

## **Effect of heating and Root Zone Temperature Optimization (RZTO) on Tomato Yield in Almeria, Spain**

Dr. Sharon Devir

### **Introduction**

The city of Almeria is considered the world's Tomato Capital, considered one of the largest producer of tomatoes for decades. The region produces tomato fruits of different varieties and ship millions of tons annually to the domestic, EU and international markets.

Sub optimal root zone temperatures<sup>1</sup> (RZT) can restrict the growth of tomatoes (*Solanum Lycopersicon L.*), resulting in decreased fruit yield under field conditions.

A trial that took place between November 2018 – April 2019, whereas tomato roots were heated and exposed to higher RZT of plants grown in soil. The trial relied on ROOTS's RZTO technology and system developed by ROOTS Sustainable Agriculture Technologies Ltd.'s RZTO system.

### **The Goal of the Trial**

This study was conducted to determine the effects of using the ROOTS RZT system on the fruit yield of tomatoes.

### **Technical Data**

RZTO system: Throughout most of the season, the RZT was stable and ranged between 20-22°C, except for two weeks at the beginning of the season when the RZT ranged from 23-25°C (Figure 3).

### **Treatments and Experimental Design**

The experimental area was comprised of two plots with four rows. One plot was heated with the RZTO system, with a single RZT loop. The other plot was not heated and served as the control of the experiment.

### **Harvesting and Data Analysis**

The field tests comprised of two treatments: Heated roots zone and non-heated roots (Control). Each treatment was comprised of 4 repetitions. Tomatoes were harvested 18 times throughout

---

<sup>1</sup> Sasaki, Kozi, and Tositaka ITAGI. "Effect of root cooling treatment of nutrient solution on growth and yield of tomato, cucumber and melon." *Environment Control in Biology* 27.3 (1989): 89-95.

the growing cycle. The data was analyzed by a t-test ( $\alpha=0.05$ ).

## Results

### Effect of Treatments on Fruit Yield

Differences between treated and un-treated plants were found during the period from February to the beginning of April. During the period from February to the beginning of April. The mean yield of Treated vs un-treated was 21.4 and 18.04 kg/repetition respectively which represents a difference of 3.36 kg / Hectare. The difference was found to be statistically significant using paired T-test for means ( $P>0.001$ ).

The fruit mass did not differ in the first two-thirds of the season, except for one harvest (12/4/19). In the last third of the season, the fruit mass was significantly higher in the RZT heated plot compared to the control plot (Figure 1). **During this period, from the middle of February to the beginning of April, the yield increased by 36% at the RZTO heated plants compared to the non-heated plants).**

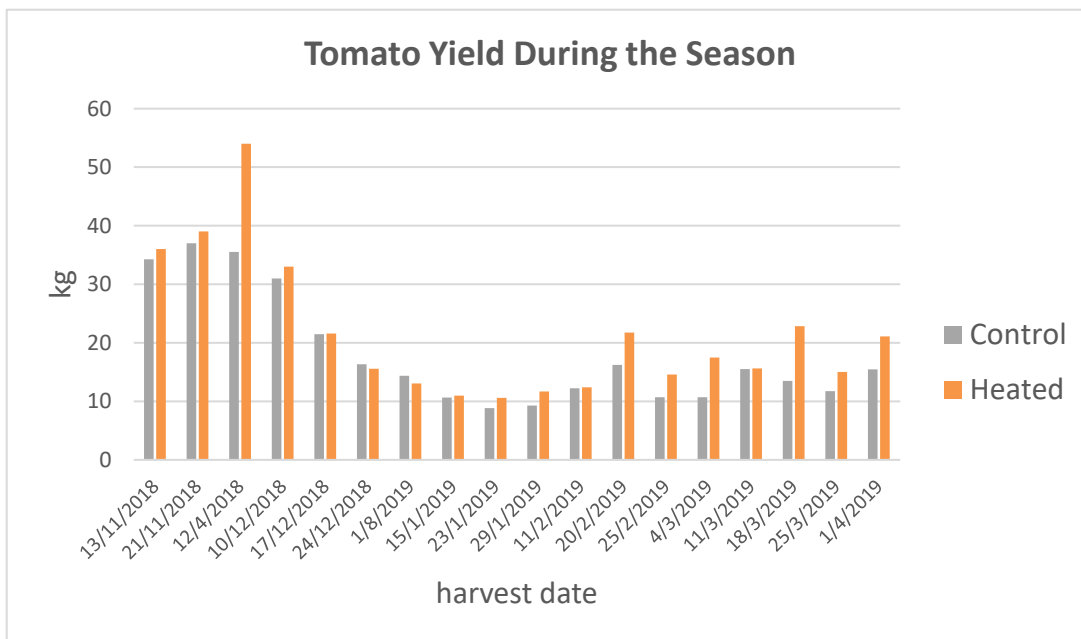


Fig 1: Tomato yield results. The heated roots treatment is in orange, the control is in gray.

