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EFFECT OF SOYBEAN OIL AND GIBBERELLIC ACID SPRAYING ON PEACH FLOWER BUDS THINNING

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ABSTRACT: Peach trees var. 'Desert Red' of five years old were sprayed at two stages (bud swelling and full bloom) by soybean oil at 2.5, 5, 10% and gibberellic acid (GA_3) at 100, 150 , 200 ppm comparing to hand thinning. The work was performed through successive seasons (2002 and 2003).

The obtained data showed that, peach growers can safely use soybean oil at 10% as cheap flower thinning agent at swelling bud or full bloom stage where it produced high fruit set, retained fruits, number of fruits per Kg, fruit quality attributes, number of fruits per tree, fruit yield and fruit sale return (LE). On the other hand, GA_3 and hand thinning treatments are more expensive and caused alike results or even less.

Key words: Peach, Chemical thinning, Soybean oil, Gibberellic acid, Fruit quality, Fruit yield.

INTRODUCTION

Peach [*Prunus persica* (L) Batsch] trees require fruit thinning to reach optimal size. Early hand thinning usually gives the best results with regard to regular cropping, yield of marketable fruits, and economic values of the crop, but this method is usually too costly and thus is impractical for growers (Link and Blanke, 1998). For instance, hand thinning of apple trees cvs. Gala, Lobo, Gister, and Elaster and of peach trees cvs. Florda Prince, Swelling, Loadel, Cresthaven, and Redhaven at different stages of flowering or pre-pit hardening (for peach) reduced fruit set and increased yield and fruit size, weight, firmness and sugar content, with a reduction in fruit acidity as compared with chemical thinning or no thinning (Byers and Marini, 1994; Abdel-Hamid, 1999; Mahmoud; 2001).

The advantages of peach thinning are well established (Johnson and Handly, 1989). Thinning flowers or fruits aims to increase fruit size, marketable fruits and overall crop value and maintain tree structure (Byers, 1987). However, blossom thinning generally increases fruit size more than thinning after full bloom (Baugher, et al. 1991). Additionally, thinning of peach trees blossoms by hand were over thinned due to poor fruit set of the remaining flowers; however, their yield was nearly equivalent to hand thinned trees 38 or 68 days after full bloom (Byers and Marini, 1994). Applications of soybean oil to dormant peach trees thinned flower buds,

reduced the amount of hand thinning required, and hastened fruit maturity (Marsh, et al. 2000).

Hand thinning of peach fruits is one of the most expensive production practices, but few alternatives to hand thinning are available. Mechanical thinning methods have been developed but results in uneven fruit spacing and require special equipment (Baugher, et al. 1991; Glenn, et al. 1994). Caustic bloom thinners are inconsistent in their effects and therefore not commercially acceptable (Byers and Lyons, 1985; Fallahi, 1997) and many of these materials are not registered for commercial use. Alternatives that are inexpensive, safe, and consistent are still being sought. Soybean oil is exempted from normal Environmental Protection Agency (EPA) registration because it is a relatively nontoxic, common food constituent, not persistent in the environment, and has no significant adverse effects on the environment (U.S.Congress,1996). Furthermore, it is relatively inexpensive, when applied to dormant peach trees, it thins flower buds in concentration-dependent manner (Myers, et al., 1996). The effects of thinning on fruit size and maturity decrease with time of application (Havis, 1962; Byers and Lyons, 1985). Little data are available on the thinning ability of soybean oil which delays bloom of peach (Myers, *et al.*, 1996).

Moderate doses of appropriately timed GA_3 sprays reduced flower bud densities without adverse effects on winter survival, yield, defoliation or bloom time, this results support the use of GA_3 as a reliable peach thinning tool (Taylor and Taylor, 1998). Gibberellic acid was effective in reducing fruit set of "Mit-Ghamer" peach trees after being applied at 50, 100 and 125 ppm at pre-bloom-stage. It was most effective at the two higher concentrations at harvest, it improved characters of matured fruits (Mansour, et al. 1987). GA_3 was more effective than GA_{4+7} at equal concentrations in reducing the percent of flower buds out of the total bud number, however GA_{4+7} increased fruit size as compared to GA_3 . GA_3 application 6 weeks after full bloom was more effective than later summer dates. The optimal concentration was between 100 to 200 mg/L according to used cultivar (Gur and Mizrahi. 1993).

