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EFFECT OF DEFOLIATION DATE ON PERIMMON "COSTATA" VEGETATIVE AND FLOWER BUD DEVELOPMENT, FRUIT SET AND CHARACTERISTICS

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Abstract

Gibberellic acid (GA3) at 500 and 1000 ppm alone or combined with naphthalene acetic acid (NAA); Ethrel (ethephon) at 1000 ppm and urea at 10% treatments were sprayed after plcking date of persimmon "Costata" fruits during 1996 and 1997 seasons. All treatments of GA3 at 500 and 1000 ppm alone or combined with NAA at 10 ppm delayed defoliation as compared with the control. On the other hand, Ethrel at 1000 ppm and urea at 10% treatments accelerated defoliation as compared with unsprayed trees. All treatments accelerated defoliation as compared with unsprayed trees. All treatments of GA3 delayed vegetative and flower bud burst, development of flower buds and picking date as compared with the control. On the contrary, Ethrel and urea treatments accelerated vegetative and flower bud burst, flower bud development and picking date as compared with the control. The delaying of defoliation resulted from the treatment of 1000 ppm GA3 caused the highest fruit set, fruit weight, volume and fruit dimensions as compared with the control and other GA3 treatments. The treatments of Ethrel and urea were not effective on fruit set, yield, fruit weight, volume and fruit dimensions as compared with the control. All treatments of GA3 alone or combined with NAA increased fruit firmness and total soluble solids as compared with control. Total tannins' content and total acldity were not affected by all the treatments of study.

INTRODUCTION

Persimmon (*Diospyros kaki L.*) is a deciduous tree and its leaves changes from green to yellow and sometimes to red in the autumn, depending on the cultuivar. It is very relevant to good production in the following season to maintain the leaves green for as long as possible (Kitagawa and Glucina, 1987). Kitagawa, *et al.* (1966) reported that Gibberellic acid sprays are very effective in keeping persimmon leaves green, but they can also retard fruit coloration. They stated

that all concentrations of GA3 delayed autumn leaf fall by 24 days in "Hiratannenashi" cv. and 15 days in "Fuyu" cv. They added that the heavy frost occurred on Dec. 2 and 3 causing all GA sprayed leaves to defoliate. However, in a nonfrost region a greater delay in defoliation might have been expected. Also, they added that sprouting of sprayed shoots in the following spring was delayed by 2 days by 200 ppm of GA3. Gibberellic acid applied on peach from early August to early September at 200 ppm resulted in bloom delay and increased hardiness near bloom (Corgan and Widmoyer, 1971). They reported that the morphological studies of buds after treatment indicated that GA3: delayed flower initiation and development after initiation, and they stated that delayed leaf senescence following GA3 application could at least partially explain the GA delay of bloom response in a mild climate.

The mechanism of GA action on abscission had been studied by Addicot and Addicott (1982). They reported three important actions of GA. The first is that applied GA intensifies the ability of an organ to which it is applied to function as nutrient sink. The net result of this effect is to inhibit or at least delay abscission of such organs. A second action of GA that can influence abscission is its ability to increase the synthesis of IAA in plant tissues. This effect may be responsible for the abscission retardation of low dosages of GA applied to cotton explants. The third action involves accelerated synthesis of hydrolytic enzymes in aleurone cells. Foliar spray of GA3 applied on 10 Oct. On persimmon inhibited fruit maturation, fruit growth, coloration, sugar accumulation and the increase in abscisic acid (ABA), but increased the endogenous GA-like activity (Zheng, *et al.*, 1991). Recently, Benarie, *et al.* (1996) reported that the application of GA3 at least 2 weeks prior to harvest of persimmon fruits either delayed or inhibited all of the cell wall changes that were found to accompany fruit softening and increased activities of exopolygalacturonase and endo-1, 4- beta-glucanase.

