Potassium nitrate improves growth in salt-stressed citrus seedlings

A greenhouse experiment was conducted with 1-year-old Navelina Citrus sinensis (L.) Osbeck scions grafted onto either Carrizo citrange (Citrus sinensis (L.) Osbeck x Poncirus trifoliata (L.) Raf.), Citrus macrophylla Wester or Cleopatra mandarin (Citrus reshni Hort. Ex Tanaka) rootstocks. Plants were grown for 60 days in pots with a mixture of sand and turf (85:15). All plants were irrigated three times per week. The control treatment was irrigated with water, the salinity treatment with water containing 25 mM NaCl:$CaCl_2$ (15:1) and the salinity + nitrate supplementation treatment with water containing 25 mM NaCl:$CaCl_2$ plus 10 mM KNO_3. Salt stress reduced total plant biomass by 27-38%, whereas potassium nitrate supplementation partially counteracted this effect by increasing the total dry matter of the plant. Potassium nitrate supplementation increased for all three rootstocks the total plant biomass of salinity-treated seedlings by 22-36% (Figure 1). Salt-stressed plants had lower photosynthesis rates than the control. The addition of KNO_3 increased photosynthetic rates of salt-treated Navelina orange by 25-30% in scions grafted on Carrizo citrange or C. macrophylla and by 66% in scions grafted on Cleopatra mandarin. The supplementation of KNO_3 also reduced leaf abscission for all three rootstocks under salinity conditions (Table 1). Next to that, potassium nitrate-induced increase in leaf biomass resulted in chloride dilution in the leaves and roots, leading to a reduction in chloride concentration, the critical parameter for salt damage.

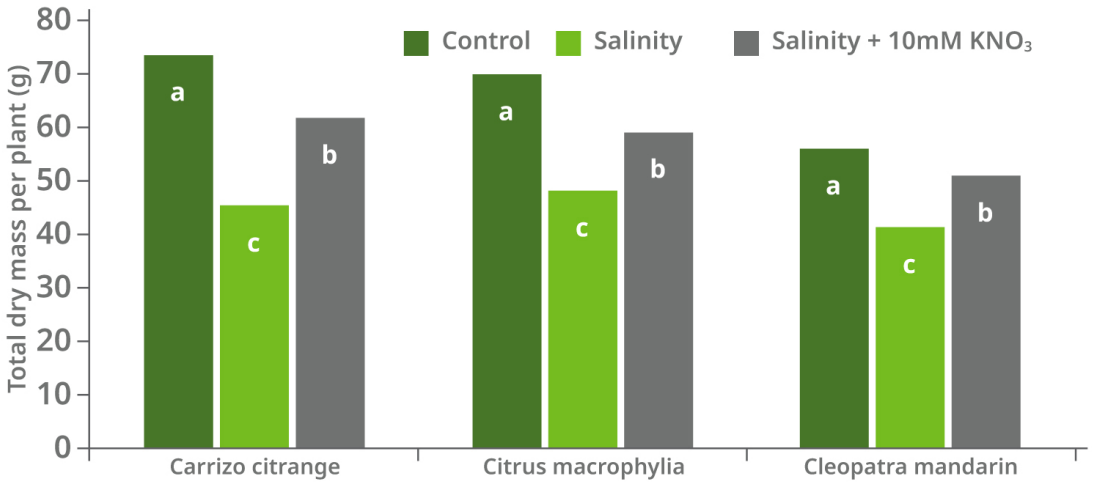

Figure 1. Treatment effect on the total dry mass (g) for Navelina citrus grafted on three different citrus rootstocks:

Table 1. Treatment effect on the leaf abscission (%) for Navelina citrus grafted on three different citrus rootstocks:

Treatments	Leaf abscission (%)		
	Citrange carrizo	Citrus macrophylia	Cleopatra mandarin
Control	0	0	0
Salinity	32,4	21,0	28,2
Salinity + 10mM KNO_3	20,2	15,1	12,6