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EFFECTS OF PHOSPHITE FOLIAR FERTILIZERS ON THE NUTRITIONAL VALUE OF PROTECTED TOMATO

Zsuzsanna Tóthné Taskovics[1], András Kovács[1], András Palkovics[2], Božica Japundžić-Palenkić[3]*

[1]Department of Horticulture, Faculty of Horticulture and Rural Development, John von Neumann University, Hungary
[2]Department of Horticulture, Faculty of Horticulture and Rural Development, John von Neumann University, Hungary
[3]Biotechnical Department, University of Slavonski Brod, Croatia
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Abstract
Protected crops is the most intensive section of vegetable cultivation. The aim of horticulturists is to realize higher crop yield along with producing vegetables for healthy alimentation. There are several ways to achieving this viasustainable plant nutrition.
Tomato represents a huge part in the vegetable consumption having important role in human health preservation e.g. due to its high vitamin C content. Therefore an enhanced vitamin C content is of high value infunctional food production.
Our research was focused onpossible ways to increasing vitamin C content in protected tomato by phosphite foliar fertilizer applicationin a small air spaced shelter. Results indicate elevated vitamin C and Ca content in some circumstances, however the small air spaced shelter proved to be incompatible for this purpose.

1 Introduction

In vegetable cultivation horticulturists strive to achieve not only an outstanding crop yield, but also to produce vegetables for healthy alimentation. Nutritional value of vegetables can be improved with sustainable plant nutrition and minimizing the use of chemicals [3].

Increased demand for functional food drive producers to grow vegetables that are good for human health. Tomato berries contain vitamin C and other vitamins, minerals, and antioxidants that have a beneficial effect on the human body. Vitamin C is a very strong antioxidant and it helps vitamin E and carotenoids in their proper function. It has an important role in theenhancement of immune system [4,10]. So tomato consumption is a strong base of a healthy diet and it has a great importance as functional food having low energy and fat content, and containing water soluble dietary fibers [6].

The daily light exposure can deeply influence the vitamin C content of tomato. The more is the light exposure in the growing season, the more is the vitamin C content in the plant tissues. However, high temperature has a negative effect on producing vitamin C production.

In the last few years the weather extremesare frequent during summer. Plants react with stress responsed to sudden temperature changes and this may effect the plant's nutrient utilization and so the quality and the quantity of the crop [2].

* Corresponding author. Tel.: +36 76 516-311
Email: tothne.zsuzsanna@kvk.uni-neumann.hu

Our earlier research demonstrated that phosphite fertilizers can increase vitamin C content of paprika pods and in order to check this hypothesis in tomatoen experiment was carried out in our institution.

2 Method

The experiment was established in a small air spaced polytunnel of Faculty of Horticulture and Rural Development, John von Neumann University. Tomatoes were planted both in spring and autumn to allow examinations in two forcing seasons. The spring plantage was launched on 20-02-2018 and the autumn one on 08-08-2018.Tomatoes were grownin coconut fibergrowing media using hydroponics. E 26.34692 tomato variety was used with a planting density of 2,5 plant/m^2. Two types of foliar fertilizers were applied in two different doses, six weeks long, with an untreated control group. Overall, five various treatments were compared, as follows:

Plantafosz Universal 5ml/1 l solution
Plantafosz Universal 10 ml/1 l solution
Phos 60 1,25 ml/1 l solution
Phos 60 2,5 ml/1 l solution
control (no foliar fertilizer)

Berry samples were collected in the ripening period two times in the spring growing season (15.05. and 13.06.), and then in the autumn growing season (05.11.), and analyzed in the Soil and Plant Laboratory of John von Neumann University.

3 Results

Vitamin C, dry matter, and nutrient elements content of the berries was determined at three sampling dates. Significant differences between the dry matter contents of the spring and autumn collected samples were found, the berries in spring having higher dry matter content (Fig. 1.).This phenomenon might be related to a generally higher light exposure in spring, and the different treatments didn't show significant differences.

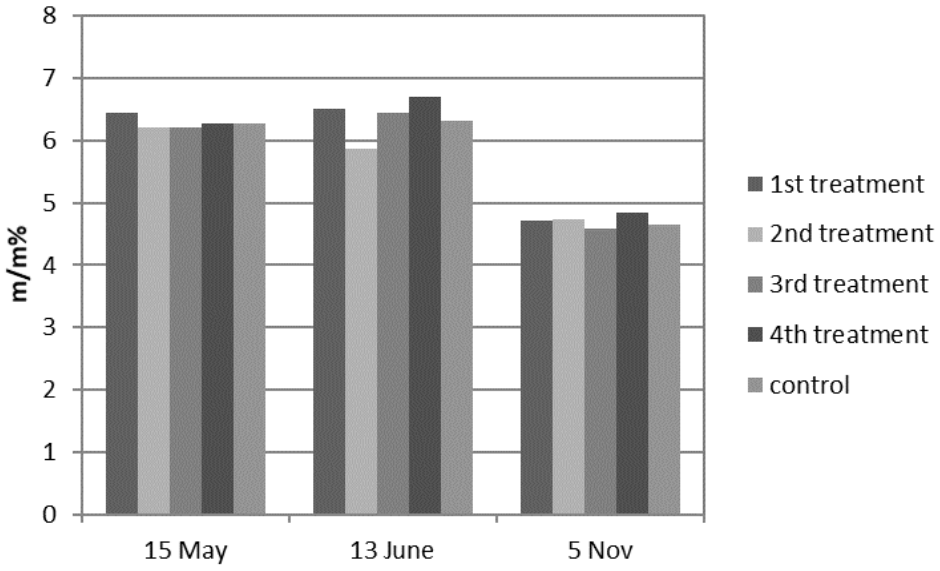

Figure 1. Dry-matter content of berries in spring and autumn season (m/m%)

