PERSISTENCE OF SELECTED *STYLOSANTHES* ACCESSIONS IN PENINSULAR FLORIDA, U.S.A.

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ABSTRACT

Persistence of nine accessions of Stylosanthes guianensis *var.* guianensis, *three accessions of* S. hamata, *and* S. humilis *(Townsville stylo) was compared with that of* Aeschynomene americana *in grass swards under grazing on a Spodosol site in peninsular Florida. None of the accessions perennated, but most flowered and set seed. Stands of* A. americana *decreased from essentially complete stands in 1982 to 80% coverage of the original planted rows in 1984. Although several* S. guianensis *accessions covered 50% or more of the original rows in the autumn of 1982 (90% stand for* S. guianensis *accession 7812), no* Stylosanthes *accession occupied more than 10% of the original rows by the autumn of 1984. Dense grass competition appeared to be a greater limitation to persistence of these* Stylosanthes *accessions than the grazing imposed. Even the* S. guianensis *var.* guianensis *and* S. hamata *accessions, which had been selected for persistence from the agronomically desirable types, were not able to persist as well as* A. americana *in the dense grass swards under grazing in this seasonally wet, subtropical environment.*

INTRODUCTION

The genus *Stylosanthes* includes several species which have potential value as forage plants in subtropical areas. Burt *et al.* (1974) reported such potential for *S. guianensis* and also noted a wide range of adaptability for *S. hamata*. Initial evaluation of *Stylosanthes* germplasm in subtropical, peninsular Florida indicated potential for the annual species, *S. humilis* (Kretschmer 1968). However, only limited commercial success with *S. humilis* has been achieved primarily due to inability of seedlings to compete with dense perennial grass stands. In recent years, *Stylosanthes* germplasm has been intensively evaluated in peninsular Florida (Brolmann 1977, 1979, 1980, and 1982; Coelho *et al.* 1981). From this germplasm evaluation, several accessions of *S. guianensis* var. *guianensis* (J. B. Brolmann, *unpublished data*) and two native *S. hamata* accessions (Brolmann 1977) have been the most persistent of the agronomically desirable types in plot evaluations.

Stylosanthes guianensis accessions representing a range in photoperiodic response as reported by Coelho *et al.* (1981), accessions of *S. guianensis* selected by Brolmann for persistence in peninsular Florida, two native *S. hamata* accessions which had persisted in plots, and the commercial cultivars, Townsville stylo (*S. humilis*) and Verano stylo (*S. hamata*), were selected for evaluation of stand persistence in grass swards under grazing in peninsular Florida. *Aeschynomene americana*, which is the most widely used tropical pasture legume in peninsular Florida, was included as a standard for comparison.

MATERIALS AND METHODS

Plant development and stand persistence of nine accessions of *S. guianensis* var. *guianensis*, three accessions of *S. hamata*, and Townsville stylo (see Table 1) were compared with *A. americana* at Ona, Florida (27° 26′ N latitude, 82° 55′ W longitude) from 1981 through 1984. Seedlings were established in peat cups using seed inoculated with 'cowpea' inoculum in the late spring of 1981 and transplanted to the field on July 30, 1981 after the first summer rains had provided favorable moisture conditions.

The field site was a flatwoods (Spodosol) area classified as an Immokalee fine sand (sandy, siliceous, hyperthermic Arenic Haplaquod) with a pH of 5.8. The flatwoods of peninsular Florida are typically droughty during the spring (March–May) and waterlogged periodically during late summer (July–September). Light frosts can occur as early as November and as late as March.

Field plantings consisted of single rows of each accession with 15 plants per row spaced 1.2 m apart within rows. Rows of different accessions were spaced 1.8 m apart. Plot layout was in a randomized complete block design with four replications. Immediately prior to transplanting the legumes, the plot area was seeded to Pensacola bahiagrass (*Paspalum notatum*) at a rate of 20 kg ha^{-1} pure live seed on a well-prepared seedbed. An 0–10–20 (N–P_2O_5–K_2O) fertilizer was applied each September and March at 280 kg ha^{-1} per application. Individual plant development was monitored throughout the 1981, 1982 and 1983 growing seasons. Flowering was monitored weekly during this time, and plant height and spread were measured every four weeks.

