UDC 634.23-154.74/.76:547.584
ID 203047180
Original research paper

Acta Agriculturae Serbica, Vol. XVIII, 35 (2013) 3-9

Acta Agriculturae Serbica FACULTY OF AGRONOMY • ČAČAK •

Study of N-phenyl-phthalamic Acid Effects on Fruit Setting and Fruit Quality of Sweet, Sour and Duke Cherries

Abdollah Khadivi-Khub,
Department of Horticultural Sciences, Faculty of Agriculture and Natural Resources, Arak University, Arak, Iran

Zia Nosrati
Iranian Academic Center for Education Culture and Research (ACECR). Department of Biotechnology and Physiology of Horticultural Plant. Karaj, Iran

Abstract: Sweet and sour cherry are economically important fruits of the temperate zone. Sweet cherry *(P. avium* L.) is a diploid (AA, 2n = 2x = 16) and sour cherry (*P. cerasus* L.) is a tetraploid (AAFF, 2n = 4x = 32), supposed to result from natural hybridization between sweet cherry and ground cherry *(P. fruticosa*) (FFFF, 2n = 4x = 32). Duke cherry (*P x gondouinii*) is a tetraploid (AAAF, 2n = 4x = 32) and a natural hybrid between sour and sweet cherry and produces fruits which are intermediate between these two cherry types. In this study, the influence of N-phenyl-phthalamic acid (Nevirol 60 WP) on fruit setting and fruit quality of three commercial cherry species (sweet cherry, sour cherry and duke cherry genotypes) was evaluated. The research results show that the use of Nevirol 60 WPT can improve fruit setting. As a result, fruit yield increased, but fruit quality parameters (weight, length, width and diameter) were decreased. There is a significant difference between the reactions of different cultivars. It is suggested that Nevirol 60 WP has a great effect in improving yield, especially by a good nutrient supply. Also, before using Nevirol 60 WP, consideration must be given to the fact that increased yields require a high nutrient supply.
Key Words: N-phenyl-phthalamic acid, Cherries, Fruit setting, Fruit quality

Received 22 January 2013 / Accepted 1 July 2013

Introduction

Prunus was divided into five subgenera (*Prunophora*, *Amygdalus*, *Cerasus*, *Padus*, and *Laurocerasus*). There are several kinds of taxonomic systems in *Prunus* subg. *Cerasus* (Fogle 1975; Ohba 1992). The species of subg. *Cerasus* grow wild throughout the temperate climate zone in the Northern Hemisphere. *P. avium* includes sweet cherries, cultivated for human consumption and wild cherry trees grown for their wood (Webster and Loonyey 1996). This species is diploid (AA, 2n=2x=16) and its natural range covers the temperate regions. *P. cerasus*, the sour cherry tree, is cultivated for fruit, used in jam or liquor. It is an allotetraploid species (AAFF, 2n=4x=32), thought to result from natural hybridization between sweet and ground cherry. *P.* × *gondouinii*, duke cherry, is an allotetraploid species (AAFF, 2n=4x=32) and is hybridization between sweet and sour cherry (Mikolos 1996).

Ensuring balance in fruit yield although the applied technologies give a good possibility for this in large-scale farming is a difficult and complicated task. Pollination of certain horticultural species, due to climatic and genetic influences, is not possible in many cases (Holb and Heijne 2001). For sufficient yields and required yield quality we have to interfere in pollination. With the help of N-phenyl-phthalamic acid, which is an agent of Nevirol 60 WP, we can achieve this goal (Racsko et al. 2006a).

N-phenil-phthalamic acid is a regulator that increases the working life of stigma and supports better pollination, which results in a higher yield (Holb et al. 2003). The acid is not auxin, but it has a synergistic effect with auxin in biological tests. This has not caused any phytotoxicity or parthenocarpia (Racsko 2004). The use of Nevirol 60 WP can reduce possible unfavourable effects of objective (agronomics, cultural practices, species and weather) and subjective conditions of fruit production and level yield fluctuations, thus considerably increasing crop safety. The product, like other regulators and all synthetic pesticides, is not approved in the organic production system (Holb and Heijne 2001).

