Screening for tolerance to waterlogging in *Brachiaria* hybrids

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Introduction

Brachiaria grasses are the most widely planted forages in the tropics. *Brachiaria* pastures during the rainy season occasionally face waterlogging conditions that severely limit pasture productivity and animal performance. Waterlogging drastically reduces oxygen diffusion into the soil causing hypoxia which is the main limitation that reduces root aerobic respiration and the absorption of minerals and water. Tolerance to waterlogging was evaluated in different *Brachiaria* grasses (Baruch, 1994; Dias-Filho and Carvalho, 1999; Dias-Filho, 2001; Rao et al., 2005). Dias-Filho et al. (1999) found that *B. brizantha* is intolerant, *B. decumbens* is moderately tolerant and *B. humidicola* (Bh) is tolerant to waterlogging. But Bh is of low forage quality. An on-going *Brachiaria* breeding program at CIAT is developing hybrids that combine the desirable attributes including spittlebug resistance, Rhizoctonia resistance, adaptation to major abiotic stress factors (acid soils, waterlogging, drought), forage quality and seed production. Reliable screening methods are needed to evaluate the *Brachiaria* hybrids. The main objective of this study is to establish a rapid and reliable selection methodology to evaluate the tolerance of the *Brachiaria* genotypes for waterlogging and to identify plant attributes that can be used as indicators of waterlogging tolerance.

Materials and Methods

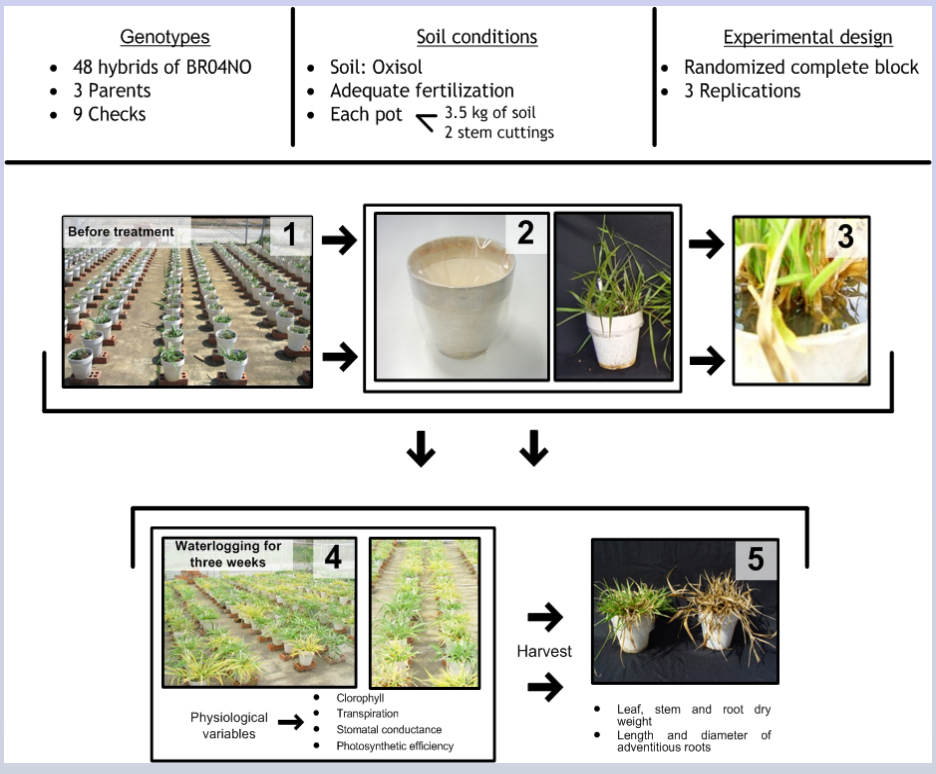

Figure 1. Different phases for the induction of waterlogging treatment to evaluate tolerance of *Brachiaria* genotypes: (1) plants grown in pots for 50 days before establishing the waterlogging treatment; (2) pots lined with plastic bags; (3) waterlogging treatment established by applying excessive water to the pots (5 cm over soil surface); (4) Waterlogging treatment applied for three weeks; and (5) phenotypic differences in waterlogging tolerance.

Results

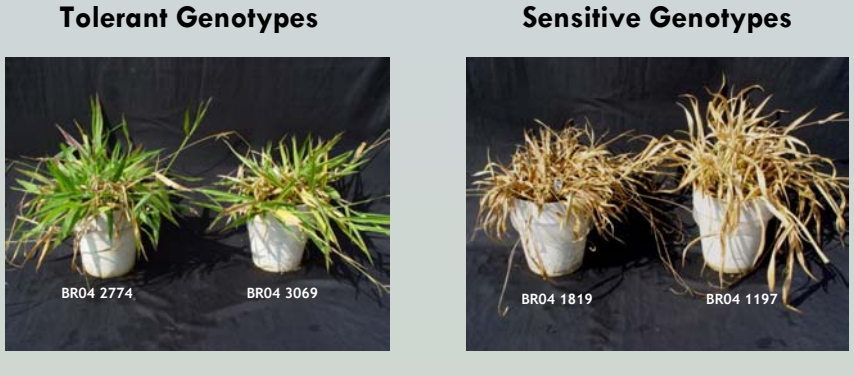

Figure 2. Phenotypic differences in waterlogging tolerance of *Brachiaria* Hybrids.

