Assiut J. Agric. Sci., (47) No. (5) 2016 (125-137) *ISSN: 1110-0486*
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Response of Seewy Date Palm to GA_3 and CPPU Spraying

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Received on: 20/6/2016 **Accepted for publication on:**27/6/2016

Abstract

The effects of GA_3 and CPPU on fruiting of Seewy date palm grown at the Experimental Orchard, Faculty of Agriculture, Assiut University, Egypt were investigated during 2013, 2014 and 2015 seasons.

All treatments were sprayed after two or eight weeks of pollination. The experiment was set up in a complete randomized block design with five replications of one bunch each.

The obtained results could be summarized as follow:

- Fruit set and fruit retention percentage were significantly decreased due to spray GA_3 at 50 ppm after two weeks of pollination followed by GA_3 or CPPU after eight weeks of pollination compared to unsprayed one (control).
- Spraying the bunch with GA_3 twice, once at 50 ppm after two weeks of pollination followed once GA_3 at 75 ppm plus CPPU at 7.5 or 15 ppm after eight weeks of pollination gave the highest fruit weight, flesh percentage and dimention of fruits compared to unsprayed ones.
- Spraying GA_3 and CPPU significantly improved the chemical fruit properties in terms of the total soluble solids and sugar contents and significantly decreased the total acidity and total soluble tannins percentages compared to unsprayed ones.

So, it concluded that spray GA_3 at 50 ppm after two weeks of pollination plus either GA_3 at 75 ppm and CPPU at 7.5 ppm or GA_3 at 75 ppm and CPPU at 15 ppm to obtain the high yield with good quality of Seewy dates. GA_3 reduce the fruit retention and consequently increase the fruit weight and size induce increased the yield. CPPU induced an increase in fruit weight and size then get high yield of Seewy dates. Thus, spraying the bunches of Seewy date palm with GA_3 and CPPU had get the heaviest yield with improvement the physical and tested chemical fruit properties.

Keywords: *Phoenix dactylifera, Gebbberelic acid, Sitofex, yield, fruit quality.*

Introduction

Date palm (*phoenix dactylifera*) is one of the ancient domestic cultivated fruit crops in the Middle East countries and their fruits play an important role in the nutritions patterns of many people. It plays an important role in the economic and social life of the people in these regions. Egypt is considered among the top ten date producers, FAO (2012). In Egypt, many cultivars are grown in different regions according to the diversity of their climatic necenity, particularly average temperature and relative humidity that affect fruit growth and development. Seewy cultivar is one of the most economically important semi-dry dates and is used demand in local and foreign markets. Date fruits constitute a substantial part of diet for Egyptian people. Plant growth regula-

tors as foliar applications are the most powerful tools for manipulating tree growth, flowering, yield and fruit quality particularly fruit size, as well as, controlling the fruit maturation. In addition, by hastening or delaying fruit maturation the growers can utilize peak demands, avoid unfavorable environmental conditions and extend the market period as well as act as messenger and are needed in small quantities (Hegazi, 1980). The growth regulators are known by their ability to increase the cell size and enhance fruit growth of dates (AL-Juburi and Al-Masry 2003).

Sitofex (CPPU) is a plant growth regulator (N-(2-chloro-4-pyridinyl)-N'-phenylurea); common name forchlorfenuron) which plays a role in cell division and cell wall elongation, also, it is a cytokinin like substance which has strong cytokinin activity by inducing fruit growth at low rates. Using CPPU reduce fruit drop and increase productivity as well as improving fruit size, fruit firmness and delaying maturation (Nickell, 1985).

Application of Hayany, Samany, Seewy and Zaghloul as well as Gur and Khalas date palms with GA_3 at 50, 100 or 200 ppm significantly increased fruit weight and fruit dimensions and fruit moisture contents compared to control. On the other hand, such treatments delayed color change and ripening (Mougheith and Hassaballa, 1979, El-Nabawy *et al*., 1981, Abou-Aziz *et al*., 1982, El-Kassas, 1983, Asif *et al*., 1985 and Galal, 1991).

