

# Size and Weight of Sweet Cherry (*Prunus avium* L. 'Regina') Fruit Treated with 3,5,6-TPA and GA3

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## Summary

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The effect of 10 ppm 3,5,6-TPA (3,5,6-trichloro-2-pyridyloxyocetic acid), 20 ppm GA 3 and their combination on size and weight of cherry fruit (*Prunus avium* L. 'Regina') were studied. 3,5,6-TPA was applied 25 days after full bloom and GA 3 during stage of fruit color change from green to straw-yellow. Fruit height, width, thickness and weight were measured. Width, thickness and weight of control fruit were the smallest. Fruit from 3,5,6-TPA - treated trees did not show significant difference in comparison to control. However, fruit from GA 3 - treated trees had significantly improved all characteristics in comparison to control fruits. Weight of fruit from trees treated with combination of 3,5,6-TPA and GA 3 was 14% higher than control fruit and 2.8% higher than fruit from GA 3 - treated trees, but there was no significant difference comparing to fruit from trees treated with GA 3 alone. These results are preliminary results after a one-year study and more research should be done to examine the possible influence of other factors, such as ecological factors, before final management recommendations could be made.

## Key words

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*Prunus avium* L., fruit quality, plant growth regulators

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## Introduction

Small fruit size is one of limiting factors for fruit quality in many fruit species, such as apple (Stern et al., 2006), pear (Stern and Flaishman, 2003), sweet cherry (Whiting and Ophardt, 2005; Sansavini and Luigi, 2005), peach (Agusti et al., 1994), and apricot (Agusti et al., 1999). Fruit size can be enlarged by application of growth regulators such as synthetic auxines and gibberelins.

Synthetic auxins can improve fruit growth if they are applied in second fruit growth stage (Westwood, 1993). It is known that synthetic auxins contribute to cell enlargement (Westwood, 1993; Davis, 2004), and fruit enlargement in some fruit species like clementine (Augusti et al., 1995), peach (Augusti et al., 1999), litchi (Stern et al., 2000), apricot (Augusti et al., 1994) and sweet cherry (Stern et al., 2007).

Auxine application at the beginning of pit hardening in plum cv. Sonagold increases intake of carbohydrates or elasticity of cell wall causing significant cell enlargement (Arteca, 1996). Use of GA 3 and auxine combination can reduce puffing in tomato fruit (Yamasaki et al., 1961) and enhance fruit weight in high temperature conditions (Sasaki et al., 2005). This treatment can also increase sugar content (mostly hexose content), which results in increased fruit weight (Kataoka et al., 2009). GA 3 application before harvest in peach (Amarante et al., 2005), tangerine (Marur et al., 1999) and sweet cherry (Kappel and MacDonald, 2002; Usenik et al., 2005) can prolong ripening and in some cases increase fruit size.

Treating of peaches with GA 3 at the beginning and ending of pit hardening prolongs ripening, increases fruit size and decreases woollines during cold storage (Pegoraro et al., 2010).

GA 3 application in sweet cherries improves fruit quality and decreases negative effect of rain or early harvest (Lonney, 1996), increases fruit weight (Faust, 1989) and delays maturation (Demirsoy and Bilgener, 2000). Delaying of maturation is of special importance for late cultivars (Choi et al., 2002), and GA 3 - treated fruit is bigger in size and more firm than untreated ones (Kappel and MacDonald, 2002).

To the best of our knowledge, there were no published studies in the available literature concerning combined effects auxines and gibberelins in inner or outer characteristics of sweet cherry fruit, so the aim of this paper is to determine how much auxines, gibberelins and their combination affect thickness, width, height or weight of cherry fruit.

## Material and methods

Trials are done in Međimurje (Donji Kraljevec) on 'Regina' cultivar on 'Gisela 5' rootstock. Cultivar 'Regina' was chosen because of its appropriate characteristics and appropriate ripening time suitable for the growing area. In trial orchard fruit trees are planted at 4 x 2.5 m apart (1000 trees/ha). Trial was set at complete randomized design with five trees for each of four treatments (control; 3,5,6-TPA; GA 3; GA 3 and 3,5,6-TPA combined). 3,5,6-TPA was applied in concentration of 10 ppm 25 days after full bloom, GA 3 was applied in concentration of 20 ppm during stage of fruit color change from green to straw-yellow. Ten fruits were picked from each tree and their width, height and thickness were measured by digital caliper and weight was measured by Mettler-Toledo analytical scale.

Statistical data analysis was done using PROC GLM in SAS (SAS Institute, 2004) using analysis of variance (ANOVA) and Tukey HSD test at  $P \leq 0.05$  level.

## Results and discussion

Fruit size and weight data are given in Table 1. Width, thickness and weight in control were the smallest while 3,5,6-TPA treatment did not show significant increase in characteristics mentioned before. Stern et al. (2007) reported that auxin treatment speeds up fruit growth only 3-4 days after application.

As a contrast, GA 3 application significantly increased all characteristics in comparison to control. GA 3 increases total soluble solids, fruit weight, skin color and prolongs maturation time (Usenik et al., 2005). Fruits treated with 20 ppm GA 3 are significantly bigger in size than untreated or ones treated with 30 ppm GA 3 (Kappel and MacDonald, 2002).

Application of combination of 3,5,6-TPA and GA 3 showed trend of further increase of all characteristics, but the difference was not significant compared to application of GA 3 alone. Weight of fruit treated with combination of 3,5,6-TPA and GA 3 showed 14% increase compared to control and 2.8% increase compared to fruit treated with GA 3 alone. Similar results are achieved in tomatoes with 50 mg GA 3 added to auxine solution applied during the anthesis. It increased fresh fruit weight for 13.18% (Kataoka et al., 2009).

## Conclusion

Results of this research showed that independent application of GA 3 during the stage of fruit color change to straw-yellow was sufficient for significant increase in size and weight of sweet

**Table 1.** The effect of 3,5,6-TPA, GA 3 and their combination of fruit size and weight of sweet cherry 'Regina' (means and SD)

Treatment	Width (mm)	Thickness (mm)	Height (mm)	Weight (g)
Control	24.22±1.50 c	21.53±1.19 c	22.38±1.26 b	7.62±0.93 c
3,5,6-TPA	24.68±1.63 bc	22.06±1.26 bc	22.51±1.28 b	7.81±1.22 bc
GA 3	25.19±1.25 ba	22.32±0.94 ba	22.99±1.26 ba	8.44±1.57 ba
3,5,6-TPA and GA 3	25.66±1.61 a	22.77±1.18 a	23.28±1.32 a	8.67±1.42 a

Note: means followed with the same letter in the same column are not significantly different at  $P \leq 0.05$  according to the Tukey HSD test

cherry fruit. These results are preliminary after a one-year study and more research should be done to examine the possible influence of other factors, such as ecological factors, before final management recommendations could be made.

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