Potassium nitrate had better results for crops growing in desert soils under highly saline conditions

Potassium nitrate outperformed potassium chloride and potassium sulphate as the K source in making up fertigation solutions for crops growing in desert soils under highly saline conditions

In this study, differences in growth vigour of Valencia orange trees, or Williams banana or Rodade tomato plants, either potted in river sand or river sand/$CaCa_3$, was assessed in relation to fertigation solutions composition, the solutions having been made up with either KNO_3, KCl or K_2SO_4. The experiment was conducted in South Africa in a nursery enclosed with 40% shade-cloth. 120 Valencia orange trees, and 120 Williams banana and 120 Rodade tomato plants, were transplanted into 2.7 l pots containing river sand or river sand/calcium carbonate (80:20 v/v), and treated with one of four nutrient solutions. One solution contained only $Ca(NO_3)_2$ and NaCl, and was applied to all the plants. The remaining three solutions were made up using the same fertilizers except for that supplying K. The K source was KCl, K_2SO_4 or KNO_3. As a consequence the NO_3^- to NH_4^+ ratio differed between solutions as well as the Cl^- or SO_4^{-2} content. NaCl was added to every solution to impose salinity stress. Elemental content except for that of S and Cl was equal in the K-containing nutrient solutions. Identical experiments were performed on each plant type.

In banana, orange and tomato growth was most vigorous in the plants treated with the solution made up with KNO_3 and least vigorous in the plants treated with the solution made up with KCl (Figures 1, 2 and 3). This was reflected by height increases, and fresh weight and number-of-leaf differences when the plants were lifted. Number

of primary roots in banana was commensurate with vigour. Enhanced vigour in the plants treated with the solution made up with KNO_3 may have additionally resulted from promoted cationic nutrient uptake. The NO_3^-/NH_4^+ ratio was greatest in the KNO_3 solution. Number of leaves showing marginal necrosis in banana or number of wilted leaves in tomato indicated greatest salinity stress following fertigation with the solution made up with K_2SO_4. In tomato, number of flower trusses, fruit number and yield were greatest where the KNO_3 solution was applied and least where KCl solution was applied. Differences in individual fruit weight were not observed.

The results clearly indicate a benefit in using KNO_3 as opposed to KCl or K_2SO_4 in fertigating crops growing in desert soils where the irrigation waters are generally saline.

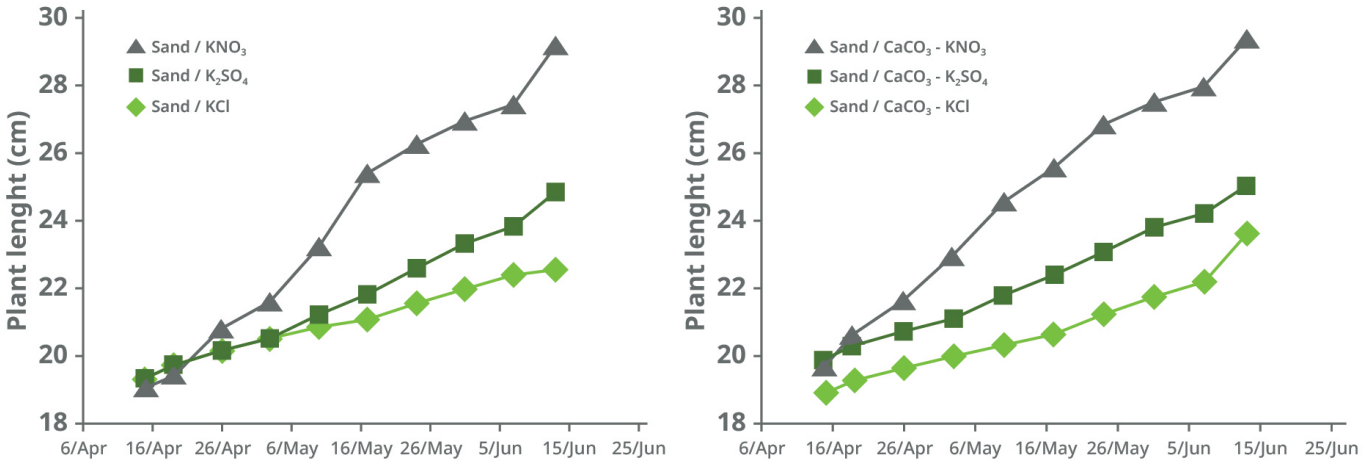

Figure 1. Banana plant lengths on each date of measurement. Left: Sand medium; Right: sand/$CaCO_3$ medium.