GA_3 application at 100 or 150 ppm after 50 days of pollination significantly increased fruit weight, fruit dimensions, flesh percentage and moisture content percentage of Sakkoty dates compared with untreated ones. GA_3 caused a slight reduction in the total soluble soils and total sugars compared to control (Soliman, 2007).

Spraying 75 ppm CPPU after 4 weeks of pollination significantly increased fruit and flesh weight as well as fruit length, fruit diameter and fruit size of Samany and Zaghloul dates. In addition, spraying 75 ppm of CPPU significantly increased Samany and Zaghloul fruit content of TSS and total sugar contents compared to control and other treatments (El-Kosary, 2009).

GA_3 spray delayed fruit ripening, as reflected by lower rutab percentage and higher acidity, phenols and tannins concentration. Fruit length significantly increased by GA_3 spray at 100 and 150 ppm compared to the control. GA_3 spray increased total soluble solid (TSS) and acidity concentration compared to the control. Generally, bunch weight was higher and fruit quality was better (Kassem *et al*., 2011 and Awad and Al-Qurashi, 2012).

Treatment with spraying with some growth regulators like Gibberellic acid (GA_3), naphthalene acetic acid (NAA), benzil adenine (BA) and SA (salicylic acid) on Barhee Cv. increased the chemical and physical properties as compared with control. Generally, treatments with growth regulators had positive influence in shelf life of Barhee Cv. (Ghazzawy 2013).

Spraying bunches of date palm with the mixture of GA_3 at 50 ppm + salicylic acid (SA) at 1000 ppm sig-

nificantly increased fruit retention, bunch weight , fruit weight , fruit size and fruit length, total soluble solids and total sugars, also decreased tannins in the fruits as compared with other treatments including the untreated bunches (Merwad *et al*., 2015).

So, The present study was conduct in order to investigate the effect of spraying GA_3 and CPPU on improving fruit quality of Seewy date palm.

Materials and Methods

The present study was carried out during three successive seasons of 2013, 2014 and 2015 on five uniform Seewy date palms (*Phoenix dactylifera* L.). The palms grown in the Experimental Orchard of the Faculty of Agriculture, Assiut University, Egypt, where the soil has a clay texture. Palms were selected randomly and at similar age (30 years-old), uniform in vigour, healthy, good physical conditions, free from insects, damages and diseases. They subjected to the same management and cultural practices, for example, artificial pollination, pruning, irrigation, fertilization and manuring. Bunches were thinned to 9 per palm by removing excess earliest, latest and smallest ones. The artificial pollination was uniformly performed in respect of source, date and method.

This investigation included nine treatments with different concentration of gibberellic acid (GA_3) and sitofex (CPPU, chloro pyridyl phenyl urea) Then, the treatments are as follows:

1- Spraying the bunches with distilled water (control). (T_1).
2- Spraying the bunches twice with GA_3, once at 50 ppm after two weeks of pollination and again at, 100 ppm after 8 weeks of pollination (T_2).
3- Spraying the bunches twice with GA_3, once at 50 ppm after two weeks of pollination and again at, 150 ppm after 8 weeks of pollination (T_3).
4- Spraying the bunches with 50 ppm GA_3 after two weeks of pollination and 15 ppm CPPU after 8 weeks of pollination (T_4).
5- Spraying the bunches with 50 ppm GA_3 after two weeks of pollination and 30 ppm CPPU after 8 weeks of pollination.(T_5).
6- Spraying the bunches twice with GA_3, once at 50 ppm after two weeks from pollination and again with (50 ppm GA_3 plus 7.5 ppm CPPU) after 8 weeks of pollination (T_6).
7- Spraying the bunches twice with GA_3, once at 50 ppm after two weeks from pollination and again with (50 ppm GA_3 plus 15 ppm CPPU) after 8 weeks of pollination (T_7).
8- Spraying the bunches twice with GA_3, once at 50 ppm after two weeks from pollination and again with (75 ppm GA_3 plus 7.5 ppm CPPU) after 8 weeks of pollination (T_8).
9- Spraying the bunches twice with GA_3, once at 50 ppm after two weeks from pollination and again with (75 ppm GA_3 plus 15 ppm CPPU) after 8 weeks of pollination (T_9).