Early defoliation by frost. Wind, or diseases not only reduces the current season's fruit development, but also causes small flowers to develop in the following season. Cell division in persimmon fruit mostly ceases just after flowering; the size of the flower, which to some extent determines fruit size, is greatly affected by defoliation in the previous season (Kitagawa and Glucina, 1987).

Japanese persimmon "Hiratanenashi" fruits harvested from a tree that had shed leaves early due to declining vigor softened 5-10 days before those from healthy tree (undefoliated), whereas fruits from a tree growing in plastic greenhouse, which shed leaves even later in the season, were the slowest to soften (temura, *et*

al., 1994). They found that GA-treatrment at harvest time reversed the effect of defoliation and mature fruits harvested from unsprayed shoots softened, whereas those from the GA-treated ones did not. They suggested that leaves on bearing shoots are important in the regulation of flesh softening of harvested mature fruits and it is proposed that GA, originating in the leaves and transported in the fruits, inhibits fruitsoftening by blocking ethylene action.

Chemical defoliation of peach by zinc sulphate and of apple by copper sulphate or urea, enhanced bud opening (Diaz, *et al.*, 1987). They found that hydorgen cyanamide (Dormex) induced early and heavy flowering of peach depending on time of application.

In warm climates, one problem in young almond trees is that timely leaf drop dose not occur, therefore, bud break is late and uneven (Grijalva-Contreras and Lopez-Carvajal, 1995). They found that the treatments of ZnSO4 (5%) and ZnSO4 (2.5%)+ urea (1.5%) recorded the higher defoliation as compared with NH4NO3 (5%), urea (5%), and the control. Non-defoliated tree had an even bud break and occurred 3 and 6 days later than defoliated ones. They found that ZnSO4 increased yield as compared with the control. Also, Flores and Martinez (1995) had found that chemical defoliation increased the percentage of bud break in "Golden Delicious" apple.

The aim of the present investigation is to study the effect of after harvest spraying of gibberellic acid alone or combined with naphthalene acetic acid; urea and Ethrel on persimmon "Costata" tree defoliation, vegetative and flower bud burst and development, fruit set, yield and fruit characteristics.

MATERIALS AND METHODS

The present investigation was performed for two successive seasons (1995 and 1996) on trees of persimmon cv. "Costata, of 6-years old grown in loamy soil in Horticultural Research Station at El-Kanater, Kalubia Governorate. Trees were subjected to similar cultural practices. The following treatments were foliar sprayed at OCt. 20 in both 1995 and 1996 seasons:

1. Control (sprayed with tap water).
2. Gibberellic acid (GA3) at 500 ppm.
3. Gibberellic acid (GA3) at 1000 ppm.
4. Gibberellic acid (GA3) at 500ppm + 10 ppm naphthalene acetic acid (NAA).
5. Gibberellic acid (GA3) at 1000ppm + 10 ppm naphthalene acetic acid (NAA).

6. Ethrel (ethephon) at 1000 ppm.
7. Urea at 10%.

Three trees were taken for each treatment (one tree for each replicate). Leaf defoliation was recorded after spraying for 12 weeks. Vegetative and flowere bud burst time was recorded for each sprayed and unsprayed trees. Flower bud development was recorded as the following stages: 1) Tight bud. 2) Visible petals 50%. 3) Petals fully visible. 4) Petals unfoloding. 5) Open bloom. Fruit set (%) and yield (Kg/tree), fruit weight, volume, diameter and height were determined. Fruit firmness (lb/Inch2) was determined by hand pressure tester (Balluf pressure tester-MEG, Co.). Total soluble solids (%) was recorded by a hand refractometer. Total acidity (%) was recorded by a hand refractometer. Total acidity (%) was determined as malic acid in fruit juice according to A.O.A.C. (1965). Tannins contents (%) was determined as malic acid in fruit juice according to A.O.A.C. (1965). Tannins contents (%) was determined as the method of Winton and Winton (1958).

