An evaluation of some accessions and varieties of *Stylosanthes* introduced in Adamawa Plateau, Cameroon

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Abstract

An evaluation of the adaptability and productivity of several accessions of *Stylosanthes* species was carried out at the Animal Research Station in Wakwa on the Adamawa Plateau, Cameroon. Before the field study a germination trial was conducted on seeds of each accession. The field study included three yield assessments: (i) seed production, (ii) cumulative yield from cuts at 60-day intervals during the wet season and (iii) uninterrupted growth at the end of the following dry season. Yields of 394 kg/ha, 357 kg/ha and 256 kg/ha of seed were recorded for *S. guianensis* FAO 46004, FAO 46482 and FAO 46484, respectively. *S. guianensis* FAO 46004 also ranked first for productivity with 5.1 t DM/ha while *S. guianensis* FAO 46497 gave a biomass production of 5.3 t DM/ha at the end of the dry season.

Evaluation de certaines acquisitions et variétés de *Stylosanthes* introduites sur le plateau de l'Adamaoua au Cameroun

Résumé

L'adaptabilité et la productivité de plusieurs acquisitions de Stylosanthes *ont été évaluées à la station de recherche zootechnique de Wakwa sur le plateau de l'Adamaoua (Cameroun). Précédée d'un essai de germination des semences, l'étude en milieu réel comportait trois volets, à savoir 1) la production de semences; 2) l'évaluation de la production cumulée de coupes effectuées à 60 jours d'intervalle pendant la saison humide; et 3) l'évaluation de la croissance jusqu'à la fin de la saison humide suivante. Les acquisitions FAO 46004, FAO 46482 et FAO 46484 de* S. guianensis *ont produit respectivement 394, 357 et 256 kg de semences par hectare. Par ailleurs, l'acquisition FAO 46004 de* S. guianensis *venait en tête pour la productivité avec une production de 5,1 t de MS/ha tandis que FAO 46497 également de* S. guianensis *avait produit 5,3 t de MS/ha à la fin de la saison sèche.*

Introduction

The alternation of dry and rainy seasons in the savannah region of West Africa has a great impact on the productivity of rangelands. During the rainy season, range plants grow fast and although their quality may be adequate early in the season, they mature rapidly with a

resulting decline in nutritive value (Pamo and Pieper, 1992, unpublished). This constrains the productivity of ruminant livestock that depend mainly on rangelands.

Pastoralists try to overcome this shortage of quality feed by practising nomadism and transhumance. However, these strategies are inadequate as cattle still lose 15–20% of their body weight during the dry season (Otchere, 1986; Mani et al, pp. 155–165), milk yields are low, calf mortality is high and many cows are unable to conceive because of nutritional anoestrus.

Legumes are desirable components in pasture where soil nitrogen is limiting and there is a need to increase crude-protein levels in herbage for dry-season grazing. A research programme was initiated at the Wakwa Animal Research Station in 1976 to identify legume species adapted to the Adamawa region to improve the quality and productivity of natural pastures. This paper presents some preliminary results obtained from the introduction of different *Stylosanthes* accessions between 1981 and 1983.

Materials and methods

The study was conducted at Wakwa Research Station situated about 8 km from Ngoundere, the Adamawa provincial capital, at about 1200 m above sea level. The long-term mean annual rainfall of the region is 1700 mm (Pamo and Yonkeu, 1986). The rainy season lasts for about seven months (April–October) with a rainfall peak during August and September.

The experimental site has a dark basaltic soil with pH of 5.4, organic–matter content of 4.9%, total nitrogen of 2.3% and an adequate amount of available phosphorus (92 ppm according to Olsen et al, 1954), but with low cation exchange capacity (Yonkeu et al, 1986).

