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Effect of some thinning methods to enhance the quality and productivity of Sewy date palm cultivar

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ABSTRACT

This research was conducted in two consecutive seasons (2020 and 2021) in a private orchard in the EL Badrashin region, Giza Governorate. To investigate the effect of two chemical compounds, ethephon (Ethrel) and naphthalene acetic acid (NAA), on date fruit thinning to improve the fruit quality of Sewy date palm by spraying this chemical twice after 15 and 25 days of pollination. Twenty-eight female trees were randomly selected from the Sewy cultivar, aged 20 years, to conduct the experiment. These trees were pollinated with pollen grain from one male in both seasons on the first day of the opening of the spath. All palm trees were treated with the same standard agricultural practices. Ten bunches per palm were kept for the thinning experiment, and all other bunchs that appeared were removed. Individual bunches were covered with plastic bags before and after spraying. 14 palm trees were sprayed with ethephon at a concentration of 0, 100, 150 and 200 ppm, and another 14 trees were sprayed with NAA at a concentration of 0, 50, 100 and 150 ppm. One concentration of the studied chemicals was sprayed on three bunches on each tree (repeated), except for a control one bunch was sprayed with water on each tree. Spraying bunches with NAA at 150 ppm or ethephon at 200 ppm gave a significant increment than the other treatments in both seasons. NAA at 150 ppm or ethephon at 200 ppm after 25 days of pollination gave the highest fruit weight (18.75 and 18.30 g, respectively) and the highest fruit length (4.54 and 4.50 cm, respectively) followed by NAA at 100 ppm or ethephon at 150 ppm compared to the second time after 15 days of pollination. While the control recorded the lowest fruit weight and fruit length in Sewy date palm cultivar. In this regard NAA at 150 ppm treatments are good to enhance fruit quality, fruit weight, fruit length and the development of fruits.

Keywords: Date palm, Phoenix dactylifera, chemical thinning, NAA, Ethephon

Introduction

The date palm, also known as *Phoenix dactylifera* L., is one of the oldest fruit trees that still grows today. Because it can endure in desert regions with high temperatures, drought, and salt, it is known as the "tree of life." limited water input requirements, long-term productivity, and multipurpose capabilities. Dates are a significant traditional crop in Egypt. Egypt produces the most dates among the top ten nations, according to FAO (2017) (1,800,000 tons). The most significant semi-dray cultivar grown in Egypt economically is Sewy date. At semi-dray stages of development, it is typically harvested and consumed. Date palm cultivar, pollination, fertilization, and water relations are the main factors influencing yield and fruit quality (Osman, 1995; Iqbal *et al.,* 2020). Date palm fruit thinning is a significant cultural practice to enhance fruit quality, including physical traits like fruit retention, bunch weight, fruit length, flesh weight, fruit weight, and fruit diameter, as well as chemical traits like total sugars. Additionally, it lessens alternate bearing in a few cultivars of date palm (Moustafa, 1998; El-Shazly, 1999).

Thinning can be done mechanically, manually and chemically (Al-Obeed *et al.,* 2005). Several types of chemical diluents such as gibberellic acid, naphthalene acetic acid, ethephon, ammonium thiosulphate (ATS) are available to improve the quality of date fruits. Ethephon is a plant regulator that is almost stable in solution below pH 4, but at higher pH values it degrades to ethylene, hydrogen chloride and phosphate ions. It provides ethylene to the plant tissue because the pH of the cell cytoplasm

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is higher than 4. The main function of ethylene is to cause changes in fruit structure, softening, color and other ripening processes. It is also known as plant senescence hormone.

The main function of ethylene is to cause changes in fruit structure, softening, color and other ripening processes. It is also known as plant senescence hormone. (Ebert and Bangerth, 1982) reported that ethylene prevented the synthesis and transfer of IAA in the fruit, which reduced the downward force and finally induced a clear region of the stem that causes fruit drop (Roberts *et al.,* 2002).

