Characterization of *Paspalum* Accessions as Ornamental Lawn

A.C.R. Castro[1], C.A.K. Taniguchi[1], F.H.D. Souza[1], F.A.S. Aragão[1], V. Loges[2], T.F. Silva[3], F.B.S. Café[3], E.B. Silva[3] and R.C.T. Rosa[4]
[1] Brazilian Corporation of Agricultural Research – Embrapa, Fortaleza, Brazil
[2] Universidade Federal Rural de Pernambuco – UFRPE, Recife, Brazil
[3] Universidade Federal do Ceará – UFC, Fortaleza, Brazil
[4] Instituto Agronômico de Pernambuco – IPA, Recife, Brazil

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Abstract

The lawn industry involves hundreds of millions of dollars around the world. Today, Brazilian lawns are formed mainly by *Paspalum notatum*. The native genus *Paspalum* contains a wide genetic variability between and within species. These germplasms are an important source to select genotypes with high potential for use as lawns. This study aimed to select the best *Paspalum* accession for use as cover for ornamental purposes. Main selection criteria are rapid expansion and low need for mowing under the conditions in northeastern Brazil. Five pre-selected *Paspalum* accessions (0102254, 043566, 023728, 010006 and 019178) were planted and field evaluations were made at two weeks intervals for two consecutive years after establishment. Soil coverage rate, ornamental quality (general appearance) of the lawn, extension of lateral growth, color homogeneity and weed invasion were rated by means of a visual appraisal. Based on the results obtained at the end of the 2nd year of cultivation, the accession 023728 had the highest scores and demonstrated an ornamental quality equal to or greater than the control.

INTRODUCTION

The use of turf grasses in the modern world fits into three major functional groups: sport, landscaping and the provision of so-called ecosystem services. The first two are well-established functions, yet the potential of significant ecosystems service provision from extensive land areas covered by turf grasses is only recent (Duller et al., 2010).

Despite the great diversity of native Brazilian flora, there are few species and cultivars of grasses used for planting lawns for gardens or functional areas (airports, industrial parks and roads) in Brazil. *Paspalum notatum* Flüggé, commonly known as Bahia grass is the most widely cultivated native species, mainly used along highways and can make excellent low-maintenance lawns. It forms an extensive and deep root system that makes this grass drought-tolerant and desirable for sod production (Newman et al., 2014).

Turf that is used for functional purpose is usually kept under a very low maintenance regime once initial establishment is achieved with no fertilizer and mowing once or twice a year. These situations include roadside verges, airfields and industrial site reclamation. Their purpose is to stabilize the soil, slow water run-off and in many situations provide wildlife habitat and help improve diversity (Duller et al., 2010).

Bahia grass is a low-growing creeping perennial with fibrous, rhizome-like stolons to >5 mm diameter, with short internodes and bearing shoots and deep fibrous roots at the nodes. It grows well in poor soils, has low vertical growth and adapts to different climate conditions including northeastern environmental conditions (high evapotranspiration) under which its flowering is scarce or non-existent (Newman et al., 2014).

Stolons are pressed firmly to the ground. Stems range from 15-70 cm (6-28 inch) high. Linear leaves vary from 3-10 mm wide, and 2-5 cm long near the stolon tip, to 20-50 (-50) cm in the upright shoots arising from the nodes. The inflorescence, a panicle, usually comprises two terminal racemes, 5-10 cm long, with spikelets inserted along the underside of the 1-mm wide rachis, straight or light. Bahia grass is a polymorphic species with different natural genotypes. Reproduction is by seed, and Bahia grass spreads

vegetatively. Potential methods of commercialization are sods, plugs and sprigs.

The native genus *Paspalum* in Brazil contains a wide genetic variability between and within species. The genetic variability contained in Embrapa *Paspalum* Germplasm Bank and its sub-collections provides a large selection of the most suitable lawn germplasm for different uses, environmental conditions and maintenance requirements.

In the present study, characterization and identification of *Paspalum notatum* accessions to use as lawn with good coverage rate and low maintenance for the Brazilian Northeast was performed.