The statistical analysis was carried out according to Snedecor and Cochran (1990) and L.S.D. test was used for performance of individual comparisons.

RESULTS AND DISCUSSION

1. Defoliation :

Fig. 1. illustrates the effect of GA3 at 500 ppm and 1000 ppm alone or combined with napthalene acetic acid (NAA) at 10 ppm, Ethrel at 1000 ppm and Urea at 10% on retained leaves on the tree during, 1996 and 1997 seasons. It is clear that the application of GA3 at 500 or 1000 ppm alone or combined with NAA at 10 ppm delayed leaf defoliation as compared with the control. On the other hand, Ethrel at 1000 ppm and urea at 10% accelerated leaf defoliation as compared with unsprayed trees. After 6 weeks from spraying, 1000 ppm GA3 + 10 ppm NAA treatment recorded the highest percentage of retained leaves on the tree (66.08 and 87.10%) for the 1st and 2nd season, respectively as compared with the control (10.99 and 6.95%) and the treatments of Ethrel at 1000 ppm (0.0 and 0.0%) and urea at 10% (1.64 and 1.89%), respectively. When the unsprayed (control) trees dropped all leaves after 9 weeks from spraying time, the trees sprayed with GA3 at 1000 ppm combined with 10 ppm NAA kept 57.07% and 72.94% from their leaves, for the 1st and 2nd seasons, respectively.

The present results are in harmony with the results of Kitagawa *et al.* (1966)

who reported that gibberellic acid sprays are very effective in keeping persimmon leaves green; Diaz, *et al.* (1987) using zinc sulphate for the defoliation of peach and copper sulphate or urea for apple and Itamura, *et al.* (1994) using GA-treatment at harvest time on persimmon.

2. Vegetative and flower bud burst time :

Results in Table 1 indicate the effect of GA3 at 500 and 1000 ppm alone or combined with NAA at 10 ppm, Ethrel at 1000 ppm and urea at 10% sprayed after picking of persimmon trees on vegetative and flower bud burst time during 1996 and 1997 seasons. Both Ethrel at 1000 ppm and urea at 10% treatments accelerated vegetative and flower bud burst time as compared with control trees. On the other hand all GA3 treatments at 500 and 1000 ppm alone or combined with NAA at 10 ppm delayed vegetative and bud burst time as compared with the control, Ethrel and urea treatments.

The present results agree with those of Kitagawa, *et al.* (1996) using GA3 preharvest application on persimmon; Itamura, *et al.* (1994) using GA-treatment at harvest time on persimmon and Diaz, *et al.* (1987) using zinc sulphate for the defoliation of peach and copper sulphate or urea for apple.

Table 1. Effect of some chemical substances on time of vegetative and flower bud burst during 1996 and 1997 seasons.

Treatments	Vegetative bud burst time		Flower bud burst time	
	1996	1997	1996	1997
Control	March 12 th	March 18 th	March 24 th	March 31 st
500 ppm GA3	March 16 th	March 20 th	March 26 th	April 1 st
1000 ppm GA3	March 16 th	March 20 th	March 27 th	April 1 st
500 ppm GA3+ 10 ppm NAA	March 12 th	March 20 th	March 27 th	April 1 st
1000 ppm GA3+ 10 ppm NAA	March 12 th	March 20 th	March 27 th	April 1 st
1000 ppm Ethrel	March 5 th	March 13 th	March 22 th	March 5 th
10% Urea	March 7 th	March 15 th	March 23 th	March 7 th

3. Flower bud development :

Results in Table 2 illustrate the effect of GA3 at 500 and 1000 ppm alone or

combined with NAA at 10 ppm, Ethrel at 1000 ppm and urea at 10% on flower bud development during 1996 and 1997 seasons. Both treatments of Ethrel at 1000 ppm and urea at 10% sprayed after picking accelerated flower bud development as compared with control and the other treatments during the two seasons. At March 25th in the first season, both treatments of Ethrel at 1000 ppm and urea at 10% reached full bloom stage (4.8 and 4.7 values, respectively) where the control flower buds reached petal unfolding stage (4.13) and the treatments of GA3 at 500 and 1000 ppm alone or combined with NAA at 10 ppm reached the stage of tight bud (1.0 value). The same trend was achieved in the second season of study.