The goal of this study was to investigate the effect and potential of two chemical compounds, ethephon (Ethrel) and naphthalene acetic acid (NAA), on fruit thinning in order to improve the fruit quality of Sewy date palm cultivar by spraying it twice after 15 and 25 days of pollination.

2. Materials and Methods

This study was conducted in two consecutive seasons (2020 and 2021) in a public orchard in EL Badrashin District, Giza Governorate. The study investigated the effect and potential of two chemical compounds, ethephon (Ethrel) and naphthalene acetic acid (NAA), on fruit thinning to improve the fruit quality of date variety Sewy by spraying this chemical at two times after 15 and 25 days of pollination.

Twenty eight randomly selected female trees of Sewy cultivar (20 years) for the test. These trees were pollinated with pollen grains from males from the same source in both seasons on the first day of spathe opining. All date palms were operated according to the same standard agricultural practices. They were cut at a ratio of 8:1 leafs/bunch. Ten sprays (replicas) were kept for thinning by palm and all other sprays that appeared were discarded. Individual packages were covered with tissue paper before and after treatment. For ethephon and NAA applications, bags were temporarily removed, sprayed after 15 and 25 days of pollination and picked up immediately. Each palm was sprayed with ethephon at 0, 100, 150 and 200 ppm and NAA at 0, 50, 100 and 150 ppm. Because one concentration of the studied chemicals was sprayed on one of three palms (replicates) separated by water-sprayed packages (control). The experimental design was a randomized complete block design with 7 replicates per treatment. The first factor contain time of application (after 15 or 25 days), while the second factor include dilution by NAA spray or spray concentrations of ethephon.

The following characteristics were studied:

2.1. Fruit set

This was calculated using the following equation:

$$\text{Fruit set \%} = \frac{\text{Number of fruits setting on the strand}}{\text{Total number of flowers per strand}} \times 100$$

2.2. Bunch Yield (kg), Fruit weight, Fruit length, Fruit diameter, Flesh weight, Seed weight

Average fruit weight was obtained in grams by weighing the fruit samples (10 fruits that picked randomly) of each treatment and the average was calculated. Also, the seeds were separated got out from fruits and weighed to calculate the average seed weight.

2.3. Statistical analysis

Analysis of variance was performed on the obtained data. Mean values were compared using the New LSD method at the 5% level, data were tabulated, and statistically factor analysis was performed according to the randomized complete block design method (Snedecor and Cochran, 1989). To find binomial percentages, percentages were converted to arcsines. According to Steel and Torrie (1980).

3. Results and Discussion

3.1. Bunch Yield (kg)

The data presented in Table (1) showed that the mean bunch weight of Sewy date palm cultivar significantly reduced the bunch yield compared to the control treatment in both seasons. However, the decrease in bunch yield was increased by increasing chemical thinning concentrations. Bunch spray with NAA 150 ppm or ethephon 200 ppm produced significant growth in both seasons compared to other treatments. On the other hand, untreated bunches recorded the highest bunch weight in both seasons. These results agree with those of (Harhash and Abdel-Nasser 2007; Marzouk et al., 2007;

Metwally *et al.,* 2012; Omar and Alam-Eldein, 2014 and Ghazzawy *et al.*, 2019). The results also agree with the date weight affected by the growth regulators.

Table 1: Effect of NAA and Ethephon on Bunch Weight (Kg) of Sewy date palm cultivar during 2020 and 2021 seasons.

