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Improving quality of date palm (*Phoenix dactylifera* L.) fruits CVS. Khalas and Sagae under different climate by spraying of date palm pollen grains extract

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Abstract

To improving fruits quality this work was done to utilize of the effective components of date palm pollen grains as amino acids, hormones, macro and micro elements, proteins, carbohydrates and fatty acids, thus date palm pollen grains extract as spraying was examined on the fruits of adult trees 10 years of date palm cultivars Khalas and Sagae cvs date palm (*Phoenix dactylifera* L.) from two successive seasons under two different climate as Egypt and Saudi Arabia, two levels of date palm pollen grains extract 600 and 800 ppm as fruit set spraying at 10, 20, and 30 days after pollination. Physical and chemical characteristics fruits were determined, applications of date palm pollen grains performed physical and chemical estimations. A positive relation could be notice of physical parameters attributed, fruit length cm, weight, diameter and flesh weight of cvs. Khalas and Sagae in Egypt and Saudi Arabia under 800 ppm pollen extract, chemical estimation in terms of total sugars, reducing and non- reducing sugars %, TSS %, Proteins mg/g f.w. were increasing with 800 ppm pollen extract, meanwhile, two levels of pollen extract decreased fruits acidity for two cultivars in the two studied climate, greatest accumulated elements N, P, K, Mg %, Fe, Mn and Zn ppm were found for two cultivars in Egypt and Saudi Arabia.

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Introduction

Importance components of date palm pollen grains as amino acids, hormones, macro and micro elements, proteins, carbohydrates and fatty acids hence causing useful effect for increasing growth by supplying plants with sufficient and stimulants necessary constituents, therefore pollen grains used in this work to enhancing quality of valuable dates fruits, date fruit is very rich in viewpoint of nutrition value. Date palm (*Phoenix dactylifera* L.) had been much utilization for human from a long time ago up to now, which is supplying many requirements of mankind, chemical compositions of date fruit (date fruit nutrition value) depend on cultivar, weather, planting regions (Naseri *et al.*, 2013), as well as pollen grain contains different macronutrients, N was found in highest concentrations, graduated by Ca, P, Mg, micronutrients were found i.e. Fe present in high concentration graduated by Zn, Mn and Cu (Bishr and Samar 2012), also date palm pollen grain rich in carbohydrates 13.41 %, crude proteins 31.11%, crude fat 20.7 %, crude fiber 1.37%, ash 4.5%, good source of macro and micro elements , logical amount vitamins A,E and C. , rich and good source of different amino acids, and 13 fatty acids, as one of this fatty acid is palmitic acid 34.45%, as well as phenylethanol (8.75%), essential oils and antioxidant activity, total phenolic and flavonoids additionally several steroids as brassinosteroid (Hassan 2011; Al- Samarai *et al.,* 2016; Farouk *et al.,* 2015 and Abd El Azim *et al.*, 2015), the fruits of date palms are consumed throughout the world and are important part of the diet in the Middle East, dates are being consumed in modern cultures for the pleasant flavor, odor, and their biting texture in addition to their use for flavoring foods are available for valorization and adoption in food processing operations (Porter 1993 and Ghnimi *et al.,* 2016), date palm fruits are used as food and industrial products play an important role in the rural communities and economies of many developing countries, dates are produced in the hot arid region of the world and marketed worldwide as high value confectionary (Mahmoudi *et al.,* 2008), "Khalas" is the most important cultivar in Saudi Arabia, this cultivar is well known for its high quality fruit (Al- Khateeb *et al.,* 2006), date palm pollen grain as water suspension sprayed at 1.5 and 2.0 g/l increased fruit set, bunch weight, yield kg/tree, fruit weight, diameter, length, flesh weight, seed weight, TSS, and decreased acidity (Awad 2010 on cv.

Khenazy and cv Lulu), pollen grain of date palm at 2g/l + milagro at 1 g/l increased fruit retention, fruit set, yield, bunch weight, weight, volume, length, diameter of fruit, flesh %, TSS, total sugars, reducing and non- reducing sugars, decreased tannins and acidity (Omaima Hafez *et al.,* 2013), green Alga extract 25 and 50 % and Lemongrass extract as spraying raise buds, yield number of cluster/vine. TSS, total sugars of grapevines (Abdelmonem and Abd-Allah 2008 and Abd-Allah *et al.,* 2013), to looking the contents of pollen grain of date palm which rich in different amino acids also macro and micronutrients, for this many researchers aimed to study the effect of different amino acids and macro and micronutrients on fruit quality of date palm and other fruits, in this respect, spraying a polyamine (putrescine) at full bloom stage markedly increased fruit set, fruit retention and size of *Mangifera indica* L. Mango fruits (Malik and Singh 2006), fruit set and bunch weight of date palm cv. 'Saidy' increased with increasing concentrations suspension 2.5-5.0 g of pollen grains and 1 g ascorbic acid/L water (El Salhy *et al.,* 2010), suspension of pollen grains/ liter water at 1.0 to 6.0 g produced highest fruit set, percentage of fruit retained, bunch weight, yield, flesh, fruit weight of Zaghloul cv. in addition increasing chemical characteristics of the fruits while decreased percentage acidity (Al-Wasfy 2014), moreover many scientists used another extract, amino acids and polyamines as, spraying putrescine from 5.0 to 10 mM at full-bloom increased yield, fruit weight, fruit volume, fruit length and diameter, total sugars, reducing and non- reducing sugars, TSS and lowered fruit acidity (Enas Ali *et al.,* 2010 on apricot; Ayad *et al.,* 2011 on olive and Abd El-Migged *et al.*,2013 on date palm cv. Amhat), pepton (amino acids) as foliar spraying and soil application at 0.25 and 0.5% increased fruit quality of peach cv florida prince peach (Abd El- Razek and Saleh 2012), liquorices

extract at 4 mg/l was spraying at two periods after fruit setting raise TSS, total sugars and reducing sugars of date palm cv. Zahdi (Al-Jebori 2006), amino acids + minerals elements at 1.5 cm/l increased sugars contents, proteins of nut Pistachio cvs (Molaie *et al.*, 2013), fulvic acid, micro-elements plus bio-fertilizers induced positive effects for enhancing yield, physical and chemical characteristics of cluster and quality of berries (El- Boray *et al.,* 2015), Accordingly, this study was aimed to evaluate the main contents of date palm pollen grains extract as fruit set spraying on the increasing quality and marketable degree fruits of date palm.

Materials and methods

This work was subjected on the adult trees 10 years old of date palm *Phoenix dactylifera* L. two cultivars Khalas and Sagae in the two different climates as (1) Egypt in the private farm in El- Esmalia Gov. (2) Saudi Arabia in National Center for Palms & Dates through two seasons 2016 -2017 (Table 1)

Temperature degree and Moisture percent at day and night for Egypt and Saudi Arabia, (Table 2. Soil PH, Ec and Fe ppm contents in Egypt and Saudi Arabia).

The three bunches were pollinated as soon as the inflorescences were opened by using pollen grains extract from the male palm grown in the region in both seasons, the other bunches were left for normal practices, pollen date palm extract (Table 3. and 4 contents of date palm pollen grains) from preferred males used at two levels 600 and 800 ppm (Darwesh *et al* 2015) as spraying on the fruit set with three replicates and control treatment (without spraying), pollen spraying at 10, 20, and 30 days after pollination.

Experimental design

Complete randomized block design with three replicates and three plantlets for each one, two growth seasons. Data were analyzed by analysis of variances (ANOVA) and the means were compared following t- test using L.s.d. values at 5 % level (Snedecor and Chocran 1990).

Pollen grains

Pollen grains of date palm (*Phoenix dactylifera* L.,cvs) were collected at the end of March from the famous good males in the area.