The present results are in line with those of Diaz, *et al.* (1987) on peach and apple and Flores and Martinez (1995) who had found that chemical defoliation enhanced bud opening in "Golden Delicious" apple.

Fruit set (%)

Fruit set (%) as affected by different concentrations of GA3 alone or combined with NAA at 10 ppm; Ethrel at 1000 ppm or urea at 10% during 1996 and 1997 seasons are shown in Table 3. The highest percentage of fruit set (42.77 and 45.6%) in the 1st and 2nd season respectively as compared with the control (35.69 and 39.55%, respectively) but the increments in fruit set were insignificant.

Yield per tree

As shown in Table 3 the highest yield/tree was obtained by the spraying of 1000 ppm treatment (37.7 and 50.6 Kg./tree, respectively in the 1st and 2nd season) followed by the treatment of 500 ppm GA3 + 10 ppm NAA (35.7 and 49.1 Kg./tree, respectively) as compared with the control (29.01 and 39.65 kg./tree, respectively). The differences were significant in the first season between all treatments of GA3 at 500 and 1000 ppm alone or combined with NAA at 10 ppm and the treatments of untreated trees and trees treated by both Ethrel at 1000 ppm and urea at 10%. However, the differences in the second season were significant only between the best treatment of GA3 at 1000 ppm and both treatments of Ethrel at 1000 ppm and urea at 10%.

The present results are in harmony with the report of Kitagawa and Glucina (1987) who stated that delaying defoliation by GA3 spraying improved good production in the following season and he added that early defoliation by frost, wind or diseases reduces the current season's fruit development and causes small flowers to

Table 2. Effect of some chemical substances on flower bud development of persimmon "Costata' during 1996 and 1997 seasons.

Treatments	1996						1997				
	22/3	23/3	24/3	25/3	26/3	27/3	28/3	29/3	30/3	31/3	1/4
Control	1.0	1.0	2.22	4.13	4.55	4.73	1.0	1.0	1.0	2.3	4.14
500 ppm GA3	1.0	1	1	1	2.15	4.25	1.0	1.0	1.0	1.0	2.8
1000 ppm GA3	1.0	1.0	1.0	1.0	1.0	2.0	1.0	1.0	1.0	1.0	2.15
500 ppm GA3+ 10 ppm NAA	1.0	1.0	1.0	1.0	1.0	2.10	1.0	1.0	1.0	1.0	2.10
1000 ppm GA3+ 10 ppm NAA	1.0	1.0	1.0	1.0	1.0	2.05	1.0	1.0	1.0	1.0	2.13
1000 ppm Ethrel	2.10	4.08	4.78	4.8	4.80	4.88	1.93	3.81	3.94	4.16	4.86
10% Urea	1.15	2.08	3.73	4.70	4.83	4.98	1.0	2.01	2.10	3.40	4.70
L.S.D. at 5%	0.068	0.040	0.140	0.120	0.240	0.140	0.090	0.030	0.11	0.270	0.470

Stages of flower bud development: 1) Tight bud 2) Petals 50% visible 3) petals fully visible 4) Petals unfolding 5) Open bloom.

develop in the following season and that small flowers produce small fruits.

Picking Date

Table 3 results indicate the effect of different treatments of GA3 alone or combined with NAA; Ethrel or urea on picking date of persimmon fruit cv. "Costata" during seasons of 1996 and 1997. All treatments of GA3 at 500 and 1000 alone or combined with NAA at 10 ppm delayed picking date of trees as compared with the untreated ones. On the other hand, Both treatments of Ethrel at 1000 ppm and urea at 10% accelerated picking date of trees as compared with the control.