The objectives of this research were to evaluate the effect of soybean oil and gibberellic acid (GA_3) spraying comparing to hand thinning on fruit thinning, fruit quality, yield and profit of peach trees cv. "Desert Red".

MATERIALS AND METHODS

This investigation was conducted during the 2001 – 2002 and 2002-2003 seasons at a private farm (at Cairo-Alexandria desert road) on "Desert Red" peach trees. 39 trees of five-year-old, budded on "Nemaguard" peach rootstock and planted at 4 x 6 meter apart were chosen. The trees were grown in sandy soil under drip irrigation system and received similar cultural practices, trained and pruned uniformly to an open center shape.

The orchard was maintained in accordance with standard local fertilization and pest control recommendations.

The following treatments were designed:

1- Spraying soybean oil at 2.5%.
2- Spraying soybean oil at 5%.
3- Spraying soybean oil at 10%.
4- Spraying gibberellic acid (GA_3) at 100 ppm.
5- Spraying gibberellic acid (GA_3) at 150 ppm.
6- Spraying gibberellic acid (GA_3) at 200 ppm.
7- Hand thinned trees (leaving about 10-15 cm between adjacent fruits) 10 and 17 days after full bloom and sprayed with tap water, as control.

The adjuvant Top film (0.25% cm^3/L), produced by Mobil company was premixed with soybean oil, prior to adding to spray water at 0.2% (v/v) concentration, at rates of the oil treatments. Different treatments (except of hand thinning) were carried out at two stages, first at bud swelling stage (at 21 and 29 January) and second at full bloom stage (at 20 and 25 February) in the first and second season, respectively. Each treatment was replicated on 3 individual trees, (6 treatments x 3 replicates x 2 stages = 36 trees + 3 hand thinned trees).

The completely randomized block design was followed. All treatments were sprayed by handgun sprayer to runoff on the morning under clear sky and light wind. Five limbs of uniform bloom density per each tree were tagged and fruit set percentages (at 6-7 mm fruit diameter) and retained fruits percentages (after preharvest drop) were calculated. Yield data were recorded in terms of both weight and number of fruits/tree.

Fruit quality characters were recorded and included fruit weight, size, polar diameter, equatorial diameter, firmness as measured by Advanced Force Gauge RH13, UK (fruit firmness lb/$inch^2$). Also, total soluble solids (TSS%), total acidity (g malic acid/100 g fresh weight) were determined according to the methods described by (A.O.A.C. 1990).

Statistical analysis:

The analysis of variance of the obtained data was carried out according to Snedecor and Cochran (1990).

RESULTS AND DISCUSSION

Fruit yield:

A. Number of fruits/tree:

Results in Table (1) show the effect of soybean oil at 2.5, 5, 10% and gibberellic acid (GA_3) at 100, 150, 200 ppm and hand thinning on number of

fruits/tree of "Desert Red" peach during 2002 and 2003 seasons. Number of fruits per tree gradually decreased as soybean oil or GA_3 concentration increased. It is also clear that, hand thinning retained number of fruits per tree similar about the same with those obtained by spraying soybean oil at 10% or GA_3 at 150 and 200 ppm. There are variation between the two studied seasons as regard the number of fruits/tree and that may be returned to changes in climate.

B. Total yield/tree:

Results in Table (1) show the effect of soybean oil at 2.5, 5, 10% and gibberellic acid (GA_3) at 100, 150, 200 ppm and hand thinning on total yield Kg./tree of "Desert Red" peach during 2002 and 2003 seasons. Total fruit yield per tree caused by GA_3 spray at 150 ppm do not differ (34.35 Kg) than those caused by hand thinning (37.16 Kg), while that caused by spraying with soybean oil at 10% was relatively better (40.00 Kg) in the 1st season. In the 2nd season, soybean oil at 10%, GA_3 at 200 ppm and hand thinning get alike fruit yield (31.60, 32.83 and 36.30 Kg, respectively). However, the differences were not significant.