Preparation of Palm Pollen Extracts

Two different extracts were prepared from pollen grains of date palm using the procedure reported by (Nagai *et al* 2002) with some modifications as follows: To prepare water pollen extract (WPE), 0.1 g of pollen grains was mixed with 10.0 ml of distilled water (DW). After one hour, the mixture was sonicated by ultrasonic probe (frequency at 6 kHz) for 30 s then centrifuged at 5,000 rpm for 10 min with the temperature set at 20°C. The resulting supernatant was used as water pollen extract in all experiments.

The second method which was used in this work, extraction of pollen with ethanol, after extraction with ethanol (0.1 g pollen and 10.0 ml ethanol), the solvent was removed from the obtained extract by evaporation. The residue was re dissolved in the same volume of DW (10.0 ml). at the end of this experiment morphological fruit and chemical parameters were recorded as follows.

Physical parameters

Fruit length cm, Fruit and flesh weight g and fruit diameter.

Chemical parameters

Total sugars, Reducing and Non reducing sugars, TSS, Proteins mg/g d.w. total acidity and elements N,P,K, Mg, Fe, Mn, and Zn.

Total sugar, reducing sugars as described by Shales and Schales (1945) non-reducing sugars by differentiate between total and reducing sugars. Total Soluble Protein: Total soluble protein levels were measured by using BIO-RAD protein assay dye reagent by the method of Bradford (1976).

Total soluble solids T.S.S.%: in fruit juice was determined by hand refractometer.

Total acidity: as described by A.O.A.C (1995), percentage as percentage by titration against NaOH (0.1 N) using phenolphethaline as an indicator, results were converted to percent of malic acid (as the dominant organic acid in the fruit). N,P,K, Mg, Fe, Mn and Zn: according by (Jackson, 1973).

Results

Fruits morphological attributes

It is important to note that treatments of date palm pollen grains significantly improved the fruit quality in terms of increasing the fruit and flesh weight, length, diameter and seed weight (Table 5) explain the effect of two studied climate and levels of date palm pollen grains extract on the different date palm (*Phoenix dactylifera* L.) fruit physical estimation as weight g, fruit length cm, diameter cm, flesh weight g, and seed weight (g), Fruit weight under Egypt climate with spraying of level 800 ppm pollen extract recorded significant greatest weight 18.0 and 18.5 g for Khalas cv. and 15.5 and 15.3 g for Sagae cv. than Saudi Arabia climate 11.8 and 12.5 for Khalas cv. and 14.1 and 14.3 g for Sagae cv. in the same order of two studied seasons compared to control treatment.

Table 1. Temperatures and moisture degree in the tested months in Egypt and Saudi Arabia.

		2016											
		March		April		May		June		July		August	
		D	N	D	N	D	N	D	N	D	N	D	N
Egypt		26.8	14.3	31.5	17.3	30.7	18.9	37.1	24.4	39.5	24.1	35.4	24.3
Saudi Arabia	Co	30.2	16.8	34.2	19.1	43.3	26.2	44.5	27.4	48.0	31.2	48.2	30.3
Egypt		30.0		30.0		36.0		39.0		41.0		40.0	
Saudi Arabia	Moisture	37.7		32.7		17.9		11.3		18.1		21.5	
		2017											
		March		April		May		June		July		August	
		D	N	D	N	D	N	D	N	D	N	D	N
Egypt		28.7	16.7	33.4	18.3	34.9	20.5	38.6	26.4	39.5	25.1	36.4	26.3
Saudi Arabia	Co	30.5	20.1	36.2	23.2	43.9	27.3	43.4	29.3	47.6	28.2	47.5	29.3
Egypt	Moisture	31.0		31.8		39.0		40.5		41.8		41.5	
Saudi Arabia		40.0		32.2		18.0		12.1		17.7		20.5	

Key words: D= Day N= Night.

It has been found that of fruit length (Table 5) exhibited the longest fruits were recorded under Saudi Arabia climate with 800 mg/l pollen grains spraying with Khalas cv. 3.7 and 3.7 for than 3.4 and 3.5 cm for Egypt climate respectively for two seasons with significant differs in between, cv. Sagae haven't significant differs between two climates with two levels of extract, upon the control treatment which have the shortest fruits.

Table 2. Soil characteristics in the Egypt and Saudi Arabia.

	PH	Ec (dsm-l)	Fe ppm
Egypt	6.8	3.2	2.6
Saudi Arabia	7.75	2.8	2.6

Table 3. Total indole contents of pollen extracts (mg/g pollen).

Pollen extract	Indole content
Water extract	10±0.34
Ethanol extract	9±0.21

The results represent the mean ± S.D.

Regarding to estimate the fruit diameter (Table 5), there was marked increasing under spraying of 600 ppm pollen extract of Sagae cv. under Saudi Arabia 2.8 and 2.9 climate than Egypt climate 2.4 and 2.5 whereas Khalas cv. haven't differs under two climates in the second season, thickness fruit was found in the Sagae cv. fruits under Saudi Arabia climate by spraying of 800 ppm pollen extract 2.9 and 2.9 cm than 2.6 and 2.7 for Egypt climate respectively for two seasons without insignificant differs in between in the second season also Khalas cv. By increasing dose of date palm pollen grains extract 800 ppm induced significant largest flesh weight 17.1 and 17.6 and 14.6 and 14.4 g for Egypt climate and 11.0 and 11.7 and 13.3 and 13.5 g for Saudi Arabia climate in the same order of two cultivars and seasons, smallest weight of flesh were obtained under control treatment. Concerning to the seed weight that gave insignificant variance under Egypt and Saudi Arabia with 800 ppm pollen grains spraying date palm pollen grains, while control treatment have lift the highest seed weight for two climate, cultivars and seasons. Results from Fig 1. clearly indicate that fruit weight and flesh weight for two cvs takes place great heavy fruits under Egypt condition than Saudi Arabia condition, additionally it could be noticed that fruit length for khalas cv. was highest under Saudi Arabia condition than Egypt condition, concerning Sagae cv. gave insignificant differs between two conditions, while fruit diameter showed great wide for khalas cv. in Egypt condition than Saudi Arabia, Sagae cv. under two climates haven't significant variance, same trend was found in seed weight that have heaviest under Egypt than Saudi Arabia without insignificant differs.

Table 4. Contents of pollen grain date palm (*Phoenix dactylifera* L.).

Palm pollen grains contents							
Elements		Chemical composition % (g/100 g d.w.)		Amino acids %		Fatty acids %	
						Saturated fatty acid	
C %	27.8	Moisture%	28.8	Isoleucine	1.49	Capric acid	0.46
N %	54.1	Ash %	4.57	Leucine	3.34	Lauric acid	4.82
Mg %	0.12	Fiber %	1.37	Lysine	2.95	Myristic acid	13.33
P %	0.66	Fat	20.74	Phenylalanine	1.63	Palmitic acid	34.45
S %	0.69	Proteins %	31.11	Threonine	1.72	Stearic acid	2.04
K %	5.5	Carbohydrates %	13.41	Valine	1.81	Arachidic acid	7.32
Ca %	7.0	Vitamins		Hisitidine	1.61	Mono saturated fatty acid	
Zn mg/100g	281.0	A (IU/100g)	7708.33	Methionine	0.11	Palmitoleic acid	7.07
						Oleic acid	7.19
Fe mg/100g	241.0	E (IU/100g)	3030.9	Alanine	2.61	Polyunsaturated fatty acid	
Mn mg/100g	284.0	C (mg/100g)	89.09	Arginine	1.61	Linoleic acid	14.24
Na mg/100g	0.22			Aspartic acid	3.55	Arachidonic acid	4.57
B mg/100g	309.4			Glutamic acid	1.74	Eicosapentaenoic acid	0.52
Ni mg/100g	302.4			Glycine	2.24		
Co mg/100g	305.4			Serine	1.89		
Cu mg/100g	319.6			Cysteine	0.42		
Mo mg/100g	302.2			Tyrosine	1.55		
				Proline	0.28		