Table 3. Effect of some chemical substances on fruit set, yield and picking date of persimmon "Costata" fruits during 1996 and 1997 seasons.

Treatments	Fruit set (%)		Yield/tree (Kg.)		picking date	
	1996	1997	1996	1997	1996	1997
Control	35.69	39.55	29.01	39.65	Oct. 10	Oct. 14
500 ppm GA3	40.15	32.99	32.65	40.50	Oct. 15	Oct. 17
1000 ppm GA3	42.77	45.60	37.76	50.6	Oct. 15	Oct. 17
500 ppm GA3+ 10 ppm NAA	40.50	42.04	35.7	49.1	Oct. 15	Oct. 17
1000 ppm GA3+ 10 ppm NAA	41.03	42.29	34.85	48.10	Oct. 15	Oct. 17
1000 ppm Ethrel	35.06	36.83	29.93	36.00	Oct. 1st	Oct. 7th
10% Urea	35.72	37.85	29.85	38.2	Oct. 5th	Oct. 12
L.S.D. at 5%	N.S.	N.S.	3.04	12.80	--	--

Fruit Weight

As shown in Table 4, the treatment of GA3 at 1000 ppm alone recorded the heaviest fruits (116.95 and 112.88 g., respectively) in 1st and 2nd seasons followed by the treatment of GA3 at 500 ppm combined with NAA at 10 ppm (106.78 and 109.20 g., respectively) as compared with the control (89.05 and 87.43 g.). The differences between the treatments of Ehtrel at 1000 ppm and urea at 10% and the control were insignificant in the two studied seasons.

The present results are in line with the report of Kitagawa and Glucina (1987) who stated that delaying defoliation by GA3 spraying improved good production in

the following season and he added that early defoliation by frost, wind or diseases reduces the current season's fruit development and causes small flowers to develop in the following season and that small flowers produce small fruits.

Fruit Volume

As shown in Table 4, the treatment of GA3 at 1000 ppm alone recorded t he largest fruits (125.93 and 125.6 ml., resepectively) in 1st and 2nd seasons followed by the treatment of GA3 at 500 ppm combined with NAA at 10 ppm (116.3 and 115.48 ml., respectively) as compared with the control (102.25 and 97.5 ml.). The differences between the treatments of Ehtrel at 1000 ppm and urea at 10% and the control were insignificant in the second seasons.

The present results are in line with the report of Kitagawa and Glucina (1987) who stated that delaying defoliation by GA3 spraying improved good production in the following season and he added that early defoliation by frost, wind or diseases reduces the current season's fruit development and causes small flowers to develop in the following season and that small flowers produce small fruits.

Fruit Dimensions

Results presented in Table 4 indicate the treatmentt of GA3 at 1000 ppm alone recorded the highest fruit diameter (5.73 and 5.55 cm., respectively) in 1st and 2nd seasons followed by the treatment of GA3 at 500 ppm combined with NAA at 10 ppm (5.58 and 5.55 cm., respectively) as compared with the control (5.43 and 5.25 cm.). As regard fruit height, the treatment of GA3 at 1000 ppm alone recorded the highest fruit height (5.33 and 5.45 cm., respectively) in 1st and 2nd seasons followed by the treatment of GA3 at 500 ppm combined with NAA at 10 ppm (5.29 and 5.530 cm., respectively) as compared with the control (5.12 and 5.00 cm.) The differences between the treatments of Ehtrel at 1000 ppm and urea at 10% and the control were insignificant in the two studied seasons.

Fruit Firmness

The results in Table 5 indicate the effect of different treatments on persimmon fruit firmness (lb/Inch2) during 1996 and 1997 seasons. The differences in fruit firmness were significant in the first season and insignificant in second one. In the first season, the treatment of 1000 ppm GA3 recorded the highest firmness (19.00 lb/Inch2) followed by the treatment of GA3 at 1000 ppm + NAA at 10 ppm

Table 4. Effect of some chemical substances on physical characters of persimmon "Costata" fruits during 1996 and 1997 seasons.

