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SALT TOLERANCE EFFECTS OF *SOLANUM CHEESMANIAE* HKT1;1 AND/OR HKT1;2 FUNCTION LOSS IN A RECIPROCAL GRAFTING TOMATO EXPERIMENT*

María Remedios Romero-Aranda¹, Jesús Espinosa², Paloma González-Fernández², Emilio Jaime-Fernández¹, José Ángel Traverso³, María José Asins⁴, Andrés Belver²

¹IMSH "La Mayora", UMA/CSIC, Málaga; ²Estación Experimental del Zaidín, CSIC, Granada; ³Faculty of Sciences, University of Granada; ⁴IVIA, Moncada, Valencia
Corresponding author: Andrés Belver (andres.belver@eez.csic.es)

HKT1-like Na⁺ transporters play an important role in Na⁺ and K⁺ homeostasis and salt tolerance by removing Na⁺ from the xylem controlling its accumulation in shoots (Asins et al. 2013). In previous studies, we used recombinant inbred lines (RILs) derived from *Solanum lycopersicum* cv. Cerasiform and *S. cheesmaniae*, a halotolerant wild species, combined with RNAi-induced loss-of-function in all *HKT1;1* and *HKT1;2* allelic variants. We showed that *HKT1;2* *lycopersicum* and *cheesmaniae* alleles are functionally responsible for the major tomato QTL *lkc7.1* related to Na⁺/K⁺ homeostasis in the aerial part of the plant under saline conditions (Asins et al. 2013; Jaime-Pérez et al. 2017). In the present study, we analyse the physiological impact of function loss in *cheesmaniae* alleles at the *HKT1;1* and *HKT1;2* loci in the roots and aerial parts of the tomato plant in order to determine the relative contributions of each locus in the different tissues to plant Na⁺/K⁺ homeostasis and subsequently to tomato salt tolerance. We generated different reciprocal rootstock/scion combinations with non-silenced, single RNAi-silenced lines for *SchHKT1;1* and *SchHKT1;2*, as well as doubly silenced lines, at both loci from a near isogenic line (NIL14), which is homozygous for the *S. cheesmaniae* haplotype in a genomic region (31.1 Mb) containing both HKT1 loci (Jaime-Pérez et al. 2017). Grafted combinations were cultivated with a Hoagland nutrient solution supplemented with 0 and 70 mM of NaCl under natural greenhouse conditions during the fall-spring season following the usual cultural practices of commercial greenhouse tomato production (Romero-Aranda et al. 2020). Our results show that salt treatment reduced vegetative growth and altered the Na⁺/K⁺ ratio in leaves and flowers, negatively affecting fruit production, particularly in graft combinations containing *SchHKT1;2*-silenced and double-*SIHKT1;2/SchHKT1;1* silenced lines, when used for both rootstock and scion. We concluded that the impact of the removal of Na⁺ from the xylem by *SchHKT1;2* in the aerial part of the plant can be even greater than that on Na⁺ homeostasis at the root level in tomato under saline conditions. This suggests that *SchHKT1;2* may also play a role in Na⁺ phloem loading and consequently in determining Na⁺ recirculation towards the root zone, as well as the salt content of sink tissues such as developing leaves, flowers and fruits.

Asins et al. (2013). *Plant Cell and Environment* 36: 1171-91. Jaime-Pérez et al. (2017) *Plant Cell Environm* 40, 658–671. Romero-Aranda et al. (2020) *Plant Physiol Biochem* 154, 341-352.

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