The various accessions and species of *Stylosanthes* tested came from different international organisations (Office de la recherche scientifique et technique outre-mer (ORSTOM), Centro Internacional de Agricultura Tropical (CIAT), FAO etc). Before field seeding, an indoor germination trial was carried out on all accessions in 1980. Two hundred seeds of each cultivar were selected and divided into two halves. One half was treated by dipping in hot water (60°C) for three to five minutes. Treated and untreated seeds were further divided into two replicates of 50 seeds each. The seeds were scattered in petri-dishes with wet blotting paper and covered with lids. Every morning for 10 days, germinated seeds were recorded and removed. At the end of this period, the percentage of germinated seeds from treated and untreated seeds was calculated.

Each accession was grown on a 12 x 7.5 m main plot divided in three subplots (A, B and C) with two replicates of 3 x 3 m for the evaluation of seed and forage production. The following were performed in the three subplots:

- In subplot A, cumulative yield was measured during the rainy season by cutting every 60 days.
- In subplot B at the end of the dry season, biomass was cut and weighed, and effects of diseases, parasites and predators were assessed.
- In subplot C, seed yield and phenological events were recorded.

Forage was cut at about 15 cm above ground level and weighed immediately. A 500 g sample was oven-dried for dry-matter determination. At maturity, seeds were hand-harvested in a known surface area, cleaned and weighed.

Results and discussion

Germination

The best germination rates were recorded with treated seeds (Table 1). Treated Stylo cv 46004[1] recorded a 98% germination rate while untreated Stylo 46498 ranked first with a

1. All accessions are referred to by their FAO numbers; Stylo is *S. guianensis*.

germination rate of 44%. Untreated Stylos 46492, 46489 and *S. hamata* 46007 recorded the poorest germination rate (1%). These results are in agreement with previous results (Skerman, 1977). Accessions FAO 46502 and 46572 did not perform well even when treated; this may have been due to poor-quality seed since in the field trial cv 46502 performed relatively well.

Seed yield

High seed yield is an important attribute of success because it has an impact on the cost of commercial seed and on soil seed reserves for recruitment of new seedlings in pastures. Due to variable growth rates, some accessions had good potential for seed production: *Stylo* 46004, 46482 and 46484 ranked highest with 394 kg, 357 kg and 256 kg/ha of seed, respectively, while cv 46489, 46500 and 46492 show promise and should be kept under close observation (Table 1). These results are better than those obtained in Zaire by Risopoulos (1966) or in Queensland where seed yields reached 330 kg/ha (Gilchrist, 1967). Skerman (1977) reported an average *Stylosanthes* seed production of between 90 and 100 kg/ha.[2]

Table 1. *Seed yield and germination percentage of treated and untreated seed of FAO accessions of* Stylosanthes.

Accessions	Germination(%)		Seed yield (kg/ha)
	Treated	Untreated	
46004	98	5	394
46482	83	2	357
46484	73	10	256
46489	53	1	162
46500	80	4	148
46492	83	1	107
46499	80	2	99
46491	63	6	98
46498	96	44	52
46481	83	2	–
46493	76	10	–
46497	31	5	–
46502	2	8	–
46495	–	5	–
S. capitata 46009	69	2	80
S. subsericia 46512	1	5	51
S. hamata 46009	–	–	80
46007	–	1	21

Seed production of the other *Stylosanthes* species was much lower than for stylo accessions. Yields of *S. hamata* were surprisingly low in view of the high yields reported by Agishi (pp. 275–285).

Forage production

The rainy season forage production of the different stylo cultivars was highly variable (Table 2). *Stylosanthes guianensis* 46004 was best followed by 46482 and 46493. These yields are in agreement with some studies cited by Skerman (1977), but are lower than the 11 t DM/ha of DM recorded by Gilchrist (1967) in Queensland and the 19–20 t DM/ha obtained

2. Seed yields are comparable to those reported by Kachelries and Tarawali (pp. 291–301), but much lower than the yields summarised by Agishi in Table 2 (p. 286).