Fruits chemical attribute

Sugars contents of date palm fruits considered as the limit quality for fruits graduating, regarding the total sugars % in response to date palm pollen extract as spraying treatments under different climates; it is evident from data presented in (Table 6) that all the studied levels 600 and 800 ppm resulted in progressively rising of total sugars from control to treatments under two climates, under Egypt climate total sugars recorded maximum contents in the Khalas fruits with 800 ppm extract pollen grains 73.4 and 76.9 than Saudi Arabia climate that have 63.5 and 64.5 % respectively, meanwhile under Saudi Arabia Sagae cv. recorded highest total sugars contents than Egypt 59.8 and 61.2 and 83.2 and 84.3% respectively for two seasons, control treatment

produced lowest significant sugars contents under two climates and cvs. Reducing sugars (Table 6) were significant affected by two climates and levels of pollen grains extract, Egypt climate produced greatest accumulation of reducing sugars fruits than Saudi Arabia for two tested cvs. gradually increasing of reducing sugars from control treatment which gave the little quantity of reducing sugars to high dose of extract 800 ppm that gave 60.3 and 63.7 % fruits contents of Khalas for Egypt and 40.2 and 41.1% for Saudi Arabia, Sagae cv. have 57.6 and 59.0 % for Egypt without insignificant differs between khalas cv. and 46.7 and 47.8% for Saudi Arabia respectively, Non- reducing sugars might have represented in (Table 6) clarified the significant variance under two climates and levels of pollen grains extract, on the contrary non-reducing sugars were highest under Saudi Arabia with high level of pollen grains extract. Significant impact of different climates on the fruit contents of TSS % (Table 6) which significant accumulated under Saudi Arabia with high level of extract and two tested cultivars, 41.7 and 42.1 % under Saudi Arabia for Khalas cv and 41.6 and 43.1% for Sagae cv. than Egypt climate 26.0 and 27.6% for Khalas cv. and 26.0 and 28.5% for Sagae cv. under Egypt climate, however lowest fruit contents of TSS was left with control treatment under two climate. two studied climate showed insignificant variance on the fruit proteins contents with two levels of pollen grains extract which upon the control treatment, on the contrary fruit acidity haven't any differs under two tested climate while the different levels of pollen grains resulted in significant effects on the lowest fruit contents of acidity above control treatment. Concerning to the differences between chemical estimations under Egypt and Saudi Arabia observed in Fig. 2 and 3. on the total sugars which recorded highest contents under Egypt climate with Khalas cv while under Saudi Arabia Sagae cv. which contain superior quantity of fruit sugars, Egypt climate increased fruit reducing sugars upon the other climate, Saudi Arabia climate caused huge contents of non-reducing sugars and TSS% for two cultivars, insignificant variance was obtained between two tested climate and levels of extract on the fruit protein contents and acidity.

Table 5. Effect of spraying date palm pollen grains extract on the fruit morphological characteristics of date palm (*Phoenix dactylifera* L.) cvs. Khalas and Sagae under Egypt and Saudi Arabia.

Treatments		Fruit weight (g)				Fruit length (cm)				Fruit diameter (cm)				Flesh weight (g)				Seed weight (g)			
		Khalas cv.		Sagae cv.		Khalas cv.		Sagae cv.		Khalas cv.		Sagae cv.		Khalas cv.		Sagae cv.		Khalas cv.		Sagae cv.	
A	B	1st	2nd	1st	2nd	1st	2nd	1st	2nd	1st	2nd	1st	2nd	1st	2nd	1st	2nd	1st	2nd	1st	2nd
Egypt	Con	15.3	15.3	13.3	13.3	3.3	3.3	2.3	2.4	2.6	2.6	2.4	2.5	14.2	14.2	12.3	12.3	1.1	1.1	1.0	1.0
	600	16.5	16.9	14.5	14.6	3.3	3.3	2.4	2.5	2.6	2.6	2.4	2.5	15.5	15.9	13.6	13.8	1.0	1.0	0.9	0.8
	800	18.0	18.5	15.5	15.3	3.4	3.5	2.6	2.6	2.8	2.9	2.6	2.7	17.1	17.6	14.6	14.4	0.9	0.9	0.9	0.9
	Mean	16.6	16.9	14.4	14.4	3.3	3.4	2.4	2.5	2.7	2.7	2.5	2.6	15.6	15.9	13.5	13.5	1.0	1.0	0.9	0.9
Mean		16.8		14.4		3.4		2.5		2.7		2.6		15.8		13.5		1.0		0.9	
Saudi Arabia	Con	9.8	9.8	10.7	11.6	3.4	3.5	2.4	2.4	2.3	2.3	2.1	2.1	8.8	8.8	9.8	10.7	1.0	0.9	0.9	0.9
	600	10.4	10.8	13.3	13.3	3.4	3.6	2.5	2.5	2.3	2.4	2.8	2.9	9.5	10.0	12.5	12.5	0.9	0.8	0.8	0.8
	800	11.8	12.5	14.1	14.3	3.7	3.7	2.6	2.6	2.4	2.8	2.9	2.9	11.0	11.7	13.3	13.5	0.8	0.8	0.8	0.8
	Mean	10.7	11.0	12.7	13.1	3.5	3.6	2.5	2.5	2.3	2.5	2.6	2.6	9.8	10.2	11.9	12.2	0.9	0.8	0.8	0.8
Mean		10.9		12.9		3.6		2.5		2.4		2.6		10.0		12.1		0.9		0.8	
LSD at 5%		A= 1.2 B= 1.4 AB= 1.9	A=1.1 B=1.4 AB=1.7	A=0.7 B=0.9 AB=1.3	A=0.7 B=0.9 AB= 1.2	A=0.8 B= 0.9 AB= 1.0	A=0.8 B=0.8 AB= 0.9	A=0.1 B=0.1 AB= 0.1	A=0.1 B=0.1 AB= 0.1	A= 0.4 B= 0.4 AB= 0.6	A=0.4 B=0.5 AB= 0.6	A= 0.2 B= 0.2 AB= 0.3	A= 0.2 B= 0.3 AB= 0.3	A=1.2 B= 1.3 AB= 1.6	A= 1.2 B= 1.3 AB= 1.5	A= 0.9 B= 1.2 AB= 1.7	A= 1.0 B= 1.2 AB= 1.7	A0.1 B=0.1 AB= 0.2	A=0.1 B=0.1 AB= 0.2	A=0.1 B=0.1 AB= 0.2	A=0.1 B=0.1 AB= 0.2

Fruit macro and micro elements

Fruit macro elements %

Relevance results were obtained with spraying fruit set with date palm pollen grains extract on the macro elements N,P,K and Mg % presented in (Table 7) showed that fruit nitrogen content was created at greatest accumulated under Saudi Arabia with 800 ppm of date palm pollen extract 1.4 and 1.6 for Khalas and 1.5 and 1.8 for Sagae under Saudi Arabia, 1.3 and 1.4 % for Khalas cv. and 1.2 and 1.3 % for Sagae cvs.

respectively for 1st and 2nd seasons above level 600 ppm, lowest nitrogen contents given by control treatment under two climates, phosphorus fruit contents gained the maximum under Egypt climate with two application of pollen grains extract, highest contents performed with 800 ppm extract 0.33 and 0.33 % for Khalas cv. and 0.34 and 0.34% for Sagae cv., 0.06 and 0.06 for Khalas cv. and 0.05 and 0.06 for Sagae cv. under Saudi Arabia, Egypt climate lead to higher fruit contents of potassium with two applications of pollen grains extract and two cultivars, the level 800 ppm under Egypt climate induced high results of potassium contents, on the other hand Mg fruit contents haven't significant differs under two climates while increased significantly with high dose of extract 800 ppm and the lowest contents found with control treatment.

