



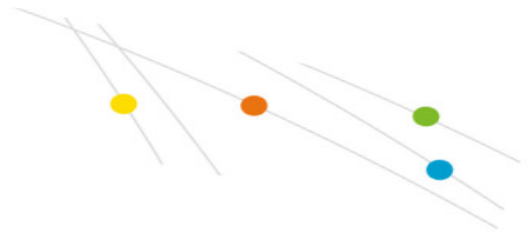
The application of Ultrasol®ine K plus helps to improve the growth of green Lollo lettuce in hydroponic production in Iquique, Chile.

Iodine (I) should be considered as a plant nutrient. This is the main conclusion of Kiferle et al., 2021.

In this work, the presence and identity of natural iodinated proteins in higher plants, which had never been described before, was published. 82 iodinated proteins that participate in important biological processes in higher plants have been identified. Like the deficiency of any other plant nutrient, iodine deficiency can lead to 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 target sufficiency value. In intensive and fertigated indoor growing systems, the nutrient solution and irrigation water are the main sources of iodine. This deficiency will manifest as suboptimal root or leaf development, late flowering, reduced fruit growth, and reduced resistance to stress, resulting in lower yields compared to a field crop. that sufficient iodine has been supplied in the nutrient solution.

A trial was carried out at the agricultural research and development center of the community of Pozo Almonte, in Chile. This greenhouse is part of the SQM Community Project, which was inaugurated in 2019, in collaboration with the municipality of Pozo Almonte, Iquique, Chile. The objective is to develop hydroponic crops for sale in the local market. In these dependencies, anyone who wants to grow their own hydroponic



crops can receive training, and the center will provide a guide as a pilot plan to identify the best business process and production techniques. The use of potassium nitrate in the nutrient solution, supplied as Ultrasol® K Plus, is now standard practice. Now during the winter period (June-July, 2021) the benefit of the application of Ultrasol® K Plus on the growth of lettuce growing hydroponically has been studied.

The application of Ultrasol® K Plus or Ultrasol® in the standard solution was compared during the production of green lettuce Lollo var. "Bartimer", in a culture system in two states. In the initial stage with young seedlings they were propagated in high plant density tables (150 plants/m<sup>2</sup>, between 3-6 weeks after sowing), followed by the maturation stage (production) in final tables (25 plants/m<sup>2</sup>, between 7 to 10 weeks after sowing). Table 1 indicates the details of the recirculated nutrient solution in these two phenological stages. The composition of the applied nutrient solution was identical in both growth stages, but the electrical conductivity (EC) of the nutrient solution (SN) in the initial stage was 0.6 mS/cm, it increased to 1.2 mS in the maturation stage. /cm. Plants' need for iodine is aligned with their needs for other nutrients. Consequently, a higher need for potassium, nitrogen and iodine in mature plants is ensured with a higher dose of Ultrasol® K Plus.

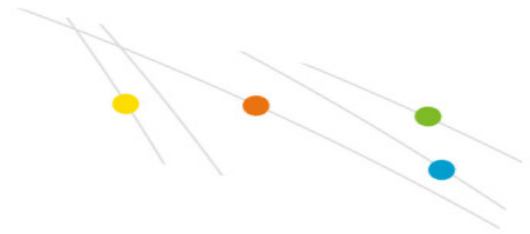
Iodine deficiency in plants will result in a slight reduction in both shoot and root growth. In lettuce leaves, iodine participates in nitrogen metabolism and photosynthesis, for plant growth. However, most of the iodine taken up by the plant ended up in the root system, where it plays an important role in ensuring an adequate supply of oxygen, necessary for the process of respiration that consumes sugar and



releases energy, required to feed the plants. metabolic processes in the root.

The result of the trial in Pozo Almonte provides a clear demonstration of the benefit of adding iodine to the nutrient solution, to accelerate shoot and root growth. The plants treated with Ultrasol®ine were harvested 1 day earlier compared to the control. The weight and height of the lettuce heads, and the length of the root system were evaluated (Figure 1). The fresh weight of plants harvested Ultrasol®ine K Plus instead of Ultrasol® K Plus was 29% higher with Ultrasol®ine K Plus, and also root length and plant size were significantly higher (Figure 1). . This benefit really began to develop in the early stage of growth, and was visible to the naked eye from the first week of transplanting to the high-density table (Figures 2 and 3).





Cuadro 1. Composición de la solución nutritiva aplicada.