After 7 days of waterlogging stress, the majority of genotypes turned chlorotic. After 21 days of waterlogging treatment, several *Brachiaria* hybrids were dead. Significant genotypic variability was observed in green leaf biomass production (Figures 1 and 2). Among the 60 genotypes tested, *B.dictyoneura* CIAT 6133 and BR02NO1485 were outstanding in green leaf biomass production. Among the 48 hybrids of BR04NO series, BR04NO3069, BR04NO3207 and BR04NO2774 were superior in their production of green leaf biomass than the others hybrids. Genotypes that had greater amount of green leaf biomass and higher values of leaf chlorophyll content (SPAD) also showed less amount of dead leaf biomass (Figure 3).

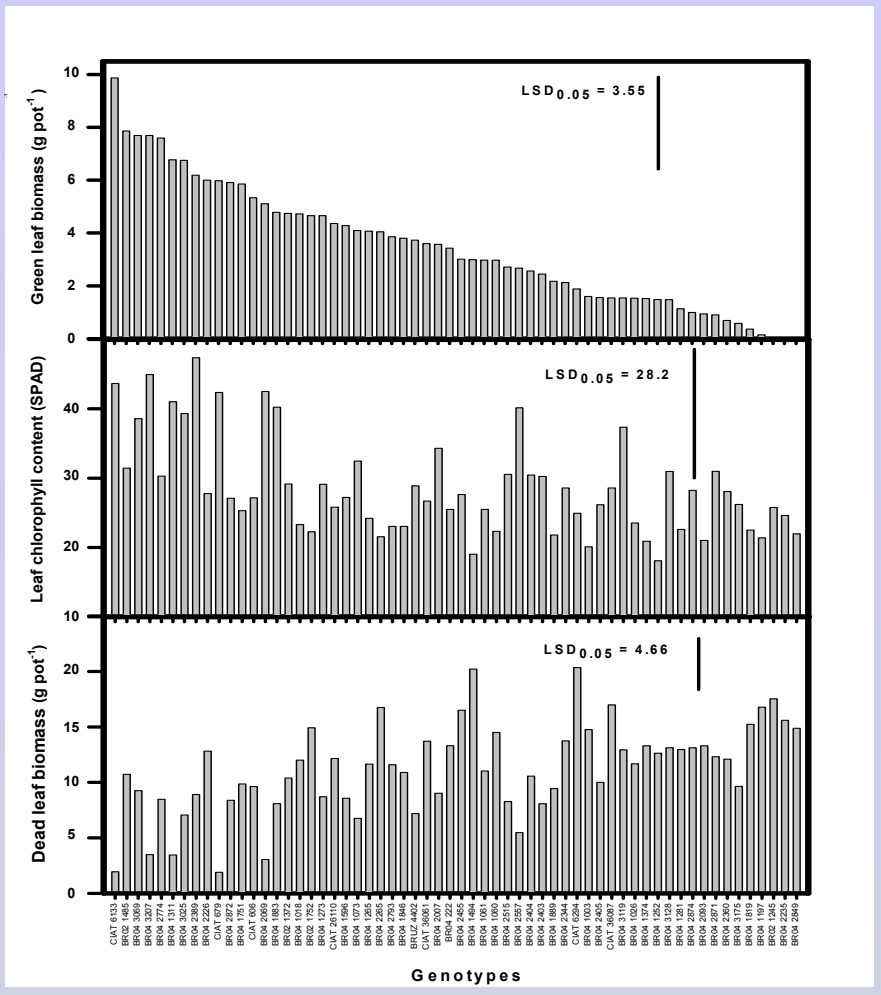

Figure 3. Influence of waterlogging on phenotypic variation in green leaf biomass production (g pot $^{-1}$), leaf chlorophyll content (SPAD) and dead leaf biomass (g pot^{-1}) of three parents, nine checks and 48 hybrids of BR04 series of *Brachiaria*, grown in an Oxisol. Plant attributes were measured at 21 days after waterlogging. LSD values are at the 0.05 probability level.

Conclusions

- We implemented the screening method for evaluating waterlogging tolerance and screened 48 BR04NO series of hybrids and identified three hybrids (BR04NO3069, BR04NO3207 and BR04NO2774) that were superior in their tolerance to waterlogging based on greater values of green leaf biomass production and leaf chlorophyll content and lower values of dead leaf biomass.
- These three plant attributes could serve as criteria for selection for waterlogging tolerance in *Brachiaria*.

References

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Acknowledgements

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