TABLE 1

Identification of Stylosanthes *accessions, plant survival and height during the establishment year measured on October 8, 1981, and flowering period during 1982–83 (daylength in parentheses)*

Accession	Species	Percent of plants surviving	Plant height	Flowering period	
		%	cm		hr
Townsville	*S. humilis*	43 ab**	36 bc	Sept. 13–Dec. 27	(12.4–10.4)
Verano	*S. hamata*	72 bcd	39 c	Aug. 30–Dec. 19†	(12.8–10.4)
7303*	*S. hamata*[1]	50 abc	24 ab	Oct. 18–Nov. 29	(11.5–10.6)
7413	*S. hamata*[1]	39 ab	18 a	no plants present	
2025	*S. guianensis*[2]	98 d	64 f	Sept. 23–Jan 13+	(12.1–10.4)
7035	*S. guianensis*[3]	77 cd	43 cd	Aug 3.–Jan. 13	(13.4–10.4)
7039	*S. guianensis*[4]	88 d	44 cd	Oct. 18–Dec. 19	(11.5–10.4)
7040	*S. guianensis*[5]	97 d	48 de	no plants present	
7572	*S. guianensis*[6]	88 d	43 cd	no plants present	
7812	*S. guianensis*[7]	88 d	54 de	Sept. 23–Dec. 27	(12.1–10.4)
7919	*S. guianensis*[6]	87 d	57 ef	Sept. 13–Dec. 21	(12.4–10.4)
7921	*S. guianensis*[6]	80 cd	48 de	Oct. 11–Dec. 21	(11.7–10.4)
7959	*S. guianensis*[6]	88 d	46 cde	Sept. 27–Dec. 21	(12.0–10.4)
Florida common	*Aeschynomene americana*	100 d	114 g	Sept. 23–Dec. 19	(12.1–10.4)

* University of Florida, Agricultural Research Center at Ft. Pierce identification number.
**Means in a column not followed by a common letter differ ($P < 0.05$) according to Duncan's Multiple Range Test.
† Date of first winter frost of the season which was light (0 °C) and killed the top-growth of only some plants.
+ Date of second frost of the season which was the first to kill top-growth of all accessions.
1. Indigenous to south of Florida; 2. from Panatal, Brazil; 3. USDA PI 401506; 4. PI 401510; 5. PI 401511; 6. selected for persistence; 7. selected for drought tolerance.

Two of the replications of the legume plants and 1 ha of surrounding pasture were grazed by two yearling steers during June and July of 1982. All four replications were grazed from mid May to mid September 1983 at a stocking rate of 3 head ha^{-1}. The plot area was not grazed in 1984.

RESULTS

Field establishment was generally satisfactory as shown in Table 1. The establishment period was wet with waterlogged soils during much of September. During this period, dense grass competition developed. Perhaps largely due to the dense grass competition, initial growth of all accessions was primarily upright. Thus, plant height provided a useful, nondestructive comparison of productivity among accessions. Although *S. guianensis* accessions were generally taller than accessions of the other two *Stylosanthes* species (Table 1), *A. americana* plants were taller than plants of all *Stylosanthes* accessions throughout the growing season.

All accessions flowered during October–November 1981. However, frost on November 22 prevented seed maturation for *S. hamata* accession 7413 and *S. guianensis* accessions 7040 and 7572. The remaining 10 *Stylosanthes* accessions regenerated at least some plants in 1982. This regeneration was from seed with no individual plants perennating.

Stand regeneration of the *Stylosanthes* accessions was less each spring from 1982 through 1984 (Table 2). All *Stylosanthes* accessions developed slower in the spring than *A. americana* as illustrated by the data in Table 2 for May 10, 1982. Although several *S. guianensis* accessions produced stands which were not significantly less than stands of *A. americana* by November 29, 1982 (Table 2), in both 1983 and 1984 all *Stylosanthes* stands were significantly less than stands of *A. americana*.

TABLE 2

Proportion (% of length) of the rows originally planted to a legume accession in 1981 occupied by the legume in subsequent years (visual estimates).

