

Effect of Some Plant Growth Regulators on Induction of Seedless Fruits in Some Date Palm Cultivars

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The effect of spraying unpollinated flowers of date palm cultivars (Nebut-Seif, Sakaie, Seleg and Khudari) with GA_3 , IAA and 2,4,5-T at various concentrations of single or combined regulators and in one or two sprays on the production of seedless fruits, was studied in 1985 and 1986.

Different cultivars responded to the treatments at various degrees. The treatments resulted in the production of seedless fruits, but the percentages obtained differed greatly with the concentration, the number of sprays and the season. The two-spray treatment of 50 ppm GA_3 + 10 ppm 2,4,5-T produced 70.20% seedless fruits in the Nebut-Seif cv. in 1985; whereas, the single spray treatment with 50 ppm IAA produced 79.17% seedless fruits in the Sakaie cv. in 1986. Most of the seedless fruits maintained colour characteristic of the Khalal stage. Few of the seedless fruits reached the rutab stage. Weight of the seedless fruits was relatively less as compared with the normal fruits.

As with many other plants, the use of plant growth regulators in date palm may increase the yield and induce seedless fruits. A good seedless date, approaching the pollinated one in quality, would be highly desirable either as a fresh fruit or for various purposes of date processing.

Few investigations were carried out in this respect, and their results were not promising. Thus, Sharpless and Hilgeman (1950) studied the effect of synthetic hormones (2,4-D, NAA and IBA at the rate of 20 and 500 ppm) on growth and ripening of "Sayer" date palm fruits. The treatments were applied on three dates representing different stages of fruit development. They concluded that the chemicals and concentrations used had no stimulatory effect on the growth and ripening of normally pollinated fruits in this cultivar.

Nixon (1959) applied GA₃ to 'Medjool', 'Deglet Noor', 'Halawy', 'Khadrawy' and 'Barhee' date palm fruits and found an increase in length of Deglet Noor fruits, but the effect on length of other cultivars was variable. Ketchie (1967) showed that GA₃ (20, 50 and 100 ppm) applied to pollinated bunches produced larger fruit than on checks. This effect on unpollinated bunches was not certain. Seedless dates were obtained in unpollinated bunches treated with GA₃. Abd-Alaal *et al.* (1982) found that the use of 2,4-D, 2,4,5-T, 2,4,5-TP, IAA and GA₃ at the concentrations of 25-100 ppm resulted in formation of seedless dates in the "Khadrawi" date palm cultivar. The seedless dates were somehow similar to the normal dates in size and shape. Abou Aziz *et al.* (1982) reported that unpollinated spadices treated once or twice with 50 or 100 ppm GA₃ produced some seedless fruits lighter in weight, longer and thinner than seeded fruits. At Oneiza, Saudi Arabia, Hussein *et al.* (1974) reported that GA₃ applied to pollinated fruits of "Barhi" dates had a very small effect on fruit physical characteristics.

The present investigation was carried out in 1985 and repeated in 1986 to determine the effect of GA₃, IAA and 2,4,5-T on inducing seedless fruits in four date palm cultivars.

Materials and Methods

The four cultivars used; were 'Nebut-Seif', 'Sakaie', 'Seleg' and 'Khudari'. These cultivars are grown at the College of Agriculture Orchard at Eleisha in Riyadh. Vigorous and almost uniform in size trees were chosen. Three trees per cultivar were used. The spathes formed on each tree were thinned to eight. The spathes were covered with paper bags before cracking. After cracking, the flower strands were thinned to 60 strands/spathe, then they were divided into three groups of 20 strands each. These groups were randomly treated with the different growth regulators used. Two different concentrations were used for each growth regulator. GA₃ and IAA were used at the concentrations of 50 or 100 ppm, whereas, 2,4,5-T at 10 or 20 ppm. The growth regulators were used either alone or in different combinations and were applied either once or twice. In the two application treatments, the second application was applied one month after the first (Table 1).

The fruits were harvested during the first week of September in 1985 and 1986. The number of parthenocarpic fruits was counted, and the percentage of these parthenocarpic fruits was calculated for each treatment. The average weight of the fruit was determined.