Receta solución de fertilizantes					Estado de desarrollo								
(g o ml*/1000 L)					Alta densidad (50%)			Producción (100%)					
Ultrasol®ine K Plus (ensayo) o Ultrasol® K Plus (práctica del agricultor)					200			400					
Ultrasol® Calcium					150			300					
Ultrasol® Magnit					100			200					
Ultrasol® MKP					75			150					
Ultrasol® NitOne 25-0-25					50			100					
Dissolvine® Q48 (Fe EDDHA)					18			35					
Ácido fosfórico 85%, 65 P <sub>2</sub> O <sub>5</sub>					40*			40*					
Solución de nutrientes en mmol/L, incluyendo la concentración de minerales en el agua de riego (CE 0.6 mS/cm en mmol/L: 0.5 K, 1,3 Ca, 0.5 S, 0.3 Mg, 1.6 Na													
Estado del cultivo: CE				pH	N	N-NO <sub>3</sub>	N-NH <sub>4</sub>	K	Ca	S	Mg	Na	Fe
1.2 mS/cm				pH 6	5.3	4.5	0.8	3.1	1.9	0.7	0.6	1.6	0.02
1.8 mS/cm				pH 6	10.5	9.0	1.5	2.5	2.5	0.9	1.0	1.6	0.04

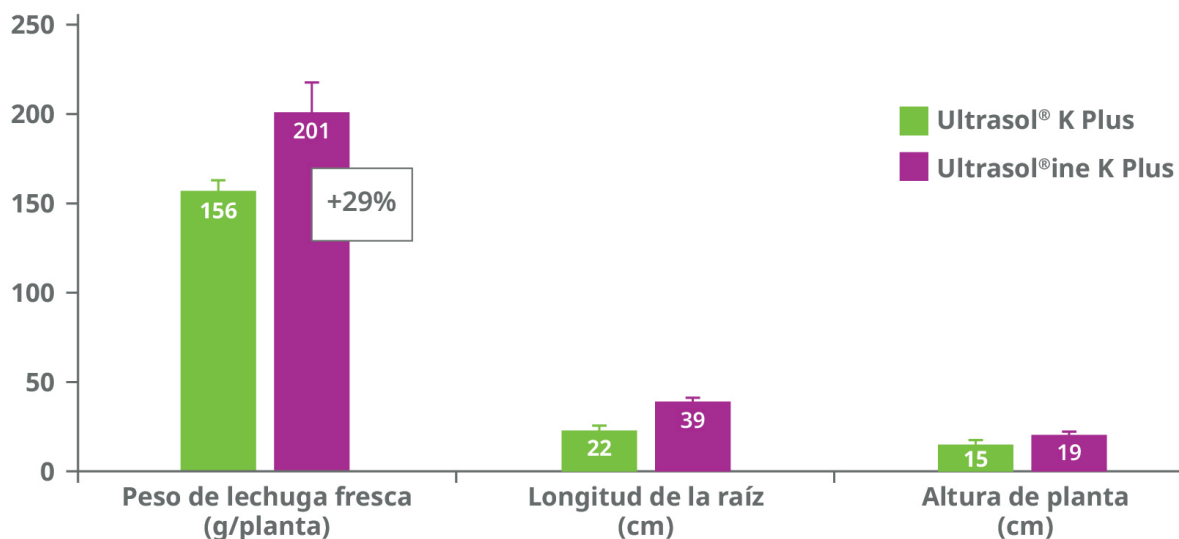
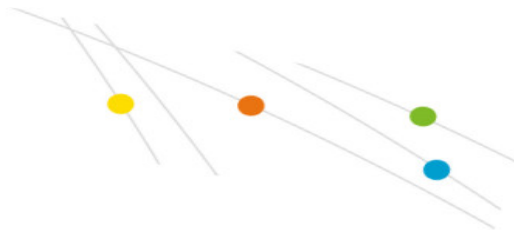


Figura 1. Desviación estándar  $\pm$  promedio de peso, longitud de raíz y altura de la planta, evaluada sobre 20 plantas por tratamiento (10 plantas de cada replica), 23/24 días después del segundo transplante. Los promedios de valores evaluados en plantas



en el tratamiento de Ultrasol<sup>®</sup>ine K Plus son significativamente mayores que aquellos del tratamiento con Ultrasol<sup>®</sup> K Plus (Wilcoxon Mann-Whitney,  $m=n=20$ ,  $p<0.05$ ). Con Ultrasol<sup>®</sup>ine K Plus, las mesas fueron cosechadas un día antes debido a su tamaño mayor.