Table 6. Effect of spraying date palm pollen extract on the sugars, TSS %, proteins mg/g f.w. and acidity % contents of date palm (Phoenix dactylifera L.) fruits Khalas and Sagae cvs under Egypt and Saudi Arabia.

Treatments		Total sugars %				Reducing sugars %				Non-reducing sugars %				TSS %				Proteins mg/g f.w.				Acidity %			
		Khalas cv.		Sagae cv.		Khalas cv.		Sagae cv.		Khalas cv.		Sagae cv.		Khalas cv.		Sagae cv.		Khalas cv.		Sagae cv.		Khalas cv.		Sagae cv.	
A	B	1st	2nd	1st	2nd	1st	2nd	1st	2nd	1st	2nd	1st	2nd	1st	2nd	1st	2nd	1st	2nd	1st	2nd	1st	2nd	1st	2nd
Egypt	Con	61.8	62.0	56.1	57.9	55.2	56.6	52.2	53.9	5.6	4.8	3.9	4.0	25.5	26.6	23.8	26.7	0.3	0.3	0.3	0.4	0.17	0.17	0.18	0.18
	600	71.5	74.2	60.1	60.9	57.7	59.3	55.1	56.9	13.9	14.9	4.7	4.1	24.9	26.4	25.5	27.9	0.5	0.5	0.4	0.5	0.17	0.17	0.17	0.16
	800	73.4	76.9	63.3	64.8	60.3	63.7	57.6	59.0	13.5	13.2	5.7	5.8	27.5	29.8	28.6	30.9	0.5	0.6	0.5	0.5	0.16	0.15	0.14	0.13
	Mean	68.9	71.0	59.8	61.2	57.7	59.9	54.7	56.6	11.0	11.0	4.8	4.6	26.0	27.6	26.0	28.5	0.4	0.5	0.4	0.5	0.17	0.16	0.16	0.16
Mean		70.0		60.5		58.8		55.7		11.0		4.7		26.8		27.8		0.5		0.5		0.17		0.16	
Saudi Arabia	Con	55.7	56.4	77.6	79.6	30.5	31.6	42.2	42.5	25.2	24.8	35.4	37.1	33.7	34.1	32.8	35.6	0.3	0.3	0.3	0.3	0.18	0.18	0.17	0.17
	600	59.1	60.1	85.6	86.4	35.9	39.6	44.8	45.9	23.2	20.5	40.8	40.5	44.8	45.1	43.5	44.1	0.5	0.6	0.5	0.5	0.18	0.17	0.15	0.15
	800	63.5	64.5	86.3	86.8	40.2	41.1	46.7	47.8	23.3	23.4	39.6	39.0	46.5	47.1	48.6	49.5	0.6	0.6	0.6	0.6	0.15	0.15	0.14	0.13
	Mean	59.4	60.3	83.2	84.3	35.3	37.4	44.6	45.4	23.9	22.9	38.6	38.9	41.7	42.1	41.6	43.1	0.5	0.5	0.5	0.5	0.17	0.17	0.15	0.15
Mean		59.9		83.8		36.4		45.0		23.4		38.8		41.9		42.4		0.5		0.5		0.17		0.15	
LSD at 5%		A= 2.7 B= 3.4 AB= 4.8	A= 2.7 B= 3.5 AB= 4.9	A= 4.0 B= 4.5 AB= 6.3	A= 4.1 B= 4.6 AB= 6.5	A= 3.2 B= 3.9 AB= 5.6	A= 3.2 B= 4.0 AB= 5.8	A= 3.2 B= 3.9 AB= 5.6	A= 3.2 B= 4.0 AB= 5.7	A=1. 9 B= 2.2 AB= 3.9	A= 1.9 B= 2.3 AB= 4.0	A= 1.9 B= 2.5 AB= 4.2	A= 1.9 B= 2.7 AB= 4.5	A=2. 1 B= 2.5 AB= 3.5	A= 2.2 B= 2.6 AB= 3.6	A= 2.3 B= 2.8 AB= 4.0	A= 2.3 B= 2.8 AB= 3.9	A= 0.07 B= 0.09 AB= 0.1	A= 0.06 B= 0.09 AB= 0.1	A= 0.06 B= 0.09 AB= 0.1	A= 0.07 B=.0 AB= 0.1	A=0. 01 B= 0.01 AB= 0.02	A= 0.1 B= 0.01 AB= 0.02	A= 0.01 B= 0.01 AB= 0.02	A= 0.01 B= 0.01 AB= 0.02

These obtained results in (Fig. 4) confirmed differs contents of macro elements under two climates Egypt and Saudi Arabia, maximum contents of fruit nitrogen was found under Saudi Arabia for two cultivars, while Sagae cv. had biggest content of phosphorus under Saudi Arabia than Khalas cv. that had the highest contents under Egypt climate, large fruit potassium contents produced under Egypt climate for two cvs. Mg fruit content haven't significant differs under two different climates

Fruit micro elements ppm

Micro elements Fe, Mn and Zn ppm (Table 8) realized different values with two tested extract, Fe ppm under Egypt climate revealed increasing values with 800 ppm comparing control treatment above Saudi Arabia climate, Fe ppm ascending from control treatment 175.0 and 182.0 ppm to 600 ppm pollen grains extract 215.0 and 224.0 and at 800 ppm pollen grains extract 228.0 and 230.0 ppm respectively for cultivars and seasons, Mn fruit contents displayed significant varying between two climates and treatments, the maximum contents were derived under Saudi Arabia with 800 ppm pollen grains extract 18.5 and 20.1 ppm for Khalas cv. and 17.0 and 22.5 ppm for Sagae cv. respectively for two seasons upon control treatments, Zn ppm clarified rising contents under Egypt climate from control treatment 50.8 and 54.2 for Khalas cv and 43.4 and 45.8 ppm for Sagae cv. less than 800 ppm which gave the great

contents of fruit Zn 53.9 and 58.6 for Khalas cv. and 52.8 and 56.8 ppm for Sagae cv. respectively for two seasons, while Saudi Arabia climate had fewer contents of fruit Zn with two applications of pollen grains. Statistical results on the micro elements (Fig. 5) showed relatively differs between two climates and extract levels of date palm pollen grains in relation to iron and zinc presented highest mean value under Egypt climate, however the fruit Mn contents were significantly highest under Saudi Arabia in the Sagae cv.

Table 7. Effect of spraying date palm pollen grains on the fruit contents of microelements of Khalas and Sagae cvs. under Egypt and Saudi Arabia.

