Turkish Journal of Agricultural and Natural Sciences
Special Issue: 2, 2014

TÜRK
TARIM ve DOĞA BİLİMLERİ
DERGİSİ

TURKISH
JOURNAL of AGRICULTURAL
and NATURAL SCIENCES

www.turkjans.com

The Efficacy of Aminoethoxyvinylglycine (ReTain) For Improving Fruit Set on '0900 Ziraat' Sweet Cherry

[a]Erdal AĞLAR*, [b]Lynn E. LONG [c]Burhan ÖZTÜRK, [d]Onur SARAÇOĞLU, [d]Kenan YILDIZ, , [c]Medeni KARAKAYA
[a] Cumhuriyet University, Suşehri Timur Karabal Vocational High School, Sivas, Turkey
[b]Department of Horticulture, Oregon State University, Oregon, USA
[c]Department of Horticulture, Faculty of Agriculture, University of Ordu, Ordu, Turkey
[d]Department of Horticulture, Faculty of Agriculture, University of Gaziosmanpaşa, Tokat, Turkey
*Corresponding author: erdalaglar@hotmail.com

Abstract

A study was carried out to determine the effect on fruit set and fruit quality of different rates of applications [control (0 mg L^{-1}), 250, 500 and 750 mg L^{-1}] of AVG applied to '0900 Ziraat' sweet cherry variety grafted on MaxMa 14 rootstock. Compared to the control, it was determined that fruit set on the trees applied with AVG increased from 97.5% to 130.4%. While the soluble solids content was significantly decreased, significant differences in fruit quality (fruit weight, fruit sizes, flesh firmness, titratable acidity, ripening index and color characteristics) were not observed between control and AVG treatments. There was significant difference between AVG rates with regard to soluble solids content. The lowest SSC value was obtained from the 500 mg L^{-1} AVG treatment.

Keywords: Fruit set, 0900 Ziraat, Color, Firmness, Fruit Weight, *Prunus avium*, Soluble Solids Content, Ripening Index.

0900 Ziraat Kiraz Çeşidinde Meyve Tutumunda Aminoethoxyvinylglycine (ReTain)' nin Etkisi

Özet

Bu araştırma, MaxMa 14 anacı üzerine aşılı 0900 Ziraat çeşidinde, farklı oranlardaki AVG sprey uygulamalarının (0, 250, 500 and 750 mg L^{-1}) meyve tutumu ve kalitesi üzerine etkilerini belirlemek amacı ile yürütülmüştür. AVG ile kontrol arasında mukayese yapıldığında, AVG uygulanan ağaçlarda meyve tutumunda 97.5 % ile 130.2 % arasında bir artışın meydana geldiği tespit edilmiştir. Suda çözülebilir kuru madde (SÇKM) önemli bir şekilde azalırken, meyve kalitesinde (meyve ağırlığı, meyve büyüklüğü, dayanıklılık, titre edilebilir asitlik, olgunluk oranı ve renk özellikleri) AVG ve kontrol arasında önemli farklılıklar gözlemlenmemiştir. SÇKM üzerine AVG uygulama dozları arasında da oluşan fark önemlidir. En düşük SSC' miktarı, 500 mg L^{-1} AVG uygulaması ile elde edilmiştir. .

Anahtar Kelimeler: Meyve tutumu, 0900 Ziraat, Renk, Dayanıklılık, Meyve ağırlığı, Prunus avium, Çözülebilir kuru made oranı, Olgunluk indeksi.

Introduction

Sweet cherry is popular, due to its beautiful color and unique taste, and the fact that it is marketed during the spring and early summer when the selection of fresh fruit is limited. Production of sweet cherry in Turkey continues to increase while markets expand. Over the years it has shown to be a profitable crop for Turkish growers. At present, Turkey is the leading producer of sweet cherries in the world, supplying 21,3% (480.748 tons) of the total (Anonymous, 2013).

The main variety produced in Turkey is '0900 Ziraat', which is widely planted throughout the country. It is this variety that is exported to Europe and marketed for its high fruit quality and long shelf-life. '0900 Ziraat', however, is plagued by low fruit set.

