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AUTOTETRAPLOID CITRUS LIMONIA ROOTSTOCKS ARE MORE TOLERANT TO WATER DEFICIT THAN PARENTAL DIPLOIDS

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Water shortage of soils is one of the main abiotic constraints affecting growth and yield in citrus. When grown in the field, tetraploid seedlings and varieties grafted on tetraploid rootstocks have been shown to be slow growing plants. In this work, we investigated the anatomy and morphology of root and leaf diploid and autotetraploid Rangpur lime (Citrus limonia) seedlings grown in control condition. The autotetraploid line arose from chromosome doubling in nucellar cells of diploid Rangpur lime and has strictly the same allelic composition than the diploid one. In autotetraploids, roots and leaves were thicker and cell size was bigger than in diploids. Leaf stomatal conductance of autotetraploids was lower than for diploids. Using 20 K cDNA microarrays, leaf gene expression was investigated in both genotypes. A very limited number of genes were significantly differentially expressed in both genotypes (? 0.5%) suggesting that gene dosage per cell or post-transcriptional events may explain the phenotypic differentiation between diploids and autotetraploids. We also investigated the tolerance to water stress of diploid and autotetraploid seedlings and also their behaviour as rootstocks of Valencia Delta orange (Citrus sinensis) and citron (Citrus medica) varieties. At the beginning of the stress, leaf stomatal conductances of autotetraploid seedlings and varieties grafted on autotetraploid rootstocks were respectively lower than those of diploid seedlings and varieties grafted on diploid rootstocks. At the end of the experiment, autotetraploid seedlings and varieties grafted on autotetraploids showed the highest tolerances. This work suggests that greater tolerance is linked to a more efficient regulation of gas exchanges in autotetraploid seedlings and varieties grown on autotetraploids genotypes. Investigations of ABA root content in diploids and autotetraploids suggest that constitutive biosynthesis of this hormone is higher in autotetraploids. Analyses of candidate gene expression were performed at the root level. The results showed that NCED1, which is involved in the last step of ABA biosynthesis was over expressed in roots of autotetraploids. To have a better understanding of the impact of diploid and tetraploid rootstocks on scion, we have also investigated gene expression using microarrays and qRT-PCR in Valencia Delta leaves grafted on diploid and autotetraploid rootstocks in control and water deficit conditions.

Keywords: Citrus, tetraploidy, salt stress, water deficit