EVALUATION OF TROPICAL AND SUBTROPICAL FORAGE GRASSES IN THE NORTHWEST REGION OF RIO GRANDE DO SUL, BRAZIL

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*In memoriam

ABSTRACT

A collection of 137 accessions of tropical and subtropical grasses of *Pennisetum purpureum* (53), *Panicum maximum* (10), *Brachiaria* spp. (9), *Hemarthria altissima* (19), *Setaria* spp. (11), *Digitaria* spp. (22), *Cynodon* spp.(7) and *Paspalum* spp. (6) was evaluated for frost tolerance (FT), dry matter yield per cut (DMYC), number of cuts (NC) and accumulated dry matter yield per year (ADMY). Crude protein content (CPC), leaf/stem ratio (L/S), pubescence (P) and animal preference under grazing (AP) were also recorded in 20 entries of in *P. purpureum*. Data exploration involved cluster analysis and ordination, revealing the most promising entries among and within genus. In general ADMY and FT were the most important variables to discriminate entries. *Pennisetum*, *Panicum* and *Hemarthria* were the most productive genus with high FT. *Cynodon* and *Paspalum* showed high FT.

KEYWORDS

Animal preference, dry matter production, forage quality, germoplasm evaluation, germoplasm introduction, subtropical grasses, tropical grasses

INTRODUCTION

Intensive crop farming on slopes of dystrophic red-yellow latossols in the Northwest region of Rio Grande do Sul (RS), Brazil, has caused soil erosion which has led to declining yields and reduced farm income. Researchers have recorded losses of fertile soils, minerals and seeds. These are attributed to continuous cultivation of annual crops, mainly soybeans, corn and wheat. This system breaks soil structure, reduces aggregate size, blocks porosity, promoting superficial soil sealing, which in turn reduces water infiltration, increasing soil erosion. If soil fertility is to be improved, soil erosion must be reduced. This can be achieved by including forage grasses in the crop rotation. For that reason accessions of tropical and subtropical grasses were evaluated to identify adapted materials for use by farmers. In this paper we discuss results collected on agronomic attributes of 137 accessions of 8 genera.

METHODS

The evaluation covered four growing seasons from December 1983 to June 1987, in Centro de Treinamento COTRIJUÍ, Augusto Pestana (28° 50' S; 54° W, 448 m altitude). The climate is Cfa type (Köeppen), subtropical humid, with light frosts, 1600 mm average annual rainfall. The soil is a dystrophic red-yellow latossol, clay texture, pH 5.6, 6.5 ppm of P and 3.6% of organic matter content. A collection of 137 accessions of tropical and subtropical grasses of *Pennisetum purpureum* (Elephant-grass) (53), *Panicum maximum* (10), *Brachiaria spp*. (9), *Hemarthria altissima* (19), *Setaria* spp. (11), *Digitaria* spp. (22), *Cynodon* spp.(7) and *Paspalum* spp. (6) was evaluated for frost tolerance (FT), dry matter yield per cut (DMYC), number of cuts (NC) and accumulated dry matter yield per year (ADMY). Crude protein content (CPC), pubescence (P), leaf/stem ratio (L/S) after a 60 days growth period and animal preference under grazing (AP) were also recorded in 20 entries of Elephant-grass. The accessions were established in 6 x 5 m plots without replicates and fertilised every year. Frequency and height of cuts were applied according to plant morphology and physiology. Data were subjected to cluster analysis (minimum variance method) and ordination (principal coordinates analysis) (Pielou, 1984), applying euclidean distances, with data standardised by the range within variables, using application Multiv (Pillar, 1995).

RESULTS AND DISCUSSION

Cluster analysis and ordination revealed three genus groups, on the basis of variables NC, DMYC, ADMY and FT. The first group includes *Pennisetum* (Elephant-grass), *Panicum*, *Hemarthria* and *Setaria*, the second *Brachiaria* and *Digitaria* and the third *Cynodon* and *Paspalum* (Figure 1). The first group, at the right side of the diagram, including *Brachiaria*, was the most productive. The ADMY were 18.4, 15.0, 13.8, 13.6, 10.8, 6.6, 5.8 and 2.8 t/ha/year for Elephant-grass, *Panicum*, *Brachiaria*, *Hemarthria*, *Setaria*, *Digitaria*, *Cynodon* and *Paspalum*, respectively. The high productivity and adaptation showed by cultivars of these genuses were also observed by Medeiros (1976) and Maraschin & Nabinger (1985).

