Antioxidants Response of Two Tomato Varieties to Fungicides and Acetylsalicylic Acid Treatments

Ramona Aurelia HOROTAN^{1*}, Simona OANCEA²⁾, Al. S. APAHIDEAN¹⁾

¹Departament of Horticulture, University of Agricultural Sciences and Veterinary Medicine, 400372 Calea Mănăştur 3-5, Cluj-Napoca, România

²Lucian Blaga University of Sibiu, Department of Agricultural Sciences and Food Engineering, Sibiu

*Corresponding author, e-mail: aurahorotan@yahoo.com

Bulletin UASVM Horticulture 72(1) / 2015

Print ISSN 1843-5254, Electronic ISSN 1843-5394

Doi:10.15835/buasvmcn-hort:10585

ABSTRACT

The antioxidants (ascorbic acid and total phenolics) activity was evaluated as a comparative study regarding the influence of selected systemic fungicides, CuSO₄ mixture and acetylsalicylic acid on tomato fruits. Experimental crop consisted of two tomato varieties on which three types of treatments were applied. The antioxidants analysis was performed by spectrophotometric methods both for ascorbic acid and total phenolics determination. Our results showed significant differences regarding the antioxidants level in the experimental tomato crops.

Keywords: *acetylsalicylic acid, fungicides, Lycopersicon esculentum.*

INTRODUCTION

It is known that by consumption of non-organic plant food, there is a great risk of ingestion of pesticide traces that are most likely stocked in plant. Abiotic constraints are responsible for oxidative stress, which causes imbalances between pro-oxidants and antioxidants in tomato (Horotan and Oancea, 2013). The tomato antioxidant potential depends on varieties and cultivation systems. Cwalina-Ambroziak *et al.* (2012) found a very low content of reducing sugars and phenols (2.33 mg 100 g⁻¹) in the tomato treated with fungicides comparing with those untreated (control group) (3.80 mg 100 g⁻¹). The results obtained by Hallman (2012) showed a significant higher content of vitamin C in organic tomatoes (430.14 mg dry weight) compared to conventional tomatoes (380.84 mg dry weight).

MATERIALS AND METHODS

The two experimental tomato crops, the Sibiu local population and Buzău 50, both with undetermined growth, were treated with three types of treatment: (1) systemic fungicid Acrobat

MZ 90/600 WP (TP), (2) CuSO₄ (bordeaux) mixture - sustainable treatment (TS) and (3) acetylsalicylic acid solution (TA) (5g/10 l water/100 m²). From the two tomato varieties, 6 experimental variants located in 3 replicates resulted. The antioxidants analysis was performed by spectrophotometric method using 2,6- dichlorophenolindophenol for ascorbic acid determination (ISO 6557/2 - 1984) and Folin-Ciocalteu for total phenolics determination, respectively (Singleton *et al.*, 1965). Results were expressed in mg 100 g⁻¹ of fresh weight. The 6 tomato samples used in the laboratory were collected at the same time of the day after an *Phytophthora infestans* attack. Samples have been frozen for 25 days at -18°C until analysis. Statistical analysis was performed using t-test for dependent valued.

RESULTS

The results obtained showed significant differences regarding the ascorbic acid level in the experimental tomato crops. Tomatoes sprinkled with TA showed very significant increase of ascorbic acid level compared with the tomatoes

Tab.1. The content of ascorbic acid and total phenolics in fresh tomatoes.

Treatment	Ascorbic acid (mg 100 g ⁻¹)					Total Phenolics (mg GAE 100 g ⁻¹)				
	Local pop.	Buzău 50	Dif.	p	Semnif	Local pop.	Buzău 50	Dif.	p	Semnif
TP	50.074	28.195	-	-	-	37.071	38.749	-	-	-
TA	88.804	63.960	-37.250	0.0252	**	28.896	27.614	9.655	0.0971	ns
TS	45.842	50.028	-8.805	0.6217	ns	41.266	31.865	1.345	0.8485	ns

The differences are significant at $p < .05000$

sprinkled with systemic fungicide (considered as control group). For the variety Buzau 50, the amounts of ascorbic acid in tomatoes sprinkled with TA and TS, was over 120% to those sprinkled with TA and over 70% to those sprinkled with TS, compared to the control group (TP) (tab.1). Stephane George et al (2011) found an ascorbic acid content of 15.8 mg 100 g⁻¹ of fresh tomato. Violeta Nour et al (2013) has obtained ascorbic acid values between 91.9 – 329.7 mg kg⁻¹ and Atila Gulec et al (2013) 6.43 mg g⁻¹ fresh weight.

The level of total phenolics in tomatoes sprinkled with TA decreased by approximatively 15%, both in the local Sibiu population and the variety Buzau 50. The sustainable treatment for tomato local population determined an increase of total phenolics level, while tomatoes of the variety Buzau 50 showed a slight decrease, compared to TP (tab.1). As demonstrated by Peter S. Boches et al (2009), total phenolics in tomato are between 40.05 – 81.85 mg GAE 100 g⁻¹. Also, Violeta Nour et al (2013) reported that total phenolics in fresh tomato is between 312.2 – 557.8 mg kg⁻¹ and Atila Gulec et al (2013) obtained 51.53 mg GAE 100 g⁻¹.

CONCLUSIONS

Fungicides Acrobat MZ 90/600 WP inhibited the ascorbic acid production in tomato crop of Buzău 50 cultivar. Acetylsalicylic acid stimulated the ascorbic acid production in tomato crop of Sibiu local population. It was found that the applied treatments on tomatoes have not a significant effect on the amount of total phenolics. The sustainable treatment (CuSO₄ mixture) resulted

in an increased level of total phenolics only in the local population of tomato.

Acknowledgements: This paper was published under the frame of European Social Fund, Human Resources Development Operational Programme 2007-2013, project no. POSDRU/159/1.5/S/132765.

REFERENCES

1. Güleç A, Nergiz-Unal R, Akyol A, Acar J (2013). Phenolic content and ascorbic acid are major contributors to antioxidant capacity of fruits and vegetables commonly consumed in Turkey, *Journal of Food, Agriculture & Environment*, vol.11 (3&4), 463-468.
2. Boches P (2009). Breeding Tomato for increased fruit phenolics, <https://books.google.ro>.
3. Horotan A, Oancea S (2013). Effects of fungicide and acetylsalicylic acid treatments on the physiological and enzymatic activity in tomato (*Lycopersicon esculentum* Mill.), *Acta Universitatis Cibiniensis Series E: Food Technology*, vol. XVII (no. 1), 13-26.
4. Nour V, Trandafir I, Mira I (2013). Antioxidant compounds, mineral content and antioxidant activity of several tomato cultivars grown in Southwestern Romania, *Notulae Botanicae Horti Agrobotanici Cluj Napoca*, vol. 41(1), 126-135.
5. Singleton VL, Rossi JA Jr. (1965). Colorimetry of total phenolics with phosphomolybdic
6. -phosphotungstic acid reagents, *Amer. J. Enol. Viticult.*, Vol.16, 144-158;
7. George S, Tourniaire F, Gautier H, Goupy P, Rock E, Caris Veyrat C (2011). Changes in the contents of carotenoids, phenolic compounds and vitamin C during technical processing and lyophilisation of red and yellow tomatoes, *Food Chemistry*, 124, 1603-1611.