Different sources of potassium (K) for a better management of fertigation under conditions of water stress and / or salinity in fruit-tree crops

José M Fontanilla[1]; Dolors Roca[2]; Isabel Rodriguez[3]; Rodolfo Canet[3]; Ana Quiñones[3]
[1]Marketing &Agronomist Manager Haifa Iberia
[2]Servei de Transferència de Tecnologia. DG DRiPAC. Conselleria d'Agricultura, Medi Ambient, Canvi Climàtic I Desenvolupament Rural. Generalitat Valenciana (Spain)
[3]Centro para el Desarrollo de la Agricultura Sostenible (CDAS), Instituto Valenciano de Investigaciones Agrarias. Carretera CV-315, Km 10.7, 46113 Moncada-València (Spain)

INTRODUCTION

The salinization of agricultural soils is one of the most serious problems facing agriculture. In recent years, the increase in salinized cultivation areas has been dramatic due to the intensification of agriculture, the indiscriminate pumping of water for irrigation in areas near the sea together with the use of high saline index fertilizers. A high concentration of salts, apart from the specific toxicity due to the absorption of ions in high concentrations, results in a high osmotic potential of the soil solution force the plant to use more energy to uptake the water.

As for the nutrients, potassium (K) is one of the essential macronutrients for plants that is required in large quantities by them for proper vegetative and reproductive development. It is known as the "fruit quality nutrient". Moreover, this element regulates the opening and closing of stomata, therefore, playing an important role in the water uptake in plants. Hence, it will be key for the greater or lesser crops water-stress tolerance.

OBJECTIVES

The effect of different sources of potassium applied in fertigation on the absorption of nutrients, production, fruit quality and vegetative growth-stage of young clementine plants of Nules and kaki, bright red and on different soil parameters are being analysed

Figure 1. Field of assays, Nules clementine mandarin grafted onto Carrizo citrange and "Rojo Brillante" persimmon grafted onto Lotus

MATERIALS AND METHODS

Young citrus plants of the Nules clementine variety grafted on Carrizo citrange and "Rojo Brillante" persimmon grafted onto Lotus (salinity sensitive rootstock) are being cultivated on sandy loam soil.

The following treatments have been carried out:

CONTROL: Treatment 0 or control without contribution of potassium fertilizers

ClK: nutrigation with liquid fertilizer with chlorides based on potassium chloride

SK: nutrigation with chloride-free liquid fertilizer based on potassium sulphate

MultiK™: nutrigation with soluble solid fertilizers based on potassium nitrate

Foliar analysis, stem hydric potential, and nutrient concentration and electrical conductivity in the soil extract were measured

RESULTS

The nutritional status of the plants was not affected by the different fertilizers, only potassium foliar concentration was higher in leaves of Nules clementine fertilized with MultiK™ (potassium nitrate). However, foliar concentration of chlorine was much higher in trees fertilized with chloride-based fertilizers in both fruit trees. In addition, the plants fertilized with this form of K presented a greater fall of the fruit, possibly because they underwent a greater hydric stress (greater water potential) at critical moments of cultivation. As for the effects on soil, treatments fertilized with potassium chloride drove to EC values significantly higher than the rest of the treatments, with the potassium concentration in the saturation extract being higher than that of the other treatments.

Table 1. Macronutrient concentration in spring flush leaves of Nules clementine in 2016 and 2017

Treatments	N	P	K	S	Ca	Mg	Cl	Na
CONTROL	2.38	0.120	0.75c	0.19	3.03	0.31	0.17	0.02a
SK	2.46	0.131	0.89b	0.17	3.56	0.28	0.15	0.01b
ClK	2.46	0.148	0.92b	0.19	3.64	0.29	0.14	0.01b
MultiK	2.49	0.129	0.96a	0.14	3.03	0.24	0.15	0.01b
ANOVA[Y]	NS	NS	*	NS	NS	NS	NS	**
CONTROL	2.41	0.093	0.57c	0.18	3.63	0.28	0.33b	0.03a
SK	2.21	0.093	0.83b	0.17	3.54	0.22	0.37ab	0.02b
ClK	2.30	0.097	0.84b	0.19	3.31	0.22	0.38a	0.02b
MultiK	2.33	0.100	0.94a	0.21	3.82	0.25	0.31b	0.02b
ANOVA[Y]	NS	NS	*	NS	NS	NS	*	**

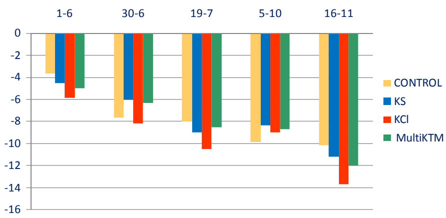

Figure 1. Stem hydric potential (Mpa) in Nules clementine in 2016

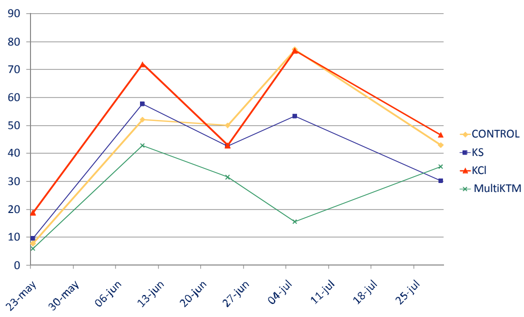

Figure 2. Dry weight of fallen organs (mainly fruits) in Nules clementine

Table 2. Macronutrient concentration in leaves of persimmon

Treatments	N	P	K	S	Ca	Mg	Cl	Na
CONTROL	1.13	0.085	0.56	0.279	3.38	0.70	2.66a	0.016
SK	1.37	0.116	1.05	0.283	3.13	0.63	1.65b	0.019
ClK	1.18	0.089	1.03	0.296	2.82	0.63	2.78a	0.012
MultiK	1.15	0.080	0.99	0.262	3.17	0.60	1.12c	0.017
ANOVA[Y]	NS	NS	NS	NS	NS	NS	*	NS

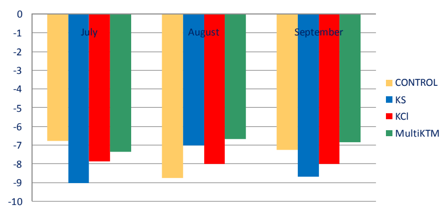

Figure 3. Stem hydric potential (Mpa) in persimmon

Table 3. Electrical conductivity in soil extract of persimmon

Treatments	EC	K
CONTROL	16.20a	0.17c
SK	4.05c	0.14c
ClK	18.35a	0.50a
MultiK	10.92b	0.30b
ANOVA[Y]	**	*