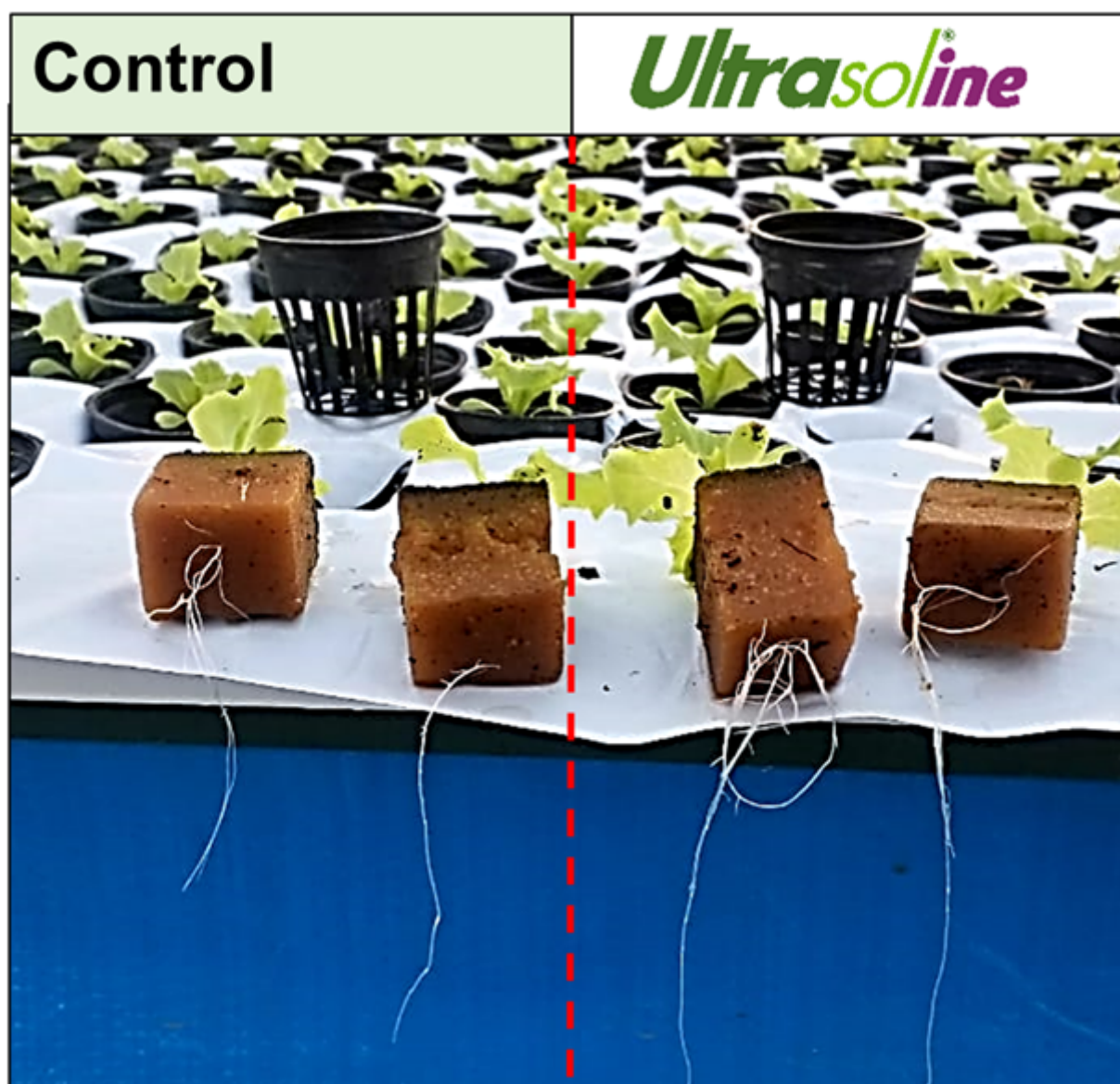
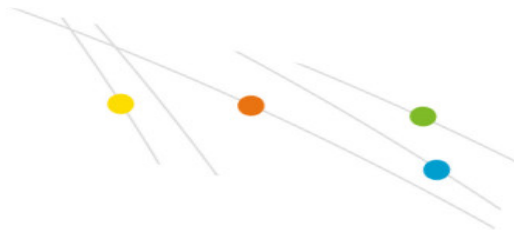


Figura 2. Diferencias en el desarrollo del crecimiento radicular en plantas de lechuga poco después del transplante 2 semanas después de la siembra, en las mesas de alta





densidad ( $150 \text{ plantas/m}^2$ ), sumergido en un sistema hidropónico.