Table 2. *Wet- and dry-season yields (t DM/ha) of* Stylosanthes guainensis *accessions over three years, 1981–83.*

Accession	1981		1982		1983		Mean	
	Wet	Dry	Wet	Dry	Wet	Dry	Wet	Dry
46004	4.62	–	4.28	4.08	6.26	1.19	5.01	–
46482	3.05	5.50	5.40	4.76	5.71	2.70	4.70	4.32
46484	2.61	11.38	2.77	7.36	6.48	1.65	3.96	6.80
46489	3.85	5.20	1.75	2.86	5.62	1.39	3.74	3.15
46481	0.63	–	3.67	6.01	6.46	1.48	3.59	–
46491	1.97	5.36	3.50	0.49	3.68	0.75	3.05	2.20
46498	2.28	4.09	2.77	4.68	3.93	1.37	2.99	3.38
46497	2.12	6.58	3.17	6.17	3.54	3.24	2.94	5.33
46503	1.36	–	2.33	–	2.35	–	2.01	–
46499	3.00	–	2.21	–	–	–	–	–
46500	–	–	5.80	2.41	4.91	1.27	–	–
46502	–	–	–	0.85	–	0.71	–	–
46493	–	5.31	–	3.56	–	1.93	–	3.60

by Pamo and Yonkeu (1989) in the Faro lowlands of the Adamawa plateau. Nevertheless, these yields appear promising especially as no phosphorus fertiliser was applied.

The other *Stylosanthes* species (*hamata, capitata* and *fructicosa*) also showed variable results and yielded less than most of the stylo cultivars both during the rainy and the dry seasons (Table 3). The general decline in forage production in 1983 was due to the severe dry season. No specific disease, parasite or predator effects were recorded.

Table 3. *Wet- and dry-season yields of accessions of* S. capitata, S. fruticosa *and* S. hamata *over three years, 1981–83.*

Accession	1981		1982		1983		Mean	
	Wet	Dry	Wet	Dry	Wet	Dry	Wet	Dry
S. capitata								
46009a	1.08	2.64	0.90	2.56	1.18	0.65	1.06	1.92
460096	1.08	2.43	0.90	2.56	3.21	1.23	1.37	2.07
S. fruticosa[1]	-	–	3.62	1.42	3.38	1.81	–	–
S. hamata[2]	2.03	1.62		1.24		1.63		

1. FAO 46477.
2. FAO 46007.

Evaluating Stylo cultivars on three major attributes — seed, wet-season yield under cutting and end of dry season yields over a three-year period — appears sound (Table 4). This evaluation identified three cultivars (46482, 46484, 46004) that excelled in all attributes, whereas others performed poorly when cut, but yielded better in the dry season (e.g. 46489, 46497). Some other cultivars (46406, 46493, 46500) showed promise but did

not undergo the entire screening procedure. Other attributes such as persistence may be added; the best cultivars persisted well, while others (46406, 46491) showed poor dry-season performance. Appraisal by attributes may be useful when recommending mixtures. This is particularly important when year-round use is envisaged including grazing, cut and carry in the wet season and hay-making for the dry season. If a final attribute like anthracnose tolerance were added, mixtures could be "balanced" for risk-spreading.

Table 4. *Production scores of the six most promising* S. guianensis *accessions.*

FAO accession	Seed production		Rainy season production		Dry season production		Total score
	Yield (kg/ha)	Score	Yield (t/ha)	Score	Yield (kg/ha)	Score	
46482	357	5	4.70	5	4.32	5	15
46484	256	4	3.95	4	6.80	6	14
46004	394	6	5.05	6	1.76	2	14
46489	162	3	3.74	3	3.15	4	10
46491	98	1	3.05	1	2.20	3	5
46500	148	2	3.57	2	1.22	1	5

This preliminary evaluation has clearly shown the adaptability and high potential for stylo production in the Adamawa region for improved pastures. The environmental conditions of this area appear favourable for high forage yields. However, more research is needed to identify the best agronomic practices and management techniques to improve and sustain these yields. Few other species of *Stylosanthes* were included in the evaluation, hence screening and evaluation of a broader range of legumes is recommended.

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