Data were analysed statistically using the analysis of variance. L.S.D. was calculated to test differences among treatment means (Snedecor and Cochran 1967).

Table 1. Treatments of different plant growth regulators and concentrations used.

Treatment No.	Treatments used	
1	GA ₃ 50 ppm	Single spray
2	GA ₃ 100 ppm	" "
3	IAA 50 ppm	" "
4	IAA 100 ppm	" "
5	2,4,5-T 10 ppm	" "
6	2,4,5-T 20 ppm	" "
7	GA ₃ + IAA (50 + 50 ppm)	" "
8	GA ₃ + 2,4,5-T (50 + 10 ppm)	" "
9	IAA + 2,4,5-T (50 + 10 ppm)	" "
10	GA ₃ + IAA + 2,4,5-T (50 + 50 + 10 ppm)	" "
11	Distilled water	" "
12	Pollination	
13	GA ₃ 50 ppm	Two sprays
14	GA ₃ 100 ppm	" "
15	IAA 50 ppm	" "
16	IAA 100 ppm	" "
17	2,4,5-T 10 ppm	" "
18	2,4,5-T 20 ppm	" "
19	GA ₃ + IAA (50 + 50 ppm)	" "
20	GA ₃ + 2,4,5-T (50 + 10 ppm)	" "
21	IAA + 2,4,5-T (50 + 10 ppm)	" "
22	GA ₃ + IAA + 2,4,5-T (50 + 50 + 10 ppm)	" "
23	Distilled water	" "
24	Unpollinated	

Results

Nebut-Seif

The data obtained in 1985 showed that spraying the unpollinated flowers with GA₃, IAA and 2,4,5-T resulted in the production of seedless fruits in most of the treatments used, but the percentages obtained varied with the treatment (Table 2). The data also showed that the effect was generally accentuated in the two-spray application than in the single one and in the combined regulators than the single chemical. The highest percentage was obtained in the two-spray treatment of 50 ppm GA₃ + 10 ppm 2,4,5-T, since the percentage of the seedless fruits reached 70.20. Next to this treatment in effect were the following treatments arranged in descending order:

50 ppm GA₃ + 50 ppm IAA, 44.70%
 50 ppm GA₃ + 10 ppm 2,4,5-T, 39.00%
 50 ppm GA₃ + 50 ppm IAA + 10 ppm 2,4,5-T, 33.90% and
 50 ppm IAA + 10 ppm 2,4,5-T, 31.07%

Table 2. Effect of some growth regulators on the production of seedless fruits (%) in some date palm cultivars

Treatment No.	1985		1986				
	Nebut Seif	Khudari	Nebut Seif	Khudari	Seleg	Sakaie	
1	15.23	----	38.10	1.93	1.37	26.30	
2	14.47	----	34.67	6.70	0.84	42.67	
3	5.10	2.30	27.33	16.30	12.73	79.17	
4	17.00	7.70	30.60	0.67	0.65	21.63	
5	15.23	10.60	27.10	0.67	0.39	20.90	
6	6.00	8.70	27.50	0.90	0.32	19.40	
7	10.80	10.60	29.47	3.97	5.57	56.67	
8	23.60	8.30	33.77	0	0.30	39.20	
9	31.07	4.80	47.00	4.30	5.50	29.93	
10	18.30	5.50	16.63	4.00	9.73	19.57	
11	0	0	0	0	0	0	
12	0	0	0	0	0	0	
13	----	3.90	43.27	6.13	1.47	4.23	
14	26.40	----	40.80	2.53	1.15	54.43	
15	4.37	12.50	42.30	4.53	8.77	49.00	
16	8.00	5.80	32.80	6.60	0.43	31.03	
17	----	2.10	34.20	2.27	5.70	30.00	
18	23.10	2.30	33.63	0.39	3.57	18.27	
19	44.70	----	26.00	16.07	2.30	34.97	
20	70.20	6.20	40.77	11.37	6.82	22.57	
21	39.00	3.90	36.10	3.20	5.51	27.67	
22	33.90	7.20	16.87	38.23	9.33	19.57	
23	0	0	0	0	0	0	
24	0	0	0	0	0	0	
L.S.D.	5%	9.82	4.36	16.01	17.80	NS	29.19
	1%	13.12	5.83	21.38	23.79		39.02

In the rest of the treatments, the percentages of seedless fruits obtained were relatively low; 26.40% or less (Table 2).