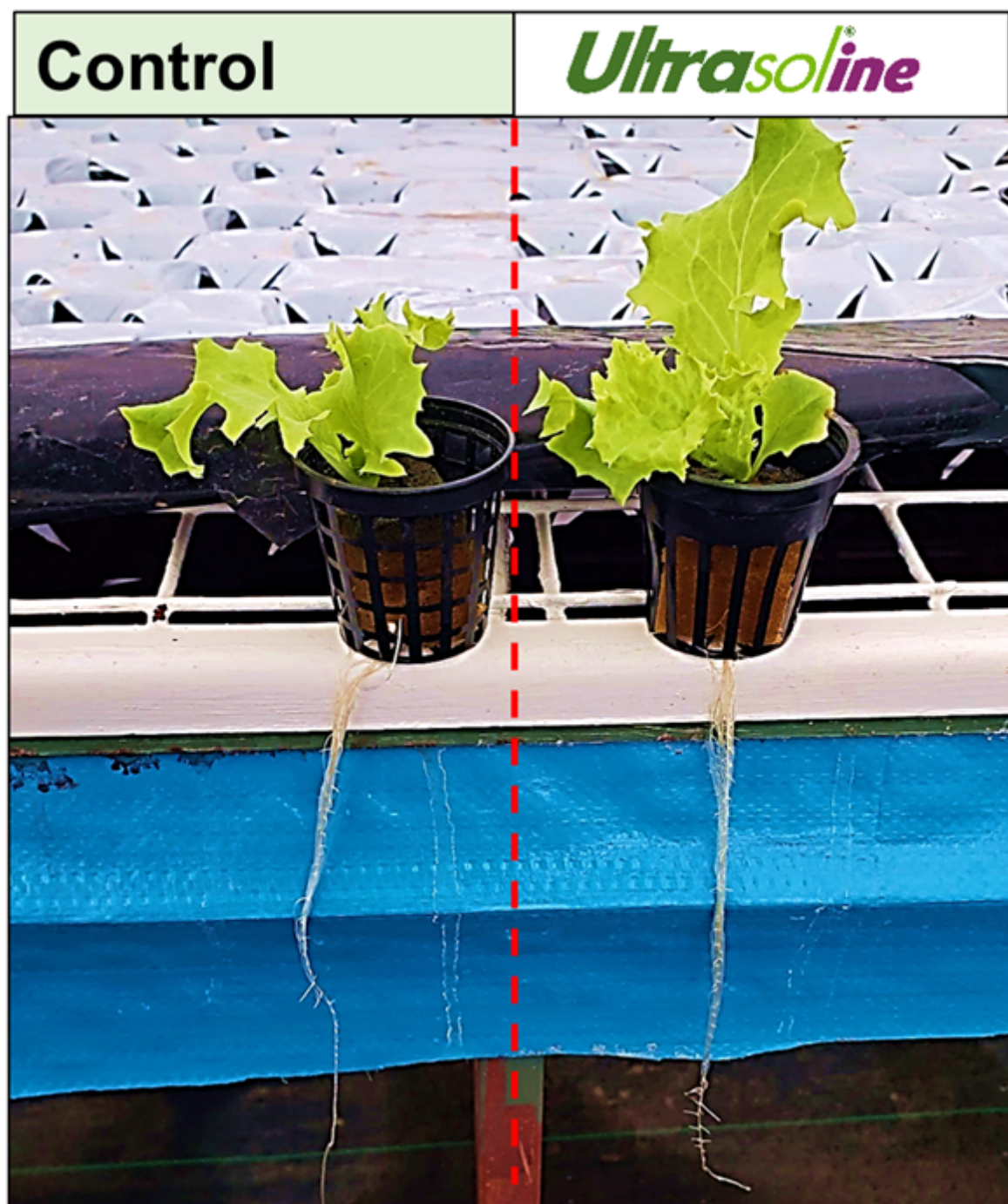


Figura 3. Las plantas se encuentran listas para ser transplantadas desde las mesas de alta densidad, a la próximas mesas con densidad de  $25 \text{ plants/m}^2$  en la septima



semana. El beneficio para el crecimiento de la planta del yodo como un micronutriente en la solución nutritiva es claramente visible con un aumentó de la biomasa de raíz y brote.