Its application is recommended for the flowering period in greenhouses, and foilhouses, as well as in field (orchard) cultivation for some crops such as apple (Racsko 2004; Racsko et al. 2006a), sour cherry (Racsko et al. 2006b), sweet cherry (Thurzo et al. 2008) and eggplant (Kowalska et al. 2008).

The product may be mixed with insecticides, fungicides and foliar fertilizers, excepting alkaline products. Attention has to be paid to the phytotoxic effect of some scab fungicides in the full bloom period, which should be avoided (Holb et al. 2003). The preparation of the spray liquid does not need any special measures, as the preparation contains the necessary constituents to ensure quick and thorough wetting. For applications with ground machine use 400-1000 l/ha, at aerial applications 60-80 l/ha. It is important to note that while a higher yield is

aimed at through better fruit setting, a higher level of basic nutrition should be provided.

Materials and methods

The research was conducted from 2011 to 2012, in collection experiments of the Seed and Plant Institute Karaj, Iran. Ten trees from three sweet cherry cultivars, 10 trees from two sour cherry cultivars and 10 trees from one duke cherry genotypes were chosen for this study. Some characteristics of the genotypes are presented in Table 1. Trees were planted in north-south row direction. The usual cultivation and integrated plant protection were applied. For better fruit setting, N-phenyl-phthalamic acid, an agent of Nevirol 60 WP, was applied at a rate of 0.4 kg/ha. It was sprayed at full bloom.

Table 1. Characteristics of the experimental cherry (sweet, sour and duke cherry) plantations and the chosen cultivars.

Number	Cultivar	Region	Fruit skin colour	Fruit size	Fruit shape
1	Sweet cherry 1	Iran	Blackish Red	Large	Heart
2	Sweet cherry 2	Iran	Blackish Red	Large	Heart
3	Sweet cherry 3	Iran	Blackish Red	Large	Heart
4	Sour cherry 1	Iran	Blackish Red	Medium	Round
5	Sour cherry 2	Iran	Blackish Red	Medium	Round
6	Duke cherry	Iran	Blackish Red	Medium	Round

The observation and measurement were carried out on five trees per treatment. The total number of trees was 30. Tables contain the average of these data. Fifty fruits from each tree of cherry cultivars were randomly sampled for this evaluation, giving the total number of 1500 per cultivar. The following properties of the studied species were determined:

1) Fruit setting: the number of fruit harvested from 100 flowers per tree.

2) Fruit weight: The weight of fruit was estimated in 0.1 grams using digital analytic scales.

3) Fruit diameter: This was measured in 0.1 millimeters using a slide-gauge.

4) Fruit length: This was measured similar to fruit diameter in 0.1 millimeters using a slide-gauge.

5) Fruit width: This was measured similar to fruit diameter in 0.1 millimeters using a slide-gauge.

Analysis of variance was performed for all traits by SAS and MSTATC softwares.

Results and Discussion

The variance analysis of the effect of Nevirol 60 WP on fruit quality parameters is shown in Table 3. Results showed that fruit setting in cultivars of cherry species (sweet, sour and duke cherries) increased in many cases, when N-phenyl-phthalamic acid (Nevirol 60 WP) was applied. The increase in fruit setting was detected for sweet cherries, sour cherries and duke cherries (Figure 1 and Table 2).