Accession	1982		1983	1984
	May 10	Nov. 29	Sept. 19	Dec. 6
	%	%	%	%
Townsville	10 abc*	35 ab	0 a	0 a
Verano	0 a	30 ab	8 a	0 a
7303	8 ab	1 a	0 a	0 a
7413	0 a	0 a	0 a	0 a
2025	20 abcd	50 abc	8 a	1 a
7035	5 a	55 abc	13 a	5 a
7039	1 a	5 a	23 a	1 a
7040	0 a	0 a	0 a	0 a
7572	0 a	0 a	0 a	0 a
7812	35 cd	90 c	33 a	10 a
7919	45 d	75 bc	28 a	10 a
7921	30 bcd	70 bc	5 a	5 a
7959	5 a	55 abc	5 a	1 a
Aeschynomene	100 e	100 c	95 b	80 b

*Means (of four replications) within each column not followed by a common letter differ ($P < 0.05$) according to Duncan's Multiple Range Test.

At the end of the grazing period in 1982, all *Stylosanthes* accessions had been grazed to about the same height (15 to 20 cm) as the grass sward. *Aeschynomene americana* plants had been grazed to a height of 5 to 10 cm. In the grazed treatment, pronounced decumbent spreading growth of lower branches occurred on *S. guianensis* accessions 7035, 7812, 7919, and 7921. Growth of *Stylosanthes* accessions in the ungrazed treatment was essentially upright, and height ranged from 45 cm for Verano and *S. guianensis* accession 7812 to 90 cm for *S. guianensis* accession 2025. General sward height varied from 40 to 90 cm with dense stands of the sown bahiagrass and naturally occurring *Cynodon dactylon*, *Paspalum urvillei*, and *Indigofera hirsuta*. There were no consistent differences between the grazed and ungrazed treatments in flowering date in 1982 or in subsequent regeneration in the spring of 1983.

The flowering periods of individual legume accessions during the autumn and early winter of 1982–1983 are shown in Table 1. Initial flowering times in 1982 were consistently earlier for individual accessions than in the establishment year of 1981 or in 1983 when the plantings were grazed until mid September.

DISCUSSION

Initial seedling development in 1982 indicated that most of the *Stylosanthes* accessions evaluated were adapted to the waterlogged soils and hot, humid summer environment of the peninsular Florida flatwoods. Once established, individual plants of most accessions proved to be both persistent under moderate grazing pressure and competitive in dense grass swards. Most accessions flowered early enough in the year for seed production prior to normal winter frost. Although plant regeneration of several accessions occurred from natural reseeding for three years, stands of these accessions decreased each year.

Previous evaluation in small plots had indicated that four of the *S. guianensis* accessions and the two native *S. hamata* accessions had potential to persist in this environment. In concurrence with the report of Cameron and Ludlow (1977) that *S. guianensis* var. *guianensis* (robust type) possessed insufficient cold tolerance to persist at temperatures down to $-5°C$, the light frosts encountered each winter were apparently responsible for lack of perennation of the *Stylosanthes* accessions which were perennial types. Late flowering prevented regeneration from seed of only three accessions. Failure of the remaining accessions to persist in adequate stands in the grass sward through annual reseeding was largely due to excessive grass competition by the time the *Stylosanthes* seedlings emerged. The perennial grass sward began growth 3 to 4 months earlier in the spring than emergence of even the earliest *Stylosanthes* accessions.

Even though late emergence and a short grazing season are major limitations in the commercial use of *A. americana* in south Florida, the *Stylosanthes* accessions evaluated were even later than *A. americana* in establishment of grazable stands each year. Value of the species, *S. guianensis* and *S. hamata*, as pasture plants in this seasonally wet, low fertility, subtropical environment is apparently dependent upon development of agronomically acceptable accessions that will perennate.

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FORMATION OF SEED YIELD IN *PANICUM MAXIMUM* CV. GATTON

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ABSTRACT

The components of seed yield were recorded in a seedling crop of Panicum maximum *cv. Gatton grown as an artificial sward in a glasshouse at St. Lucia, Brisbane, Australia. Individual heads emerging over 58 days were dated, time of start of anthesis recorded, and seeds harvested by hand-shaking. Rate of head appearance reached a maximum of c. 12* m^{-2} day^{-1} *11 days after first head emergence and continued at c. 3* m^{-2} day^{-1} *thereafter. Branch number per head and 100-seed weight were relatively constant, but number of spikelets per branch decreased sharply with later date of head emergence, and seed setting was also greater on early-formed heads. Shedding of individual spikelets occurred at a*