

## USING SOME GROWTH REGULATORS FOR PRODUCING SEEDLESS FRUITS OF SAMANI DATES (*Phoenix dactylifera* L.)

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### ABSTRACT

To obtain some information about the effect of some growth regulating substances on produced normal size seedless fruits, yield per bunch and fruit characteristics at full yellow colour stage of Samani date cultivar (12-year-old) were assessed for two successive seasons (1997 and 1998). Effects of different concentrations of IAA, GA<sub>3</sub> and BA applied twice during the full bloom and one week later were compared on different bunches on the same palm.

Unpollinated bunches treated with IAA and/or GA<sub>3</sub> twice at 5, 10 and 20 plus 10 ppm BA produced seedless fruits. Yet, the yield was significantly less than that of seeded fruits developed after hand pollination. Seedless IAA, GA<sub>3</sub> and BA induced fruits were lower in average fruit weight, fruit size, seed weight, fruit length, fruit diameter and length/diameter ratio. Whereas, higher values of total soluble sugars and reducing sugars were induced compared to those produced after hand-pollination. The better effects were obtained with GA<sub>3</sub> + BA application (20+10 ppm) and IAA + BA application (20+10 ppm).

Results concluded that production of seedless fruits is possible and further studies should be done to produce fruits with normal size.

### INTRODUCTION

Samani date is an important soft cultivar in Egypt. The mature fruits are commonly used in the jam manufacture. Production of seedless Samani dates will improve such industry for jam process. Therefore, the present investigation aimed to study the possibility of producing such seedless Samani fruits by the application of synthetic growth regulators, especially Indole-3-acetic acid (IAA), Gibberellic acid (GA<sub>3</sub>) and Benzyladenine (BA) sprays to unpollinated flower bunches. IAA concentration was found to be very high in non-pollinated flowers and declined at fruit set, rose again as fruits entered the rapid phase of growth, then declined as fruits advanced towards the ripening phase. Changes in IAA concentration during fruit development may reflect the role of this natural hormone in the control of various fruit developmental stages (Abbas *et al.*, 2000). Unpollinated bunches treated with GA<sub>3</sub> once or twice at 50 or 100 ppm produced seedless fruits for Sewy and Samani dates. Yet, the yield was significantly less than that of seeded fruits developing after hand pollination. Seedless GA<sub>3</sub> induced fruits were lighter in average fruit weight, longer and thinner, they added that, fruit maturation of GA<sub>3</sub> stimulated fruits showed signs of retardation as indicated by a reduction in total soluble solids and total sugars, Samra (1978), Maximos *et al.* (1979) and Abbas (1982). Furthermore, Mawlood (1980) found that the TSS of seedless Samani fruit increased significantly as the season advanced. GA<sub>3</sub> showed significant effects on TSS of seedless Samani fruit in the two seasons. GA<sub>3</sub> however, in the 2<sup>nd</sup> season, gave the least TSS value. Bakr *et al.* (1988)

studied the effect of GA<sub>3</sub> at 500 ppm the obtained results clearly show that the seedless Samani fruits on wind pollination treatments were significantly less in fruit length, diameter, volume, weight and TSS than those of seeded ones, also GA<sub>3</sub> treatment decreased statistically the previous fruit characteristics. They added that the average yield as a fruit weight was significantly higher on hand pollinated palm while wind pollinated palms developed the least averages. In a recent study, Tafazoli (1991) found that fruit number for Shahani date was reduced in the absence of pollination, GA<sub>3</sub> at 50 or 100 ppm when sprayed on unpollinated bunches, produced normal size seedless fruits that were late in ripening. Application of GA<sub>3</sub> at pollination and one week later caused fruit thinning.

This study was undertaken to obtain some information about the effect of IAA, GA<sub>3</sub> and BA on produced normal size seedless fruits, yield per bunch and fruit characteristics at full yellow colour stage of Samani date cultivar under Ismalia climatic conditions.

## **MATERIALS AND METHODS**

This study was carried out in 1997 and 1998 seasons on five Samani date palm trees, each as a replicate of about 12-year-old grown seven meters apart (square system) in a sandy soil and irrigated with drip system at El-Kassasein Research Station, Ismalia Governorate, Egypt. All trees were uniform in growth and in good physical conditions. No special agricultural practices were done, except pruning which was practiced to maintain bunch/mature leaves ratio of 1:7. The number of spathes per tree was adjusted to seven by removing the excess from the latest small bunches, hence the remained bunches were nearly equal and chosen at different directions.

Six treatments of IAA + BA and GA<sub>3</sub> + BA were applied to comparable bunches on the same palm twice during the full bloom and one week later. One of the seven bunches on each palm was labeled and hand pollinated with grains of the same male and served as control. The IAA and GA<sub>3</sub> were sprayed at concentrations of 5, 10 and 20 ppm, whereas, BA concentration was 10 ppm. During spraying, all bunches were bagged in polyethylene bags for one week to prevent the transmission of pollen grains to the branches. To all growth regulators solutions Triton B was used as a wetting agent at 0.1%. This experiment was arranged in a complete randomized design including seven treatments. Each treatment was replicated five times.