Treatments		15 days from pollination		Mean	25 days from pollination		Mean	General mean
		2020	2021		2020	2021		
NAA	0 ppm	18.76	18.74	18.75	18.65	18.73	18.69	18.72
	50 ppm	17.23	17.11	17.17	17.18	17.39	17.28	17.22
	100 ppm	16.46	16.32	16.39	16.23	16.21	16.22	16.305
	150 ppm	15.22	15.14	15.18	15.13	15.11	15.12	15.15
Mean		16.91	16.82	16.87	16.79	16.86	16.82	16.85
Ethephon	0 ppm	18.99	18.87	18.93	18.63	18.51	18.57	18.75
	100 ppm	17.35	17.33	17.34	17.32	17.23	17.27	17.30
	150 ppm	16.59	16.45	16.52	16.61	16.44	16.52	16.52
	200 ppm	15.33	15.21	15.27	15.26	15.24	15.25	15.26
Mean		17.065	16.965	17.01	16.955	16.855	16.90	16.96
General mean		16.99	16.89	16.94	16.87	16.8575	16.86	16.90
New LSD at P≤5% for Time (B) 0.21		Treatments (A) 0.37		A× B 0.28		B× C 0.13		
		Concentration (C) 1.3		A× C 0.24		A× B ×C 1.17		

3.2. Fruit Weight (g)

The data showed that all thinning treatments significantly increased the mean fruit weight of the date palm cultivar Sewy compared to the control in both seasons (Table 2). Fruit weight was significantly affected by spray, spray time and interactions in both seasons. Fruits treated with NAA had the highest weight compared to fruits treated with ethephon. Spraying with NAA at 150 ppm produced the highest fruit weight (18.34 g) compared to ethephon at 200 ppm (18.05 g). Regarding the time of spraying, the data showed that bunches produced the highest fruit weight after spraying 25 days after pollination (15.90 g) compared to the second time after 15 days of pollination (15.57g) in both seasons.

According to chemical compound concentrations, NAA at 150 ppm or ethephon at 200 ppm produced the highest fruit weight (18.34 and 18.05 g, respectively) followed by NAA at 100 ppm or ethephon at 150 ppm, while the control recorded the lowest fruit weight (11.73 and 11.37 g) in Sewy date palms. Interactions between spraying time and chemical compound concentrations showed that trees produced the highest fruit weight when sprayed with NAA 150 ppm or ethephon 200 ppm 25 days after pollination (18.75 and 18.30 g) compared to the second time after 15 days of pollination (17.93 and 17.81 g) compared to others interactions related to that.

Table 2: Effect of NAA and Ethephon on Fruit Weight (g) of Sewy date palm cultivar during 2020 and 2021 seasons.

Treatments		15 days from pollination		Mean	25 days from pollination		Mean	General mean
		2020	2021		2020	2021		
NAA	0 ppm	11.51	12.41	11.96	11.46	11.52	11.49	11.72
	50 ppm	16.22	16.42	16.32	16.71	16.91	16.81	16.56
	100 ppm	17.13	17.31	17.22	17.72	17.91	17.81	17.51
	150 ppm	17.89	17.97	17.93	18.67	18.83	18.75	18.34
Mean		15.68	16.02	15.85	16.14	16.29	16.21	16.03
Ethephon	0 ppm	11.44	11.34	11.39	11.39	11.29	11.34	11.36
	100 ppm	15.32	15.52	15.42	16.21	16.21	16.21	15.81
	150 ppm	16.43	16.61	16.52	16.57	16.43	16.50	16.51
	200 ppm	17.75	17.87	17.81	18.28	18.32	18.30	18.05
Mean		15.235	15.335	15.28	15.61	15.56	15.58	15.43
General mean		15.46	15.68	15.57	15.87	15.92	15.90	15.73
New LSD at P≤5% for Time (B) 0.23		Treatments (A) 01.02		A× B 0.03		B× C 0.03		
		Concentration(C)0.12		A× C 0.40		A× B ×C 0.21		

It was clearly seen that the best result was obtained by spraying 150 ppm NAA but there was no significant difference in fruit weight in both seasons. The increase in average fruit weight achieved by thinning may be due to a decrease in fruit compactness, which prevents them from clustering. Thus, such fruits take advantage of the possibility of natural growth. These results are consistent with (Marzouk *et al.,* 2007; Metwally *et al.,* , 2012; Omar and Alam-Eldein, 2014; and Ghazzawy *et al.,* 2019). They found that the best fruit weight was obtained with the NAA treatment. They reported that NAA treatment is beneficial for fruit weight and fruit development.