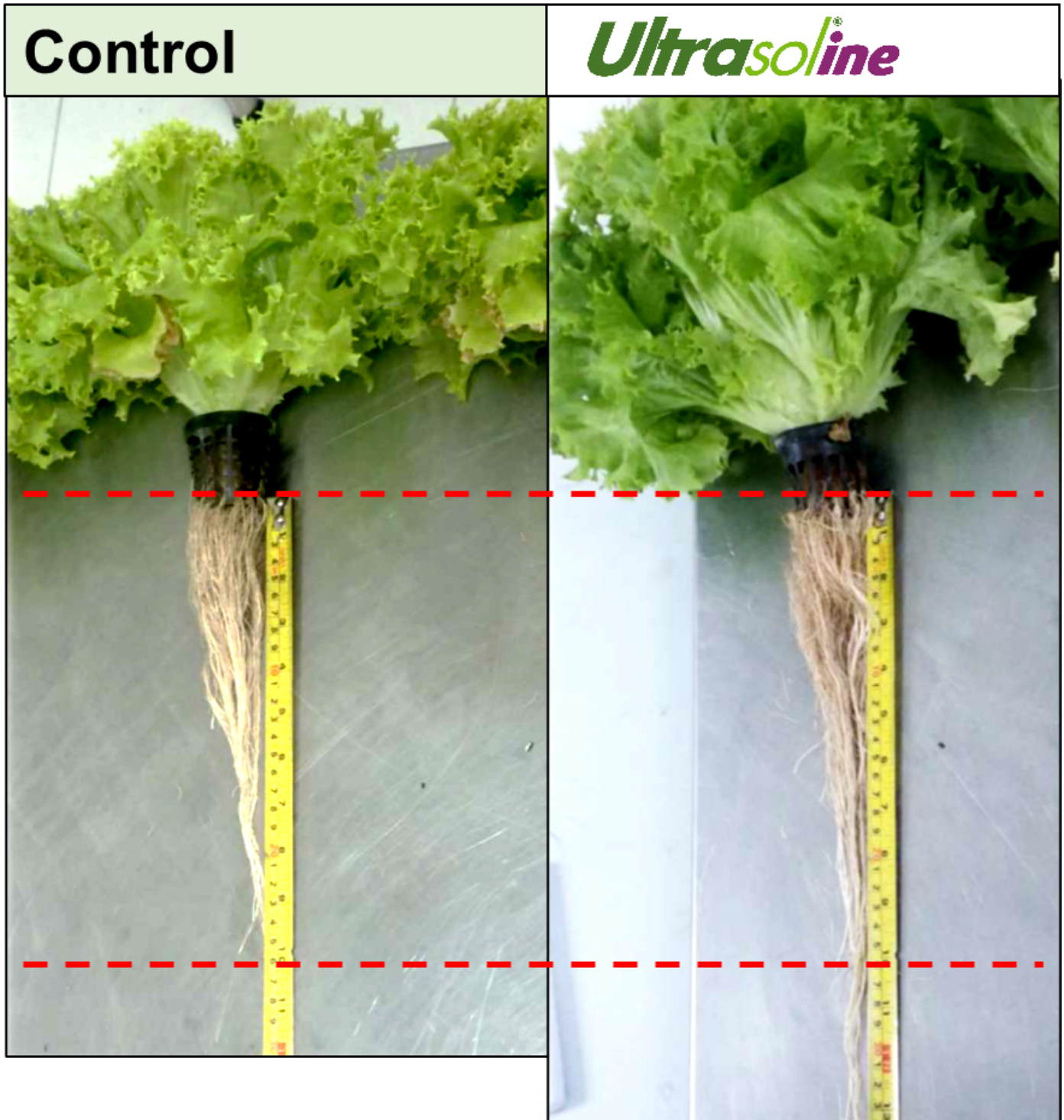
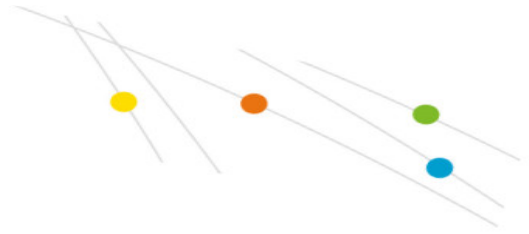


Figura 4. Las plantas a cosecha, a los 23 días después del segundo transplante por Ultrason<sup>®</sup>ine K Plus. Estas fueron cosechadas un días antes en comparación al testigo,





el cuál fue cosechado a los 24 días después del segundo transplante.