



Productive and morphological responses of *Megathyrus maximus* hybrids submitted to water deficit and waterlogging

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The effects of water deficit and waterlogging stress on forage plants are diverse and impact both physiology and morphology, consequently affecting productive characteristics. Mechanisms of tolerance to these stress factors are found in many plants and may be based on adaptation strategies to improve gaseous exchanges and maintain the energy production. Despite advances in the genetic improvement program of *Megathyrus maximus*, significant gaps still exist in the understanding the differential ability to tolerance to soil water stress, especially concerning new hybrids selected in previous phases of program. In this study, seven genotypes of *Megathyrus maximus* (PM407, PM409, PM408, PM411, PM414, PM415, PM427) from the breeding program, coordinated by Embrapa beef cattle, and the Massai cultivar were cultivated in pots filled with soil (4 kg) collected from the arable layer (first 20 cm). The experiment was conducted in a greenhouse in Juiz de Fora, Minas Gerais state, Brazil. The experimental design was randomized blocks with factorial arrangement 8×3×2 (eight genotypes, three water conditions, and two harvest times) using three replications. The water conditions were as follows: (I) control - sufficient water (maintained at 100% of the field capacity); (II) water deficit - irrigation interrupted on day 0, and (III) waterlogging - provided via watering the soil until saturation (set as 3 cm of water above the ground) from day 0. The first harvest was performed after 20 days of water stress and the second after 12 days of recovery. Productive and morphological traits were evaluated at the end of the stress period and after the recovery period. Statistical analyses were performed using R Software version 3.6.1 and comparisons among means were performed according to the Tukey test and significant differences were set at $p \leq 0.05$. All hybrids submitted to water deficit showed reduced aerial and root mass. However, after the stress period, a survival response to the water deficit was observed, with the recovery of approximately 28.4% of the aerial part and 16.3% of the root system in all genotypes. The hybrid PM409 showed an adaptive potential to waterlogging conditions, as suggested by the greater root production (41.2%) observed in this hybrid compared to the average production of other genotypes. In addition, this hybrid showed no reduction on leaf and stem mass production in waterlogging condition, compared to the control condition. The results demonstrated that no hybrid was tolerant to water deficit. However, the hybrid PM409 showed promising traits for waterlogging stress tolerance.

Keywords: aerial biomass, genetic improvement of forage plants, Massai cultivar, plant water stress, root mass