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Citrus tetraploid rootstocks are more tolerant to water deficit than diploid

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ABSTRACT: Citrus are grown in semi arid areas that are exposed to water deficit. In citrus, polyploidy is a natural phenomena and the presence of tetraploid plants among rooostocks seedlings is not rare. Those tetraploid plants originate from the chromosome duplication in nucellar cells (somatic cells) of the diploid apomictic parent. They present a specific anatomy when compared to diploids, like thicker roots and leaves, and change of stomatal density and size, that altogether affect the plant growth rate and seems to make them more adapted abiotic stresses. In the present work we investigated tetraploid tolerance to water deficit by comparing the behaviour of the diploid Rangpur lime, well known for its good tolerance to water deficit stress, and its autotetraploid. Rangpur lime seedlings and Valencia Delta sweet orange grafted on Rangpur lime were also studied along a water deficit. The stomatic conductance, the PSII activity and the water consumption were monitored. At the end of the stress, samplings were harvested for abscisic acid assays and transcriptomic studies. In control conditions, tetraploid Rangpur lime and Valencia Delta grafted on tetraploid Rangpur lime presented a lower stomatic conductance (gs) when compared respectively to diploid Rangpur lime and Valencia Delta grafted on diploid rootstock. This suggests a lower transpiration stream and a lower photosynthesis activity when a tetraploid rootstock is used. This is in agreement with the smaller plant size that is usually observed for tetraploid plants and the reduction of vigour that is observed for varieties grafted on tetraploid rootstock. Under stress condition, gs declined in the same time for diploid and tetraploid rootstock, the combination Valencia Delta / Rangpur lime being less affected by the stress that the non grafted Rangpur lime. The phothosystem II activity was reduced sooner for diploid Rangpur lime and diploid Rangpur lime grafted with Valencia Delta when compared to tetraploid Rangpur lime and tetraploid Rangpur lime grafted with Valencia Delta. Preliminary results suggest that in control condition, tetraploids rootstocks synthesize constitutively more abscisic acid than diploid. Molecular studies are currently performed to try to understand the molecular determinant of the greater tolerance of tetraploid citrus to water deficit. If the higher tolerance of tetraploid rootstocks to drought is confirmed under field conditions, the selection of tetraploids will be a relatively easy way to improve existing rootstocks for citrus.