Fruit set:

Results in Table (2) indicate the effect of soybean oil at 2.5, 5, 10% and gibberellic acid (GA_3) at 100, 150, 200 ppm and hand thinning on percentages of fruit set of "Desert Red" peaches during 2002 and 2003 seasons. The effective thinners were soybean oil at 10% and hand thinning for the first season, while soybean oil at 10% and 5%, GA_3 at 200 ppm and hand thinning for the second season. However, the differences were significantly specially in the 2nd season. Besides, the studied thinning agents have the same trend at bud swelling and full bloom with no significant differences.

The present results agree with the previous results of (Johanson and Handley, 1989); (Byers, 1987); (Baugher, et al., 1991); (Byers and Marini, 1994); (Myers, et al. 1996); and (Moran, et al., 2000); using soybean oil for peach thinning. Also, the present results are parallel with the previous GA_3 applications on peach (Mansour, et al., 1987; Gur and Mizrahi, 1993; Taylor and Taylor, 1998).

Retained fruits:

The effect of soybean oil at 2.5, 5, 10% and gibberellic acid (GA_3) at 100, 150, 200 ppm and hand thinning on percentages of retained fruits of "Desert Red" peaches during 2002 and 2003 seasons are presented in Table (21). It is noticed that, soybean oil spray at 10%, GA_3 spray at (150 ppm in the 2nd season only), 200 ppm and hand thinning were more effective as thinning agents than the other treatments regarding to retained fruits. Moreover, the differences were sometimes statistically confirmed. However, the present

Table (1): Effect of thinning by soybean oil and gibberellic acid on number of fruits/tree and total yield (Kg/tree) of peach cv. "Desert Red" during 2002 and 2003 seasons.

Treatments (A)	Stages (B)											
	Number of fruits/tree						Total yield (Kg)/tree					
	2002 season			2003 season			2002 season			2003 season		
	Bud swelling	Full bloom		Bud swelling	Full bloom		Bud swelling	Full bloom		Bud swelling	Full bloom	
Soybean oil:												
2.5%	809.0	853.7	831.3	838.7	525.0	681.8	43.20	51.36	47.28	59.32	38.20	48.76
5%	783.0	735.0	759.0	676.0	412.7	544.3	43.49	45.25	44.37	49.25	30.51	39.88
10%	564.3	617.0	590.7	427	361.0	394.0	39.31	40.69	40.00	35.66	27.53	31.60
GA_3 (ppm):												
100	985.0	700.0	842.5	951.0	437.3	694.2	64.86	35.20	50.03	60.32	31.74	46.03
150	492.0	665.7	578.8	471.7	374.7	423.2	32.95	35.74	34.35	33.48	28.45	30.97
200	440.7	459.0	449.8	410.7	360.0	385.3	31.27	25.16	28.22	35.79	29.82	32.81
Hand thinning	687.0	587.0	587.0	369.0	369.0	369.0	37.16	37.16	37.16	36.30	36.30	36.30
Ave. (B)	665.9	659.6		592.0	405.7		41.75	38.65		44.30	31.79	
L.S.D. at 5%												
Treat. (A)	78.83			63.15			5.987			5.404		
Stages (B)	N.S.			89.31			N.S.			7.643		
A*B	51.61			41.34			3.919			3.538		

Table (2): Effect of thinning by soybean oil and gibberellic acid on fruit set (%) and retained fruits (%) on peach cv. "Desert Red" during 2002 and 2003 seasons.

Treatments (A)	Stages (B)											
	Fruit set (%)						Retained fruits (%)					
	2002 season			2003 season			2002 season			2003 season		
	Bud swelling	Full bloom		Bud swelling	Full bloom		Bud swelling	Full bloom		Bud swelling	Full bloom	
Soybean oil:												
2.5%	77.47	78.33	77.90	84.90	86.00	85.45	42.83	39.97	41.40	37.40	36.97	37.00
5%	73.97	71.73	72.85	73.93	62.27	68.10	30.27	35.97	33.12	36.43	32.07	34.25
10%	69.53	69.00	69.27	68.37	60.37	64.62	27.70	32.10	29.90	29.87	27.50	28.68
GA_3 (ppm):												
100	78.00	78.67	78.34	85.03	87.60	86.32	52.10	48.77	50.43	32.63	35.63	34.13
150	75.13	76.67	75.90	81.03	82.63	81.83	45.03	38.90	41.97	28.73	27.50	28.82
200	72.70	75.87	74.28	69.40	73.77	71.58	41.77	32.07	36.92	27.47	26.70	27.08
Hand thinning	72.50	72.50	72.50	75.97	75.97	75.97	32.03	32.03	32.03	33.77	33.77	33.77
Ave. (B)	74.19	74.68		76.95	75.59		38.82	37.11		32.33	31.40	
L.S.D. at 5% Treat. (A)	7.584			7.721			6.636			6.286		
Stages (B)	N.S.			N.S.			N.S.			N.S.		
A*B	4.965			5.055			4.344			4.117		

treatments were confluent at both bud swelling and full bloom stages throughout the two studied seasons.