Figure 2 shows that the most productive and frost tolerant Elephant-grass accesses were IJ-7138, Taiwan A-144, IJ-7136, Hibrido 534-A, Turrialba, Taiwan A-25, Merckeron Santa Rita and CNPGL-477. The dwarf type (1) showed the highest animal preference, associated with lower pubescence and higher L/S and CPC. The range of ADMY was 38.2 to 5.1 t/ha/year between the most and the least productive, with an average of 2.8 cuts per year for the most productive and 1 cut for the least. Maraschin & Nabinger (1985), in 35 cultivars of Elephant-grass recorded 3.21 up to 6.67 t/ha of dry matter (DM) during spring and summer evaluations, while Monks & Alves (1983) registered 8.93 up to 9.43 t/ha of DM for Cameroon. Maraschin & Nabinger (1985) recorded high DM production for Taiwan A-144. Rodrigues *et al.* (1986) demonstrated that the dwarf type is adapted to animal grazing.

The most productive accesses of *Panicum* were Colonião Agroceres, Colonião and Deodoro. Green and Riversdale were the most FT, despite being among the least productive. The ADMY ranged from 10.1 up to 20.5 t/ha/year for Green and Colonião Agroceres, respectively. Previous evaluations at the same site (Medeiros 1976, Medeiros & Zambra 1987) considered Gatton the most promising cultivar.

The *Hemarthria* accessions CUF-533, CTC 364-872, Busche esepper, CTC 365-509, Redalta 229-993, SAE-73145, IPEACO-337, IPEACO-336, Florida 367-897 and I-1445 were the most productive with high FT. The ADMY varied between 3.7 (460-76-CNPGL) up to 20.5 t/ha (CUF-533). The most FT were Florida 36-1863, as in Tcacenco (1981), and I-1445.

The most productive accesses of *Setaria* were *Setaria anceps* IPEACO, Tainana 89, Kazungula EEI-173, C-1112 (*S. nigrirostria*) and *S. splendida*. The range of ADMY was 4.2 (Narok) up to 15.1 t/ha (Kazungula EEI-173), with 2 and 2.75 cuts per year respectively. Medeiros and Zambra (1987) found high dry matter yield for Kazungula (8.66 t/ha/year) at the same site. Despite its low production, Narok showed high FT as in Medeiros (1976).

Among *Brachiaria*, ADMY varied from 9.9 (Nativa-EEI *B. purpurascens*) to 26.4 t/ha (CTC *B. brizantha*), the latter being also the most FT.

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Figure 1

Dispersion diagram of genuses generated by principal coordinates analysis (59% of the variability between genuses is explained by the first axis and 32% by the second). **Correlation coefficients**: Axis I: NC= 0.84; ADMY=0.84; DMYC=0.99; FT= -0.006; Axis II: NC= -0.40; ADMY=-0.40; DMYC=0.10; FT=-0.95. **Genuses**: 1- *Pennisetum*; 2- *Panicum*; 3- *Brachiaria*; 4- *Hemarthria*; 5- *Setaria*; 6- *Digitaria*; 7- *Cynodon*; 8- *Paspalum*.

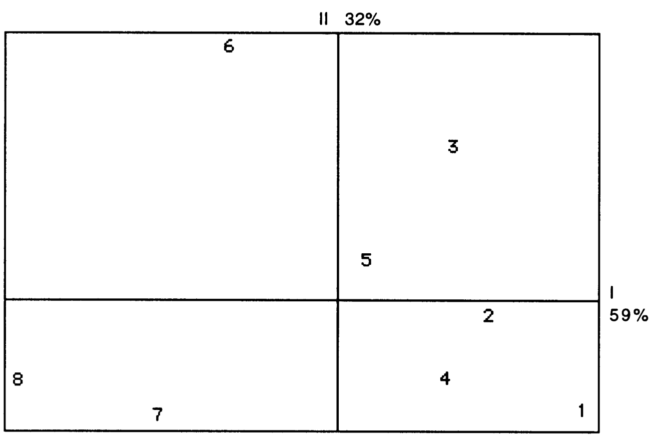

Figure 2

Dispersion diagram of 20 Elephant-grass accesses generated by principal coordinates analysis (45% of the variability is explained by the first axis and 20% by the second). **Correlation coefficients**: Axis I: NC=-0.65; DMYC=-0.82; ADMY=-0.85 CPC= 0.68; L/S= 0.70; FT=-0.03; P=-0.64; AP=0.70; Axis II: NC=0.27; DMYC=0.44; ADMY= 0.44; CPC=0.30; L/S=-0.0007; FT=0.90; P=-0.35; AP=0.27. **Accesses**: 1-Celetia (dwarf type); 2-Mineiro; 3-Gramafante; 4- Merckeron Pinda; 5- IJ-7141; 6- Mole Volta Redonda; 7- CNPGL- 477; 8- Taiwan A-148; 9- Porto Rico 534-B; 10- Taiwan A-144; 11- Cameroon; 12- Albano; 13- IJ-7138; 14- Mercker; 15- Turrialba; 16- Taiwan A-25; 17- Napier Mercker Sea; 18- Hibrido 534-A; 19- IJ-7136; 20- Pusa Napier I.