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EVALUATION OF *PASPALUM* SPP. WITH ADAPTATION TO POORLY DRAINED SOILS IN THE TROPICAL AMERICAS

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Abstract

A collection of *Paspalum* accessions obtained from Brazil was tested for their adaptation to poorly drained soils. Three accessions were selected based on their DM production and nutritive value. Productivity and quality of these three accessions was stable over the periods of maximum and minimum rainfall, giving potential for continuos forage supply throughout the year in the tropical Americas. Grazing trials for the selected accessions are underway.

Keywords: *Paspalum arundinellum; Paspalum atratum; Paspalum guenoarum; Paspalum plicatulum*; *Paspalum* SP.; waterlogging

Introduction

Large areas of poorly drained soils occur in the savannas of tropical America. Widely distributed forages such as *Brachiaria decumbens* and *Brachiaria brizantha* are poorly adapted to these environments (Hare et al., 1999a). In contrast, some species of *Paspalum* are known for their adaptation to poorly drained conditions and their tolerance of the major pest of pasture grasses in Tropical America, spittlebug (Grof et al., 1989, Hare et al., 1999a,b; Kalmbacher et al., 1997a). A collection of material introduced from Brazil therefore has been tested under seasonally inundated conditions in Colombia.

Material and Methods

A collection of 8 accessions of Paspalum species had been obtained from EMBRAPA Genetic Resources in Brazil; *Paspalum* sp. CIAT 26982 (BRA-009415), 26983 (BRA-009687), 26984 (BRA-010537), 26988 (BRA-012874), *Paspalum guenoarum* CIAT 26985 (BRA-003824), *Paspalum atratum* CIAT 26986 (BRA- 009610), *Paspalum arundinellum* CIAT 26987 (BRA-012602) and *Paspalum plicatulum* CIAT 26989. The material was planted vegetatively in rows at a distance of 50 cm in November 1996 at CIATs experimental station in Santander de Quilichao (Latitude 3 6' N, Longitude 76 3' W). The site is located at an elevation of 990 asl and has an average annual temperature of 24°C and annual rainfall of 1800 mm. During the time of the experiment, annual rainfall was 1798, 2030 and 2204 mm in 1997, 1998 and 1999 respectively. The soil at the experimental site is a poorly drained Ultisol, with a pH of 4.2 and an organic matter content of 6.9% in the topsoil (0-20cm).

A Randomized Complete Block Design with three replications was employed. Fertilization was 40 kg/ha P at establishment, with an annual maintenance dressing of 22 kg/ha P, 40 kg/ha K, 20 kg/ha Mg and 20 kg/ha S.

A standardization cut was done approximately one year after planting in December 97. Subsequently evaluation for Dry Matter (DM) production was done every 6 weeks. For this paper we summarized yields over minimum and maximum rainfall periods. Samples for quality analysis were taken once in the period of minimum and once in the period of maximum rains. Samples were dried at 70°C for 72 hours and dry weight recorded. Subsequently samples were milled though a 1mm sieve and analyzed for *In-vitro* dry matter digestibility (Moore 1970) and total N (Chapman and Pratt 1961) to calculate crude protein contents (%N * 6.25).

Data was analyzed using Analysis of Variance followed by mean separation using the Duncan procedure. The confidence level for mean separation was set at 5%.

Results and Discussion

Problems were encountered in the generative reproduction of the accessions; therefore material was propagated by cuttings. We confirm in this study the ease of vegetative propagation of *Paspalum* spp. - at least for the accessions under evaluation - as reported by Hare (1999b).

Of the 8 accessions planted, CIAT 26988 did not establish and was therefore excluded from further analysis. Dry matter (DM) yields of 6 week regrowths – averaged over the two years of the experiment - ranged from 670 to 2800 kg/ha and 714 to 2900 kg/ha for the periods of minimum and maximum rainfall, respectively. In both seasons the order of accessions was the same, CIAT 26986 followed by 26989, 26987 and 26985 (Figure 1). The first two accessions in both periods yielding significantly ($P<0.05$) more DM than CIAT 26985, 26983, 26982 and 26984. Yields of *P. atratum* CIAT 26986 (=BRA 009610, = cv. Ubon in Thailand) are comparable to yields reported by Grof et al. (1989) for the Brazilian Cerrados but substantially lower then the ones reported by Hare et al. (1999a) and higher then the ones reported by Pizarro (1992). *P. atratum* CIAT 26986 maintained high levels of production in both seasons of the year, which is in agreement with results from the Cerrados of Brazil, Florida and Thailand. In contrast to results from Hare et al. (1999b) and Kalmbacher et al. (1997a), in our study all accessions maintained similar levels of productivity throughout the year, thus offering the possibility for a relatively stable forage supply. The resistance to frequent cutting, in our case every 6 weeks throughout the year of *P. atratum* CIAT 26986 confirms results of Hare et al. (1999b).

Data on the nutritive quality of the *Paspalum* accessions evaluated is still scarce. Our results confirm the large variations in quality of *Paspalum* accessions found by Pizarro (1992), the best accessions showing levels comparable to other tropical grasses (Table 1). Hare et al. (1999b) describe the reluctance of farmers in the utilization of *Paspalum plicatulum* because of its perceived low quality and palatability. At least in terms of protein and digestibility in our study *P. plicatulum* compares favorably with the other *Paspalum* species. However, we do not have sufficient data available to indicate interspecific variation in quality parameters.