The obtained results are in harmony with those of (Johanson and Handley, 1989); (Byers, 1987); (Baugher, et al., 1991); (Byers and Marini, 1994); (Myers, et al. 1996); and (Moran, et al., 2000); using soybean oil for peach thinning. Also, the present results are parallel with the previous GA_3 applications on peach (Mansour, et al., 1987; Gur and Mizrahi, 1993; Taylor and Taylor, 1998).

Number of fruits/Kg:

The effect of soybean oil at 2.5, 5, 10% and gibberellic acid (GA_3) at 100, 150, 200 ppm and hand thinning on number of fruits/Kg of "Desert Red" peaches during 2002 and 2003 seasons are shown in Table (3). It is well known that high bigger peach fruits is preferable than small ones so, we can arrange the effectiveness of the present treatments as effective thinning agents in the following order: soybean oil at 10%, hand thinning then GA_3 at 200 ppm (in the first season), while in the 2nd season were: hand thinning, GA_3 at 200 ppm then soybean oil at 10%. At bud swelling stage, the treatment of soybean oil gave the highest number of fruits/kg as compared with hand thinning treatment and other treatments in the first season, where in the second season, the treatment of GA_3 at 100 ppm gave the highest number of fruits/Kg as compared with hand thinning treatment which recorded the lowest number of fruits/Kg. At full bloom stage, the treatment of GA_3 at 100 ppm was superior in number of fruits/Kg than all treatments in the two seasons of the study, where the lowest numbers of fruits/Kg were recorded by the treatment of soybean oil at 10% in the first season

The previous results of (Johanson and Handley, 1989); (Byers, 1987); (Baugher, et al., 1991); (Byers and Marini, 1994); (Myers, et al. 1996); and (Moran, et al., 2000); using soybean for peach thinning are in agreement with the present results. . Also, the present results are similar to the previous GA_3 applications on peach (Mansour, et al., 1987; Gur and Mizrahi., 1993; Taylor and Taylor, 1998).

Fruit weight and size:

The effect of soybean oil at 2.5, 5, 10% and gibberellic acid (GA_3) at 100, 150, 200 ppm and hand thinning on fruit weight (g.) and size (cm^3)of "Desert Red" peaches during 2002 and GA_3 2003 seasons are presented in Table (3). It is clearly observed that, hand thinning, soybean oil at 10% and GA_3 at 200 ppm were more effective to get bigger peach fruits (with both weight and size). Meanwhile, soybean oil spray at 10% was superior than the two mentioned treatments in the 1st season, while, hand thinning was superior in the 2nd season. Generally, statistical analysis of the data mostly confirmed the differences than the other treatments. Moreover, the present peach

Table (3): Effect of thinning by soybean oil and gibberellic acid on number of fruits/Kg., fruit weight and size of peach cv."Desert Red" during 2002 and 2003 seasons.