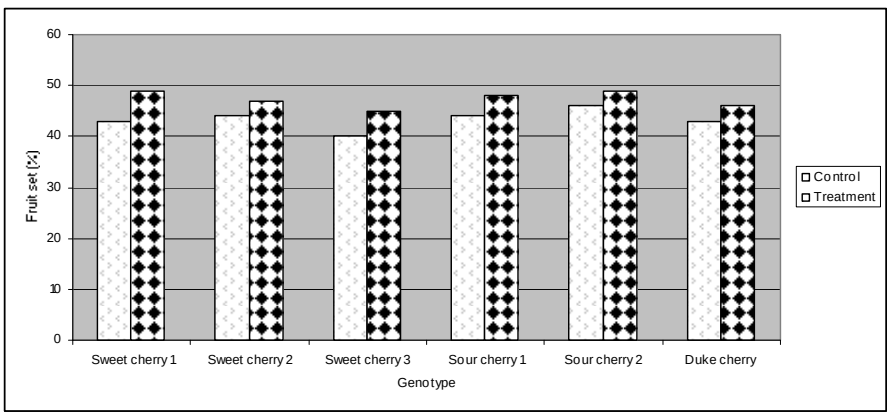

Figure 1. Effect of Nevirol 60 WP on the fruit setting of cherries

However, it is worthy of mention that the increase in fruit setting was not significant in several cases. These results were in agreement with findings in apple (Racsko 2004; Racsko et al. 2006a), sour cherry (Racsko et al. 2006b), sweet cherry (Thurzo et al. 2008) and eggplant (Kowalska et al. 2008).

The positive effect of Nevirol 60 WP on fruit setting was considerable for high setting cultivars. Fruit setting was the highest in cultivar 1 of sweet cherry (49%). The increase in fruit setting increased the number of fruit per tree. These results were in agreement with findings in apple (Racsko 2004; Racsko et al. 2006a), sour cherry (Racsko et al. 2006b) and sweet cherry (Thurzo et al. 2008).

Table 2. Effect of Nevirol 60 WP on quality parameters of cherry fruits

Cultivars	Fruit Set (%)		Fruit Length (mm)		
	Control	Treatment		Control	Treatment
Sweet cherry 1	43	49	Sweet cherry 1	19.35	18.68
Sweet cherry 2	44	47	Sweet cherry 2	19.78	18.85
Sweet cherry 3	40	45	Sweet cherry 3	19.1	18.4
Sour cherry 1	44	48	Sour cherry 1	18.7	17.93
Sour cherry 2	46	49	Sour cherry 2	18.9	17.9
Duke cherry	43	46	Duke cherry	19.04	17.96
	Fruit weight (gr)			Fruit Width (mm)	
	Control	Treatment		Control	Treatment
Sweet cherry 1	4.32	3.56	Sweet cherry 1	19.44	18.62
Sweet cherry 2	4.37	3.69	Sweet cherry 2	18.9	18.3
Sweet cherry 3	4.23	3.57	Sweet cherry 3	18.8	18.2
Sour cherry 1	2.98	2.74	Sour cherry 1	16.26	15.53
Sour cherry 2	3.61	2.9	Sour cherry 2	16.77	16.08
Duke cherry	3.93	3.33	Duke cherry	16.94	16.29
	Fruit Diameter (mm)				
	Control	Treatment			
Sweet cherry 1	16.9	16.2			
Sweet cherry 2	16.33	15.82			
Sweet cherry 3	16.1	15.6			
Sour cherry 1	15.5	15.19			
Sour cherry 2	16.67	15.5			
Duke cherry	18	16.87			

A decrease in fruit weight was considerable in all cultivars under Nevirol treatment (Table 2). The reason for this is that fruit set was high and fruit received insufficient nutrition for growth. A similar tendency was found for fruit diameter, length and width, but differences among cultivars were presented. These results were in agreement with findings in apple (Racsko 2004; Racsko et al. 2006a), sour cherry (Racsko et al. 2006b) and sweet cherry (Thurzo et al. 2008).

Conclusion

Results showed that Nevirol 60 WP can increase fruit setting in cherries, also leading to increased yields. Nevirol 60 WP treatment showed significant differences among cultivars. Nevirol 60 WP has a great effect on crop yield, especially when applied with a fertilizer. Before using Nevirol 60 WP, consideration should be given to the fact that increased yields require a nutrient supply, otherwise fruit weight, diameter, length and width will decrease, resulting in yield reduction.

References

Fogle H.W. 1975. Cherries, In: J. Janick and J.N. Moove , (eds). Advances in Fruit Breeding Purdue University Press, West Lafayette.

