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Effect of Spraying Some Nutrients on Fruiting of Sewy Date palm (*Phoenix dactylifera L.*) Under New Valley Conditions

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Abstract

This study was carried out during two successive seasons of 2019 and 2020. To evaluate the effect of some nutrients spray on yield and fruit quality of Sewy date palm cultivar grown under El-Kharga Oasis , New Valley conditions. The experiment was set up in a complete randomized block design with ten treatments, using five replicates, bunch each. The data revealed that: Mega phosphor, omega potas and omega cal-mag spray significantly increased the fruit retention and bunch weight compared to the untreated ones. Omega potas application was more effective compared with omega cal-mag or mega phosphor. Spraying either mega phosphor, omega potas or omega cal-mag at any studied concentration was accompanied by improving fruit quality in terms of a significant increase in fruit weight, total soluble solids, sugars contents, NPK and beta carotene and significantly decreased in total acidity tannins and phenols compared to control. The best results were obtained when using 4 cm^3/L of omega potas or 4 cm^3/L of omega cal-mag or 4cm^3/L of mega phosphor, respectively. Also, no significant differences were found between spraying the two concentrations (2 cm^3 or 4 cm^3 of mega phosphor, omega potas and omega cal-mag. Therefore, from the results of the study, it could be concluded that must be sprayed the date bunches with 2 cm^3/L of omega potas or 2 cm^3/L of omega cal-mag to obtain a high yield with good properties, hence, high value marketing.

Keywords: Date palm, Nutrients, fruit quality.

Introduction

Date palm (*Phoenix dactylifera L.*) is considered an old fruit tree in many countries all over the world**.** Dates are high energy food and rich in carbohydrates (60-70% sugar, mainly glucose and fructose) serve as an important food **(Wrigley, 1995).** It is one of the main crops to grow in the arid land of most countries of the Middle East and North Africa and affects the high proportion of the economics of these countries **(FAO, 2016)**. Date palm is grown in Egypt in both Nile Valley, and desert districts. The total area and number of females reached 117073 feddans and 14379648 palms. The produced yield reached 1465030 tons according to **Ministry of Agriculture and Land Reclamation (M.A.L.R.) (2019)**. Date palm cultivars are of three main types according to its fruit moisture content and they are classified as soft, semi-dry and dry cultivars (**Selim *et al*., 1970**). Sewy dates are one of the important semi-dry varieties that are suitable for packaging, processing and storage, it is considered to be one of the most important varieties for local market and export. It is located in New Valley, Al Bahareya Oasis, Al Fayoum and Al Giza Governorates **(Jaradat and Zaid, 2004).** The dates yield and quality are variable due to various factors such as cultivar, region, climate, fertilization and cultural practices. One of the important affecting yield and fruit quality of date palm is fertilization. Macro and micro-elements cause an efficient yield and fruit quality improvement while soil application can supply enough nutrients to improve date palm production. Also, it causes worldwide anxiety about environmental pollution by nutrients leaching into groundwater **(Dinnes *et al*., 2002)**. Foliar fertilization had advantage of low application rates. Uniform distribution of fertilizer materials and quick responses to applied nutrients **(Umar *et al*., 1999)**. One of the best tools for date palm productive potential studies is the direct application of nutrient elements on inflorescences and fruit **(Al-Khateeb *et al*., 2006)**. Spraying macro and micronutrients had also an important role in the development and cause efficient yield and quality improvement **(Umar *et al*., 1999)**. Nitrogen is a major element required by all plans and adequate nitrogen is essential for tree growth, leaf cover, blossom formation, and fruit set and fruit size. **(Sharma, 2016)**. Potassium showed a great role in controlling cell water content and carbohydrates biosynthesis and mobilization in plant tissues, consequently carbohydrates play a serious role in fruit set and retention **(Khayyat *et al*, 2007; Shahin, 2007; Harhash and Abdel-Nasser, 2010)**. Potassium is an important solute in expanding cells and expansive growth that very sensitive to K deficiency. Also potassium is needed for the enlargement of fruit **(Marschner, 1995)**. Potassium activates the enzymes involved in sugar biosynthesis and helps in translocation of sugars **(Archer, 1988)**. Many investigators studied the effect of potassium and/or boron spraying on fruit set, yield and fruit quality. **Al-Hamoudi (2006)** reported that spraying of Barhee date palm with potassium sulfate or boric acid significantly increased fruit retention, physical and chemical fruit parameters. Phosphorus is very important in the metabolic processes, i.e. blooming and flower development. It is the main constituent of energy compounds (ATP and ADP) genetic information system, cell membranes, phospholipids, nucleic acid, nucleotids and co-enzymes (**Marschner, 1995**). Spraying date palm inflorescences with boric acid and/or calcium nitrate had a significant effect on fruit set, yield and fruit quality **(Sarrwy *et al* 2012 and Omar *et al* 2015)**. Calcium plays a main role in protecting the structure and quality of the cell wall by preventing the germination of fungal spores and by blocking destructive enzymatic reactions, thus helping to fruit firmness **(Biggs., 1999)**. Calcium is known as one of the most essential minerals that decide the quality of the fruit because it is needed for cell elongation and cell division **(Rizzi and Abruzzese, 1990)**. Calcium functions have emerged as a cross-linkage of the middle lamella that connects cells next to

