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# Agronomic and nutritional evaluation of intraspecific crosses in *Brachiaria decumbens*

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## Introduction

*Brachiaria decumbens* cv. Basilisk is the single most important forage grass used for pastures in the tropics. This cultivar has exceptional adaptation to acid soils, vigorous growth, ease of establishment, and good forage value throughout the year, but these favorable characteristics are counteracted by its susceptibility to insect pests − spittlebugs. Breeding to produce improved cultivars within this species was impossible until 2009 due to the lack of compatible sexual ecotypes. With the success of somatic chromosome duplication of sexually reproducing diploid plants of *B. decumbens* (Simioni and Valle 2009), intraspecific crosses with natural apomictic tetraploid accessions were finally possible. This abstract reports the results of the agronomic and nutritional evaluation of 50 pre-selected intraspecific hybrids of *B. decumbens*.

## Methods

Four hundred and fifty-seven intraspecific hybrids, obtained from crosses between 3 sexual plants artificially tetraploidized by colchicine and the apomictic tetraploid cv. Basilisk, comprise the Embrapa Beef Cattle base population of *B. decumbens*. Of these, 50 hybrids were selected (mass selection), vegetatively propagated and transplanted to a field trial at Embrapa Beef Cattle, Campo Grande, MS, Brazil, in a randomized complete block design, with 4 replications and 5 plants per plot with spacing of 1.0 x 0.5 m. The commercial cv. Basilisk was used as a control. The evaluation began in July 2011 and continued for 6 cuts: 2 cuts during the dry season (July 20 and September 28, 2011) and 4 cuts during the rainy season (November 04 and December 09, 2011, and January 07 and February 29, 2012).

Agronomic evaluations were made for total dry matter (TDM), leaf dry matter (LDM), leaf dry matter percentage (L), leaf:stem ratio (LSR) and regrowth (REG). The regrowth score was a combined score from 0 (poor) to 6 (excellent) based on density scores (percentage of tillers showing regrowth) and speed of regrowth. A leaf sample from each plot, previously dried and ground, was used for the analysis of crude protein (CP), in vitro dry matter digestibility (IVDMD), neutral detergent fiber (NDF) and lignin (LIG) by near-infrared reflectance spectroscopy (NIRS) (Marten et al. 1989).

Data were analyzed using the restricted maximum likelihood/best linear unbiased prediction procedure (REML/BLUP), implemented in the software SELEGEN REML/BLUP (Resende 2002), with the following univariate model: $y = Xm + Zg + Wp + e$, where $y$ is the data vector; $m$ is the fixed effect (combination cut-block); $g$ is the genetic effect (random); $p$ is the permanent environmental effect (random); and $e$ is the random error. X, Z and W are the incident matrices for $m$, $g$ and $p$, respectively.

## Results and Discussion

The joint analysis (not shown) detected highly significant differences ($P<0.01$) for hybrids for all traits evaluated. Significant differences were detected in the hybrids x harvests interaction for TDM, LDM, L, LSR, REG, CP and IVDMD, but not for NDF and LIG. Thus, genetic variation was present among the hybrids for all traits

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evaluated, and performance of the hybrids differed significantly across harvests for all except 2 of these traits. The selection accuracy estimates in the joint analysis ranged from 62 to 93% for the evaluated traits, which are considered moderate to high values.

The TDM BLUP overall mean of the hybrids (902 kg/ha) was higher than for cv. Basilisk (829 kg/ha) and the mean of the best performing 10 hybrids was 33% superior to cv. Basilisk (Table 1). The hybrid with highest performance (1196 kg/ha) yielded 367 kg/ha more than cv. Basilisk, which demonstrates the excellent prospects for this breeding program. For the traits related to leaf, the component of the forage with highest nutritional value, overall mean values for LDM, L and LSR of the hybrids were 21.3, 13.7 and 50% superior to cv. Basilisk, respectively. The hybrid with the highest LDM (770 kg/ha) had almost 60% more LDM than the cultivar and the hybrid with highest LSR (4.0) had more than twice as much leaf as the control. Traits related to the leaf component in the forage are very important in breeding programs, because leaves are preferentially consumed by cattle and have higher nutritive value than stems. The overall mean REG of the hybrids did not differ from the cv. Basilisk mean (3.3); however, the mean REG of the best 10 hybrids and the best hybrid were 15 and 39% superior to the cultivar, respectively. For nutritive value traits, overall means for CP and IVDMD of the hybrids were higher than for the cultivar, while NDF and LIG were lower than for the cultivar. This shows that it is feasible to identify and select hybrids with better nutritive value. The highest CP recorded amongst the hybrids (13.2%) was 1.5 percentage units higher than for cv. Basilisk (Table 1). Some of the best 10 hybrids for nutritive value traits were coincident with the best 10 hybrids for agronomic traits (not shown), indicating that it is possible to select hybrids with high performance for both agronomic and quality traits. Further evaluation for other traits like resistance to spittlebugs and seed production needs to be considered before superior hybrids can be identified to continue to the next phase of the breeding program.

**Table 1.** BLUP mean values of the *Brachiaria decumbens* hybrids and cv. Basilisk for agronomic and nutritive-value traits, evaluated in 6 harvests at Embrapa Beef Cattle.

| | TDM[1] (kg/ha) | LDM (kg/ha) | L (%) | LSR | REG |
|---|---|---|---|---|---|
| $Mean_1$ | 1196 | 700 | 64.0 | 4.0 | 4.6 |
| $Mean_{10}$ | 1103 | 673 | 62.9 | 3.3 | 3.8 |
| Overall mean | 902 | 536 | 58.2 | 2.4 | 3.3 |
| Basilisk mean | 829 | 442 | 51.2 | 1.6 | 3.3 |
| | CP (%) | IVDMD (%) | NDF (%) | LIG (%) | |
| $Mean_1$ | 13.2 | 74.9 | 59.6 | 2.4 | |
| $Mean_{10}$ | 12.9 | 74.4 | 60.6 | 2.5 | |
| Overall mean | 12.4 | 73.8 | 61.7 | 2.6 | |
| Basilisk mean | 11.7 | 73.6 | 63.3 | 2.8 | |

[1]TDM: Total dry matter; LDM: Leaf dry matter; L: Leaf dry matter percentage; LSR: Leaf:stem ratio; REG: Regrowth (0, poor to 6, excellent); CP: leaf crude protein percentage; IVDMD: leaf in vitro dry matter digestibility; NDF: leaf neutral detergent fiber percentage; LIG: leaf lignin percentage. $Mean_1$: BLUP mean value of the best hybrid; $Mean_{10}$: BLUP mean value of the best 10 hybrids; Overall mean: BLUP mean value of all 50 hybrids.

## Conclusion

There is genetic variability for a range of agronomic and nutritive value traits in *Brachiaria decumbens* hybrids, making it possible to select superior hybrids with higher performance than cv. Basilisk. This selection process is underway and results will be reported elsewhere.

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