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THE INFLUENCE OF BIOSTIMULATOR BIOCHICOL 020 PC ON QUANTITY AND QUALITY OF YIELD OF GRAPEVINE CULTIVAR 'DANMARPA POLONIA'

PIOTR CHEŁPIŃSKI, GRZEGORZ MIKICIUK, JOANNA POPIEL, KAROLINA SAWICKA, IRENEUSZ OCHMIAN

CHAIR OF POMOLOGY, WEST POMERANIAN UNIVERSITY OF TECHNOLOGY IN SZCZECIN
UL. JANOSIKA 8, 71-424 SZCZECIN, POLAND
E-mail: chelpp@go2.pl

Abstract

The experiment was carried out near Szczecin (Poland), in 2008-2009. The object of the study was the first Polish cultivar of dessert grapevine - 'Danmarpa Polonia'. The experimental factor was spraying of biostymulator Biochicol 020 PC. Two concentrations of Biochicol were applied – 1% and 4%. Spraying was performed from flowering to fruit harvest. The following parameters of the investigated variety were determined: the yield of fruit, number and size of clusters, firmness, mass and diameter of an individual fruit, the content of L-ascorbic acid, total acidity in fruit and soluble solids content. The degree of infection of leaves and fruit by fungi of downy mildew (*Plasmopara viticola*) was also observed .The results were put to a one-factor analysis of variance. The significance of differences between the averages was defined by Duncan's test at $\alpha = 0.05$.

Biochicol influenced the yield, number and size of clusters, and the number of fruit in clusters, whereas the length of clusters was not affected 1%concentration of Biochical, significantly decreased infection by downy mildew and total acidity in fruit and increased the content of L-ascorbic acid and soluble solids in fruit.

Key words: grape, Biochicol, Danmarpa Polonia

INTRODUCTION

Grapevine is the most popular species of fruit-growing in the world. World production of grapes is over 66 million tonnes per year (FAOSTAT). Global warming and new varieties create new opportunities for the cultivation of this species in Poland. Increasingly used biostimulators, that increase both the resistance of plants to environmental conditions and the quantity and quality of yield are an important factor in the cultivation of this species .

The aim of this study was to assess the influence of biostimulator Biochicol on the yield quantity and quality of grapevine var. 'Danmarpa Polonia', grown near Szczecin (Poland).

MATERIAL AND METHODS

The experiment was carried out in Wolczkowo village, near Szczecin (Poland), in 2008-2009. The object of the study was a three -year-old, the first Polish cultivar of dessert grapevine - 'Danmarpa Polonia' (a mutant of cultivar Panonia Kincse). The one -factor experiment was conducted in a randomized blocks design, in three replications. The experimental factor was a foliar application of biostimulator Biochicol (chitosan) 020 PC. Two concentrations of this biopreparation were applied - 1% and 4%. Spraying was performed from flowering to fruit harvest The following parameters of the investigated cultivar were determined: the yield of fruit, number and size of clusters, firmness, mass and diameter of an individual fruit, the content of L-ascorbic acid, total acidity in fruit and soluble solids content. The degree of infection of leaves and fruit by fungi of downy mildew (Plasmopara viticola) was also observed .Firmness and diameter of fruit was checked by a non-destructive method using the FirmTech 2 device connected to a computer. The content of L-ascorbic acid was determined by a reflectometer RQflex 10 (Merck). Total acidity in fruit was determined by nitration of a water extract of grapevine homogenate with 0.1N NaOH to the end point of pH 8.1 (according to PN-90/A-75101/04). Soluble solids content was determined by a refractometer Atago Pol 1.

The results of research were put to a one-factor analysis of variance. The significance of differences between the averages was defined by Duncan's test at $\alpha = 0.05$.

RESULTS AND DISCUSSION

The studies carried out in Poland and all over the world show a positive effect of foliar application of chitosan biostimulator on the growth, flowering and fruiting of many plant species (Alcaraz-Lopez et al. 2003, Djanaguiraman et al. 2005, Grenda, 2003). The application of differentiated doses of Biochicol 020 PC had a significant influence on the yield of grapevine cultivar 'Danmarpa Polonia' (Table 1). The largest yield of fruit was obtained after applying Biochicol at the concentration of 4%, the smallest at the concentration of 1%. According to many authors Biochicol stimulates a better vegetative growth of apple trees (Basak, 2007) and facilitates extraction of nutrients from the soil (Bennewitz and Hlusek, 2006). In our studies it significantly reduced the number of clusters on a plant. The application of differentiated doses of biopreparation had a significant influence on the number of fruit in clusters (Table 1). The largest number of fruit in a cluster was obtained after the application of the preparation at the concentration of 4%, the smallest after the application of 1%. Biochicol 020 PC did not significantly affect the length of grapevine cluster, whereas plants sprayed with the biostimulator showed a decrease in the width of a cluster in relation to the control plants .It was also observed that Biochicol 020 PC had a significant effect on crosswise diameter of an individual fruit of grapevine cultivar 'Danmarpa Polonia' (15.0-23.9 mm) Table 1. No influence of the used preparation on the firmness of tested fruit was found. The firmness of fruit varied from 252.0 to 298.0 $G \cdot mm^{-1}$ (Table 1).