Treatments		%															
		N				P				K				Mg			
		Khalas cv.		Sagae cv.		Khalas cv.		Sagae cv.		Khalas cv.		Sagae cv.		Khalas cv.		Sagae cv.	
A	B	1st	2nd	1st	2nd	1st	2nd	1st	2nd	1st	2nd	1st	2nd	1st	2nd	1st	2nd
Egypt	Con	1.1	1.2	0.7	0.8	0.32	0.32	0.31	0.31	0.3	0.3	0.3	0.3	0.09	0.09	0.09	0.09
	600	1.2	1.2	1.0	1.0	0.33	0.34	0.34	0.34	0.4	0.5	0.3	0.5	0.13	0.14	0.13	0.13
	800	1.3	1.4	1.2	1.3	0.35	0.36	0.36	0.36	0.5	0.6	0.6	0.6	0.14	0.16	0.15	0.16
	Mean	1.2	1.3	0.97	1.03	0.33	0.33	0.34	0.34	0.37	0.47	0.4	0.47	0.12	0.13	0.12	0.14
		1.3		1.0		0.33		0.34		0.4		0.44		0.13		0.13	
Saudi Arabia	Con	1.2	1.3	1.4	1.4	0.04	0.04	0.03	0.03	0.20	0.2	0.20	0.38	0.11	0.12	0.10	0.10
	600	1.3	1.5	1.4	1.7	0.06	0.06	0.05	0.07	0.23	0.3	0.24	0.39	0.13	0.14	0.12	0.13
	800	1.4	1.6	1.5	1.8	0.07	0.08	0.06	0.09	0.25	0.4	0.25	0.41	0.14	0.16	0.13	0.15
	Mean	1.3	1.5	1.4	1.6	0.06	0.06	0.05	0.06	0.23	0.3	0.23	0.39	0.13	0.14	0.12	0.13
		1.4		1.5		0.06		0.4		0.27		0.31		0.14		0.13	
LSD at 5%		A= 0.1 B= 0.2 AB=0.2	A=0.1 B= 0.2 AB= 0.2	A= 0.1 B= 0.2 AB= 0.2	A= 0.1 B= 0.2 AB= 0.3	A=0.06 B= 0.07 AB=0.1	A=0.06 B= 0.07 AB=0.1	A= 0.1 B=0.1 AB=0.1	A=0.1 B=0.2 AB=0.2	A=0.1 B=0.1 AB=0.2	A= 0.1 B=0.1 AB=0.2	A=0.1 B= 0.2 AB= 0.2	A= 0.2 B=0.3 AB=0.3	A= 0.01 B= 0.01 AB=0.02	A= 0.01 B= 0.01 AB=0.02	A= 0.2 B=0.2 AB= 0.3	A= 0.2 B=0.2 AB=0.3

Table 8. Effect of spraying date palm pollen extract on the date palm fruits macro elements of Khalas and Sagae cvs. in Egypt and Saudi Arabia.

Treatments		ppm											
		Fe				Mn				Zn			
		Khalas cv.		Sagae cv.		Khalas cv.		Sagae cv.		Khalas cv.		Sagae cv.	
A	B	1st	2nd	1st	2nd	1st	2nd	1st	2nd	1st	2nd	1st	2nd
Egypt	Con	175.0	182.0	47.0	47.7	15.2	15.7	11.3	11.4	50.8	54.2	43.4	45.8
	600	215.0	224.0	118.0	125.3	16.6	17.3	11.5	12.4	50.9	56.4	51.5	56.3
	800	228.0	230.0	179.3	210.7	17.5	18.9	12.9	13.6	53.9	58.6	52.8	56.8
	Mean	206	212	115	127.7	16.4	17.3	11.9	12.5	51.9	56.4	49.2	52.9
		209		121.4		16.9		12.2		54.2		51.1	
Saudi Arabia	Con	98	99	95	95	17.0	17.0	14.6	14.8	40.0	40.3	39.8	39.9
	600	109	109	106	110	17.8	18.8	15.6	21.0	41.5	42.7	42.0	43.3
	800	111	114	112	115	18.5	20.1	17.0	22.5	43.2	44.3	45.5	45.8
	Mean	106	107.3	104.3	106.7	17.8	18.6	15.7	19.4	41.6	42.4	42.4	43.0
		106.7		105.5		18.2		17.6		42.0		42.7	
LSD at 5%		A=7.8 B= 9.1 AB=12.2	A= 8.6 B= 10.3 AB= 13.3	A= 5.8 B=7.1 AB=10.1	A=6.0 B= 7.5 AB= 10.6	A=1.2 B=1.4 AB=2.1	A= 1.4 B= 1.7 AB=2.4	A= 1.1 B= 1.3 AB= 1.9	A= 1.2 B= 1.4 AB= 2.1	A= 1.6 B= 2.0 AB=2.8	A=1.8 B= 2.3 AB=2.9	A= 4.1 B= 5.1 AB= 7.2	A= 4.1 B= 5.1 AB= 7.2

Discussion

Documents related to the importance of foliage spraying, Spraying plants are widely used to correct a nutrition insufficiency or to prove nutrients and it is preferable where this soil is usually poor in their nutrients content (El-Kholy *et al.* 1994) foliar spray at specific plant growth stages, which containing mineral can be used as a primary technique for

maximizing plants productivity (Chen *et al.,* 2004), or nutrient may be loss from agricultural land which encourage the agriculture practitioner to find efficient ways to fertilizers supplements (Dong *et al.* 2005), spraying fruit set with date palm pollen grains as biofertilizers treatments that create many useful effects for plants, Biofertilizers consider as environment friendly as well as decreased agricultural costs, play an important role in enhancing crop productivity through enhancing nutritional status of leaves by effective microorganisms in improving the availability of nutrients through hormonal exudates and absorption of available nutrients (Eissa, 2003).

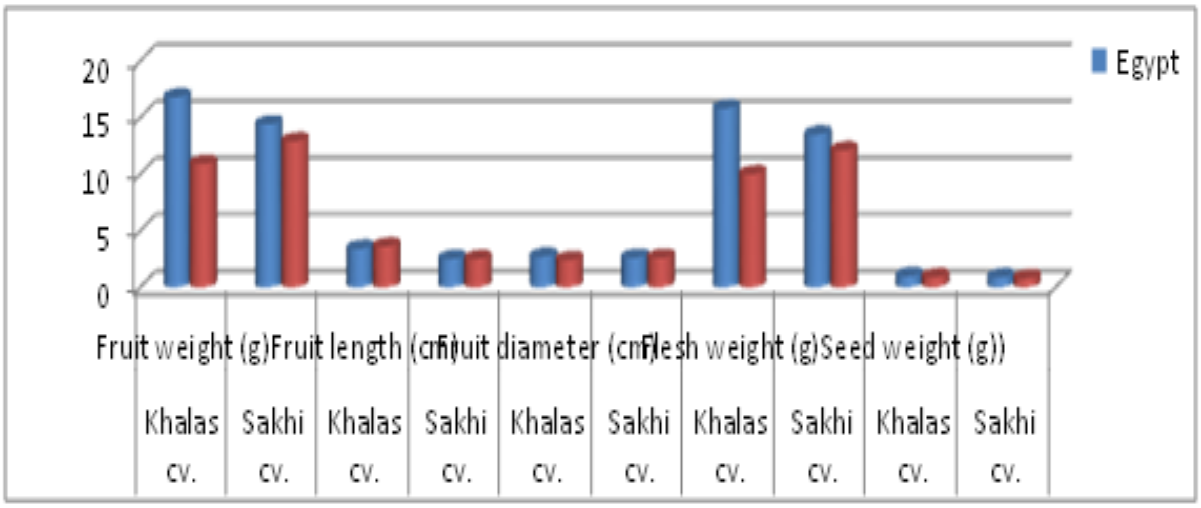

Fig. 1. Fruits physical characters of date palm under Egypt and Saudi Arabia conditions.

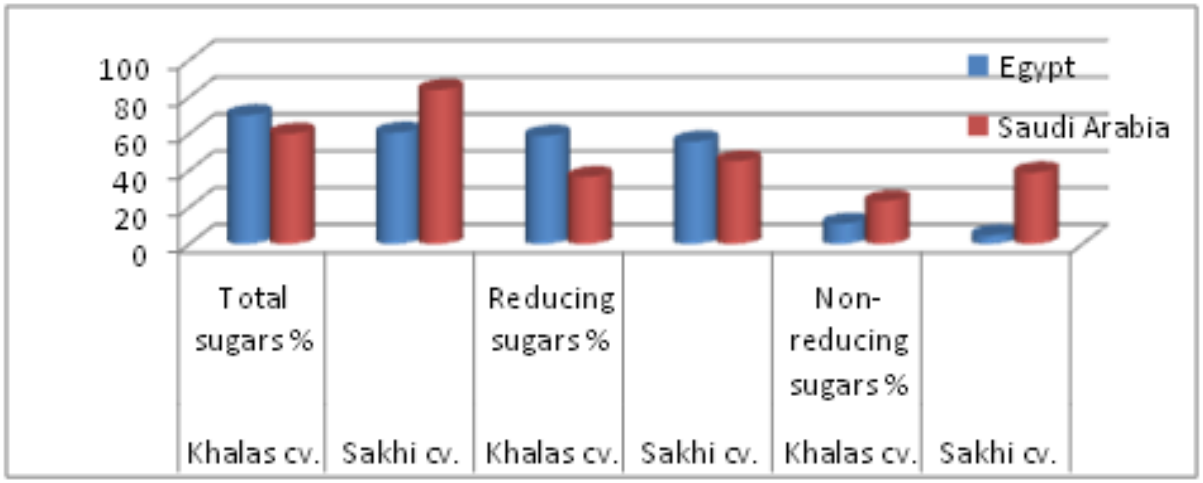

Fig. 2. Fruits contents of sugars under Egypt and Saudi Arabia.