Regarding the vitamin C content (Fig. 2), the values measured at the first sampling time didn't show significant difference between the treatments. The highest values were obtained from

the June sampling when approx. 35 mg / 100 g was measured in the case of two treatments. In autumn season samples of two treatments showed higher vitamin C content compared to the other treatments, which was similar to the best values in June. This result is a bit controversial. According to literature vitamin C content decreases along with the decline in light exposure. During the spring and the autumn sampling we measured higher vitamin C content in the treated tomatoes than in the controls. So the treatment had a beneficial effect.

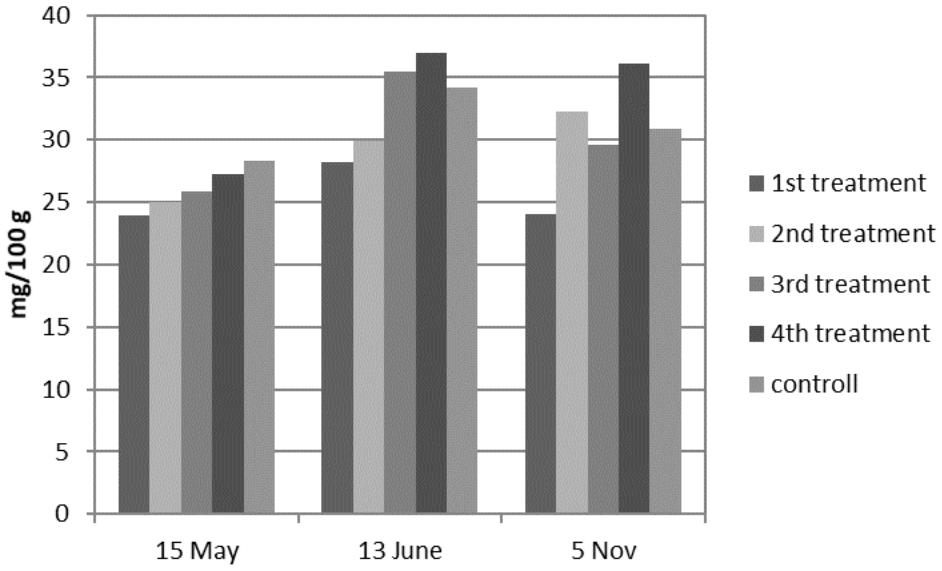

Figure 2. Vitamin C content of berries in spring and autumn season (mg/100 g)

Regarding the nutrient elements, N, P, K, Ca and Mg were examined. Significant differences in the treatments and in the seasons were only experienced in the case of Ca (Fig. 3.).

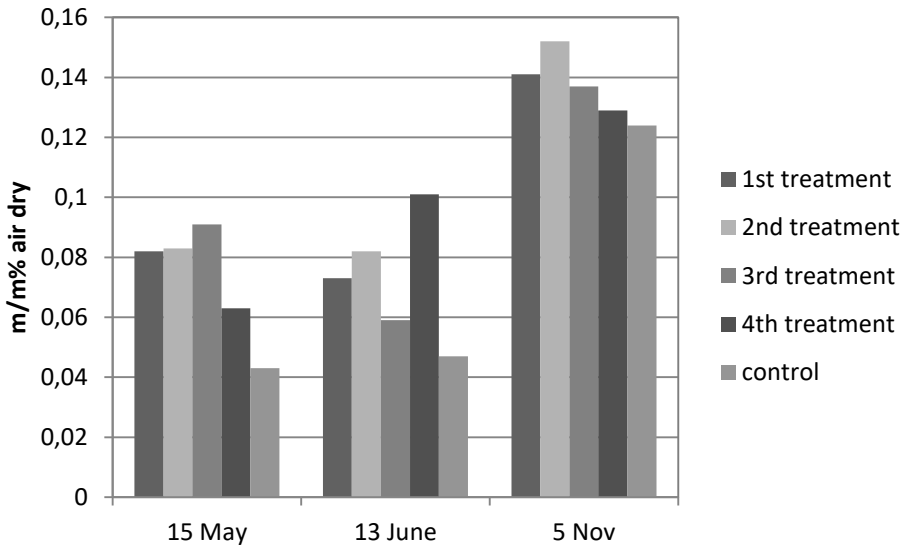

Figure 3. Ca content of berries in spring and autumn season (m/m% air dry)

Ca content of the berries was low at both sampling times in spring plantage. So there were a huge amount of unsaleable, Ca deficient berries in spring season. The high temperature made it

harder for the plant to absorb Ca from the nutrient solution, but some treatments (where higher Ca levels were measured) probably helped the plant to withstand stress, so Ca uptake could also be better.

The fact that low humidity and high temperature prevailed in the small air spaced shelter in most of the growing season (especially in the spring season), remained uncontrolled, thus had a strong negative effect on the physiology of tomato plants.

4 Conclusion

The effect of the foliar fertilizers on the nutritional value cannot be supported by statistical analysis. Results were produced by the role of climatic factors. The content value of the berries was influenced by the high temperature, the large temperature fluctuation in the spring season, and the decreased amount of light in the autumn season. It is necessary to repeat the experiment with the optimization of the environmental conditions (large air spaced shelter) and the use of other phosphite foliar fertilizers.

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