3.3. Fruit Length (cm)

The data in Table 3 showed that all thinning treatments increased the average fruits length of date palm cultivar Sewy compared to the control group (in Beseri and Rutbe stages) in both seasons. Fruit length was significantly affected by spray, time of spray and interactions in both seasons.

Fruits treated with NAA or ethephon recorded the highest fruit length (4.08 and 4.06 cm, respectively) compared to untreated fruits (control). Spraying with NAA at 150 ppm or ethephon at 200 ppm gave the highest fruit length (4.48 and 4.46 cm, respectively) compared with NAA 100 ppm or ethephon 150 ppm. On the other hand, the control produced the smallest fruit length (3.29 and 3.33 cm) on Sewy date palms. Regarding the time of spraying, the results showed that date palm fruit length after spraying was greater at 25 days after pollination than after the second spraying at 15 days after pollination in both seasons (4.09 and 4.05 cm, respectively). Interactions between chemical compound concentrations and spray time showed that trees produced the longest fruit when sprayed with NAA 150 ppm or ethephon 200 ppm 25 days after pollination (4.54 and 4.50 cm, respectively). These results are consistent with (Hasan *et al.,* 1998; Hesami and Abdi, 2010; Metwally *et al.,* 2012; Omar and Alam-Eldein, 2014; Al-Saikhan and Sallam 2015 and Ghazzawy *et al.,* 2019). They found that NAA treatment improves fruit quality, fruit length and fruit development in date palm.

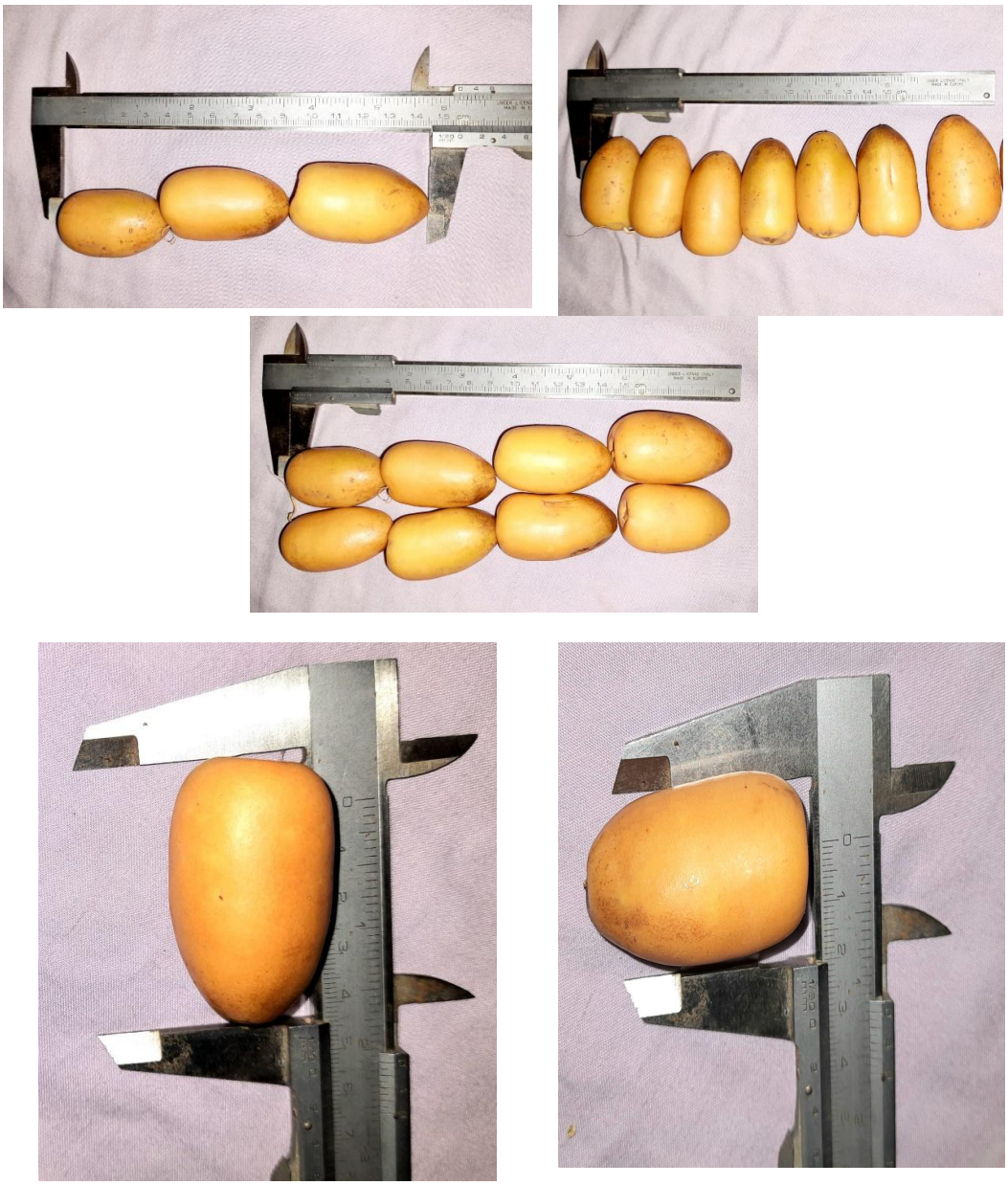
Table 3: Effect of NAA and Ethephon on fruit length (cm) of Sewy date palm cultivar during 2020 and 2021 seasons.