Solutions of above concentration of (GA_3 and CPPU) were solubi-

lized with distilled water and then sprayed on the bunches.

These treatments were applied on the same palm. Bunches were sprayed using a small hand sprayer until run-off. Bunches were separated from each side with plastic sheets to avoid any overlap between them. Other horticultural practices were carried out as usual.

This experiment was arranged in a complete randomized block design (RCBD) with five replications, one bunch each.

The following measurements were determined during the three investigated seasons.

Yield components

The fruit set and fruit retained percentage were calculated after one month of pollination and at harvest respectively. Five inner and outer strands per spathe after month of pollination, as well as at harvest time. The percentage of fruit set or fruit retention were calculated using the following equation:

$$\text{Fruit set or retained \%} = \frac{\text{Total number of set or retained fruits/strand}}{\text{Total nodes number per strand}} \times 100$$

Bunches were harvested at the first week of October when fruits reached Khalal stage and their weighing were recorded. Twenty five fruits from each bunch were picked at random to determine the physical fruit characteristics, i.e. fruit weight, dimensions, percentage of flesh weight. The chemical constituents i.e. TSS% using the hand refractometer, total and reducing sugars, as well as, total acidity % (as a citric acid/100 g pulp) and total soluble tannins % were determined according to A.O.A.C. (1985).

Statistical analysis was done according to Mead *et al*. (1993) using L.S.D. at 5% to compare among different treatment means.

Results

Yield

The initial fruit set and retention percentage as well as bunch weight are considered as index for the yield. Data presented in Tables 1 & 2 show the effect of GA_3 and CPPU spraying on set and retention percentage of fruits as well as bunch weight of Seewy date palm during 2013, 2014 and 2015 seasons. It is obvious from the data that the results took similar trend during the three studied seasons.

As a general overlook at the results, it could be observed that the fruit set and fruit retention percentage were significantly decreased due to spray of GA_3 and CPPU compared to unsprayed one (control). The recorded fruit set % was 65.07,57.55, 57.23, 56.38, 57.15,57.17, 57.98, 57.30 and 57.07% as an av. of three studied seasons for control (T_1), GA_3 twice (50+100 ppm, T_2), GA_3 twice (50+150 ppm, T_3), GA_3 plus CPPU (15 ppm, T_4), GA_3 plus CPPU (30 ppm, T_5), GA_3 twice (50+50 ppm) plus CPPU (7.5 ppm, T_6), GA_3 twice (50+50 ppm) plus CPPU (15 ppm, T_7), GA_3 twice (50+75 ppm) plus CPPU (7.5 ppm, T_8) and GA_3 twice (50+75 ppm) plus CPPU (15 ppm, T_9), respectively. The corresponding fruit retention percentage were 58.91, 53.63, 53.14, 52.82, 53.20, 53.01, 54.12, 54.21 and 53.70 as an av. of three studied seasons, respectively. The least fruit set percentage (56.38, 57.07 & 57.15 %) was recorded on the bunches that sprayed with T_4, T_9 and T_5 during three seasons, respectively and fruit retention (52.82,

53.01 & 53.14 %) was recorded on the bunches that sprayed with T_4, T_6 and T_2 during three seasons, respectively. Then the decrement percentage of fruit set attained 13.35, 12.29 & 12.17 % and fruit retention attained 10.34, 10.02 & 9.79% as an av. of two studied seasons for T_2, T_3 and T_9 compared T_1, respectively.

On the other hand, all treatments significantly increased the bunch weight compared to untreated one (control). The value of bunch weight were 16.68, 19.87, 19.80, 19.38, 20.57, 19.80, 19.77, 19.47 and 20.20 kg as an av. the three studied seasons, respectively. Then the corresponding increment percentage of bunch weight attained 19.12, 18.71, 16.19, 23.32, 18.71, 18.53, 16.73 and 21.10 for T_2 to T_9 compared to T_1, respectively.