Increasing all physical fruit characteristics referred to important components as amino acids and different macro and micro elements which reflected on the estimations fruits, these agreement by other scientists as, Amino acids are organic nitrogenous compounds which involved in proteins synthesis and have stimulating effect on the growth and some chemical constituents (Talaat *et al.* 2005), Amino acids are essential for plant growth as they are involved in the biosynthesis plant compound (Abou Dahab and Nahed 2006), amino acid stimulants can be improve fertilizer assimilation, increase uptake of nutrients and water, enhancing photosynthetic rate and dry matter partitioning therefore increase crop yield (Dinnoo *et al.* 2009), Rashied pollen grains enhancing fruit set, fruit retention and enhanced fruit dimensions, bunch weight and yield per palm, also increasing of total soluble solids, reducing sugars,

non-reducing and total sugars (Merwad *et al.* 2015), pollen grains + Milagro as activator resulted in the highest effect in increasing fruit set, fruit retention %, yield/palm (Kg) and chemical properties of Zaghloul date palm cultivar (Omaima Hafez *et al.* 2015), other natural extracts were used to increasing fruit characters as, spraying yeast extract at 2.5 gm/L, citric and ascorbic acids each at 100 ppm positive action on weight, cluster volume, number of berries per cluster, number of clusters per vine and yield (Mostafa *et al.* 2007), humic acid extract increased bunch length and diameter, berry weight, width and length increasing cluster of grape cv.

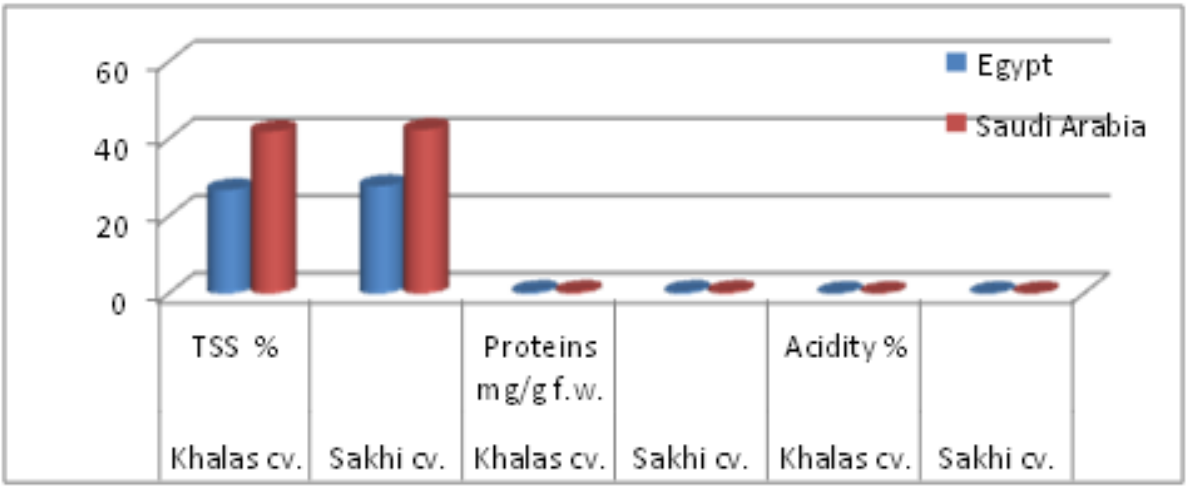

Fig. 3. fruits contents of TSS%, Proteins mg/g f.w. and acidity % under Egypt and Saudi Arabia.

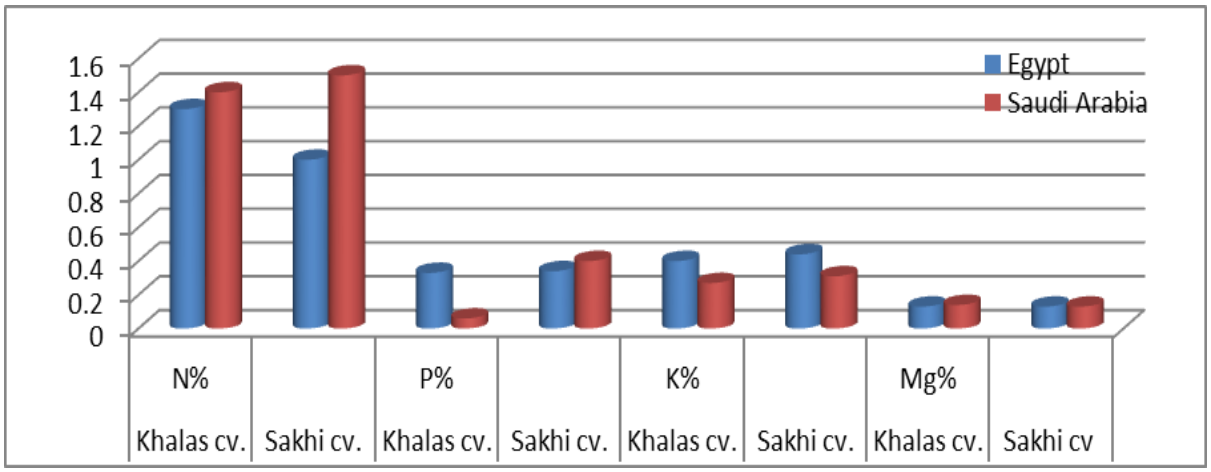

Fig. 4. fruit contents of macro elements under Egypt and Saudi Arabia condition.

Italia (Ferrara and Brunetti 2010 and Abd El-Ghany *et al.* 2001 on Thompson seedless' grapevines), amino acids sprayings at concentrations of 0.02-0.06% significant increments in the panicle length of mango trees, number of fruits (Mouco *et al.* 2009), nut weight, kernel weight and length of pecan nut cv. western Schley with 5 ml/L supramino + 0.5% urea+0.1% boric acid+0.5% zinc sulphate (Naira Ashraf *et al.* 2013), 0.5, 1.0 and 1.5 g/l pollen grains were significantly highiest fruit set, bunch weight and total yield per tree of 'Helali' date palm cultivar (Adel Alqurashi 2011), 1g pollen grain with 1g Milagro Stimcrop recorded the highest physical and chemical characteristics of fruits expressed by fruit shape, weight, volume, flesh value, bunch weight and yield/tree values for fruitset and retained fruits (Malaka Saleh *et al.* 2014), reducing sugars and total sugars were markedly enhanced. bunch spraying of 0.2 borax + 0.2% potassium sulphate and 0.4 % borax + 0.4 % potassium sulphate and soil fertilizers

treatments with magnesium and zinc as sulphate at 200 and 400 mg/tree produced highest fruit and flesh weight, fruit length and diameter, contents of TSS %, protein, total sugars, reducing and non-reducing % sugars and high fruit macro and micro elements (Darwesh *et al.* 2015), spraying date palm pollen grains at 2 g + 3 g sugar /l increased highest bunch weight and yield highest fruit quality of Segae date palm cultivar (Soliman *et al.* 2017).