MATERIALS AND METHODS

The experiment was conducted at Embrapa Tropical Agroindustry (Brazilian Agricultural Research Corporation) located in Pacajus, Ceara State, Brazil, with the coordinates 4°11'07"S; 38°30'07"W and an altitude of 70 m above sea level. The region has a tropical climate, average temperatures of 26-28°C and 1020 mm average annual rainfall. The soil, classified as Ultisol, has a sandy/medium texture and low organic matter content. The plantlets were derived from Embrapa *Paspalum* Germplasm Bank in Embrapa Cattle Southeast, São Carlos, São Paulo State, Brazil. The propagation material consisted of grass plugs (10×10 cm) that were planted directly in the soil.

A randomized block design was used with five accessions (012254, 023566, 023728, 010006 and 019178) and four replications (plots) and the commercial *Axonopus* cultivar 'São Carlos' as control. The plot size was 2.5 m long by 1.5 m wide, the spacing between plug plants was 15 cm. Irrigation was applied when needed using sprinklers to prevent stress. A 30 cm portion of the plot remained uncut to preserve the total height of the accessions after a year (Fig. 1).

All weeds were removed on the plots during establishment. The establishment phase was complete when the plots were completely covered by lawn.

The most common way to evaluate lawn quality is by a subjective visual system (Pennucci and Langille, 2007). Field evaluations started after the lawn establishment and were performed every week after mowing. The plots were mowed every time that the height reached 7 cm, during one year after establishment. Soil coverage rate, general appearance, lateral growth, color homogeneity and weed occurrence were rated (scale 1-5) and scored by three evaluators (Table 1). Mowing times along the year, height of the uncut portion and lawn dry matter produced at each pruning were also observed. The pruned matter were dried at 70°C, in forced convection oven, until constant weight, then, dry mass was determined. The data obtained were subjected to variance analysis and means were compared by Tukey test at 5% probability.

RESULTS AND DISCUSSION

The accessions had 100% survival and the plugs showed similar development. The accessions 023728, 010006 and 012254 and the control completely covered the plot in 100 days after planting (DAP) and accessions 023566 and 019178, in 125 DAP. *Curvularia* sp. occurrence was observed in the accessions, except accession 023728. No significant difference in the plant soil coverage rate was observed. All accessions had excellent coverage (Table 2). The ability to occupy the available space efficiently, influences water and nutrients management and is related to lawn quality (Deputy, 2000).

General appearance in regards to vigor of the lawn was rated high for all the accessions, indicating all accessions had a pleasant and vigorous appearance. Visual merit is the overall measure of the suitability of the lawn for its potential use and incorporates lawn density, texture, leaf width, disease and weed incidence, growth habit and color. All these factors need to be considered when selecting plants and populations for cultivar selection (Deputy, 2000).

Significant differences occurred in lateral growth, color homogeneity and weed occurrence. Lateral growth of plants in the plot over one month ranged from minimum 2.0-2.50 (Accessions 012254 and 023566) to maximum 4.75 (Accession 023728) (Table 2).

Color homogeneity scores varied from 4.75 (Accession 010006) to 3.50 and 3.0 for accessions 023728 and 043566, respectively. Accession 010006 differed only to accession 019178, 012254 and the control. The old leaves from these accessions showed pale color aspect after mowing.

All the accessions had higher dry mass production than the control (from 75.9 to 129.3%). The uncut plot portion expresses the potential plant development under no or low maintenance and the 019178 accession had the highest height. In fact, this is not a desirable characteristic because higher plants require more lawn maintenance.

CONCLUSIONS

Based on the results obtained at the end of the 1st year of cultivation, the accession 023728 had on average the best scores and demonstrated ornamental quality equal to or greater than the commercial *Axonopus* cultivar control 'São Carlos'. This accession seemed to grow well in Pacajus-Ceara-Brazil stress conditions and might be suitable for a functional purpose when kept under a low maintenance regime.

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Tables

Table 1. Score system used to evaluate Brazilian native *Paspalum* accessions for use as lawn for landscaping purpose. Pacajus, Ceara State, Brazil, 2013-2014.