In general, these findings indicated that it should be sprayed GA_3 twice at 50 ppm plus (100 or 150 ppm) as well as GA_3 twice at 50 plus 75 ppm and CPPU either (7.5 or 15 ppm) to obtain the high yield of Seewy date palms. Where the early GA_3 reduce the fruit set and then give a chance for the better growth of the fruits well and high yield. On other hand, the second GA_3 spray as well as CPPU increase the fruit weight and size, hence get high yield of Seewy date palm.

Table 1. Effect of some growth regulators spraying on fruit set(%) and Fruit retention (%) of Seewy date palm during 2013, 2014 and 2015 seasons.

No	Ch. / Tret.	Fruit set (%)				Fruit retention (%)			
		2013	2014	2015	Mean	2013	2014	2015	Mean
T_1	Control	61.00	68.72	65.50	65.07	54.76	61.20	60.77	58.91
T_2	GA_3 50+100 ppm.	54.90	61.43	56.31	57.55	50.47	56.29	54.12	53.63
T_3	GA_3 50+150 ppm.	53.60	61.60	56.50	57.23	51.11	56.60	51.70	53.14
T_4	GA_3 50+CPPU 15 ppm.	54.30	60.63	54.20	56.38	50.75	55.80	51.90	52.82
T_5	GA_3 50+CPPU 30 ppm.	55.30	61.80	54.35	57.15	51.31	56.20	52.10	53.20
T_6	GA_3 50+(GA_3 50+CPPU 7.5 ppm).	54.30	60.81	56.40	57.17	50.89	55.85	52.30	53.01
T_7	GA_3 50+(GA_3 50+CPPU 15 ppm).	55.10	62.34	56.50	57.98	51.40	57.35	53.60	54.12
T_8	GA_3 50+(GA_3 75+CPPU 7.5 ppm).	54.60	61.50	55.80	57.30	52.30	56.80	53.52	54.21
T_9	GA_3 50+(GA_3 75+CPPU 15 ppm).	54.20	62.10	54.90	57.07	52.32	56.38	52.40	53.70
	LSD 5%	1.89	2.11	2.58		1.92	2.05	2.11	

Fruit quality

Physical characteristics:

Data presented in Tables (2 & 3) show the effect of GA_3 and CPPU spraying on some physical properties i.e. fruit weight, seed weight and flesh percentage as well as shape and dimentions of Seewy dates during 2013, 2014 and 2015 seasons. Spraying Seewy date bunches with either GA_3 or CPPU significantly increased the fruit weight, flesh percentage and dimentions of Seewy date in compared unsprayed one.

Spraying GA_3 twice at 50&75 ppm plus CPPU at either 7.5 or 15 ppm gave the highest fruit weight, flesh percentage and dimention of fruits compared to unsprayed one. The recorded fruit weight were 13.60, 17.62, 17.91, 17.79, 17.75, 17.48, 17.50, 17.93 and 17.94 g as an av. of three studied seasons, flesh percentage was 87.06, 88.80, 88.90, 88.71, 88.90, 88.92, 88.80, 88.90 and 88.98 %, fruit length was 3.98, 4.38, 4.46, 4.40, 4.44, 4.40, 4.40, 4.47 and 4.49 cm and fruit diameter was 2.31, 2.52,

2.58, 2.58, 2.54, 2.57, 2.58, 2.57 and 2.61 cm as an av. of three studied seasons, respectively. Hence, the heaviest fruit weight (17.94 & 17.94 g) was recorded on bunch that sprayed with either GA_3 twice at 50+75 plus CPPU either 7.5 or 15 ppm against (13.60 g) in unsprayed ones as an av. the three studied seasons, respectively. The corresponding increment percentage due to these treatments over unsprayed ones attained 31.84 & 31.91% as av. of three studied season, respectively.

On the other hand, the maximum values of fruit flesh % 88.90 & 89.98% was recorded on bunch that sprayed with GA_3 twice 50+75 ppm plus CPPU at 7.5 or 15 ppm against 87.06% in unsprayed ones respectively.

Also, the highest fruit length 4.47 & 4.49 cm was recorded on the bunches that sprayed with either GA_3 twice 50+75 plus CPPU 7.5 or 15 ppm respectively, against 3.98 cm in unsprayed ones. The corresponding increment percentage of fruit length due to these treatments over control was 12.31 & 12.81% as. an. av. of three studied seasons, respectively.