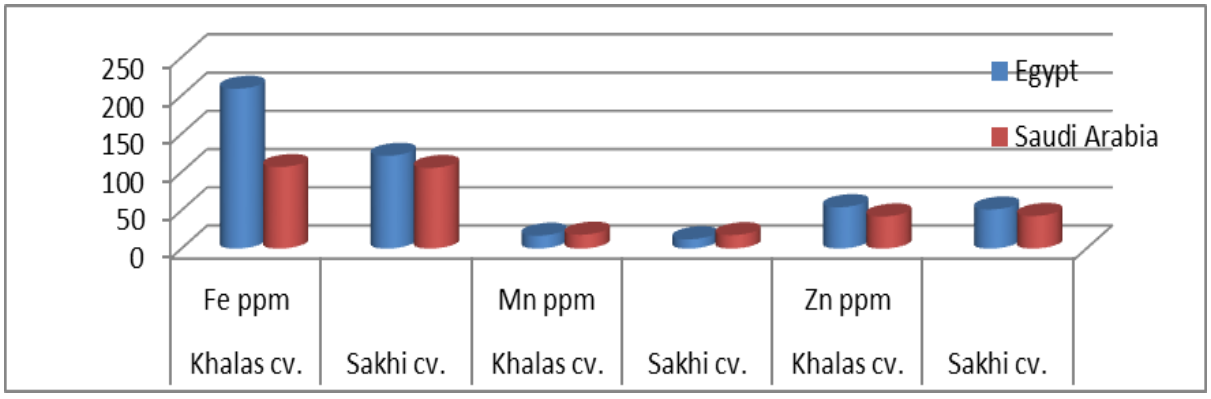

Fig. 5. Fruit contents of micro elements under Egypt and Saudi Arabia condition.

Conclusion

Date palm pollen grains own an effective components as amino acids, hormones, macro and micro elements, proteins, carbohydrates and fatty acids hence causing useful effect for increasing growth by supplying plants with sufficient and stimulants necessary constituents, the document results were found exhibited that pollen grains extract at 800 ppm for enhancing fruit quality (morphology and chemical estimations) for two studied cultivars under two climates.

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References

Abd El Moniem EA, Abd-Allah ASE. 2008. Effect of Green Alga Cells Extract as Foliar Spray on Vegetative Growth, Yield and Berries Quality of Superior Grapevines. American-Eurasian Journal Agricultural & Environmental. Sciences **4(4),** 427-433

A.O.A.C. 1995. Official Methods of Analysis. 13th Ed. Association of Official Analytical Chemists, Washington D.C., USA.

Abd-Allah ASE, Abd El-Razek E, Mona Abdalla A, Saleh MMS. 2013. Effect of spraying Lemongrass extract at full bloom on yield and fruit quality of 'Flame seedless' grape. Journal of Applied Sciences Research **9(2),** 1244-1248 Horticulture Crops & Technology Department.

Abed El-Azim MH, El-Mesalamy AM, Yassin, FA, Khalil SA. 2015. Identification Phenolic and Biological Activities of Methanolic Extract of Date Palm Pollen (*Phoenix dactylifera*). Journal of Microbial Biochemical Technology **7(1).**

Abd El-Ghany AA, Marwad IA, El-Samir A, El-Said BA. 2001. The effect of two yeast strains or their extraction on vines growth and cluster quality of 'Thompson seedless' grapevines. Assuit Journal of Agricultural Science **32,** 214–224.

Abd El-Migeed MMM, Mostafa EAM, Ashour NE, Hassan HAS, Dorria M Mohamed, Saleh MMS. 2013. Effect of potassium and polyamine sprays on fruit set, fruit retention, yield and fruit quality of Amhat Date Palm. International Journal of Agricultural Research **8(2),** 77-86. http://dx.doi.org/10.3923/ijar.2013.77.86

Abd El-Razek E, Saleh MMS. 2012. Improve Productivity and Fruit Quality of Florida Prince Peach Trees Using Foliar and Soil Applications of Amino Acids. Middle-East Journal of Scientific Research **12(8),** 1165-1172.
http://dx.doi.org/10.5829/idosi.mejsr.2012.12.8.1861

Abou Dahab TAM, Nahed Abd El-Aziz G. 2006. Physiological Effect of Diphenylamin and Tryptophan on the Growth and Chemical Constituents of *Philodendron erubescens* Plants World Journal of Agricultural Sciences **2(1)**, 75-81 © IDOSI Publications, 2006.

Al-Jebori K. 2006. Effect of gibberellin and liquorice extract on fruit chemical characteristics of date palm fruits *Phoenix dactylifera* L. *zahdi* cv. Iraq academic, Al-Anbar University **1(4),** 205-211 Department of Horticulture- College of Agriculture/University of Baghdad.

Al-Samarai AH, Al-Salihi FG, Al-Samarai RR. 2016. Phytochemical constituents and nutrient evaluation of date palm (*Phoenix dactylifera* L.) pollen grains. Tikrit Journal of Pure Science **21(1),** 56-62. Department of Chemistry, College of Education, Samara University, Samara, Iraq.

Alqurashi AD. 2011. Effect of pollen grain-water suspension spray on fruit set, yield and quality of Helali. Date palm (*Phoenix dactylifera* L.). Journal of Applied Horticulture, **13(1),** 44-47.
www. Horticulture research.

Al-Wasfy MMM. 2014. Yield and fruit quality of Zaghloul date palm nin relation to using new technique of pollination. Stem. Cell **5(1),** 14-17. http://dx.doi.org/10.7537/marsscj050114.03

Awad MA. 2010. Pollination of Date Palm (*Phoenix dactylifera* L. 'Lulu') with Pollen Grains Water Suspension. Proc. 4th Int. Date Palm Conference. Acta Hort. 882, ISHS 2010, 337-344.
http://dx.doi.org/10.4197/Met. 22-1.7

Ayad HS, Yousef ARM, El-Moursi A. 2011. Improving fruit and oil quality of Picual olive through exogenous application of putrescine and stigmasterol. N.Y. Science Journal **4,** 40-45.
www.sciencepub.net

Al-Khateeb AA, Al-jabr AM, Al-jabr AM. 2006. Date Palm in Saudi Arabia. Date Palm Research Center, Ministry of Agriculture, Al-Hassa, Saudi Arabia (in Arabic).

Bishr M, Samar YD. 2012. Comparative Study of the Nutritional Value of Four Types of Egyptian Palm Pollens. Journal of Pharmacy and Nutrition Sciences **2(2),** 50-56.

Bradford MM. 1976. A Rapid and Sensitive Method for the Quantitation of microgram quantities of protein utilizing the principal of protein-Dye Binding. Analytical Biochemistry **72,** 248-254.

Chen Y, De Nobili M, Avid T. 2004. Stimulatory effects of humic substances on plant growth. In: F. MAGDOFF; R. R. WEIL (Eds.): Soil Organic Matter in Sustainable Agriculture, 103-129 CRC Press, New York, USA.

Darwesh Rasmia SS, Amal Zein El-Din FM, Eman Zayed MM, Gehan Salama MY. 2015. Inducing date palm somatic embryogenesis and plantlets growth using date palm pollen grains extract. Egypt Journal Hort. **42 (1)**: 389 - 403 Central Lab. For Date Palm Researches and Development, Agricultural Research Centre, Cairo, Egypt.

Darwesh, Rasmia SS, Essam A, Madbolly, Abd-El Hameed KH. 2015. Influence Spraying Fruit Set and Soil Application on the Quality of Date Palm Fruits (*Phoenix Dactylifera* L.) Cv. Sewi. International Journal of Chemical, Environmental & Biological Sciences (IJCEBS) **3(2),** 183- 189 Central Lab. For Date Palm Researches and Development, Agricultural Research Centre, Cairo, Egypt.