The weight of the seedless fruits was also affected by the treatment and by the number of sprays applied. In general, the average weight of seedless fruits was higher in the two-spray treatments as compared with single-spray treatments (Table 3). The results also showed that the treatments which produced relatively high percentages of seedless fruits gave fruits relatively higher in weight and close to the weight of normally pollinated fruits.

Table 3. Effect of some growth regulators on seedless fruit weight (g) in some date palm cultivars

Treatment No.	1985		1986				
	Nebut Seif	Khudari	Nebut Seif	Khudari	Seleg	Sakaie	
1	8.50	---	9.70	11.40	5.10	15.67	
2	7.70	---	8.60	6.80	6.07	14.30	
3	10.17	10.50	8.30	9.20	5.90	17.90	
4	11.70	11.50	8.40	13.03	4.70	17.33	
5	7.20	12.00	8.40	10.63	5.87	15.10	
6	7.60	13.20	8.00	7.67	4.37	11.03	
7	8.70	11.60	8.80	10.00	6.10	13.56	
8	12.40	10.40	7.80	---	5.90	15.73	
9	7.60	12.83	10.70	9.53	4.90	12.47	
10	9.50	10.23	6.90	13.00	5.57	---	
11	---	---	---	---	---	---	
12	13.80	12.50	11.75	15.43	8.38	15.26	
13	---	10.30	9.70	10.83	4.47	15.27	
14	11.40	---	10.30	11.40	6.20	15.37	
15	7.90	12.50	10.47	9.67	6.07	16.00	
16	7.60	11.30	8.40	8.20	4.40	13.30	
17	---	13.00	8.70	7.53	5.97	14.00	
18	9.10	9.00	8.90	10.50	4.60	16.00	
19	13.20	---	8.60	8.47	6.17	14.60	
20	13.10	15.50	10.00	10.80	5.23	10.93	
21	15.70	13.60	9.33	8.00	4.70	15.43	
22	12.60	15.30	6.70	8.83	4.57	12.87	
23	---	---	---	---	---	---	
24	---	---	---	---	---	---	
L.S.D.	5%	3.42	1.55	1.66	1.61	0.89	NS
	1%	4.56	4.56	2.21	2.13	1.19	

Concerning fruit maturity, the seedless fruits obtained in the various treatments remained yellow, a colour relevant to that of the Khalal stage. It was also observed that few seedless fruits reached the rutab stage (Fig. 1).