Moreover, the highest values of fruit diameter (2.57 & 2.61 cm) was recorded on bunch that sprayed with GA_3 twice 50+75 plus ppm CPPU at 7.5 or 15 ppm against 2.21 cm in unsprayed ones. The corresponding increment percentage of fruit diameter due to these treatments unsprayed ones attained 11.26 & 12.98% as an av. of three studied seasons, respectively.

Generally, the above results disclosed that no significant difference between all treatments on physical properties of fruits, therefore, it could be concluded that spraying GA_3 at 50 ppm after two weeks of pollination followed by GA_3 at 75 ppm plus CPPU at 7.5 ppm after 8 weeks of pollination to get highly improved all physical properties. Such treatment are very important target than total yield due to the improve in physical fruit traits induce an increase in packable yield.

Table 2. Effect of some growth regulators spraying on Bunch weight, fruit weight and flesh of Seewy date palm during 2013, 2014 and 2015 seasons.

No	Bunch weight (kg)				Fruit weight (g)				Flesh (%)			
	2013	2014	2015	Mean	2013	2014	2015	Mean	2013	2014	2015	Mean
T1	15.40	17.25	17.40	16.68	13.10	14.00	13.70	13.60	87.02	87.00	87.15	87.06
T2	19.60	20.40	19.60	19.87	17.32	17.33	18.22	17.62	88.57	88.86	88.97	88.80
T3	20.30	19.30	19.80	19.80	18.15	18.22	17.36	17.91	88.98	89.08	88.65	88.90
T4	19.70	19.20	19.25	19.38	17.10	18.10	18.17	17.79	88.36	88.84	88.94	88.71
T5	20.60	20.80	20.30	20.57	17.53	17.60	18.13	17.75	88.93	88.75	89.02	88.90
T6	19.20	19.60	20.60	19.80	17.88	17.32	17.24	17.48	89.04	88.86	88.86	88.92
T7	19.10	19.80	20.40	19.77	17.70	17.62	17.19	17.50	88.87	88.93	88.60	88.80
T8	19.20	19.80	19.40	19.47	18.20	18.50	17.10	17.93	88.96	89.14	88.60	88.90
T9	20.20	20.20	20.20	20.20	18.15	17.42	18.25	17.94	89.15	88.58	89.21	88.98
L.S.D 5%	1.65	1.28	1.41		1.21	1.19	1.38		1.05	1.08	1.43	

Table 3. Effect of some growth regulators spraying on fruit length, fruit diameter and shape of Seewy date palm during 2013, 2014 and 2015 seasons.

No	Fruit length (cm)				Fruit diameter (cm)				Shape (%)			
	2013	2014	2015	Mean	2013	2014	2015	Mean	2013	2014	2015	Mean
T1	3.90	3.95	4.10	3.98	2.27	2.37	2.28	2.31	1.72	1.67	1.80	1.73
T2	4.32	4.40	4.42	4.38	2.58	2.51	2.48	2.52	1.67	1.75	1.78	1.74
T3	4.43	4.45	4.50	4.46	2.66	2.57	2.51	2.58	1.67	1.73	1.79	1.73
T4	4.41	4.41	4.39	4.40	2.56	2.61	2.58	2.58	1.72	1.69	1.70	1.70
T5	4.35	4.37	4.60	4.44	2.53	2.56	2.52	2.54	1.72	1.71	1.83	1.75
T6	4.37	4.33	4.51	4.40	2.59	2.54	2.57	2.57	1.69	1.70	1.75	1.72
T7	4.40	4.30	4.50	4.40	2.63	2.59	2.53	2.58	1.67	1.66	1.78	1.70
T8	4.45	4.46	4.51	4.47	2.63	2.54	2.53	2.57	1.69	1.76	1.78	1.74
T9	4.51	4.35	4.62	4.49	2.70	2.61	2.51	2.61	1.67	1.67	1.84	1.73
L.S.D 5%	0.19	0.20	0.22		0.11	0.08	0.10		N.S	N.S	N.S	

Chemical characteristics:

Data presented in Tables (4 & 5) show the effect of GA_3 and CPPU spraying on some chemical properties i.e. total soluble solids, sugar contents, as well as total acidity and total soluble tannins percentage of Seewy date fruits during 2013, 2014 and 2015 seasons.