All fruit bunches were harvested when hand-pollinated fruits reached at late Khalal stage (full colour stage) of maturity (Figure, 1). The weight of fruits per bunch was recorded. Samples of 20 fruits were picked at random from each bunch for determination of physical and chemical characteristics. Total soluble solids percentage determined by using a hand refractometer. Total and reducing sugars were determined according to the method of Lane and Eynon outlined in A.O.A.C. (1975). Statistical analysis was done according to Snedecor and Cochran (1980) using LSD test.

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## RESULTS AND DISCUSSION

Effect of both IAA + BA and GA<sub>3</sub> + BA at different concentrations on produced seedless fruits, yield and fruit quality of Samani date cultivar was studied during 1997 and 1998 seasons.

### Effect on produced seedless fruits and yield:

Data in Table (1) reveal that the application of IAA, GA<sub>3</sub> and BA twice (at full bloom and one week later) at 5, 10 and 20 ppm plus 10 ppm BA induced seedless fruits. These results are confirmed with Tafazoli (1991). Yet, the bunch weight was significantly less than that of seeded fruits developed after hand-pollination. Bunches treated with GA<sub>3</sub> +BA always gave higher values than those treated with IAA + BA of the same concentrations. However, better effects were obtained with GA<sub>3</sub> +BA application (20 + 10 ppm). The bunch weight of these induced seedless fruits in the utmost case was about 62.09% less than the seeded fruits produced after hand pollination. Similar effect of GA<sub>3</sub> was reported in date fruits Samra (1978), Maximos *et al.* (1979), Abbas (1982) and Bakr *et al.* (1988).

**Table (1): Effect of some growth regulators sprays in comparative to hand-pollination on the bunch weigh of Samani date fruits in the two seasons of 1997 and 1998.**

Treatment	Bunch weight (Kg)	
	1997 season	1998 season
5 ppm IAA + 10 ppm BA	6.23	6.03
10 ppm IAA + 10 ppm BA	5.90	5.07
20 ppm IAA + 10 ppm BA	6.57	6.53
5 ppm GA <sub>3</sub> + 10 ppm BA	8.33	7.27
10 ppm GA <sub>3</sub> + 10 ppm BA	6.97	6.73
20 ppm GA <sub>3</sub> + 10 ppm BA	8.33	8.57
Hand pollination	22.80	22.37
LSD (P= 0.05)	1.81	1.65

### Effect of fruit quality:

The data in Table (2) reveal that fruits developing after the application of IAA, GA<sub>3</sub> and BA twice to unpollinated bunches gave lower values of average fruit weight, fruit size, seed weight, fruit length, fruit diameter and length/diameter ratio at harvest time than these produced after hand pollination. The weight of the seed and length/diameter ratio of fruits were not markedly affected by the application of IAA, GA<sub>3</sub> and BA. Fruit of GA<sub>3</sub> + BA application was not affected markedly compared with that produced by the application of IAA +BA. However, better effects were obtained by GA<sub>3</sub> + BA application (20 +10 ppm) and IAA + BA application (20 +10 ppm). This reduction in fruit weight could not be considered as resultant of the disappearance of the seeds from the fruit as the weight of the seeds comprised about 10.90 of the seeded fruits. This means that the weight variation noticed between IAA, GA<sub>3</sub> + BA bunches and hand-pollinated ones could be attributed to the reduction in the average weight and size of the individual fruit. These finding are in line with there reported by Samra (1978), Maximos *et al.* (1979), Abbas (1982) and Bakr *et al.* (1988).



**Chemical constituents:**

The data in Table (3) show that seedless fruits induced by both IAA + BA and GA<sub>3</sub> + BA sprays twice were significantly higher total soluble solids than seeded fruits that developed from hand pollination. Seedless fruit that were sprayed with GA<sub>3</sub> + BA (20 +10 ppm) significantly gave higher values of total soluble solids than those sprayed with IAA + BA (20+10 ppm). The trends of total sugars and reducing sugar of various treatments almost paralleled those obtained for total soluble solids. However, adverse effect on fruit composition and quality Samra (1978), Maximos *et al.* (1979) and Abbas (1982). On the other hand, Mowlood (1980) with seedless Samani fruit found that GA<sub>3</sub>, showed significant effects in the two seasons.