Treatments		15 days from pollination		Mean	25 days from pollination		Mean	General mean
		2020	2021		2020	2021		
NAA	0 ppm	3.31	3.33	3.32	3.23	3.32	3.275	3.29
	50 ppm	4.12	4.13	4.125	4.22	4.21	4.215	4.17
	100 ppm	4.32	4.35	4.335	4.43	4.42	4.425	4.38
	150 ppm	4.42	4.44	4.43	4.55	4.53	4.54	4.48
Mean		4.04	4.06	4.05	4.10	4.12	4.11	4.08
Ethephon	0 ppm	3.33	3.33	3.33	3.32	3.34	3.33	3.33
	100 ppm	4.11	4.12	4.115	4.11	4.13	4.12	4.12
	150 ppm	4.31	4.33	4.32	4.32	4.32	4.32	4.32
	200 ppm	4.41	4.43	4.42	4.5	4.5	4.5	4.46
Mean		4.04	4.05	4.05	4.06	4.07	4.07	4.06
General mean		4.04	4.06	4.05	4.09	4.09	4.09	4.07
New LSD at P≤5% for Time (B) 0.21		Treatments (A) 0.22		A× B 0.23		B× C 0.13		
		Concentration (C) 0.12		A× C 0.14		A× B ×C 0.21		

3.4. Fruit Diameter (cm)

The data showed that all thinning increased the average fruits diameter of the date palm cultivar Sewy compared to the control in both seasons. Fruit diameter was significantly affected by spray treatment, spray time and their interaction in both seasons. Fruits treated with NAA or ethephon had the largest fruit diameter (2.30 and 2.29 cm, respectively) compared to untreated fruits (control). Spraying with NAA 150 ppm or ethephon 200 ppm gave the highest fruit diameter (2.53 and 2.49 cm, respectively) followed by NAA 100 ppm or ethephon 150 ppm (2.33 cm), on the other hand the control gave the smallest fruit diameter (2.11 cm) in Sewy date palms in both seasons. The spraying time showed a larger fruit diameter at 25 days after pollination than the second time at 15 days after pollination in both seasons (2.30 and 2.29 cm, respectively). bunches produced the largest fruit diameter when sprayed with NAA at 150 ppm or ethephon at 200 ppm 25 days after pollination (2.53 and 2.50 cm, respectively). These results are consistent with (Bakr *et al.,* 1997; Khalifa, 1999; Bamiftah, 2000;