each other. Also, it is necessary for enzymatic reactions, gives the equilibrium of both anions and cations in the plant and plays a main role in cell membrane stabilization **(Stebbins *et al*., 1972)**. Spraying micronutrients improves fruit set, fruit retention and development as well as yield and fruit quality **(Sarrwy *et al* 2012 and Omar *et al* 2015)**. Boron is involved in processes such as protein synthesis, transport of sugars, and carbohydrate metabolism **(Hänsch and Mendel, 2009)**. The impact of some microelements, such as boron on dates yield and fruit quality seems to play an important role in achieving satisfactory fruit set and fruit quality **(Attalla *et al* 2007 and Khayyat *et al* 2007)**. Therefore, the main objective of the current study is to evaluate the effect of some nutrients spraying on yield and fruit quality of Sewy date palm under New valley conditions.

Materials and Methods

The present study was carried out during the two successive seasons of 2019 and 2020 on 20 years old Sewy date palms. The selected palms were grown in sandy loam soil at the Research farm, New Valley University, El-Kharga Oasi, (lttitude 25°45' 30.38.99" and longitude 30°54' 63.96"), New valley Governorate, Egypt. The laboratory work was conducted in horticulture department faculty of agriculture, New Valley University and faculty of agriculture Assiut University. Five healthy palms nearly similar in growth vigor were selected. Regular agricultural practices were carried out as usual. The leaf/bunch ratio was adjusted at the end of the blooming season to meet its value of 8:1. Artificial pollination was uniformly performed in respect of source, date and method to avoid residues of metaxenia.

This investigation included the following ten spray treatments.

T_1: spraying water (control)

T_2: spraying 1 cm^3 mega phosphor / L water

T_3: spraying 2 cm^3 mega phosphor / L water

T_4: spraying 4 cm^3 mega phosphor / L water

T_5: spraying 1 cm^3 omega potas / L water

T_6: spraying 2 cm^3 omega potas / L water

T_7: spraying 4 cm^3 omega potas / L water

T_8: spraying 1 cm^3 omega cal-mag / L water

T_9: spraying 2 cm^3 omega cal-mag / L water

T_{10}: spraying 4 cm^3 omega cal-mag / L water

These treatments were applied on the same palm. Mega phosphor (as a source of phosphorous and potassium), omega potas (as a source of potassium) and omega Cal-mag (as a source of nitrogen, calcium and boron). Solutions were prepared by adding 1 or 2 or 4 cm^3/L water. All treatments were applied two times six weeks after pollination and one month later. Bunches were sprayed using a small hand sprayer until run-off bunches were separated from each side with plastic sheets to avoid any contamination between other treatments. The experiment was arranged in a randomized complete block design including ten treatments with five replications of one bunch each. The following parameters were determined to evaluate the effects of different treatments on yield and dates quality.