Spraying Seewy date bunches with either GA_3 or CPPU significantly improved the dates chemical constituents in terms of increasing the total soluble solids and sugar contents and decreasing the total acidity and total soluble tannins percentages compared to unsprayed ones.

It could be simply to see from data that total soluble solids were equivalent to sugar content and reversed current with total acidity and tannin content.

In general, view, spraying GA_3 once followed by CPPU or GA_3 twice plus CPPU gave the highest total soluble solids and sugar contents of fruits during the three studied seasons. The recorded TSS % were 34.47, 36.93, 36.93, 37.80, 36.87, 37.17, 37.27, 37.37 and 38.10 % as an av. of three studied seasons, total sugars % were 26.28, 28.05, 28.21, 28.04, 28.11, 28.23, 28.30, 28.19 and 28.70 % as an av. of three studied seasons, reducing sugars % were 19.77, 21.05, 20.96, 20.95, 20.98, 21.09, 21.28, 20.97 and 21.33 % as an av. the three studied seasons and non-reducing sugars were 6.51, 7.00, 7.25, 7.10, 7.14, 7.14, 7,02, 7.21 and 7.37 % as an av. of three studied seasons, respectively.

The highest TSS values were 37.80 & 38.10% as an av. of three studied season due to (T_4) or (T_9), respectively. On other hand, the least ones was (34.47%) were recorded on unsprayed bunches. Hence, the corresponding increment percentage attained (9.66 & 10.53%), respectively. Also, the highest total sugars values were 28.30 & 28.70 % as an av. of three studied season due to spraying with T_7 and T_9, respectively. On the other hand, the least ones was (26.28%) were recorded on untreated bunches. Hence, the corresponding increment percentage attained 7.69 & 9.21%, respectively. The obtained highest reducing sugars values were 21.28 & 21.33 % as an av. of the

three studied season due to spraying with T_7 and T_9, respectively. On other hand, the least ones was (19.77%) were recorded on untreated bunches. Hence, the corresponding increment percentage attained (7.64 & 7.89%), respectively. For non-reducing sugars the highest values was (7.26 & 7.27 % as an av. the three studied season) due to T_3 and T_9, respectively. On other hand, the least ones was (6.51%) were recorded on untreated bunches. Hence, the corresponding increment percentage attained (11.34 & 13.21%), respectively.

On other hand, The recorded titratable acidity % were 0.331, 0.205, 0.224, 0.214, 0.230, 0.247, 0.250, 0.202 and 0.201 % as an av. of three studied seasons and total soluble tannins % (0.811, 0.418, 0.398, 0.445, 0.371, 0.449, 0.372, 0.338 and 0.337% as an av. of three studied seasons), respectively.

Also, the least values of titratable acidity percentage (0.202 & 0.201% as an av. the three studied seasons) were recorded on fruits of bunches the received sprays of GA_3 twice 50 ppm after 2 weeks of pollination followed GA_3 75 ppm plus CPPU 7.5 (T_8) or 15 ppm (T_9) after 8 weeks of pollination compared the highest ones (0.331%) on fruit of bunches that untreated ones. Also, the least values of total soluble tannins percentage (0.338 & 0.337% as an av. of three studied seasons) were recorded on fruits of bunches that treated with T_8 and T_9 compared the highest ones (0.811%) on fruit of bunches that untreated ones control. Hence the decrement percentage of tannins due to T_8 and T_9 sprays under control attained (58.32 & 58.45% as an av. of three studied seasons), respectively.

Hence it could be concluded that spraying GA_3 at 50 ppm after 2 weeks of pollination followed GA_3 at 75 ppm plus CPPU at 7.5 ppm after 8 weeks of pollination to improve the tested chemical fruit properties.

It is suggested to spray GA_3 twice at 50 and 7.5 ppm plus CPPU at 7.5 ppm to obtain the high yield with good quality of Seewy dates.