Results on *Paspalum* spp. under grazing are even more scarce with the most ample information available for *Paspalum atratum* CIAT 26986. Results obtained with cattle in Thailand, Florida and Brazil, indicated liveweight gains of 500-700 g/day and good persistence in the sward (Barcellos et al., 1997; Hare et al., 1999b; Kalmbacher et al., 1997b). In the case of *Paspalum atratum* CIAT 26986 planted in association with *Arachis pintoi*, liveweight gains were comparable to *Brachiaria* spp. - *Arachis pintoi* mixtures (Barcellos et al., 1997). In contrast to Hare's evaluation in Thailand there is therefore some potential of grass-legume mixtures based on *Paspalum* spp. and *A. pintoi*. However we do not yet know about differences among accessions of *A. pintoi* in respect to tolerance to waterlogging.

In this study we have confirmed the high potential of *Paspalum* spp for seasonally waterlogged soils in the Latin American tropics. On the basis of dry matter production and quality parameters, we selected *Paspalum atratum* CIAT 26986, *Paspalum plicatulum* CIAT 26989 and *Paspalum guenoarum* CIAT 26985 for further testing under grazing and more detailed studies on their quality and acceptability by grazing animals. Further regional testing, with and without legumes with farmer participation is suggested.

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Cultivar	1994	1995	1996	1997	1998	1999	Av.
	---------------------------------- Mg (tonne)/ha ----------------------------------						
Alamo*	9.6	20.6	16.4	11.3	11.6	16.3	14.3
Kanlo*	9.7	19.3	16.4	11.0	14.6	15.2	14.4
Cave-in-Rock**	8.6	12.0	11.3	10.0	12.1	12.9	11.2
Shelter**	7.6	12.1	9.1	8.0	11.8	12.0	10.1
NC-1*	7.7	19.6	14.5	11.2	13.4	13.4	13.3
NC-2*	7.8	18.7	16.2	11.7	16.1	14.9	14.2
LSD 0.05	1.4	2.4	1.6	2.2	2.1	3.4	

* = lowland
** = upland

Table 1 - Biomass yields of switchgrass at Princeton, KY. One-cut management with only one harvest at the end of the season in November

Cultivar	1994	1995	1996	1997	1998	1999	Av.
	------------	------------	------------	Mg (tonne)/ha	------------	------------	------------
Alamo*	16.0	19.6	14.5	13.4	16.0	13.6	15.5
Kanlo*	15.9	17.1	14.0	12.5	15.8	11.5	14.5
Cave-in-Rock**	15.7	14.3	12.7	10.9	14.8	11.4	13.3
Shelter**	11.0	12.9	10.0	8.2	12.9	9.1	10.7
NC-1*	9.2	15.2	12.3	13.0	15.3	13.6	13.1
NC-2*	11.7	16.2	12.7	11.7	15.3	13.8	13.6
LSD 0.05	1.4	2.4	1.6	2.2	2.1	3.4	

* = lowland
** = upland

Table 2 - Biomass yields of switchgrass at Princeton, KY. Two-cut management with one harvest in June and one in November

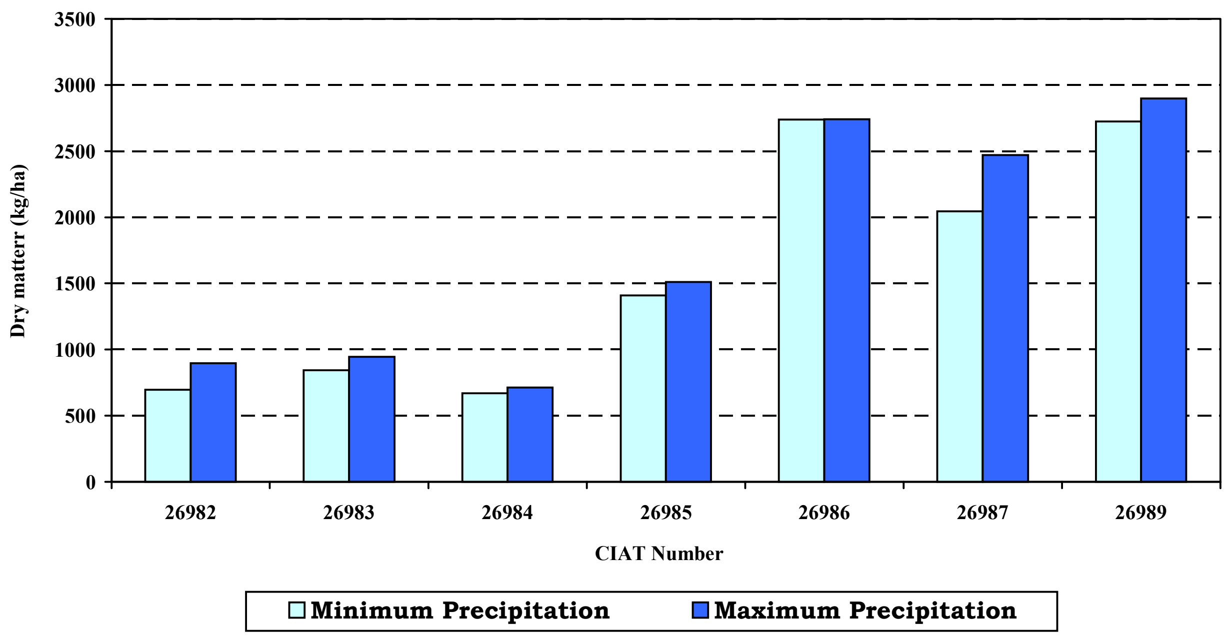

Figure 1 - Dry matter yields of seven accessions of *Paspalum* spp. planted on a poorly drained soil at Santander de Quilichao, Cauca, Colombia, as affected by rainfall precipitation.