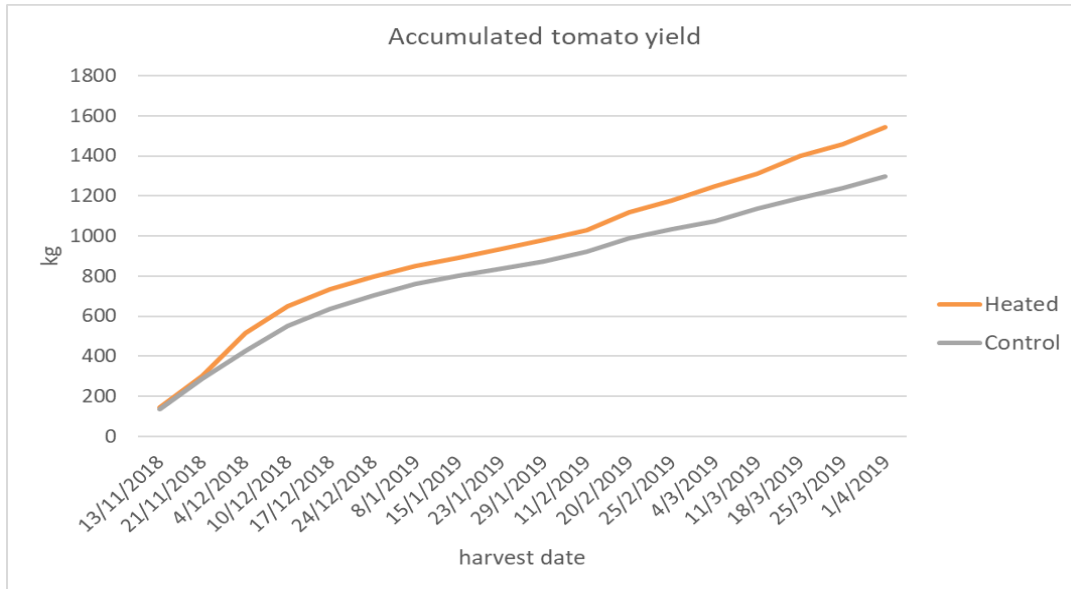


Figure 2. The total accumulative yield during the entire season was 19% higher in the RZT heated plot compared to the control plot (1545 kg and 1300 kg, respectively).

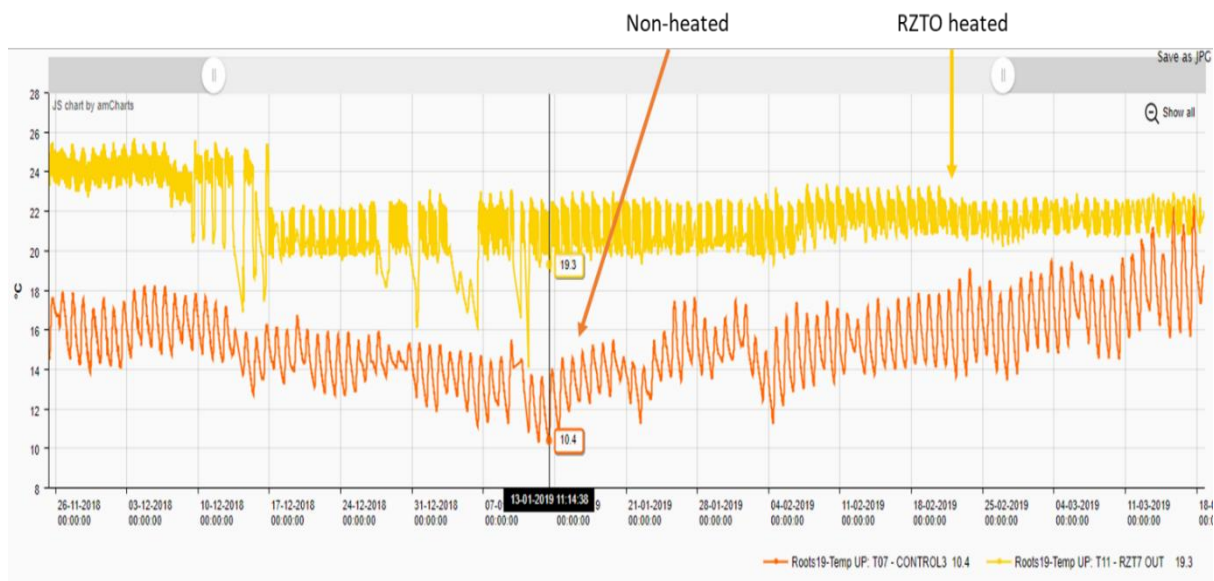


Fig 3: Temperatures measured in the roots zone. The upper yellow graph presents the RZTO heating temp, and the lower orange graph presents the control temperature.

## Conclusions

The effect of treating the roots zone temperature as a key factor influencing growth and yield proved positive results. **The RZTO system installed in the tomato greenhouse in Almeria showed the outcome of increased tomato production during the last third of the season and increased tomato yield mass by 36%.**