Dinnoo YS, Boodia N, Sembhoo C. 2009. Effect of naturally occurring amino acid stimulants on the growth and yield of hot peppers (*Capsicum annum* L.). Journal of Animal & Plant Sciences **5(1),** 414-424.
www.biosciences.elewa.org/JAPS

Dong S, Cheng L, Scagel CF, Fuchigami LH. 2005. Timing of urea application affects leaf and root N uptake in young Fuji/M9 apple trees. Journal of Horticultural Science Biotechnology. **80,** 116-120.

El-Kholy SA, Afify MM, Mazrou MM, Morsy GA. 1994. Effect of Foliar Nutrition with Ferty- X Fertilizer on the Growth and Essential Oil Production. Menofiya Journal Agricultural Research **19(1-2),** 449.

El-Salhy AM, El-Bana AA, Abdel-Galil HA, Ahmed EFS. 2010. Effect of pollen grains suspensions spraying on yield and fruit quality of Saidy date palm. Acta Horticulture **882,** 329-336
http://dx.doi.org/10.17660/ActaHortic.2010.882.37

Eissa EM. 2003. Effect of some biostimulants on vegetative growth yield and fruit quality of "Kelsey " plum. Egypt Journal of Applied Science **18(5B),** 175- 194
www.insipub.com/ajbas/2008/1432-1437.pdf

EL-Boray MS, Mostafa MF, Shaltout AD, Hassan KH. 2015. Influence of fulvic acid plus some microelements and microorganisms on yield and quality characteristics of superior seedless grapevines. Journal of Plant Production, Mansoura University **6(3),** 287 -305.
www.SolidDocument.com

Enas Ali AM, Sarrwy SMA, Hassan HSA. 2010. Improving Canino Apricot Trees Productivity by Foliar Spraying with Polyamines. Journal of Applied Sciences Research **6(9),** 1359-1365 © 2010, INSInet Publication.

Farouk A, Metwaly A, Mohsen M. 2015. Chemical Composition and antioxidant activity of Date Palm pollen grains (*Phoenix dactylifera* L. Palmae) essential oil for Siwe Cultivar Cultivated in Egypt. Middle East Journal of Applied Sciences **5(4)** 945-949. Flavor and Aromatic Chem. Dept., National Research Center, Dokki, Giza, Egypt. Current Research Web.

Ferrara G, Brunetti G. 2010. Effects of the times of application of a soil humic acid on berry quality of table grape (*Vitis vinifera* L.) cv. *italia*. Spanish Journal Agricultural Research **8,** 817-822.
www.inia.es/sjar

Ghnimi S, Umer S, Karim A, Afaf Kamal-Eldin. 2016. Date fruit (*Phoenix dactylifera* L.): An underutilized food seeking industrial valorization. NFS Journal **6(2017),** 1–10
https://doi.org/10.1016/j.nfs.2016.12.001

Hassan Hazem MM. 2011. Chemical Composition and Nutritional Value of Palm Pollen Grains. Global Journal of Biotechnology & Biochemistry **6(1),** 01-07. © IDOSI Publications, 2011.

Jackson ML. 1973. Soil Chemical Analysis. Prentice-Hall, Inc. India.

Malaka Saleh A, El- Shamma MS, Omaima M Hafez, Essam A Mostafa, Naguib MM. 2014. Improving Pollination Process of Samani Date Palm Cultivar Using the Bio-Activator Milagro Stimcrop. International Journal of Plant & Soil Science **3(10),** 1200-1209
www.sciencedomain.org

Malik AU, Singh Z. 2006. Improved fruit retention, yield and fruit quality in mango with exogenous application of polyamines. Science Horticulture **110,** 167-174
www.Springer.com

Mohammadi AH, Aboutalebi AH, Hassanzadeh H, Mohammadi M. 2008. Effect of plant growth regulators on quantitative and qualitative characteristics of Shahani date fruit. Journal of Research in Agricultural Sciences **4(2),** 204-212.

Merwad MA, Mostafa EAM, Saleh MMS, Mansour AA. 2015. Yield and fruit quality of Hayany date palm as affected by different pollen grain sources. International Journal of Chem Tech Research **8(6),** 544-549.
www.sphinxsai.com

Molaie H, Panahi B, Tajabadipour A. 2013. The effect of foliar application of some amino acid compounds on photosynthesis and yield of two commercial cultivars in pistachio orchards of Kerman province in Iran. International Journal of Agriculture and Crop Sciences **5(23),** 2827-2830
www.ijagcs.com

Mostafa MFM, El-Boray MS, Mostafa MF, Hamed AA. 2007. Effect of some bio stimulants on yield and berry qualities of grapevines. Journal of Agricultural Science - 4744 Mansoura University **32 (6),** 4729.

Mouco, MA do C, de Lima MAC, Da Silva AL, Dos Santos SCA, Rodrigues FM, Oostguyse SA. 2009. Amino acids on mango yield and fruit quality at Submedio Sao Francisco Region, Brazil UNESP Institutional Repository. Viii International Mango Symposium. Leuven 1: Int Soc Horticultural Science **820,** 437-442.

Nagai T, Inoue R, Inoue H, Suzuki N. 2002. Scavenging capacities of pollen extracts from *Cistus ladaniferus* on autoxidation, superoxide radicals, hydroxyl radicals and DPPH radicals. Nutr Res **22,** 519–26.

Naira Ashraf, Moieza Ashraf, Hassan GH, Rehman MU, Dar NA, Inayat MK, Iqbal U, Banday SA. 2013. Effect of foliar application of nutrients and biostimulant on nut quality and leaf nutrient status of pecan nut cv. "Western Schley". African Journal of Agricultural Research **8(6),** 559-563.
https://doi.org/10.5897/AJAR12.1685

Naseri B, Abdalhossein Aboutalebi A, Khademi R. 2013. Effects of calcium and micro-nutrients amino chelate on quantity and quality of 'Kabkab' date fruit. International Journal of Farming and Allied Sciences **2(S2),** 1302-1306.
www.ijfas.com

Omaima Hafez M, Nagwa SZ, Malaka Saleh A, Mostafa EAM, El-Shamma MS. 2015. Effect of the Bio-activator Milagro on Pollination Efficiency and Fruit quality of Zaghloul Date Palm Cultivar. International Journal of Chem. Tech. Research **8(4),** 1502-1508
www.sphinxsai.com

Omaima Hafez M, Malaka Saleh A, Mostafa EAM, El- Shamma MS, Maksoud MA. 2013. Improving pollination efficiency, yield and fruit quality of two date palm cultivars using growth activator. International Journal of Agriculture Research 1-9.
http://dx.doi.org/10.3923/ijar.2013

Porter BN. 1993. Sacred Trees, Date Palms, and the Royal Persona of Ashurnasirpal II, J.Near Eastern Stud. **52(2),** 129–139.

Shales O, Schales SS. 1945. A simple method for the determination of glucose in blood. Arch. Biochem. **8,** 285-289.

Soliman SS, ALEbidi AI, AL-Saif AM, AL-Obeed RS, AL-Bahelly AN. 2017. Impact of pollination by pollen grain- water suspension spray on yield and fruit quality of Sagae date palm cultivar (*Phoenix dactylifera* L.) Pak. J. Bot., **49(1),** 119-123. Plant Production Dept., College of Food & Agric. Sciences, King Saud University, Box 2460, Riyadh 11451, Saudi Arabia.

Snedecor GW, Cochran WG. 1990. Statistical Methods. 11th Ed. Iowa State Univ., Press. Ames, Iowa, USA.

Talaat Iman M, Bekheta MA, Mona Mahgoub M. 2005. Physiological response of periwinkle plants (*Catharanthus roseus* L.) to tryptophan and putrescine. International. Journal of Agriculture Biology **2,** 210-213.
www.ijab.org