Treatments (A)	Stages (B)																	
	Number of fruits/Kg.						Fruit weight (g.)						Fruit size (cm^3)					
	2002 season			2003 season			2002 season			2003 season			2002 season			2003 season		
	Bud swelling	Full bloom		Bud swelling	Full bloom		Bud swelling	Full bloom		Bud swelling	Full bloom		Bud swelling	Full bloom		Bud swelling	Full bloom	
Soybean oil:																		
2.5%	18.72	16.64	17.68	14.16	13.76	13.96	53.55	60.12	56.84	70.67	72.72	71.7	46.30	54.77	50.53	56.81	55.89	5[illegible]6.35
5%	18.22	16.26	17.24	13.69	13.65	13.67	55.49	61.66	58.57	73.24	73.24	73.38	47.75	56.21	51.98	63.22	59.48	6[illegible]1.35
10%	14.43	15.19	14.81	12.28	13.13	12.71	69.59	66.06	67.83	85.39	76.21	80.8	62.09	57.56	59.83	68.89	67.28	6[illegible]8.08
GA_3 (ppm):																		
100	15.20	19.99	17.59	15.79	13.83	14.81	65.86	50.70	58.28	63.42	72.49	67.95	59.06	41.59	50.33	59.25	67.45	6[illegible]3.47
150	15.04	18.98	17.01	14.21	13.17	13.69	66.96	53.42	60.19	70.56	76.02	73.29	55.24	42.56	48.90	64.25	69.51	6[illegible]6.88
200	14.09	18.43	16.26	12.50	12.08	12.29	71.07	55.33	63.20	80.22	82.78	81.50	63.28	54.99	59.13	72.26	77.55	7[illegible]4.91
Hand thinning	15.81	15.81	15.81	10.19	10.19	10.19	63.29	63.29	63.29	98.80	98.80	98.80	50.05	50.05	50.05	79.10	79.10	7[illegible]9.10
Ave. (B)	15.93	17.33		13.26	12.83		63.69	58.65		77.47	78.93		54.82	51.10		66.29	68.04	
L.S.D. at 5% Treat. (A)	1.87			1.316			6.375			8.890			3.147			9.177		
Stages (B)	N.S.			N.S.			N.S.			N.S.			N.S.			N.S.		
A*B	1.229			0.862			4.173			5.820			2.060			6.008		

treatments were confluent at both bud swelling and full bloom stages throughout the two studied seasons.

The obtained results are in harmony with those of (Johanson and Handley, 1989); (Byers, 1987); (Baugher, et al., 1991); (Byers and Marini, 1994); (Myers, et al. 1996); and (Moran, et al., 2000); using soybean oil for peach thinning. Also, the present results are parallel with the previous GA_3 applications on peach (Mansour, et al., 1987; Gur and Mizrahi, 1993; Taylor and Taylor, 1998).

Number of fruits/Kg:

The effect of soybean oil at 2.5, 5, 10% and gibberellic acid (GA_3) at 100, 150, 200 ppm and hand thinning on number of fruits/Kg of "Desert Red" peaches during 2002 and 2003 seasons are shown in Table (3). It is well known that high bigger peach fruits is preferable than small ones so, we can arrange the effectiveness of the present treatments as effective thinning agents in the following order: soybean oil at 10%, hand thinning then GA_3 at 200 ppm (in the first season), while in the 2nd season were: hand thinning, GA_3 at 200 ppm then soybean oil at 10%. At bud swelling stage, the treatment of soybean oil gave the highest number of fruits/kg as compared with hand thinning treatment and other treatments in the first season, where in the second season, the treatment of GA_3 at 100 ppm gave the highest number of fruits/Kg as compared with hand thinning treatment which recorded the lowest number of fruits/Kg. At full bloom stage, the treatment of GA_3 at 100 ppm was superior in number of fruits/Kg than all treatments in the two seasons of the study, where the lowest numbers of fruits/Kg were recorded by the treatment of soybean oil at 10% in the first season

The previous results of (Johanson and Handley, 1989); (Byers, 1987); (Baugher, et al., 1991); (Byers and Marini, 1994); (Myers, et al. 1996); and (Moran, et al., 2000); using soybean for peach thinning are in agreement with the present results. . Also, the present results are similar to the previous GA_3 applications on peach (Mansour, et al., 1987; Gur and Mizrahi., 1993; Taylor and Taylor, 1998).

Fruit weight and size:

The effect of soybean oil at 2.5, 5, 10% and gibberellic acid (GA_3) at 100, 150, 200 ppm and hand thinning on fruit weight (g.) and size (cm^3)of "Desert Red" peaches during 2002 and GA_3 2003 seasons are presented in Table (3). It is clearly observed that, hand thinning, soybean oil at 10% and GA_3 at 200 ppm were more effective to get bigger peach fruits (with both weight and size). Meanwhile, soybean oil spray at 10% was superior than the two mentioned treatments in the 1st season, while, hand thinning was superior in the 2nd season. Generally, statistical analysis of the data mostly confirmed the differences than the other treatments. Moreover, the present peach

thinners have the same trend at bud swelling and full bloom stages throughout the two studied seasons.