Metwally *et al.,* 2012; Omar and Alam-Eldein, 2014; Ghazzawy *et al.,* 2019 and El-Sharabasy and Ghazzawy 2019). They found that spraying with NAA or ethephon increased fruit diameter and improved fruit quality of date palm.



Effect of NAA at 150 ppm on fruit length and fruit diameter after 25 days from pollination on fresh date palm

Effect of NAA at 150 ppm on fruit length and fruit diameter after 25 days from pollination on dry fresh Palma

Table 4: Effect of NAA and Ethephon on fruit diameter (cm) of Sewy date palm cultivar during 2020 and 2021 seasons.

Treatments		15 days from pollination		Mean	25 days from pollination		Mean	General mean
		2020	2021		2020	2021		
NAA	0 ppm	2.12	2.1	2.11	2.11	2.12	2.115	2.11
	50 ppm	2.22	2.22	2.22	2.22	2.24	2.23	2.23
	100 ppm	2.32	2.34	2.33	2.32	2.34	2.33	2.33
	150 ppm	2.51	2.53	2.52	2.52	2.54	2.53	2.53
Mean		2.29	2.29	2.29	2.29	2.31	2.30	2.30
Ethephon	0 ppm	2.11	2.11	2.11	2.11	2.12	2.115	2.11
	100 ppm	2.21	2.23	2.22	2.22	2.22	2.22	2.22
	150 ppm	2.33	2.33	2.33	2.33	2.33	2.33	2.33
	200 ppm	2.47	2.49	2.48	2.49	2.51	2.50	2.49
Mean		2.29	2.29	2.29	2.28	2.30	2.29	2.29
General mean		2.29	2.29	2.29	2.30	2.30	2.30	2.29
New LSD at P≤5% for		Treatments (A) 0.11		A× B 0.13		B× C 0.12		
Time (B) 0.02		Concentration (C) 0.12		A× C 0.14		A× B ×C 0.11		

3.5. Seed Wight (g)

As shown in Table (5), fruits sprayed with NAA produced the least seed weight (1.32 g) than ethephon (1.34 g). In contrast, the control produced the highest seed weight (1.34 g) on Sewy date palms in both seasons. Fruits treated with NAA at 150 ppm or ethephon at 200 ppm produced the highest seed weight (1.32 and 1.34 g). Regarding the spraying, no differences were observed between seed weight after 25 days of pollination and the second time after 15 days of pollination in both seasons. These results are consistent with (Bassal and El-Deeb 2003; Ahmed *et al.,* 2010; Al Hammadi and Kurup 2012; Al-Saikhan and Sallam 2015; Ghazzawy *et al.,* 2019; Ahmed *et al.,* 2019 and El-Sharabasy and Ghazzawy 2019). They found that spraying with NAA or ethephon increased fruit diameter and improved fruit quality of date palm.

Table 5: Effect of NAA and Ethephon on Seed Weight (g) of Sewy date palm cultivar during 2020 and 2021 seasons.