Treatments	Fruit weight (g.)		Fruit volume (ml)		Fruit diameter (cm)		Fruit height (cm)	
	1996	1997	1996	1997	1996	1997	1996	1997
Control	89.05	87.43	102.25	97.5	5.43	5.25	5.12	5.00
500 ppm GA3	90.70	89.35	102.18	101.85	5.38	5.30	5.23	5.05
1000 ppm GA3	116.85	112.88	125.93	125.60	5.73	5.55	5.33	5.43
500 ppm GA3+ 10 ppm NAA	106.78	109.20	116.30	115.48	5.58	5.55	5.29	5.30
1000 ppm GA3+ 10 ppm NAA	95.55	90.18	106.30	107.70	5.45	5.47	5.16	5.25
1000 ppm Ethrel	86.53	86.55	96.58	101.95	5.38	5.13	5.10	4.95
10% Urea	86.95	88.6	96.63	94.38	5.35	5.11	4.98	4.86
L.S.D. at 5%	7.40	7.88	3.46	4.39	0.19	0.21	0.14	0.15

(18.95 lb/Inch 2) as compared with the control (17.9 lb/Inch^2).

Total Soluble Solids (T.S.S.)

Total soluble solids (T.S.S. %) as affected by different treatments during 1996 and 1997 seasons are presented in Table 5. The treatment of 1000 ppm recorded the highest T.S.S. (21.11 and 22.04%, respectively in the first and second season) followed by the treatment of 500 ppm GA3 + 10 ppm NAA (18.61 and 19.89%, respectively) as compared with the control (16.27 and 15.76). The differences were only significant between the control and the treatment of 1000 ppm GA3 in the first season, but there were significantce between the control and all GA3 treatments at 500 and 1000 ppm alone or combined with NAA at 10 ppm in the second season. T.S.S. did not affected by both treatments of Ethrel at 1000 ppm and urea at 10% in the two seasons of the study.

Total Tannins contents :

Results shown in Table 5 indicate the effect of GA3 500 and 1000 ppm alone or combined with NAA at 10 ppm; Ethrel at 1000 ppm and urea at 10% on total tannin content (%) in the seasons of 1996 and 1997. It is evident that the total tannin contents (%) did not affected by all sprayed chemicals in the two seasons of study.

Total Acidity

Total acidity (%) as affected by the different treatments of GA3 at 500 and 1000 ppm alone or combined with NAA at 10 ppm; Ethrel at 1000 ppm and urea at 10% are presented in Table 5. All treatments did not record any significant effect on total acidity (%) in the two seasons of study.

Table 5. Effect of some chemical substances on firmness, total soluble solids total tannins (%) and acidity of persimmon "Costata" fruits during 1996 and 1997 seasons.

Treatments	Fruit firmness (lb/Inch2)		T.S.S. (%)		Total tannins (%)		Total acidity (%)	
	1996	1997	1996	1997	1996	1997	1996	1997
Control	17.9	18.64	16.27	15.76	4.30	4.38	0.59	0.48
500 ppm GA3	18.95	18.69	17.45	17.70	4.37	4.28	0.58	0.49
1000 ppm GA3	19.00	18.67	21.11	22.04	4.38	4.41	0.59	0.64
500 ppm GA3+ 10 ppm NAA	18.90	18.65	18.61	19.89	4.36	4.41	0.60	0.54
1000 ppm GA3+ 10 ppm NAA	18.95	18.69	17.89	19.17	4.35	4.37	0.59	0.50
1000 ppm Ethrel	17.90	18.65	15.94	15.19	4.38	4.40	0.58	0.51
10% Urea	17.90	18.65	16.80	15.88	4.40	4.29	0.59	0.49
L.S.D. at 5%	0.082	N.S.	2.42	1.79	N.S.	N.S.	N.S.	N.S.