In the case of 'Regina' it is known that poor fruit set is caused by short ovule longevity (Racsko, 2012). ReTain (AVG), consisting of 15% aminoethoxyvinylglycine, inhibits ethylene production in flowers thus increasing the life-span of ovules and improving fruit set. In a study

conducted by Washington State and Oregon State universities AVG improved fruit set on both 'Regina' and 'Tieton' sweet cherry cultivars in the Pacific Northwest, USA (Zhang, et al, unpublished). The basis of poor fruit set in '0900 Ziraat' is unknown so it is unclear whether '0900 Ziraat' will respond to AVG in a similar manner. The objective of this study is to determine if AVG will influence fruit set and quality parameters of '0900 Ziraat' sweet cherry.

Materials and Methods

The study was conducted in Susehri, Sivas in 2014. The trees used in the study were four year old '0900 Ziraat' trees that were grafted onto MaxMa 14. The trees were trained to the Spanish Bush system and were planted at a distance of 3.5 x 4 m. No chemical pesticides or fertilizers were used in the orchard. Trees were irrigated with flood irrigation and two tons of organic fertilizer were applied per 1000 m².

AVG was applied by hand gun at three rates (250, 500 and 750 mg) plus an unsprayed control. Applications were made at 10% full bloom on 9 April 2014. Each treatment consisted of 6 trees for a total of 24 trees. Three branches were selected per tree and all flowers on each branch were counted at full bloom on 13 April 2014.

Ten days prior to harvest, the number of fruit on each branch was determined. At harvest, 25 fruit per tree were picked randomly in order to determine fruit quality characteristics. Fruit samples were analyzed at the Agriculture Faculty of Ordu University laboratory.

Percentage of fruit set on each tree was calculated by dividing the number of fruit by the number of flowers. Fruit width, fruit thickness and fruit length were determined by a digitial caliper with 0.01 mm sensitivity. Average fruit weight was determined by dividing yield per tree by the number of fruit each tree produced. Fruit color was determined by taking 25 fruit from each tree and measuring the color of each fruit from two distinct points on the fruit with the help of a colorimeter (Minolta Co., model CR-400, Tokyo, Japan). Color of the epidermis was assigned two categories a^* and b^*. According to a prepared scale, a^* defines redness-greenness and b^* defines yellowness-blueness. Fruit firmness was measured as the maximum force (N) required to penetrate the fruit vertically. Measurements were carried out by the universal test device Zwick Z0.5 (Zwick/Roell Z0.5, Germany), a device that can apply force up to 500 N and has a 1,8 mm thick stainless-steel tip, at a speed of 0,5 mm/s and maximum 10 mm penetration into the fruit. Twenty-five fruit harvested from each tree were divided into 3 groups.Juice obtained from these fruit was tested in three different measurements to determine soluble solids content (SSC) by a digital hand-held refractometer [%, (PAL-1, McCormick Fruit Tech., Yakima, Wash.)]. Juice acidity was ascertained by using a pH-meter (Hanna, model HI9321). For titratable acidity (TA), 10 mL samples of juice were mixed with 10 mL of distilled water. The samples were titrated with NaOH up to 8,1 pH. Ripening index was calculated as the SSC value divided by the TA value. The data in the randomized block design was established as to factorial design and analyzed by the ANOVA procedure in the SAS statistical program. The differences between treatments were determined by using Duncan test ($p<0,05$).

Results and Discussion

Significant differences in fruit set compared to the control were found at all three rates of AVG. At 500 mg L^{-1}, fruit set was increased by 130%. However, difference between treatments (250, 500 and 750 mg L^{-1}) were not significant (Table 1 and Fig. 1).

AVG had little influence on fruit quality characteristics such as fruit size, fruit color, pH, firmness and titratable acidity. No statistical differences in fruit quality were found between any rates of treatments and the control except in relationship to SSC where all treatments reduced SSC relative to the control (Tables 1, 2, 3 and Fig. 1).