The obtained results are in agreement with those of (Johanson and Handley, 1989); (Byers, 1987); (Baugher, et al., 1991); (Byers and Marini, 1994); (Myers, et al. 1996); and (Moran, et al., 2000); using soybean for peach thinning. Also, the present results are similar to the previous GA_3 applications on peach (Mansour, et al., 1987; Gur and Mizrahi, 1993; Taylor and Taylor, 1998).

Fruit dimensions:

Fruit dimensions [polar diameter and equatorial diameter (cm)] of "Desert Red" peaches during 2002 and 2003 seasons as affected by soybean oil at 2.5, 5, 10% and gibberellic acid (GA_3) at 100, 150, 200 ppm and hand thinning are presented in Table (4). It is noticeable that, soybean oil at 10%, GA_3 at 200 ppm and hand thinning were positively increased peach fruit dimensions relatively than the other treatments. However, these results were constant throughout the two studied seasons, when conducted at bud swelling or full bloom stages.

The previous results of (Johanson and Handley, 1989); (Byers, 1987); (Baugher, et al., 1991); (Byers and Marini, 1994); (Myers, et al. 1996); and (Moran, et al., 2000); using soybean oil for peach thinning are in agreement with the present results. . Also, the present results are in harmony with the previous GA_3 applications on peach (Mansour, et al., 1987; Gur and Mizrahi ,1993; Taylor and Taylor, 1998).

Fruit firmness ($lb/inch^2$):

Results in Table (5) indicate the effect of soybean oil at 2.5, 5, 10% and gibberellic acid (GA_3) at 100, 150, 200 ppm and hand thinning on fruit firmness ($lb/inch^2$) of "Desert Red" peach during 2002 and 2003 seasons. At full bloom spraying, the highest firmness (17.23 $lb/inch^2$) resulted from spraying soybean oil at 10% in the first season, and in the second season, the highest firmness (16.17 $lb/inch^2$) as a result of spraying soybean oil at 5%, while, hand thinning treatment recorded the lowest firmness (11.44 and 11.50 $lb/inch^2$) in the first and second season, respectively. These results obviously mean that, soybean oil as a thinning agent not only increased fruit weight, size and dimensions,but also increased fruit firmness. Subsequently mean that , soybean oil caused better fruit quality with better fruit handling while hand thinning caused better fruit quality but with less fruit firmness. It had been noticed that the fruit firmness average was significantly higher in the full bloom spraying than in the swelling bud spraying throughout the two studied seasons.

The obtained results agree with those of (Johanson and Handley, 1989); (Byers, 1987); (Baugher, et al., 1991); (Byers and Marini, 1994); (Myers, et al. 1996); and (Moran, et al., 2000); using soybean oil for peach thinning. Also,

Table (4): Effect of thinning by soybean oil and gibberellic acid on fruit dimensions of peach cv. "Desert Red" during 2002 and 2003 seasons.

Treatments (A)	Stages (B)											
	Polar diameter (cm)						Equatorial diameter (cm)					
	2002 season			2003 season			2002 season			2003 season		
	Bud swelling	Full bloom		Bud swelling	Full bloom		Bud swelling	Full bloom		Bud swelling	Full bloom	
Soybean oil:												
2.5%	4.80	4.90	4.85	5.03	4.95	4.99	4.57	4.87	4.72	4.95	5.00	4.98
5%	4.87	5.03	4.95	5.07	4.99	5.03	4.73	4.90	4.82	5.07	5.07	5.07
10%	5.13	5.17	5.15	5.27	5.09	5.18	4.97	5.03	5.00	5.21	5.11	5.16
GA_3 (ppm):												
100	5.07	4.70	4.88	5.20	5.13	5.17	4.93	4.60	4.77	5.13	5.06	5.09
150	5.00	4.93	4.97	5.27	5.21	5.24	4.93	4.83	4.88	5.25	5.17	5.21
200	5.30	5.27	5.28	5.40	5.46	5.43	5.17	5.10	5.13	5.28	5.49	5.39
Hand thinning	5.50	5.50	5.50	5.25	5.25	5.25	5.43	5.43	5.43	5.18	5.18	5.18
Ave. (B)	5.10	5.07		5.21	5.15		4.96	4.97		5.15	5.16	
L.S.D. at 5% Treat. (A)	0.228			0.206			0.147			0.145		
Stages (B)	N.S.			N.S.			N.S.			N.S.		
A*B	0.149			0.135			0.147			0.145		

Table (5): Effect of thinning by soybean oil and gibberellic acid on fruit firmness, TSS and acidity of peach cv. "Desert Red" during 2002 and 2003 seasons.