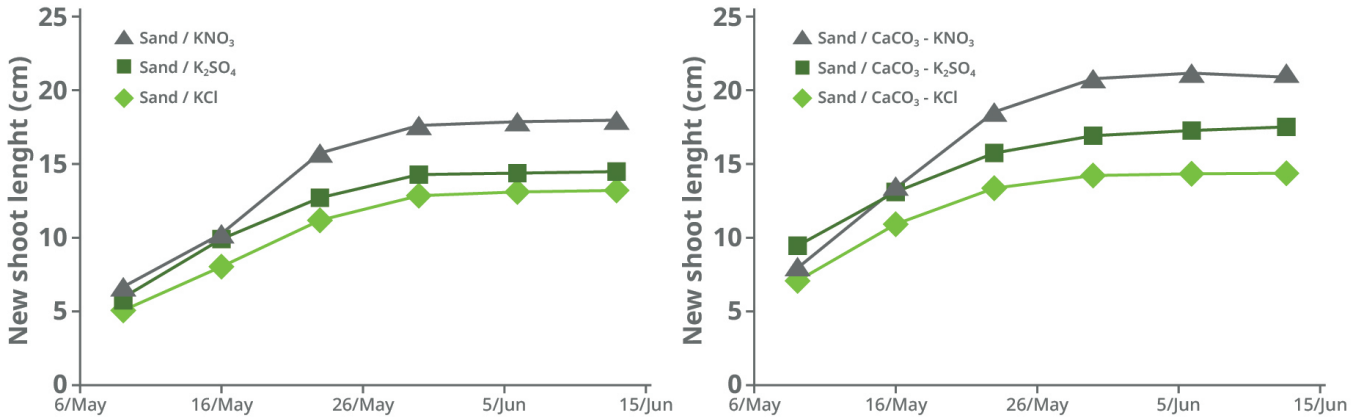

Figure 2. Orange new shoot lengths on each date of measurement. Left: Sand medium; Right: sand/$CaCO_3$ medium.

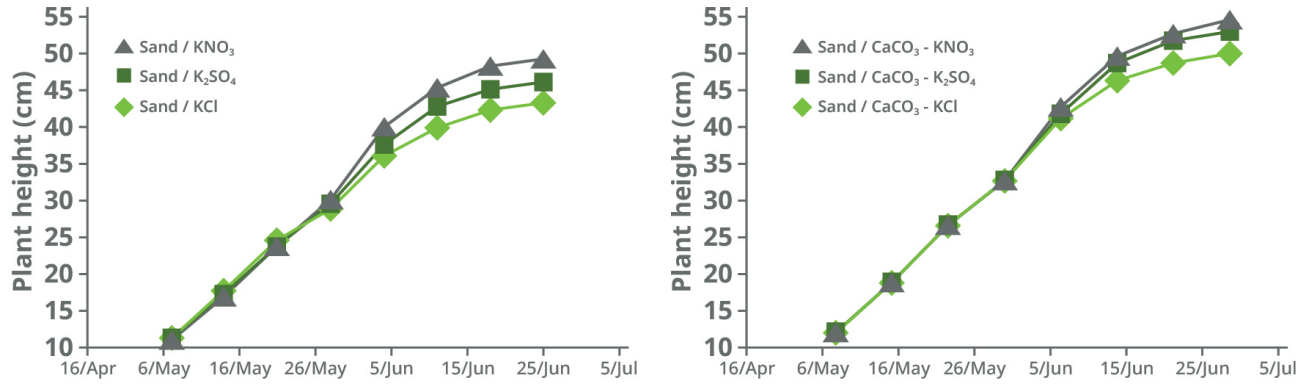

Figure 3. Tomato height on each date of measurement. Left: Sand medium; Right: sand/$CaCO_3$ medium.