Yield components and fruit quality

Fruit retention percentage was estimated at harvest time. Five strands per bunch were randomly selected from each replication and the percentage was calculated as the following equation

$$\text{Fruit retained\%} = \frac{\text{Total number of retained fruits/strand}}{\text{number of retained fruit/strandand number of flower scars}} \times 100$$

The harvest took place at the peak of full color stage (before it´s quite ripe) and bunches weights were recorded. Samples of fifty fruits were picked at random from each replicate to determine some physical and fruit properties, i.e., fruit weight, fruit dimensions, percentage of fruit flesh. The chemical constituents i.e., sugar contents, were determined according to the methods of **AOAC, (1995).** Total soluble solids (TSS) were estimated using a hand refractometer. Beta-carotene is estimated according to the method described by **Ngkok and Solcha (1991).** Total phenols: date fruits (1/2 g) were extracted by 30 ml ethanol and water (1:1 v/v). The mixture was stirred for three h. at room temperature and then

centrifuged at 3000 rpm. The supernatant was collected and filtered. Total phenols of date fruits were determined using Folin-Ciocalteu reagent according to **Velioglu *et al*., (1998)**. Absorbance was measured at 725 nm using a UV-vis spectrophotometer. The blank contains ethanol and water (1:1v/v) and the reagents. The calibration curve was prepared by measuring the absorbance of the known concentration of gallic acid. Total phenolic contents were expressed as gallic acid equivalent (mg/100g) on a dry weight basis **(Asami *et al*., 2003)**. The tannin content was determined using the Indigo Carmen indicator according to **Balbaa (1981).** Titration was carried out using 0.1 N potassium permanganate solutions. Tannins in fresh weight were calculated (as total tannins percentage) according to the following equation: 1 ml potassium permanganate (0.1 N) = 0.00416 g. tannins. Percentages of N, P, K.: fruit sample of ten fruits/bunch were collected at harvest date. The samples were washed several times with tap water and rinsed with distilled water and air-dried at 70°C for 72h. The dry materials were ground in a stainless-steel mill and 0.5 g of each sample was digested using concentrated sulfuric acid and 30% hydrogen peroxide. The concentrations of N, P and K in the dried fruits were determined according to the following procedures outlined by **Wilde *et al*., (1985)**. Total nitrogen percentage was measured by the micro-kjeldahl methods **(Chapman and Pratt, 1975)**, phosphorus percentage was determined colorimetrically **(Peach and Tracey, 1968)** and potassium percentage was determined using flame photometer (**Piper, 1950**). All the obtained data were tabulated and analyzed according **to Gomez and Gomez, (1984)** using New L.S.D. test for distinguishing the significant differences between various treatment means according to **Steel and Torrie (1980).**

Results

Yield component: The retention percentage of fruits and bunch weight are considered as an index for the yield. Data presented in Table (1) show the effect of some nutrients spraying (mega phosphor, omega potas and omega cal-mag) on retention percentage of fruits and bunch weight of Sewy date palm during 2019 and 2020 seasons. It is obvious from the data that the results took a similar trend during the two studied seasons. In a general view, all treatments significantly increased the fruit retention percentage and bunch weight compared to control. No significant differences in fruit retention and bunch weight were recorded between spraying with mega phosphor, omega potas or omega cal-mag. Moreover, no significant differences were recorded due to using any treatment compared to other. There were significant differences between the sprayed any one and the control. The significantly least fruit retention (66.03%) and greatest values (68.99% as an average of two seasons) were recorded due to spray 2 cm^3/L mega phosphor (T_2) and 4 cm^3/L omega cal-mag (T_{10}), respectively. The lowest fruit retention was obtained from the control (64.87% as an average of two seasons). Then the corresponding increment percentage of fruit retention over control were ranged from (1.79 to 6.35%). On the other hand, the heaviest bunch weight was recorded from spraying 4 cm^3 omega potas/L (13.42 kg as an average of two seasons). While the lightest bunch weight was obtained from the control (10.82kg as an average of two seasons). Hence, the corresponding increment percentage of bunch weight over control were ranged from 7.86 to 24.09 as an av. two studied seasons. In a general view, the results show that spraying with any nutrient compound under studied significantly increased the fruit retention percentage and consequently increased the bunch weight compared to control. Also, there were no significant differences due to spray with any nutrient compound between them. Also, there was no significant increased fruit retention or bunch weight due to an increase in the spraying solution from 2 to 4%. Therefore, in terms of economy, it should be using the lower concentration, 2% of any sprayed compound.