Treatments (A)	Stages (B)																	
	Fruit firmness (lb/inch²)						TSS (%)						Acidity (%)					
	2002 season			2003 season			2002 season			2003 season			2002 season			2003 season		
	Bud swelling	Full bloom		Bud swelling	Full bloom		Bud swelling	Full bloom		Bud swelling	Full bloom		Bud swelling	Full bloom		Bud swelling	Full bloom	
Soybean oil:																		
2.5%	11.73	15.97	13.85	11.60	15.60	13.60	10.67	9.83	10.25	10.50	10.00	10.25	0.64	0.58	0.61	0.60	0.57	0.59
5%	11.13	14.10	12.62	10.90	16.17	13.53	9.67	10.17	9.92	10.33	10.50	10.42	0.62	0.55	0.58	0.55	0.57	0.56
10%	11.20	17.23	14.22	11.37	15.57	13.47	10.67	10.50	10.58	10.17	10.83	10.50	0.56	0.59	0.57	0.53	0.59	0.56
GA_3 (ppm):																		
100	11.63	16.03	13.83	11.33	15.90	13.62	9.83	9.67	9.75	10.17	9.83	10.00	0.52	0.55	0.54	0.52	0.52	0.52
150	12.33	13.87	13.10	11.93	14.60	13.27	9.67	10.00	9.83	9.67	10.00	9.83	0.53	0.58	0.56	0.56	0.54	0.55
200	11.41	16.47	13.93	11.50	15.83	13.67	10.00	10.17	10.08	9.83	10.50	10.17	0.59	0.57	0.58	0.59	0.61	0.60
Hand thinning	11.44	11.44	11.44	11.50	11.50	11.50	9.83	9.83	9.83	10.50	10.50	10.50	0.55	0.55	0.55	0.55	0.55	0.55
Ave. (B)	11.55	15.01		11.45	15.02		10.05	10.02		10.17	10.31		0.57	0.57		0.56	0.56	
L.S.D. at 5% Treat. (A)	1.21			1.329			0.564			0.630			0.038			0.038		
Stages (B)	1.712			1.880			N.S.			N.S.			N.S.			N.S.		
A*B	0.792			0.870			0.369			0.413			0.025			0.025		

Table (6): Effect of thinning by soybean oil and gibberellic acid on fruit sale (LE)/tree of peach cv. "Desert Red" during 2002 and 2003 seasons.

Treatments (A)	Stages (B)						Treatment cost (LE)
	Fruit sale (LE)/tree*						
	2002 season			2003 season			
	Bud swelling	Full bloom		Bud swelling	Full bloom		
Soybean oil:							
2.5%	54.00	64.20	59.10	88.99	57.31	73.15	0.25
5%	51.15	60.12	55.63	73.88	45.77	59.13	0.50
10%	56.02	54.19	55.10	50.90	41.30	46.10	1.00
GA_3 (ppm):							
100	86.75	38.31	62.53	80.71	47.61	64.16	2.33
150	44.23	39.31	41.84	50.22	42.68	46.45	3.50
200	46.91	31.70	39.31	53.68	44.74	49.21	4.67
Hand thinning	49.66	49.66	49.66	54.45	54.45	54.45	2.00
Ave. (B)	55.53	48.23		64.69	47.69		
L.S.D. at 5%							
Treat. (A)	11.81			9.524			
Stages (B)	N.S.			13.47			
A*B	7.730			6.235			

* Fruit sale (LE)/tree was calculated for total yield/tree (Table 5) and the average of fruit weight (Table 2) with consider to farm price on the base of size grading and after omitting the coast of every treatment.

at 2.5 and 5% as well as GA_3 at 150 and 200 ppm with insignificant differences. From the Table it is clear that the highest cost was the treatment of GA_3 at 200 ppm and the lowest cost was the treatment of soybean oil at 2.5%, and we can arrange the treatment cost in ascending order as follow: Soybean oil at 2.5% < Soybean oil at 5% < Soybean oil at 10% < hand thinning < GA_3 at 100 ppm < GA_3 at 150 ppm < GA_3 at 200 ppm.