**Table (3): Effect of some growth regulators sprays in comparison to hand-pollination on chemical constituents of Samani date fruits in the two seasons of 1997 and 1998.**

Treatment	TSS %		Total sugars%		R. sugars %	
	1997	1998	1997	1998	1997	1998
5 ppm IAA + 10 ppm BA	27.47	27.07	24.08	24.26	14.74	14.98
10 ppm IAA + 10 ppm BA	26.40	25.80	22.98	22.29	13.79	13.37
20 ppm IAA + 10 ppm BA	28.13	29.33	25.07	25.11	15.20	15.32
5 ppm GA <sub>3</sub> + 10 ppm BA	26.27	26.87	23.13	24.08	14.31	14.53
10 ppm GA <sub>3</sub> + 10 ppm BA	25.80	25.80	22.03	22.41	13.31	13.59
20 ppm GA <sub>3</sub> + 10 ppm BA	32.53	32.47	28.21	30.95	16.22	16.37
Hand pollination	25.80	25.60	22.29	22.15	13.51	13.65
LSD (P= 0.05)	1.16	1.20	1.47	3.11	0.81	0.97

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**استخدام منظمات النمو لانتاج ثمار عديمة البذور للبليح السمانى  
علاء الدين ثابت أبو العز\* و زينب محمد حمدى\*\* و عبد الحميد مصطفى أحمد\*\*  
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تم تصميم البحث لمعرفة تأثير اندول حمض الخليك (IAA) بتركيزات ٢٠، ١٠، ٥ جزء فى المليون اضافة الى البنزايلى ادينين (BA) بتركيز ١٠ جزء فى المليون وكذلك حمض الجبريلين (GA3) بتركيزات ٥، ١٠، ٢٠ جزء فى المليون اضافة الى البنزايلى ادينين بتركيز ١٠ جزء فى المليون المضاف مرتين خلال التزهير الكامل وبعد اسبوع آخر لانتاج ثمار لا بذرية حجمها طبيعى، على المحصول لكل السباطة، خصائص الثمار لصف البليح السمانى خلال موسم النمو ١٩٩٧، ١٩٩٨ بمحطة الأبحاث الزراعية بالقصاصين.

وقد أدت هذه الدراسة إلى الحصول على النتائج التالية:

أمكن الحصول على ثمار عديمة البذور من السباطات الغير ملقحة عندما رشت باندول حمض الخليك وحمض الجبريليك بتركيز ٥، ١٠، ٢٠ جزء فى المليون اضافة الى البنزايلى ادينين بتركيز ١٠ جزء فى المليون رشتين عند التزهير وبعده باسبوع ولكن المحصول كان أقل معنويا من محصول الثمار الناتجة عن التلقيح اليدوى كذلك كانت الثمار اللابذرية الناتجة عن معاملات اندول حمض الخليك اضافة الى البنزايلى ادينين، وحمض الجبريليك اضافة الى البنزايلى ادينين أقل فى متوسط وزن الثمرة وحجمها ومتوسط وزن البذرة وطول الثمرة وقطرها ونسبة الطول للعرض فى حين أعطت أعلى قيم لمحتوى الثمار من المواد الصلبة الذائبة والسكريات الكلية والمختزلة عن مثيلاتها البذرية الناتجة من التلقيح اليدوى أحسن التأثيرات أمكن الحصول عليها مع المعاملة حمض الخليك اضافة الى البنزايلى ادينين عند التركيز (١٠ حمض جبريليك + ١٠ بنزايلى ادينين) جزء فى المليون، والمعاملة اندول حمض الخليك اضافة الى البنزايلى ادينين عند التركيز (٢٠ اندول حمض الخليك + ١٠ بنزايلى ادينين) جزء فى المليون.

من هذه الدراسة يتضح امكانية الحصول على ثمار عديمة البذور وان كانت أصغر من الحجم الطبيعى لذلك يجب اجراء دراسات مستقبلية لانتاج ثمار حجمها طبيعى.

**Table (2): Effect of some growth regulators sprays in comparative to hand-pollination on physical characteristics of Samani date fruits at harvest time in the two seasons of 1997 and 1998**

Treatment	Fruit weight (gm)		Fruit size (ml)		Seed weight (gm)		Fruit length (cm)		Fruit diameter (cm)	
	1997	1998	1997	1998	1997	1998	1997	1998	1997	1998
5 ppm IAA+10 ppm BA	8.13	6.13	9.37	7.47	0.19	0.19	3.23	2.50	2.43	2.13
10 ppm IAA+10 ppm BA	4.87	4.33	5.97	5.57	0.21	0.23	2.33	2.23	1.93	1.83
20 ppm IAA+10 ppm BA	10.47	7.70	12.70	8.67	0.24	0.24	3.43	2.83	2.63	2.43
5 ppm GA <sub>3</sub> +10 ppm BA	8.43	6.23	9.83	7.30	0.18	0.17	3.53	2.83	2.43	2.13
10 ppm GA <sub>3</sub> +10 ppm BA	7.07	6.07	9.00	7.50	0.21	0.21	2.63	2.83	2.33	2.13
20 ppm GA <sub>3</sub> +10 ppm BA	8.47	7.97	10.00	9.00	0.22	0.21	3.33	3.03	2.43	2.23
Hand pollination	27.37	26.20	29.37	27.70	2.20	2.10	5.30	5.20	3.03	3.00
LSD (P = 0.05)	1.55	1.49	1.53	1.47	0.07	0.07	0.64	0.45	0.59	0.22