One of the most significant and limiting problems in producing '0900 Ziraat' in Turkey is low fruit set, which translates to low per acre yields. It is clear from this study that AVG has the potential to significantly increase fruit set on '0900 Ziraat' sweet cherry and improve yields. This can be done without negatively impacting the fruit quality attributes such as fruit size and firmness.

Table 1. The effects of AVG treatments on fruit set and physical properties of '0900 Ziraat' sweet cherry

Fruit characteristics	AVG treatments (mg L^{-1})			
	Control	250 (mg L^{-1})	500 (mg L^{-1})	750 (mg L^{-1})
Fruit set (%)	18.34 b	37.49 a	42.26 a	36.22 a
Fruit weight (g)	6.12 a	6.43 a	6.33 a	6.56 a
Fruit width (mm)	19.81 a	19.02 a	18.99 a	19.81 a
Fruit thickness (mm)	23.37 a	22.99 a	22.90 a	23.78 a
Fruit length (mm)	22.16 a	21.45 a	21.30 a	21.83 a
Geometric mean diameter	21.66 a	21.02 a	20.93 a	21.68 a
Fruit firmness (N)	3.07 a	3.01 a	3.02 a	3.06 a

The difference between mean values shown on the same line with the same lower-case letter is not significant ($p<0.05$).

Table 2. The effects of AVG treatments on ripening index and some chemical properties of '0900 Ziraat' sweet cherry

Some chemical properties and ripening index	AVG treatments (mg L^{-1})			
	Control	250 (mg L^{-1})	500 (mg L^{-1})	750 (mg L^{-1})
pH	3.62 a	3.58 a	3.60 a	3.62 a
Soluble solids content (%)	15.83 a	13.70 b	12.60 c	13.33 bc
Titratable acidity (% malic acid)	0.76 a	0.74 a	0.68 a	0.67 a
Ripening index	20.89 a	18.52 a	18.71 a	20.78 a

The difference between mean values shown on the same line with the same lower-case letter is not significant ($p<0.05$).

Table 3. The effects of AVG treatments on color characteristics of '0900 Ziraat' sweet cherry

Color characteristics	AVG treatments (mg L^{-1})			
	Control	250 (mg L^{-1})	500 (mg L^{-1})	750 (mg L^{-1})
a*	39.04 a	35.50 a	36.47 a	35.21 a
b*	20.28 a	16.98 a	18.75 a	17.39 a
Chroma	44.12 a	39.50 a	41.16 a	39.43 a
Hue angle	27.06 a	24.95 a	26.66 a	25.59 a

The difference between mean values shown on the same line with the same lower-case letter is not significant ($p<0.05$).

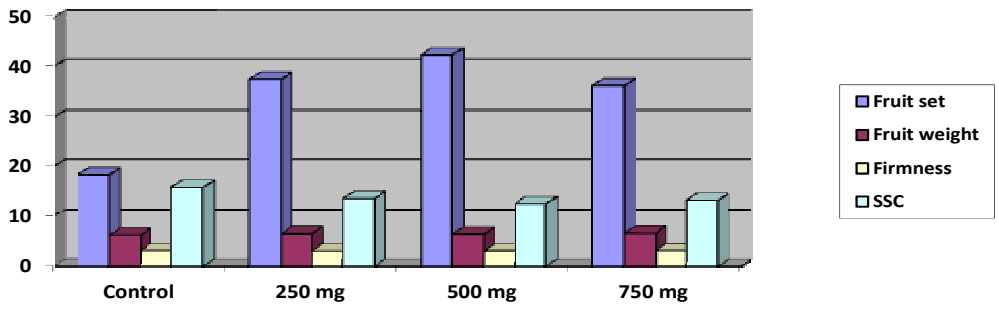

Figure.1.The effects of AVG treatments on fruit set and some physical and chemical properties of '0900 Ziraat' sweet cherry.

References

Anonymous, 2013. FAOSTAT. Food and Agriculture Organization of the United Nations. www.fao.org. 2013.

Racsko, J. 2012. Improving fruit set in 'Regina' sweet cherry with Aminoethoxyvinylglycine (ReTain) is facilitated by delayed stigmatic senescence. ***HortScience*** 47 (9) S155 (abstract)