Table (1): Effect of some nutrients spray on Fruit retention and bunch weight of Sewy date palm during 2019 and 2020 seasons

Treatments		Fruit retention %			Punch weight (kg)		
		2019	2020	Mean	2019	2020	Mean
Spraying water (control)	T_1	64.33^{b}	65.41^{b}	64.87	10.66^{d}	10.98^{d}	10.82
Spraying 1 cm^3 mega phosphor / L water	T_2	65.38^{a}	66.68^{a}	66.03	11.48^{c}	11.85^{c}	11.67
Spraying 2 cm^3 mega phosphor / L water	T_3	67.51^{a}	68.35^{a}	67.93	12.39^{b}	12.75^{b}	12.57
Spraying 4 cm^3 mega phosphor / L water	T_4	67.86^{a}	69.28^{a}	68.57	12.67^{ab}	13.08^{ab}	12.88
Spraying 1 cm^3 omega potas 45% / L water	T_5	65.93^{a}	66.95^{a}	66.44	11.65^{b}	11.98^{bc}	11.82
Spraying 2 cm^3 omega potas / L water	T_6	67.41^{a}	68.32^{a}	67.86	12.96^{ab}	13.35^{ab}	13.16
Spraying 4 cm^3 omega potas / L water.	T_7	67.92^{a}	68.63^{a}	68.27	13.25^{a}	13.58^{a}	13.42
Spraying 1 cm^3 omega cal-mag / L water.	T_8	65.89^{a}	67.55^{a}	66.72	11.60^{c}	11.95^{bc}	11.78
Spraying 2 cm^3 omega cal-mag / L water.	T_9	67.22^{a}	68.58^{a}	67.90	12.60^{ab}	13.00^{ab}	12.80
Spraying 4 cm^3 omega cal-mag /1 L water.	T_{10}	68.45^{a}	69.53^{a}	68.99	12.89^{ab}	13.31^{ab}	13.10
Revised LSD 5%		3.62	3.16		0.76	0.81	

Fruit quality

Physical properties: Data existing in Table (2) declared the effect of some nutrients spraying (mega phosphor, omega potas and omega cal-mag) on fruit weight, flesh % and fruit shape (L/D) of Sewy date palm during 2019 and 2020 seasons. It is obvious from the data that the results took a similar trend during the two studied seasons.

Spraying with mega phosphor, omega potas and omega cal-mag significantly increased the fruit weight and flesh % compared to control. Spraying 4 cm^3/L of omega potas gave the heaviest fruit weight (11.37g as an average of two seasons). The recorded fruits weight were (10.19, 10.70, 10.86, 10.24, 11.15, 11.37, 10.15, 10.88, 11.00 and 9.52g as an average of two seasons) due to spray by 1 cm^3/L of mega phosphor (T_2), 2 cm^3/L of mega phosphor (T_3), 4 cm^3/L of mega phosphor (T_4), 1 cm^3/L of omega potas (T_5), 2 cm^3/L of omega potas (T_6), 4 cm^3/L of omega potas (T_7), 1 cm^3/L of omega cal-mag (T_8), 2 cm^3/L of omega cal-mag (T_9), 4 cm^3/L of omega cal-mag (T_{10}) and spraying water (control, T_1), respectively. Hence, the corresponding increment percentage of fruit weight over untreated one was (7.04, 12.39, 14.08, 7.56, 17.12, 19.43, 6.62, 14.29 and 15.55% as an average of two seasons), respectively. On the other hand, there were no significant differences in the flesh % were recorded due to using any treatment compared to others. Also, the treatment significantly increased the flesh % compared to control. Additionally, there were no significant differences in the fruit shape (L/D) between any treatment compared to other or compared to untreated one (control).