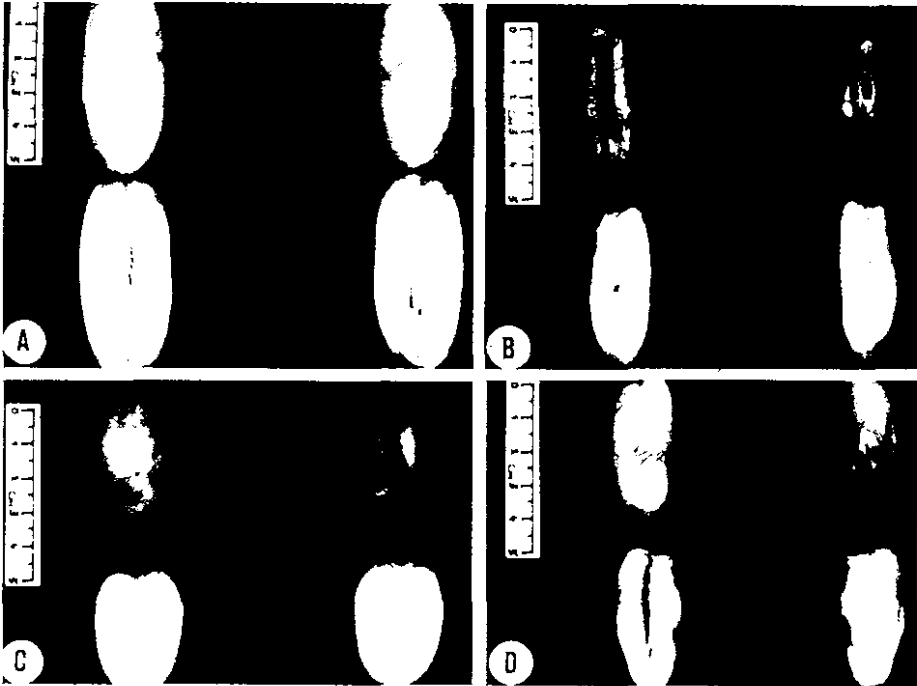


Fig. 1. Seedless fruits in:
 (A) Sakaie cultivar.
 (B) Khudari cultivar.
 (C) Nebut Seif cultivar.
 (D) Seleg cultivar.

In 1986, the production of seedless fruits with the use of different growth regulators differed with the treatment. A single application of 50 ppm IAA + 10 ppm 2,4,5-T gave the highest percentage of seedless fruits (47.00%). Two applications each of treatments 50 ppm GA₃, 50 ppm IAA, 100 ppm GA₃ or 50 ppm GA₃ + 10 ppm 2,4,5-T gave percentages of seedless fruits relatively less than the previous treatment. These percentages were 43.27, 42.30, 40.80 and 40.77, respectively.

Weight of seedless fruits was also affected by the treatment and by the number of sprays. The two spray treatments, generally, produced fruits heavier in weight than the single spray treatments. Results showed that treatments with GA₃ (50 ppm and 100 ppm), IAA (50 ppm), GA₃ + 2,4,5-T (50 ppm + 10 ppm, respectively), IAA (50 ppm) + 2,4,5-T (10 ppm) induced parthenocarpic fruits heavier in weight than in other treatments. The average fruit weight relevant to the above treatments ranged between 9.33 and 10.47 g/fruit.

Sakaie

The fruits in 1985 were impaired with various treatments, therefore, only data of 1986 are presented. Results showed that this cultivar was greatly affected with the treatments and that one spray treatment with IAA at 50 ppm was highly effective in the induction of seedless fruits which reached 79.12%, followed by one-spray treatment with GA₃ (50 ppm) + IAA (50 ppm) which induced 56.67% seedless fruits. The two-spray GA₃ (100 ppm) treatment and the two-spray treatment IAA (50 ppm) induced seedless fruits at lower percentages than the above treatments (54.43% and 49.00%, respectively). The rest of the treatments were less effective on induction of seedless fruits and ranged from 18.27 to 42.67% (Table 2).

Fruit weight was also affected with the treatment and with the number of sprays. However, in 11 of the different treatments the fruit weight averaged more than 15 g/fruit which was close to the average fruit weight of hand-pollinated fruits (Table 3).

Seleg

The 1986 results showed that this cultivar was the least responsive to the treatments with growth regulators (Table 2). The percentage of seedless fruits did not exceed 12.73 in any of the treatments.

Fruit weight was considerably reduced as compared with normally pollinated fruits (Table 3).

Khudari

The response of this cultivar to treatments with GA₃, IAA and 2,4,5-T was very little in 1985 and 1986 (Tables 2 and 3). In 1985, the highest percentage of seedless fruits was 12.50 in the two-spray treatment with IAA at 50 ppm, whereas, in 1986, the highest percentage obtained was 38.23 in the two-spray combined treatment of GA₃ (50 ppm) + IAA (50 ppm) + 2,4,5-T (10 ppm).

Fruit weight was more affected in 1985 than in 1986. The average fruit weight ranged between 12.50 and 15.50 g in almost half of the treatments in 1985 (Table 3).

Concerning fruit maturity, it was observed that seedless fruits maintained a colour similar to Khalal stage (red in cv. Kudari and yellow in the other three cvs.). It was also noted that few seedless fruits reached the rutab stage (Fig. 1).

