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Effect of water deficiency on different genotypes of *Balanites aegyptiaca*

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Abstract

Water deficit is strongly affecting plant development and production. With the decrease in rainfall in many areas and the shortage of arable land for growing food crops, there is a demand to find alternative plant species that could be cultivated in non-arable land for food supplies and bioenergy. *Balanites aegyptiaca* L. is a multi-purpose tree belonging to the family of Balanitaceae distributed in North and West Africa, and West Asia. The species is considered as drought-tolerant serving as a source of many secondary metabolites and having a potential for biofuel production. This study aimed to examine and compare the morpho-physiological responses to water stress of six different *B. aegyptiaca* genotypes collected from different

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regions. Different regimes of soil volumetric water content (VWC 35% as a control, VWC 20% as moderate and VWC 5% as a severe drought stress) were chosen to finally select the most drought-tolerant genotype under greenhouse conditions. Several growth parameters, stomata conductance, photosynthetic efficiency, infrared thermography and metabolites contents were analyzed to investigate and compare the drought impact among *B. aegyptiaca* genotypes. The results indicate that at severe drought stress each genotype has an independent strategy to cope with the water shortage through a significant reduction in biomass parameters, early stomata closure combined with small changes in photosynthetic activity and producing a high concentration of ascorbic acid and proline. Finally, we found that i) *Balanites* genotypes showed different morphological and physiological responses to cope with the water shortage, ii) collections of two or three parameters could distinguish the water stress levels among the genotypes, and iii) genotype El-Kharga showed the highest drought-tolerance compared to the other genotypes. It shows the lowest magnitude of biomass reduction and early stomata closure as strategy of saving leaf water content under severe drought stress.

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Keywords: *Balanites aegyptiaca* L., biometrical growth parameters, stomatal conductance, volumetric water content, water deficit

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