Generally, it is clear that we can use the soybean oil at concentration of 5 and 10% at bud swelling as a safe, cheap and effective method for peach fruit thinning instead of hand thinning or gibberellic acid applications.

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تأثير رش زيت فول الصويا و حمض الجبريليك على خف البراعم الزهرية للخوخ صنف دزرت رد " Desert Red"

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الملخص العربى

رشـــت أشـــجار الخـــوخ صـــنف "دزرت رد" عمر ٥ ســـنوات خلال موسمى ٢٠٠٢ ، ٢٠٠٣ فـــى موعديـــن (عند انتفاخ البراعم وعند الإزهار الكامل) بزيت فول الصويا بتركيز ٢,٥% ، ٥% ، ١٠% وحمـــض الجبريلـــيك (GA_3) بتركـــيز ١٠٠ ، ١٥٠ ، ٢٠٠ جزء/مليون ومقارنة الرش بإجراء الخف اليدوى. وأهم النتائج ما يلي:

- نـــتج أفضـــل عقـــد للثمار(%) نتيجة استخدام الجبرلين عند تركيز ١٠٠ جزء/مليون ويليه عقد الثمار نتيجة لإستخدام زيت فول الصويا ٢,٥%.
- سجلت معاملة الجبرلين بتركيز ١٠٠ جزء/مليون أعلى نسبة مئوية للثمار الباقية فى الموســـم الأول ، بينما سجلت معاملة الزيت ٢,٥% أعلى نسبة مئوية للثمار المتبقية فى الموسم الثانى.. ولم يكن هناك فرق معنوى بين متوسط الميعادين.
- نـــتج أقل عدد من الثمار لكل كجم كنتيجة لرش زيت فول الصويا ١٠% عند الإزهار الكـــامل فى الموسم الأول وكنتيجة للخف اليدوى فى الموسم الثانى بالمقارنة بالرش بالجبرلين بتركيز ١٠٠ جزء/مليون الذى أعطى أكبر عدد من الثمار/كجم.
- نـــتج أكـــبر وزن للـــثمرة كنتـــيجة للخف اليدوى بينما أعطى الرش بالجبرلين ١٠٠ جزء/مليون عند الإزهار الكامل أقل وزن للثمرة.
- حســـنت معاملات زيت فول الصويا والجبرلين من صلابة الثمار عند المقارنة بالخف اليدوى الذى أعطى أقل صلابة للثمار فى موسمى الدراسة.
- سجلت معاملة زيت فول الصويا (١٠%) أعلى نسبة مئوية للمواد الصلبة الذابة فى الموسم الأول عند مقارنتها بباقى المعاملات.

- بصفة عامة نتجت أعلىقيمة للحموضة نتيجة استخدام زيت فول الصويا ٢,٥% واقل قيمة نتيجة الرش بالجبرلين بتركيز ١٠٠ جزء/مليون.
- نتج عدد من الثمار/شجرة أعلى فى حالة الرش بزيت فول الصويا ٢,٥% والجبرلين ١٠٠جزء/مليون منه فى حالة الخف اليدوى وباقى المعاملات.

ظهر أعلى محصول/شجرة كنتيجة للرش بزيت فول الصويا٢,٥% والجبرلين بتركيز ١٠٠ جزء/مليون منه فى حالة الخف اليدوى وباقى المعاملات.

وتشير النتائج أن مزارعى الخوخ يمكنهم بأمان استخدام زيت فول الصويا بتركيز ١٠% كمعاملة خف للأزهار رخيصة الثمن حيث أعطت نتائج مرضية لنسبة عقد الثمار، عدد الثمار المتبقية حتى الجمع، عدد الثمار فى الكيلوجرام ، مواصفات جودة الثمار، عدد الثمار/شجرة، محصول الثمار والعائد النقدي من بيع المحصول. فى نفس الوقت كانت معاملات حمض الجبريليك والخف اليدوى أكثر تكلفة وأعطت نتائج مشابهة لتلك المتحصل عليها من رش زيت فول الصويا أو أقل.