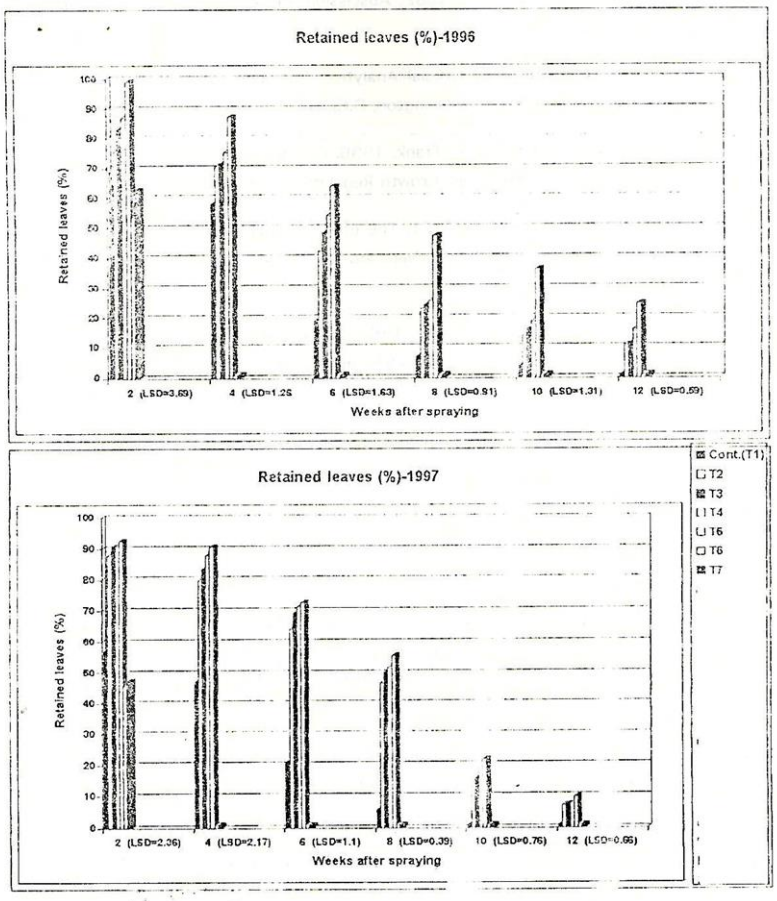

Figure 1. Effect of some chemical substances on the percentage of retained leaves on the tree of persimmon "Costata" during 1996 and 1997 (T1 = Control, T2 = 500 ppm GA3, T3 = 1000 ppm GA3, T4 = 500 ppm GA3 + 10 ppm NAA, T5 = 1000 ppm GA3 + 10ppm NAA, T6 = 1000 ppm Ethrel and T7 = 10% urea).

REFERENCES

1. Addicott, F.T. and A.B. addicott. 1982. Abscission. Un. CA. Press, Ltd. London, England. P 112-152.

2. A.O.A.C. 1965. Association of Official Analytical Chemists. Official Methods of analysis. Published by A.O.A.C. Washington, D.C., U.S.A.

3. Ben-Ari, R., Y. Saks, L. Sonego, A. Frank. 1996. Cell wall metabolism in gibberellin-treated persimmon fruits. Plant Growth Regulation., 19 (1): 25:33.

4. Corgan, J.N. and F.B. Widmoyer. 1971. The effects of gibberellic acid on flower differentiation, date of bloom, and flower hardiness of peach. J. Amer. Soc. Hort. Sci. 96 (1): 54-57.

5. Diaz, D.H., A. Alvarez and J. Sandoval. 1987. Cultural and chemical practices to induce uniform bud break of peach and apple under warm climates in mexico. Acta Hort., 199 : P. 129.

