



Increasing the level of vitamin C in tomato through light treatments during truss development

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Primary and Secondary metabolism

Primary metabolism delivers building blocks for plant growth and development, such as sugars, fatty acids, amino acids, lignin and cellulose. Secondary metabolism produces chemical compounds for plant interaction with the environment. These compounds, such as antioxidants that prevent oxidative stress, can play a role in both plant defence and reproduction systems. The application of controlled stress in greenhouse environment may lead to relative high responses in the secondary metabolism and the production of antioxidants.

Added value and vitamin C

Seed companies and growers are looking for ways to increase the added value of their produce. They are interested in potentially health beneficial compounds in fruits, but are careful to avoid health claims. Up to now they strive to improve consumers health by promoting vegetable consumption. Still, they are interested in treatments that could increase the content of health promoting compounds.

Experimental set up

Based on literature research, we selected vitamin C as a compound and light treatments as a factor in our research model. We studied the effect of red and blue light emitted by LED strips in cuvettes on developing tomato trusses in a greenhouse. Based on these first results we involved stakeholders in discussions on vegetables with added vitamin C and their role in the vegetable chain.



Figure 1: The cuvettes containing developing trusses in the crop

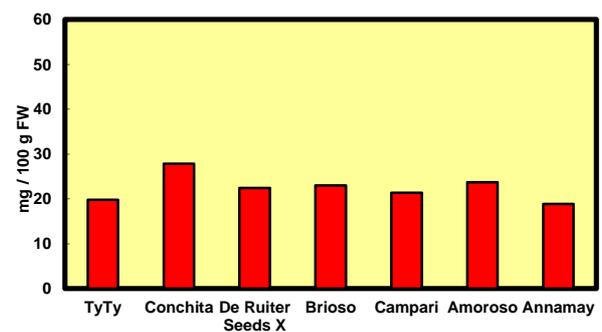
Treatments

We grew 7 tomato varieties with natural variety in vitamin C content in a greenhouse compartment. Philips Lighting constructed ventilated cuvettes with a highly reflective interior and blue-red LED strips. We inserted developing trusses into the cuvettes and attached these to the high wire to enable crop growth. The fruits received PAR light in different intensities, ranging from 300 – 5000 $\mu\text{mol m}^{-2} \text{s}^{-1}$. The maximum temperature increase in the cuvette was 1 °C above ambient greenhouse temperature.

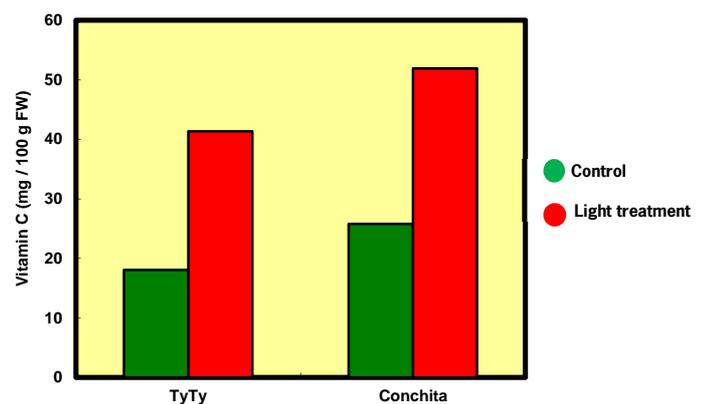


Results

Vitamin C content in different tomato varieties



Effect of light on trusses in cuvettes (red and blue) on vitamin C content in tomato



Discussion

Even at the lowest light intensity used, a considerable increase in ascorbic acid was measured. In 2011 we further focus on the dose - response curve and will have discussions on practical applications with stakeholders.