

SELECTING NEW *Brachiaria* FOR BRAZILIAN PASTURES

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Abstract

Brazilian beef production relies heavily on cultivated pastures, of which about 80% are planted mainly to two *Brachiaria* cultivars. The narrowness of diversity associated with reproduction by apomixis of most plants in this genus prompted an intense search for new cultivars amongst recently collected and introduced ecotypes from Africa. This paper reports results for a three-year evaluation of 21 pre-selected ecotypes in two typical Cerrado ecosystems. Plots, replicated four times, were seeded in rows and cut every 6 weeks during the rainy season followed by a cut in the middle and one at the end of the dry season. Significant differences were found between ecotypes, seasons and years for total, leaf or leaf + stem dry matter production, percentage of leaves, leaf: stem ratio and regrowth rate. Ecotypes differed in the two ecosystems for percentage of leaves, leaf: stem ratio and regrowth. Superior ecotypes (BRA004308, 003361, 002844, 003204, 003441) could be identified and were equally advantageous in both ecosystems.

Keywords: Agronomic evaluation, Brazilian savannas, genotype x environment interaction, new cultivars.

Introduction

Brazil is estimated to have about 100 million hectares of cultivated pastures, of which about 80% are planted mainly to two *Brachiaria* cultivars, *B. brizantha* cv. Marandu and *B. decumbens* cv. Basilisk. These are of African origin and reproduce by apomixis, i.e. asexual reproduction by seed. The narrowness of diversity available for selection associated with the potential for adaptation to the acid soils of the American savannas, prompted an intense search for new cultivars amongst recently introduced ecotypes of *Brachiaria* from Africa. Breeding and selection efforts have been undertaken with special concern for resistance to spittlebugs (Miles and Valle, 1996; Valério and Souza, 1997). Agronomic evaluation in plots was carried out in Brazil, and a group of superior ecotypes was identified (Valle et al., 1999). The main objective of this work was to evaluate 21 of those ecotypes under different ecosystems in order to identify new ecotypes of *Brachiaria spp.* with competitive advantages over existing cultivars.

Material and Methods

A collection of 212 ecotypes was previously evaluated in plots at the National Beef Cattle Research Center of the Brazilian Agricultural Research Corporation (Embrapa Beef Cattle), and 21 of these were selected based on superior agronomic attributes. These plus three commercial cultivars added as controls were evaluated in two sites to assess genotype x environment interaction and select the best to be tested under grazing in the process of releasing new cultivars. One experiment was established, in January of 1995, in a Red Dark Latossol (Oxisol): clay content 39 to 44%; pH 5.3; 4.5 mg/dm³ of P; 38 mg/dm³ of K; and 8 % aluminum saturation; the other, in December of 1995, in a Quartz Sand (Entisol) previously cropped with soybeans: clay content 8 to 12 %; pH 5.3; 19.1 mg/dm³ of P; 46 mg/dm³ of K; and 11 % aluminum saturation. Both areas were fertilized to reach 30 - 35 % soil base

saturation and to adjust for levels of P and K indicated for species of low demand. Ecotypes were seeded in 5-row plots, in four replicates. Sampled areas (4.5 m²), were cut every six weeks during the rainy season, once in the middle and again at the end of the dry season. The variables considered for comparisons were overall dry matter production (TDM), leaf (LDM), leaf + stem (GDM), percentage of leaves (% L), leaf: stem ratio (L:S), and regrowth ability (REG) measured as the rate of tillers expanded after 7 days from cutting. Data was analyzed using nested design of blocks within location (PROC GLM -SAS) and means were compared by Waller and/or Tukey test.

Results and Discussion

Significant differences ($P < 0.05$) were found between years and seasons for all variables analyzed (Table 1). There was a significant decline in production and percentage of leaves from the first to the third year, despite the fact that two replicates received maintenance fertilizer once, on both sites. Production in the rainy season (TDM, LDM and GDM) was double that of the dry season ($P < 0.05$) as expected for species of this genus (Table 1). There were differences between ecosystems ($P < 0.05$) only for percentage of leaves, leaf: stem ratio and regrowth, but not for production variables. The agronomic characteristics of the 24 ecotypes are displayed on Table 2. There were significant ($P < 0.05$) differences amongst genotypes for all variables considered. Several genotypes performed better than the controls, cv. Marandu and cv. Basilisk. The averages for the top ten ecotypes were significantly greater than the average for the collection (Table 2). The performance observed raises expectations of releasing new options of *Brachiaria* cultivars to the market. Both new ecotypes of *B. humidicola* evaluated in this trial were also superior to the commercial variety for several traits. Animals consume preferably leaves, thus LDM, %L, and L:S ratio are significant variables for selection. Genotype BRA003441 presented excellent %L (72%) on an annual

basis and a very favorable L: S ratio (8:1). Five superior ecotypes were equally advantageous in both ecosystems: BRA004308, 003441, 003361, 003204, 002844. Results from grazing studies to evaluate carrying capacity and persistence are reported in this congress for eight of these 21 ecotypes.