The fruit from the plants treated with Biochical 020 PC were characterised by a larger content of soluble solids than the fruit of control plants. The content of

the soluble solids content in the fruit of grapevine cultivar 'Danmarpa Polonia' ranged from 9.3 % (control plants) to 15.9% (Biochicol 1%) Table 1. Abdel-Mawgoud at al. (2010) think that total soluble solids showed tendency to increase (in strawberry fruit) response to chitosan application. The foliar application of biostimulator Biochicol at the concentration 1% caused a significant increase in the content of L-ascorbic acid in the fruit of the studied cultivar of grape. The content of L-ascorbic acid in control plants and sprayed with Biochicol at the concentration of 4% was similar (Table 1). The total acidity in the fruit of tested plant ranged from 0.66 to 0.90 g citric acicid·100g $^{-1}$. Biochicol application resulted in a decrease in the total acidity in the fruit of the examined cultivar (Table 1). According to Abdel-Mawgoud at al. (2010) total acidity and total sugars, in strawberry fruit, increased significantly in response to chitosan application compared to the control treatment.

Table 1

The quantity and quality of yield of grapevine cultivar 'Danmarpa Polonia'.

	Control	Biochicol	
		1%	4%
Yield of fruit (kg/plant)	1.17 a*	0.82 a	1.52 b
Number of clusters (pc/plant)	7.00 b	1.17 a	2.29 a
Number of fruit in clusters (pc)	39.9 b	23.0 a	52.8 c
Length of cluster (cm)	18.3 a	18.8 a	18.6 a
Width of cluster (cm)	10.9 b	9.3 a	10.1 ab
Diameter of individual fruit (mm)	15.0 a	23.9	22.9 b
Firmness of fruit (G·mm^{-1})	298.0 a	296.0 a	252.0 a
Soluble solids (%)	9.3 a	15.9 b	12.4 ab
L-ascorbic acid (mg·100g $^{-1}$)	10.0 a	52.0 b	14.0 a
Total acidity (g citric acicid·100g $^{-1}$)	0.90 b	0.57 a	0.66 a
Infection of leaves by downy mildew (%)	45.0	5.0	20.0
Infection of fruit by downy mildew (%)	18.5	0.0	6.6

* Averages followed by the same letter do not differ significantly at p=0,05 (Duncan's range test)

The applied Biochicol significantly decreased the infection of leaves and fruit by downy mildew. According to Król (2006), Borkowski at al. (2001, 2003), Orlikowski at al. (2001) and Wojdyła at al. (2001) chitosan as the biopreparation can be used for the control or retardation of fungi pathogens. In our studies the largest amount of infected leaves and fruit was observed in the plants sprayed with Biochicol at the concentration of 1% and the control plants (Table 1). Borkowski at al. (2007) think that spraying with Biochikol 020 PC tomato plants cultivated in the infected substrate, increased the fruit yield. However, higher fruit yield probably was connected with higher root resistance of some fungi.

CONCLUSIONS

1. Biochicol influenced the yield, number and size of clusters, and number of fruit in a cluster.

2. The application of tested biostimulator had no effect on the length of clusters.
3. The application of Biochicol at the concentration of 1%, significantly decreased infection by downy mildew and total acidity in fruit and increased the content of L-ascorbic acid and soluble solids in fruit.

REFERENCES

Abdel-Mawgoud A.M.R., A.S. Tantawy A.S., El-Nemr M.A., Sassine Y.N. 2010. Growth and yield responses of strawberry plants to chitosan application. Europ. J. of Sc.Res.39,1: 161-168

Alcaraz-Lopez C., Botia M., Alcaraz C.F., Riquelme F.2003. Effect of foliar sprays containing calcium, magnesium and titanium on plum (Prunus domestica L) fruit quality. J. of Plant Physiol., 160(12): 1441-1446

Basak A. 2007. Efficacy of natural compounds used for thinning in organic apple orchards. J. Fruit Orn. Plant Res. 15: 47-58

Bennewitz E., Hlusek J. 2006. Effect of application of two biopreparations on the nutritional status, vegetative and generative behavior of 'Jonagold' apple trees Acta Horticult.721: 129-135

Borkowski J., Nowosielski O., Kotlińska T., Niekraszewicz A., Struszczyk H. 2001. Influence of chitosan and tytanit on the growth and healthiness of the lettuce, top onion and the glasshouse tomato. Progress on the Chemistry and Application of Chitin and Its Derivatives. Monograph VII, 159-168, Ed. by H. Struszczyk

Borkowski J., Kotlińska T., Niekraszewicz A., Struszczyk H.: 2003Comparison on the effect of chitosan and tytanit on the growth and healthiness of top onion (Allium proliferum) and onion (Allium cepa) in field conditions. Progress on Chemistry and Application of Chitin and Its Derivatives. Monograph IX, 107-112, Ed. by Struszczyk

Borkowski J., Dyki B., Felczyńska A., Kowalczyk W. 2007. Effect of biochikol 020 PC (chitosan) on the plant growth, fruit yield and healthiness of tomato plant roots and stems. Polish Chitin Society, Monograph XII: 217-223

Djanaguiraman M., Pandiyan M., Durgadevi D. 2005. Abscission of tomato fruit follows oxidative damage and its manipulation by Atonik spray. Int. J. Agr.&Biol., 1560-8530/2005/07-1-39-44 [http://www.ijab.org]

FAOSTAT – http://faostat.fao.org./site/567/default.aspx#ancor

Grenada A. 2003. Activator of metabolism processes.Chemicals in Sustainable Agricult.4: 263-269

Król E. 2006.Chitosan activity in an inhibition of in vitro growth of Phomopsis viticola and protection of grapevine canes against the pathogen Phytopathol. Pol. 39: 155–162

Orlikowski L. B., Skrzypczak C., Niekraszewicz A., Struszczyk H. 2001. Influence of chitosan on the development of Fusarium wilt of carnation. Progress on Chemistry and Application of Chitin and Its Derivatives. Monograph VII,155--158, Ed. by Struszczyk

Wojdyła A. T., Orlikowski L. B., Struszczyk H.: 2001. Chitosan for the control of leaf pathogens. Chitin Enzymology: 191-196, R. A. A. Muzzarelli, ed Atec. Italy.