Treatments		15 days from pollination		Mean	25 days from pollination		Mean	General mean
		2020	2021		2020	2021		
NAA	0 ppm	1.35	1.33	1.34	1.32	1.34	1.33	1.335
	50 ppm	1.32	1.34	1.33	1.31	1.35	1.33	1.33
	100 ppm	1.31	1.33	1.32	1.33	1.35	1.34	1.33
	150 ppm	1.31	1.31	1.31	1.32	1.34	1.33	1.32
Mean		1.32	1.32	1.32	1.32	1.34	1.33	1.32
Ethephon	0 ppm	1.32	1.34	1.33	1.32	1.33	1.325	1.33
	100 ppm	1.33	1.34	1.33	1.32	1.32	1.32	1.33
	150 ppm	1.33	1.33	1.33	1.33	1.33	1.33	1.33
	200 ppm	1.34	1.34	1.34	1.33	1.35	1.34	1.34
Mean		1.33	1.33	1.33	1.31	1.33	1.32	1.33
General mean		1.32	1.33	1.33	1.32	1.34	1.33	1.33
New LSD at P≤5% for		Treatments (A) 0.22		A× B 0.03		B× C 0.02		
Time (B) 0.21		Concentration (C) 0.12		A× C 0.14		A× B ×C 0.01		

3.6. Flesh Weight (g)

Concerning the flesh weight, data in Table 6 noticed that Fruits which treated by NAA recorded the higher flesh weight (14.67 g) than ethephon (14.38 g) compared with untreated fruits (control) which recorded the lowest of flesh weight (10.13 and 9.83 g) in Sewy date palm trees in both seasons. The spraying with NAA at 150 ppm produced the highest flesh weight (16.93 g) followed by ethephon at 200 ppm (16.67 g). Spraying time showed the higher flesh weight after 25 days from pollination than

the second time after 15 days from pollination in both seasons (14.31 and 14.15 g, respectively). Fruits of Sewy date palm gave the highest flesh weight when sprayed with NAA at 150 ppm compared with ethephon at 200 ppm after 25 days from pollination (16.93 and 16.67 g, respectively). These results are in agreement with the findings of El- Shazly (1999), Moustafa and Seif (1993), AL-Obeed *et al.,* (2005), Omar and Alam-Eldein (2014) and Moustafa *et al.,* (2019).

Table 6: Effect of NAA and Ethephon on Flesh Weight (g) of Sewy date palm cultivar during 2020 and 2021 seasons.

Treatments		15 days from pollination		Mean	25 days from pollination		Mean	General mean
		2020	2021		2020	2021		
NAA	0 ppm	10.16	10.08	10.12	10.14	10.18	10.13	10.13
	50 ppm	14.9	15.08	14.99	15.4	15.56	15.18	15.18
	100 ppm	15.82	15.98	15.90	16.39	16.56	16.13	16.13
	150 ppm	16.56	16.64	16.6	17.35	17.49	16.93	16.93
Mean		14.36	14.44	14.40	14.82	14.95	14.59	14.59
Ethephon	0 ppm	9.90	9.80	9.85	9.86	9.74	9.83	9.83
	100 ppm	13.99	14.18	14.08	14.89	14.89	14.41	14.40
	150 ppm	15.09	15.28	15.19	15.24	15.1	15.18	15.17
	200 ppm	16.41	16.53	16.47	16.95	16.97	16.67	16.67
Mean		13.85	13.95	13.90	14.24	14.17	14.02	14.02
General mean		14.11	14.19	14.15	14.53	14.56	14.31	14.31
New LSD at P≤5% for Time (B) 0.21		Treatments (A) 0.22		A× B 0.23		B× C 0.13		
		Concentration (C) 0.12		A× C 0.14		A× B ×C 0.21		

3.7. Fruits moisture content (%)

Fruits which sprayed with NAA or ethephon recorded less moisture content comparing with untreated fruits (control) which gave the highest moisture content in Sewy date palm trees in both seasons. Concerning, the spraying with NAA at 150 ppm or ethephon at 200 ppm recorded the lowest moisture content (12.82 %). Spraying time, fruits showed the same results after 25 days and after 15 days from pollination in both seasons. There were no differences in moisture content when the fruits were sprayed with NAA at a concentration of 150 ppm or with ethephon at a concentration of 200 ppm after 25 days of pollination 29.27 and 78.03%, respectively El- Shazly (1999), AL-Obeed *et al.,* (2005) and Moustafa *et al.,* 2019).

