scale insects.
Stylosanthes scabra (cv.Seca)	L6-89	89-88	Easy to establish, good seed yield, high pod shattering, considerable leaf drop during the dry season, not aggressive.
Desmanthus virgatus (cv. Marc)	78373	93-07	Easy to establish, good seed yield, high pod shattering, considerable leaf drop during the dry season, attacked by scale insects.
Stylosanthes hamata (cv.Verano)	L30-86	86-88	Poor establishment, most leaves turn yellow and drop off during the early part of the dry season, not aggressive.
Stylosanthes scabra (cv. Sirani)	L3-93	88-93	Good establishment, does not cover soil well, good seed yield, fairly drought tolerant, attacked by scale insects.
Stylosanthes scabra (cv. Amarillo)	2-90	90-088	Slow to establish, loses leaves during drought, low seed yield and quality, free of pests and disease.
Arachis pintoi (cv. Amigo)	L10-93	93-88	Slow to establish, does not cover soil well, leaf yellowing and drop during the dry season, free of pests and disease
Centrosema pubescens	S942	SAARI	Good establishment, high seed yield, remains green for the greater part of the drought, attacked by aphids at flowering
Chaemocrista pilosa	7503	84-41	Easy to establish, high seed yields, moderate pod shattering, tolerant to drought.
Stylosanthes guianesis	SR811	SAARI	Poor seedling vigour, drought tolerant, attacked by anthracnose
Macroptlilium atopurpureum	S949	SAARI	Good establishment, drought tolerant, produces a lot of pods during the dry season.
Macroptilium atropurpureum (cv. Aztec)	L9-94	94-86	Good establishment, drought tolerant, produces a lot of pods though leaves become smaller, produces a lot of pods in the dry season, attacked by aphid.
Chaemocrista rotundifolia (cv. Wynn) L	39-93	93-88	Good establishment, very aggressive, produces a lot of pods, leaves become smaller and stay green during the dry season, considerable shattering of pods, free from pests and diseases.

Table 3: Mean nutritive value and DM yield of the species

Species Name	*Accession No.*	*Source*	*Nutritive value (% in the DM)*				*DM Yield (kg/ha)*		
			CP	**LIGNIN**	**NDF**	**ADF**	**Serere**	**Ngetta**	**Kaberamaido**
Desmanthus virgatus (cv. Bayamo)	82285	89-27	16.28	5.0	49.0	28.0	1600	1620	1600
Stylosanthes scabra (cv. Seca)	L6-89	89-88	13.62	6.0	51.0	30.0	2400	2300	2500
Desmanthus virgatus (cv. Marc)	78373	93-07	16.30	8.0	52.0	29.0	1500	1580	1450
Stylosanthes hamata (cv. Verano)	L30-86	86-88	13.80	5.0	54.0	31.0	3500	3800	3200
Stylosanthes scabra (cv. Sirani)	L3-93	88-93	14.20	4.0	52.0	32.0	1800	1900	1650
Stylosanthes scabra (cv. Amarillo)	2-90	90-088	16.24	6.0	48.0	28.0	2400	2200	2100
Arachis pintoi (cv. Amigo)	L10-93	93-88	14.21	5.0	53.0	32.0	3300	3200	3420
Centrosema pubescens	S942	SAARI	18.40	5.0	52.0	29.0	4450	4500	4300
Chaemocrista pilosa	***7503***	***84-41***	***21.20***	***6.0***	***50.0***	***28.0***	***2500***	***2100***	***2000***
Stylosanthes guianesis	SR811	SAARI	15.62	5.0	51.0	29.0	4600	4400	4300
Macroptilium atropurpureum	S949	SAARI	16.72	6.0	53.0	30.0	4800	4700	4650
Macroptilium atropurpureum (cv.Aztec)		***L9-94***	***94-86***	***17.40***	***6.0***	***51.0***	***31.0***	***4900***	***4800 4800***
Chaemocrista rotundifolia (cv. Wynn)	L39-93	93-88	20.24	5.0	52.0	30.0	6220	6800	6900

Conclusion and Recommendation

Basing on the overall performance, it is recommended that four of the legumes namely:- *Chaemocrista rotundifolia (c.v. Wynn), Macroptilium atropurpureum (c.v. Aztec), Centrosema pubescens and Stylosanthes scabra (c.v. Sirani)* be in the first batch for on-farm trials.

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