

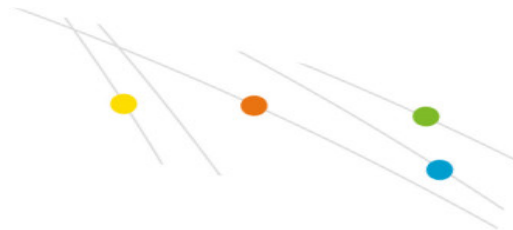
Ultrasol®ine K Plus (Potassium Nitrate with Iodine) for improved fruit quality and more calcium and anti-oxidants in fruits of cherry tomatoes

**Application of Ultrasol®ine K Plus resulted in more uniform trusses, better fruit weight, a higher level of antioxidants and more calcium in fruits of cherry tomatoes in a research station**

Iodine (I) should be considered as a plant nutrient. That is the main conclusion of [Kiferle et al., 2021](#). In that paper, the presence and identity of naturally occurring iodinated proteins in higher plants, which had never been described before, was published. Eighty-two iodinated proteins have been identified that take part in important biological processes in higher plants. Similar to deficiency in any other plant nutrient, a deficiency in iodine is predicted to cause yield losses.

In fertigated and protected horticultural crops, grown in a commercial production setting, iodine deficiency can occur when the presence of iodine in the nutrient solution is below a sufficiency target value. In intensive, fertigated cropping systems under cover, the nutrient solution and irrigation water are the main sources of iodine. This deficiency will be visible as sub-optimal root or leaf development, later flowering, lower fruit growth and lower resilience to stress, resulting in lower yields compared to a crop which has been supplied with sufficient iodine in the nutrient solution.

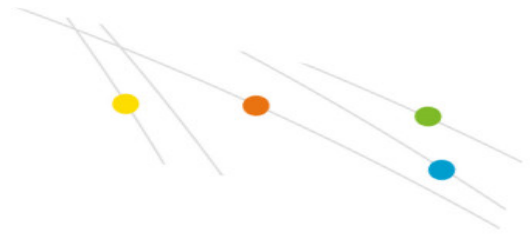
In a research station in Almeria, Spain, cherry tomatoes of the cultivar “Genio” were grown in a sandy soil, following local commercial practice. The research station was overseeing application of fertilizers, the recording of crop details and sampling of water and plant tissues. In one sector (300 m<sup>2</sup>) a fertigation grade of potassium



nitrate without iodine (control) was compared to the other sector (300 m<sup>2</sup>) where **Ultrasol<sup>®</sup>ine K Plus** (potassium nitrate containing a fixed amount of iodine) was applied as source of K and N - and iodine - in the nutrient solution. Both potassium nitrate sources were applied at the same dose and timing in a nutrient solution, which followed local recommendations (Table 1). **Ultrasol<sup>®</sup>ine K Plus** was applied for the whole crop season (August-February), starting from transplant.

Prior to the trial, samples of the irrigation water were taken and the concentration of iodine in these samples was measured. The concentration of iodine in both irrigation water, and soluble soil fraction (1:2 water extract), was below 0.1 µmol/L. The amount of iodine in **Ultrasol<sup>®</sup>ine K Plus** aimed to correct the concentration of iodine to between 1 and 10 µmol l L<sup>-1</sup> in the root zone. For each sector fruit weight was recorded on 5 moments during the crops cultivation. Additionally, to see the effect of iodine on fruit quality, the concentration in the fruits of phenolic compounds and vitamin C was determined on one sampling date, and calcium concentration in the fruits was measured on samples taken on 5 different dates. On these same dates the iodine concentration in the first fully developed leaf on the plants from which the fruits were sampled, was also determined.

Application of **Ultrasol<sup>®</sup>ine K Plus** resulted in a five-fold increase of iodine in the leaves of the tomato plants. In the sector where **Ultrasol<sup>®</sup>ine K Plus** was applied fruit weight was higher, and these fruits contained more anti-oxidants and calcium, compared to the control sector (Table 2). The calcium concentration in the fruits was especially elevated in the months of December-February (Figure 1). In December it



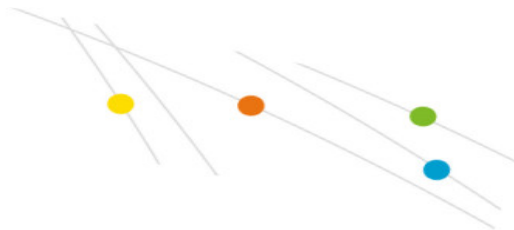
was observed that the quality of the fruit trusses (cherry tomato on the vine) was deteriorated in the untreated (iodine-deficient) control, compared to the **Ultrason<sup>®</sup>ine K Plus** sector. The lower fruit quality in the control sector was linked to cloudy weather during the fruit development in the period prior to the observation (Figure 2). In contrast, a good quality of fruits and trusses was seen in the **Ultrason<sup>®</sup>ine K Plus** sector in that same period. The positive response in fruit quality to application of **Ultrason<sup>®</sup>ine K Plus**, can be interpreted as a correction of a suboptimal level of iodine in the irrigation water. With a sufficient level of this micronutrient in the root zone, plants can iodinate proteins in the roots and leaves. These proteins have important functions in biological processes involved in growth, stress-signaling and anti-oxidant production of the roots and leaves. This allows the plant to maintain optimal levels of photosynthesis and sugar metabolism, even in the face of environmental stress.