Table 4. Effect of some growth regulators spraying on TSS %, Titratable acidity and Tannins of Seewy date palm during 2013, 2014 and 2015 seasons.

No	T.S.S (%)				Titratable acidity (g)				Tannins (%)			
	2013	2014	2015	Mean	2013	2014	2015	Mean	2013	2014	2015	Mean
T1	33.60	35.40	34.40	34.47	0.325	0.348	0.319	0.331	0.839	0.801	0.794	0.811
T2	36.20	38.30	36.30	36.93	0.189	0.218	0.209	0.205	0.425	0.411	0.419	0.418
T3	36.40	38.10	36.30	36.93	0.231	0.266	0.235	0.244	0.368	0.387	0.438	0.398
T4	36.80	38.40	38.20	37.80	0.223	0.253	0.213	0.214	0.438	0.435	0.462	0.445
T5	36.40	37.80	36.40	36.87	0.243	0.268	0.231	0.230	0.322	0.464	0.328	0.371
T6	36.90	37.70	36.90	37.17	0.267	0.245	0.239	0.247	0.451	0.421	0.476	0.449
T7	37.40	37.30	37.00	37.23	0.216	0.190	0.201	0.250	0.306	0.391	0.418	0.372
T8	37.50	36.90	37.70	37.37	0.208	0.178	0.218	0.202	0.361	0.321	0.331	0.338
T9	38.30	38.20	37.80	38.10	0.198	0.210	0.243	0.201	0.328	0.319	0.364	0.337
L.S.D 5%	0.81	0.66	0.73		0.018	0.022	0.016		0.081	0.088	0.080	

Table 5. Effect of some growth regulators spraying on sugars contents of Seewy date palm during 2013, 2014 and 2015 seasons.

No	Total sugars (%)				Reducing Sugars (%)				No reducing sugars (%)			
	2013	2014	2015	Mean	2013	2014	2015	Mean	2013	2014	2015	Mean
T1	26.13	26.50	26.20	26.28	19.65	20.10	19.56	19.77	6.48	6.40	6.64	6.51
T2	27.63	28.40	28.13	28.05	20.78	21.36	21.02	21.05	6.85	7.04	7.11	7.00
T3	27.63	29.18	27.83	28.21	20.45	21.73	20.71	20.96	7.18	7.45	7.12	7.25
T4	28.46	27.91	27.76	28.04	21.35	20.88	20.61	20.95	7.11	7.03	7.15	7.10
T5	27.81	28.00	28.53	28.11	20.83	21.10	21.00	20.98	6.98	6.90	7.53	7.14
T6	28.71	28.51	28.06	28.23	21.39	21.17	20.70	21.09	7.12	7.14	7.16	7.14
T7	28.83	28.10	27.98	28.30	21.43	21.26	21.15	21.28	7.40	6.84	6.83	7.02
T8	27.60	28.15	28.81	28.19	20.78	20.98	21.16	20.97	6.82	7.17	7.65	7.21
T9	28.31	28.93	28.85	28.70	21.43	21.38	21.18	21.33	6.88	7.55	7.67	7.37
L.S.D 5%	1.44	1.35	1.48		0.80	0.77	071		0.26	0.38	0.31	

Discussion

Plant growth regulators play an important and major role in regulating fruit growth and development. Some of these substances were used in controlling ripening date (delayed ripening) as well as improving the fruit quality, which act for increasing the income and the revenues of farmers. (Kassem *et al.,* 2011). Sitofex (CPPU) is a new plant growth regulator which has strong cytokinin activity by inducing fruit growth at low rates. Application of Sitofex at 1 to 20 ppm causes great effects on fruit size. The effectiveness was associated with methods of applications, the type of desired response, the developmental stage of the plant at time of application and other variables (Nickell, 1985 and Ogata *et al.,* 1988).

The biological effects of applying plant growth regulators on plants have received much attention due to their important use in agriculture; in particular, the economical application of plant growth regulators on flowers

and fruits (as parthenocarpic, thinning, and elongating agents) and on shoot (as a controlling agent of plant height and lateral branching (Salisbury and Ross, 1985, 1992 and Whiting, 2007).