Discussion

The results of the foregoing experiments indicated that spraying unpollinated flowers of the Nebut-Seif, Sakaie, Khudari and Seleg cultivars with GA₃, IAA and 2,4,5-T could be successful in inducing seedless fruits. The results obtained in both years (1985 and 1986) were not similar in trend, i.e. the response of any cultivar in one year to a certain treatment and/or a certain concentration was not the same in the other year. For example, with Nebut-Seif, the highest percentage of seedless fruits in the two-spray treatment of GA₃ (50 ppm) + 2,4,5-T (10 ppm) was 70.20% in 1985, whereas, the same treatment gave only 40.77% seedless fruits in 1986. Again, in Nebut-Seif cultivar, the topmost percentage of seedless fruits obtained in the one-spray treatment of IAA (50 ppm) + 2,4,5-T (10 ppm) was 47.00% in 1986 compared to 31.07% for the same treatment in 1985. In Sakaie cultivar, the production of seedless fruits was impaired with the various treatments in 1985, whereas, in 1986, it was the most responsive as compared with other cultivars, and the topmost percentage of seedless fruits was obtained in the one-spray treatment with IAA (50 ppm). Both Khudari and Seleg cultivars were the least responsive to growth regulators treatments.

The results obtained in the present investigation concerning the induction of seedless fruits using growth regulators are more or less similar in trend to previous investigations (Abou Aziz *et al.* 1982 and Ketchie 1967). Abd-Alaal *et al.* (1982), working on the Khadrawi cv. in Iraq, ascribed the failure to obtain seedless fruits to the inadequacy of single sprays, since they succeeded in producing seedless fruits with three successive sprays, at monthly intervals using 2,4,5-T at the rate of 100 ppm.

Concerning fruit weight, it is indicated that seedless fruits generally tend to be less in weight as compared with normally pollinated fruits. This falls in line with the findings of Abou Aziz *et al.* (1982).

It was also observed that seedless fruits attained a colour similar to the Khalal stage. This again might be due to the inadequacy of the number of sprays and/or the concentration used (Abd Alaal *et al.* 1982).

From the foregoing discussion, our results together with those of other investigators clearly show that seedless fruits could be obtained by using different growth regulators. The response to the treatments varies with the cultivar, concentration and year. Trials in this respect should be carried out to determine

the proper growth regulator, concentration and number of sprays for each cultivar before the treatment is recommended on a commercial scale.

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تأثير بعض المواد المنظمة للنمو على إنتاج ثمار عديمة البذور في أصناف نخيل البلح محمد عبدالرحيم شاهين، طه عبدالله نصر ومحمد علي أحمد باشه قسم الإنتاج النباتي، كلية الزراعة، جامعة الملك سعود، الرياض، المملكة العربية السعودية

درس تأثير رش الأزهار غير الملقحة لبعض أصناف نخيل البلح وهي: نبوت سيف، صقعي، سلج وخضري بواسطة GA_3 ، IAA، 2, 4, 5-T، بتركيزات مختلفة على إنتاج ثمار عديمة البذور خلال عامي 1985م، 1986م، وقد تم رش الأزهار غير الملقحة مرة واحدة أو مرتين، كما استخدمت المواد المنظمة للنمو بمفردها أو مخلوطة مع بعضها، وقد أوضحت النتائج المتحصل عليها أن الأصناف المختلفة قد استجابت للمعاملة بالمواد المنظمة للنمو المستخدمة، ولكن بدرجات متفاوتة، وقد أدت معظم المعاملات المستخدمة إلى الحصول على ثمار عديمة البذور ولكن نسبتها تختلف بدرجة كبيرة باختلاف التركيز وعدد مرات الرش، ووجد أن رش صنف النبوت سيف في عام 1985م (رشتين) بمخلوط من 50 جزء/ مليون GA_3 + 10 جزء/ مليون 2, 4, 5-T أدى إلى إنتاج 20، 70% من الثمار العديمة البذور، أما في صنف الصقعي فامكن بالرش بمحلول IAA تركيزه 50 جزء/ مليون (رشة واحدة) إنتاج 17، 79% من الثمار العديمة البذور.

ووجد أن معظم الثمار العديمة البذور الناتجة من معاملات الرش المختلفة لم تصل إلى مرحلة الرطب أو التمر، بل بقيت على حالها في مرحلة الخلال (البرس)، وأن نسبة قليلة منها وصلت إلى مرحلة الرطب. كما بينت النتائج أن متوسط وزن الثمار العديمة البذور الناتجة كان بصفة عامة أقل من مثيله في الثمار البذرية الناتجة من التلقيح العادي.