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Screening for Water Saving Traits of Common Fodder Grasses Used in Integrated Crop-livestock-forestry Systems of Central West Brazil

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Abstract

The humid subtropical climate of central west Brazil mostly provides sufficient rainfall and adequate temperatures to support year-round agriculture production in integrated tree-crop-livestock production systems. However, high rainfall variability during the drier winter is increasingly compromising one of the most productive agricultural regions in Brazil. In addition, climate scenarios indicate up to 30 % less rainfall during winter and increasing frequency of dry periods for central-south Brazil within the forthcoming decades. Information focusing on plant water use dynamics of intergrated crop-livestock-forestry systems is rare and insufficient to estimate the system's adaptive capacity to temporal water limitations and climate variability or change. The objective of this research is to characterise whole plant transpiration of selected common cultivated fodder grasses in response to atmospheric drought and shading.

Whole plant transpiration rates [mmol m^{-2} s^{-1}] of the fodder grasses *Brachiaria brizantha* cv. Marandu, *Brachiaria humidicola* cv. Llanero, *Brachiaria decumbens*, *Brachiaria ruziziensis*, *Panicum maximum* cv. Mombaca and *Panicum maximum* cv. Tanzania was measured in a transpiration chamber with adjustable atmospheric vapour pressure deficits (VPD) and three different radiation intensities (420 μmol m^{-2} s^{-1}, 730 μmol m^{-2} s^{-1}, 1200 μmol m^{-2} s^{-1}).

The results show that with increasing vapour pressure deficit and radiation intensity the transpiration rates for each fodder grass species increased linear but with different slopes. While under low VPD levels the radiation impact on transpiration rates was rather small, the effect was considerably increased under high VPD levels.

Our results suggest that common cultivated fodder grasses in Brazilian pastures reveal different response dynamics to light intensity and VPD. Both abiotic factors are highly variable within integrative crop-livestck forestry systems and improved understanding of the plant's water use traits will contribute to a resource use efficient, climate smart, and sustainable land use management.

Keywords: Brazil, fodder grasses, integrated crop-livestock-forestry systems, radiation, transpiration, vapour pressure deficit

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