References

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Table 1 - Comparisons, on a per cut basis, between years, soil/ecosystems and seasons for total (TDM), leaf (LDM) and green dry matter production (GDM: leaf + stem), percentage of leaves (%L), leaf: stem ratio (L: S) and regrowth (REG): minimum = 0 and maximum = 6.

| SOURCES | TDM | LDM | GDM | %L | L:S | REG |
|------------------|------|-----|------|------|--------|-----|
| YEAR 1 | 1576 | 851 | 1491 | 58.3 | 2.2:1 | 3.7 |
| YEAR 2 | 1337 | 744 | 1135 | 55.4 | 3.7:1 | 3.0 |
| YEAR 3 | 789 | 441 | 628 | 54.0 | 4.9:1 | 2.8 |
| LSD ¹ | 57 | 31 | 51 | 0.5 | 0.4:1 | 0.1 |
| OXISOL | 1266 | 695 | 1098 | 54.3 | 3.1:1 | 2.9 |
| ENTISOL | 1182 | 653 | 1034 | 56.8 | 4.1:1 | 3.3 |
| LSD | 236 | 135 | 214 | 0.9 | 0.01:1 | 0.1 |
| RAINY SEASON | 1494 | 809 | 1338 | 54.9 | 3.1:1 | 3.1 |
| DRY SEASON | 740 | 433 | 582 | 57.0 | 4.7:1 | 3.1 |
| LSD | 56 | 29 | 56 | 0.9 | 0.4 | 0.1 |

¹LSD= Least Significant Difference (Waller or Tukey)

Table 2 - Average (per cut) agronomic characteristics of the *Brachiaria* ecotypes evaluated in two sites in Brazil.

| CODES ¹ | TDM ² | LDM ³ | GDM ⁴ | %L ⁵ | L:S ⁶ | REG ⁷ |
|--------------------|------------------|------------------|------------------|-----------------|------------------|------------------|
| BRA004308 | 1506 | 987 | 1368 | 66.8 | 3.8:1 | 4.0 |
| BRA003361 | 1477 | 909 | 1356 | 63.5 | 3.6:1 | 3.3 |
| BRA002844 | 1399 | 821 | 1274 | 59.8 | 2.8:1 | 3.1 |
| BRA003204 | 1370 | 850 | 1294 | 63.1 | 2.4:1 | 3.1 |
| BRA003450 | 1356 | 792 | 1230 | 58.4 | 2.6:1 | 3.0 |
| BRA003441 | 1330 | 968 | 1205 | 72.3 | 7.7:1 | 4.6 |
| BRA003824 | 1325 | 724 | 1138 | 55.7 | 2.7:1 | 3.1 |
| BRA001068* | 1321 | 558 | 1086 | 45.5 | 2.0:1 | 2.6 |
| BRA003891 | 1312 | 689 | 1122 | 54.5 | 2.8:1 | 2.8 |
| BRA003484 | 1295 | 744 | 1215 | 59.3 | 2.1:1 | 3.4 |
| BRA005118 | 1248 | 487 | 1009 | 39.5 | 2.1:1 | 2.9 |
| BRA002801 | 1239 | 623 | 1092 | 53.7 | 2.7:1 | 2.9 |
| BRA003387 | 1223 | 744 | 1118 | 62.0 | 3.0:1 | 3.2 |
| BRA000591* | 1199 | 608 | 987 | 50.5 | 2.9:1 | 2.9 |
| BRA003948 | 1166 | 634 | 975 | 55.2 | 2.9:1 | 2.9 |
| BRA002739 | 1160 | 620 | 1035 | 55.1 | 2.3:1 | 3.2 |
| BRA003719 | 1154 | 459 | 955 | 42.0 | 3.3:1 | 3.0 |
| BRA003395 | 1136 | 745 | 1040 | 66.6 | 3.3:1 | 3.5 |
| BRA003000 | 1129 | 488 | 939 | 46.1 | 2.2:1 | 2.7 |
| BRA004391 | 1126 | 631 | 949 | 56.8 | 3.4:1 | 2.9 |
| BRA004499 | 996 | 441 | 819 | 44.9 | 1.7:1 | 2.3 |
| BRA003247 | 981 | 661 | 904 | 66.3 | 3.7:1 | 3.9 |
| BRA005011 | 944 | 621 | 757 | 59.5 | 8.3:1 | 3.4 |
| BRA002208* | 881 | 328 | 645 | 38.4 | 3.6:1 | 2.6 |
| AVERAGE | 1220 | 672 | 1063 | 55.7 | 3.7:1 | 3.1 |
| LSD | 176 | 99 | 153 | 1.1 | 0.7 | 0.2 |
| TOP 10 | 1369 | 828 | 1232 | 63.9 | 4.4:1 | 3.6 |

¹Brazilian Germplasm Registration Number; ²Total dry matter; ³Leaf dry matter; ⁴Green dry matter (leaf + stem); ⁵Percentage of leaves in the dry matter; ⁶Leaf: stem ratio; ⁷Regrowth after 7 days (minimum = 0 and maximum = 6). * Control cultivars: BRA001068 = *B. decumbens* cv. Basilisk; BRA000591 = *B. brizantha* cv. Marandu; BRA002208 = *B. humidicola* commercial