Scale	Soil coverage rate	General appearance	Lateral growth*	Color homogeneity	Weed occurrence
1	More than 25% of the portion with sparse areas, about 8 or failures	Unpleasant appearance	Did not exceed the side limit, grew less than 4 cm	Over 50% of pale leaves, apparent dry matter	High frequency of weeds more than 6 weeds units
2	About 20% of the portion with sparse areas, 5 to 7 failures	Deficient appearance	Grew 5-8 cm to the side limit	About 25% of pale leaves, apparent dry matter	up to 6 weeds units
3	About 10% of the portion with sparse areas, 3 or 4 failures	Regular appearance	Grew 9 to 12 cm to the side limit	About 10% of pale leaves, apparent dry matter	4-6 weeds units
4	Few sparse areas, 1 or 2 failures	Pleasant appearance	Grew 13 to 16 cm to the side limit	Green, no apparent dry matter	2-4 weeds units
5	Excellent: no sparse area	Pleasant and vigorous appearance	Grew more than 16 cm to the side limit	Green and completely uniform	No weeds

* Horizontal growth surpassing plot boundaries in one month.

Table 2. Brazilian native *Paspalum* accessions scores for use as lawn for landscaping purpose. Pacajus, Ceara State, Brazil, 2013-2014.

Accession	Soil coverage rate	General appearance	Lateral growth	Color homogeneity	Weed occurrence	Dry mass (g)	Height of the uncut portion (cm)
Control	5.00 a	3.75 a	4.00 ab	1.00 c	3.50 ab	119.84 b	56.25 ab
012254	5.00 a	5.00 a	2.00 b	2.00 bc	4.00 a	239.73 a	58.25 ab
023566	4.75 a	4.75 a	2.50 b	3.00 ab	4.25 a	262.69 a	60.75 ab
023728	4.50 a	3.50 a	4.75 a	3.50 ab	3.25 ab	274.84 a	60.00 ab
010006	5.00 a	4.25 a	3.75 ab	4.75 a	1.00 b	210.83 a	49.25 b
019178	4.75 a	4.25 a	3.25 ab	2.50 bc	3.75 a	249.81 a	70.75 a
Average	4.83	4.25	3.38	2.79	3.29	226.29	59.21
CV (%)	7.86	18.39	26.64	30.62	35.48	12.58	15.68

[1] Means followed by the same letter are not significantly different by Tukey test at 5% probability.

Figures

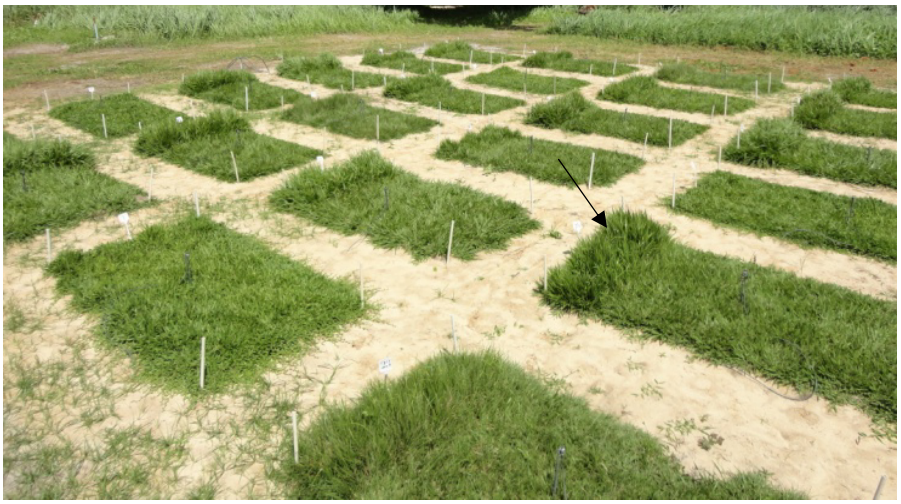

Fig. 1. Established plots before mowing, 2.5 m long by 1.5 m wide and 15 cm spacing between plants with a 30 cm uncut portion (arrow) preserving the total height of the accessions.