Holb I.J., de Jong P.F., Heijne B. 2003. Efficacy and phytotoxicity of lime sulphur in organic apple production. Annals of Applied Biology, 142, 225-233.

Holb I.J., Heijne B. 2001. Evaluating primary scab control in organic apple production. The European Journal for Horticultural Science, 66, 254-261.

Kowalska G. 2008. Flowering biology of eggplant and production intensifying fruit set - review. Acta Sci. Pol., Hortorum Cultus, 7, 63-76.

Mikolos F. 1996. Origin and dissemination of cherry. Hort Rev.

Ohba H. 1992. Japanese cherry trees under the genus *Cerasus* (*Rosaceae*). Journal of Japanese Botany, 67, 276-281.

Racsko J. 2004. Effect of Auxin-Synergistic Preparation and Fertilization on Fruit Setting and Fruit Quality of Apple. Journal of Agriculture Sciences, 15, 21-25.

Racsko J., Holb I., Szabo Z., Thurzo S., Dren G., Nyeki J. 2006. Effect of auxin-synergistic preparation (nevirol 60) on flowering date and yield of sour cherry and European plum fruits in Hungary. Acta Hort. (ISHS), 727, 279-282

Racsko J., Szabo Z., Nyeki J. 2006. Direct and indirect effects of N-Phenyl-Phthalamic acid and fertilization on fruit setting and fruit quality parameters of apple. Acta Hort. (ISHS), 727, 209-216.

Thurzo S., Racsko J., Veres Z., Soltesz M., Szabo Z., Nyeki J., Dren G., Szabo T., Holb I. 2008. Effect of N-phenyl-phthalamic acid and fertilization on flowering, fruit set and fruit quality parameters of sweet cherry. Acta Hort. (ISHS), 795. 727-732.

Webster A.D., Loonyey N.E. 1996. Cherries (Crop physiology and uses). CAB International University Press, Cambridge.

ISPITIVANJE UTICAJA N-FENIL-FTALNE KISELINE NA ZAMETANJE I KVALITET PLODA TREŠNJE, VIŠNJE I MARELICE

- originalni naučni rad -

Abdollah Khadivi-Khub,
Katedra za hortikulturne nauke, Fakultet za poljoprivredu i prirodne resurse, Univerzitet u Araku, Arak, Iran

Zia Nosrati
Iranski akademski centar za obrazovanje, kulturu i istraživanje (ACECR). Odeljenje za biotehnologiju i fiziologiju hortikulturnog bilja. Karaj, Iran

Rezime

Trešnja i višnja predstavljaju ekonomski značajne voćne vrste umerene klimatske zone. Trešnja *(P. avium* L.) je diploidna (AA, 2n = 2x = 16), a višnja (*P. cerasus* L.) tetraploidna vrsta (AAFF, 2n = 4x = 32), nastala prirodnom hibridizacijom trešnje i stepske višnje *(P. fruticosa*) (FFFF, 2n = 4x = 32). Marelica (*P x gondouinii*) je tetraploidna vrsta (AAAF, 2n = 4x = 32) i prirodan hibrid višnje i trešnje sa plodovima koji imaju osobine i jedne i druge voćne vrste. U ovom radu ispitan je uticaj N-fenil-ftalne kiseline (Nevirol 60 WP) na zametanje i kvalitet ploda tri komercijalne sorte (genotipa trešnje, višnje i marelice). Dobijeni rezultati pokazuju da primena Nevirol 60 WPT dovodi do poboljšanja zametanja ploda, što utiče na povećanje prinosa, ali i na smanjenje parametara kvaliteta ploda (mase, dužine, širine i prečnika). Postoji značajna razlika između reakcija različitih sorti. Rezultati ispitivanja ukazuju na veliki uticaj Nevirol 60 WP na poboljšanje prinosa, naročito usled dobre snabdevenosti hranljivim materijama. Pre primene Nevirol 60 WP, neophodno je uzeti u obzir da povećanje prinosa zahteva veću količinu hranljivih materija.

Ključne reči: N-fenil-ftalna kiselina, trešnje i višnje, zametanje ploda, kvalitet ploda