The promotion effect of GA_3 and CPPU on yield of some palm cultivars was emphasized by Mougheith and Hassaballa (1979), El-Kassas (1983), Soliman (2007), El-Kosary (2009) and Al-Qurashy *et al*. (2012). They concluded from their studies on different palm cultivars that spraying bunches with GA_3 as well as CPPU were increased the bunch weight and consequently the yield/palm.

Treating date palms with GA_3 at 50 and 100 ppm significantly increased fruit weight and fruit dimensions compared to control. In addition, spraying 75 ppm of CPPU significantly increased fruit content of TSS, total sugar contents compared to control.

The improvement of the fruit quality in response to use GA_3 and CPPU were reported by Mougheith and Hassaballa, (1979), El-Nabawy *et al.* (1981), Abou-Aziz *et al*., (1982), Asif *et al*. (1985), Galal (1991), Soliman (2007), Al-Obeed (2010), Kassem *et al*. (2011), Ghazzawy (2013) and Merwad et al (2015). They concluded from their studies on different palm cultivars that spraying bunches with GA_3 as well as CPPU were increased the fruit weight and fruit dimensions as well as the chemical properties of dates.

Conclusion

On the light of the previous results, it could be concluded that spray Seewy dates with GA_3 at 50 ppm after two weeks of pollination plus either GA_3 75 ppm and CPPU 7.5 ppm or GA_3 75 ppm and CPPU 15 ppm to obtain the high yield with good quality. GA_3 reduce the fruit retention and thus give a chance for the growth of the fruits well and then increase the fruit weight and size induce increased the yield, CPPU induce an increasing in fruit weight and size and get high yield of Seewy dates. Thus, spraying the bunches of Seewy date palm with GA_3 and CPPU had get the highest yield with improvement the physical and tested chemical fruit properties.

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Assiut J. Agric. Sci., (47) No. (5) 2016 (125-137) *ISSN: 1110-0486*
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استجابة نخيل البلح السيوي للرش بحمض الجبريليك والسيتوفيكس

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الملخص

أجريت هذه الدراسة في مزرعة كلية الزراعة– جامعة أسيوط – مصر ، علي أشجار نخيل البلح السيوي خلال ثلاثة مواسم ٢٠١٣ ، ٢٠١٤، ٢٠١٥ بهدف دراسة تأثير رش حمض الجبريلبك والسيتوفيكس علي المحصول وخصائص الثمار وقد تم رش حمض الجبريليك والسيتوفيكس مرتين الاولى بعد التلقيح باسبوعين والاخرى بعد التلقيح بثمانية اسابيع.
وتوضح النتائج الاتى:

- أدي رش السوباطات بحمض الجبريليك بمعدل ٥٠ ppm بعد أسبوعين من التلقيح نقصا جوهريا فى نسبة العقد الأولي والنهائي للثمار. بما يماثل عمليات خف الثمار.
- أدى رش السوباطات بـ GA3 بتركيز ٥٠ ppm بعد اسبوعين من التلقيح ثم الرش مره اخرى بتركيز ٧٥ppm اضافه الى CPPU بتركيز ٧,٥ او ١٥ ppm بعد ثمانية اسابيع من التلقيح الى تحسين خصائص الثمار الطبيعيه من حيث زياده وزن وحجم الثمار ونسبة لب الثمار.
- أدى الرش بحمض الجبريليك والسيتوفيكس الى تحسين خصائص الثمار الكيميائيه حيث تزداد نسبة المواد الصلبه الذائبه والسكريات فى الثمار بينما تقل النسبه المئويه للحموضه والتانينات بالثمار. من نتائج هذه الدراسه نوصى باهمية رش حمض الجبريليك بتركيز ٥٠ ppm بعد التلقيح باسبوعين ثم مره اخرى بحمض الجبريليك بتركيز ٧٥ ppm والسيتوفيكس بتركيز ٧,٥ او ١٥ ppm بعد التلقيح بثمانية اسابيع حيث تؤدي هذه المعاملة إلي زيادة وزن وحجم الثمار وبالتالي زيادة المحصول وتحسين خصائص الثمار الطبيعية والكيميائية.