6. Flores, A.R. and A.Martines. 1995. Effect of chemical defoliation on the budbreak of "Golden Delicious" apple. Hort. science, 30 (4) : P. 842, Abst. No. 621.

7. Grijalva-Contreras, R.L. and A. Lopez-Carvajal. 1995. Chemical defoliation of almond in warm climates of Northwestern Mexico. Hort. Science, 30 (4) : P. 842 Abst. No. 617.

8. Itamura, H., T. Fukushima; T. Kitamura; H. Harada; S.Taira and Y. Takahashi. 1994. Effects of defoliation and foliar application of gibberellic acid on fruit softening after alcohol treatment of Japanese persimmon "Hiratanenashi". J. Japanese Soc. Hort. Sci., 62 (4) : 867-875.

9. Kitagawa, H., A. Sugiura and M.Sugiyama. 1966. Effects of gibberellin spray on storage of quality of kaki. Hort. Science 1 (2): 59-60.

10. Kitagawa, H. and P.G. Glucina. 1987. Persimmon culture in New Zyealand. 2nd Ed. Published by Science Information Publishing Center, Wellington, New Zealand, P. 27.

11. Snedecor, G.W. and W.G. Cochran. 1990. Statistical Methods. 7th Ed. The Iowa State Univ. Press. Ames, Iowa, USA. P. 593.

12. Winton, A.L. and K.B. Winton. 1958. The analysis of foods. John wiley and Sons, INC, London, P. 857.

13. Zheng, G.H., K. Yonemori; K. Hirano and A. Sugiura. 1991. The effects of foliar sprays of GA33 and ethrel on fruit maturation, endogenous GA-Like activity and ABA content in Japanese persimmon (*Diospyros kaki* L.) Acta-Horticulturaesinica, 18 (3) : 193-197.

تأثير موعد تساقط الأوراق على نمو البراعم الخضرية والزهرية وعقد الثمار وصفاتها فى الكاكى صنف "كوستاتا"

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تم رش الجبرالين بتركيز 500 , 1000 جزء فى المليون منفردا أو مخلوطاً بنفثالين حمض الخليك بتركيز 10 جزء فى المليون وكذلك الأثريل (الأثيفون) بتركيز 1000 جزء فى المليون واليوريا بتركيز 10٪ بعد جمع محصول الكاكى صنف "كوستاتا" خلال موسمى ١٩٩٦ ، ١٩٩٧. وقد أخرت كل معاملات الجبرلين منفرداً أو مخلوطاً بنفثالين حمض الخليك من تساقط الأوراق عند المقارنة بالأشجار الغير المعاملة. ومن ناحية أخرى، فقد أسرعت معاملة الإثريل بتركيز 1000 جزء فى المليون واليوريا بتركيز 10٪ من إسقاط الأوراق. وقد أخرت كل معاملات الجبرلين من تفتح كل من البراعم الخضرية والزهرية ونمو البراعم الزهرية وتاريخ الجمع عند المقارنة بالكنترول (المعاملة القياسية). وبالعكس ، فإن الرش بالإثريل واليوريا قد أسرع من تفتح البراعم الخضرية والزهرية ونمو البراعم الزهرية عند المقارنة بالأشجار الغير مرشوشة. وقد نتج عن تأخير تساقط الأوراق باستخدام الجبرلين بتركيز 1000 جزء فى المليون أعلى عقد للثمار وأعلى محصول وأكبر وزن وحجم وأبعاد للثمرة عند المقارنة بالأشجار الغير مرشوشة. ولم تكن معاملتا الإثريل واليوريا مؤثرتين على العقد والمحصول وصفات الثمار. وقد أدت معاملات الجبرلين منفردا أو مخلوطاً بنفتالين حمض الخليك إلى زيادة صلابة الثمار ومحتواها من المواد الصلبة الذائبة. ولم يتأثر محتوى الثمار من الحموضة الكلية والتانينات بالرش بجميع المعاملات.