Table 1. Macronutrients supplied with fertilizers in the nutrient solution applied with each irrigation moment.

Months of application	EC dS/m	Nutrient solution composition (mmol L <sup>-1</sup> ) (exclusive of minerals in irrigation water*)					
		NO <sub>3</sub>	NH <sub>4</sub>	PO <sub>4</sub>	K	Ca	SO <sub>4</sub>
September	2.9	10.5	1.3	1	6	1.3	1.0
October-February	2.6	7.8	0.0	1	7	0.0	0.9

\*The following elements were supplied with the irrigation water (in mmol L<sup>-1</sup>): Ca 2.7; Mg 2.8; SO<sub>4</sub> 0.5; Na 6.1; Cl 12.8.

Table 2. Treatment means ± standard deviation of fruit weight and anti-oxidants in



fruits of cherry tomatoes harvested from sectors where application of potassium nitrate without iodine in the control (Control) was compared with application of iodine containing potassium nitrate (**Ultrasol<sup>®</sup>ine K Plus**). Mean calcium concentration in the fruit is based on the average of 5 monthly analyses.\*statistically significant LSD,  $p < 0.05$ .

Treatment	Fruit weight g fruit <sup>-1</sup>	Poly-phenols mg 100 g <sup>-1</sup>	Vit. C mg 100 g <sup>-1</sup>	Calcium in fruits % in DM
Control	17.9 ± 1.8	42.1 ± 1.8	12.9 ± 1.7	0.35 ± 0.08
<b>Ultrasol<sup>®</sup>ine</b>	19.4 ± 2.1	45.6 ± 3.0	15.3 ± 1.8	0.46 ± 0.22
Significance	*	*	*	

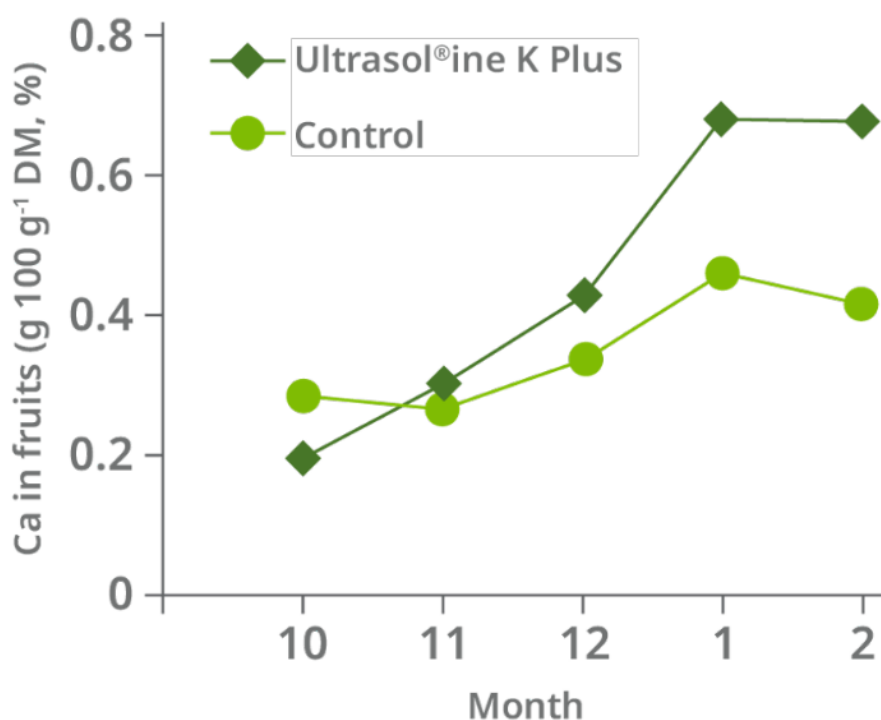
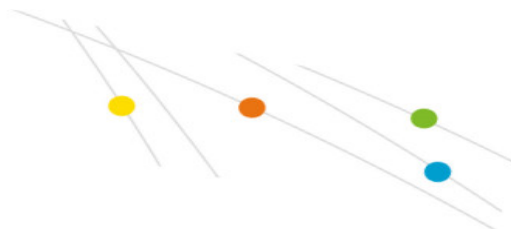


Figure 1. Calcium concentration of cherry tomato fruits harvested from sectors with potassium nitrate without iodine (Control) or with **Ultrasol<sup>®</sup>ine K Plus** in the nutrient solution at each sample moment.



**Control**

**Ultrasonline**  
**K Plus**



Figure 2. A pronounced difference in truss quality was observed, after a period of dark and cold weather with more uniform trusses of better colour in the **Ultrasonline K Plus** sector, compared to the control.

The original publication is available at

<https://doi.org/10.17660/ActaHortic.2021.1321.27>

Hora and Holwerda 2021, <https://doi.org/10.17660/ActaHortic.2021.1321.27>

Kiferle et al., 2021, <https://doi.org/10.3389/fpls.2021.616868>