Table 7: Effect of NAA and Ethephon on Fruits moisture content of Sewy date palm cultivar during 2020 and 2021 seasons.

Treatments		15 days from pollination		Mean	25 days from pollination		Mean	General mean
		2020	2021		2020	2021		
NAA	0 ppm	13.21	13.29	13.25	13.34	13.32	13.33	13.29
	50 ppm	12.87	12.85	12.86	12.84	12.82	12.83	12.84
	100 ppm	12.83	12.83	12.83	12.83	12.83	12.83	12.83
	150 ppm	12.82	12.82	12.82	12.82	12.82	12.82	12.82
Mean		12.93	12.95	12.94	12.95	12.95	12.95	12.95
Ethephon	0 ppm	13.22	13.24	13.23	13.33	13.33	13.33	13.28
	100 ppm	12.88	12.88	12.88	12.83	12.81	12.82	12.85
	150 ppm	12.85	12.85	12.85	12.85	12.78	12.81	12.83
	200 ppm	12.82	12.82	12.82	12.82	12.82	12.82	12.82
Mean		12.95	12.95	12.95	12.95	12.93	12.94	12.95
General mean		12.94	12.94	12.94	12.95	12.94	12.94	12.95
New LSD at P≤5% for Time (B) 0.02		Treatments (A) 0.32		A× B 0.02		B× C 0.11		
		Concentration (C) 0.22		A× C 0.05		A× B ×C 0.15		

3.8. Total Soluble Solids (%)

Data in Table 8 exhibited that Fruits which treated by NAA recorded the higher total soluble solids than ethephon compared with untreated fruits (control) which recorded the lowest of total soluble

solids in Sewy date palm trees in both seasons. The spraying with NAA at 150 ppm showed the highest total soluble solids (79.19 %) followed by ethephon at 200 ppm (79.16 %). Concerning spraying time, fruits recorded the same results after 25 days and after 15 days from pollination in both seasons. Fruits of Sewy date palm gave the highest total soluble solids when sprayed with NAA at 150 ppm compared with ethephon at 200 ppm after 25 days from pollination (29.27 and 78.03%, respectively). El- Shazly (1999), El-Salhy *et al.,* (2011), Samouni, *et al.,* (2016), Moustafa *et al.,* (2019) and Mahidi and Hamad (2021).

Table 8: Effect of NAA and Ethephon on Total Soluble Solids (%) of Sewy date palm cultivar during 2020 and 2021 seasons.

Treatments		15 days from pollination		Mean	25 days from pollination		Mean	General mean
		2020	2021		2020	2021		
NAA	0 ppm	77.37	77.33	77.35	77.34	77.38	77.36	77.35
	50 ppm	77.44	77.44	77.44	77.51	77.43	77.47	77.45
	100 ppm	78.21	78.33	78.27	78.23	78.33	78.28	78.27
	150 ppm	79.11	79.13	79.12	79.23	79.31	79.27	79.19
Mean		78.03	78.05	78.04	78.07	78.11	78.09	78.07
Ethephon	0 ppm	77.37	77.33	77.35	77.37	77.33	77.35	77.35
	100 ppm	77.35	77.34	77.345	77.32	77.23	77.275	77.31
	150 ppm	78.22	78.32	78.27	78.25	78.35	78.3	78.28
	200 ppm	79.14	79.14	79.14	79.17	79.19	79.18	79.16
Mean		78.02	78.02	78.02	78.04	78.02	78.03	78.02
General mean		78.02	78.02	78.02	78.02	78.02	78.02	78.02
New LSD at P≤5% for Time (B) 0.11		Treatments (A) 0.37		A× B 0.28		B× C 0.12		
		Concentration (C) .23		A× C 0.06		A× B ×C 0.13		

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