Moreover, the results showed that there were no significant differences between the two concentrations (2 cm^3 or 4 cm^3) used of mega phosphor, omega potas and omega cal-mag, therefore, from the economic side, it is preferable to spray with a concentration of 2 cm^3 omega potas/L.

Chemical properties:

Data in Tables (3 and 4) and Figures (1, 2, 3 and 4) indicated that spraying bunches with mega phosphor, omega potas and omega cal-mag at any concentration was accompanied with improving the chemical fruit properties in terms of a significant increase in the total soluble solids (TSS), Sugars contents, N%, P mg/kg, K mg/kg and B. carotene and a significant decrease in the total acidity, phenols and tannins as compared to the control. No significant differences between spraying two concentrations (2 cm^3 or 4 cm^3) of mega phosphor, omega potas or omega cal-mag. The highest values of total soluble solids, sugars content, and K% and the lowest one of total acidity percentage and phenols were obtained due to spray 4 cm^3/L omega

Table (2): Effect of some nutrients spray on fruit weight, flesh % and fruit shape (L/D) Sewy dates during 2019 and 2020 seasons

Treatments	Fruit weight (g)			Flesh %			Fruit shape (L/D)		
	2019	2020	Mean	2019	2020	Mean	2019	2020	Mean
T1	9.57^{d}	9.46^{d}	9.52	85.12^{b}	84.86^{b}	84.99	1.58	1.57	1.58
T2	10.16^{c}	10.22^{c}	10.19	86.60^{a}	87.08^{a}	86.84	1.55	1.54	1.55
T3	10.68^{b}	10.71^{b}	10.70	86.59^{a}	86.89^{a}	86.74	1.56	1.55	1.56
T4	10.85^{b}	10.86^{b}	10.86	86.64^{a}	86.96^{a}	86.80	1.56	1.55	1.56
T5	10.22^{c}	10.25^{c}	10.24	86.75^{a}	87.03^{a}	86.89	1.56	1.54	1.55
T6	11.12^{ab}	11.17^{ab}	11.15	86.93^{a}	87.11^{a}	87.02	1.55	1.55	1.55
T7	11.36^{a}	11.38^{a}	11.37	86.83^{a}	86.96^{a}	86.90	1.56	1.55	1.56
T8	10.18^{c}	10.11^{c}	10.15	86.96^{a}	87.14^{a}	87.05	1.55	1.53	1.54
T9	10.85^{b}	10.90^{b}	10.88	86.92^{a}	86.98^{a}	86.95	1.56	1.55	1.56
T10	10.96^{ab}	11.03^{ab}	11.00	86.90^{a}	87.08^{a}	86.99	1.57	1.55	1.56
Revised LSD5%	0.44	0.38		1.36	1.45		N.S	N.S	

potas/L (T_7) followed by either 4 cm^3/L mega phosphor (T_4) or 4 cm^3/L omega cal-mag used. The obtained highest TSS value was (77.05% as an average of two seasons) due to spraying with 4cm3 omega potas/L. On the other hand, the least ones were (72.39% as an average of two seasons) were recorded on untreated bunches. Hence, the corresponding increment percentage attained (6.44%). Also, the least values of total acidity percentage (0.171 as an average of two seasons) was recorded on fruits of bunches sprayed with 4 cm^3 mega phosphor/L compared to the highest ones (0.217 as an average of two seasons) on fruits of untreated bunches (control). Hence, the corresponding decrement percentage of total acidity percentage attained (26.90% as an average of two seasons). The highest values of total sugars (70.45 and 69.80%) and reducing sugars (62.02 and 61.50% as an average of two seasons were recorded due to spray by 4 cm^3 omega potas/L and 4 cm^3 mega phosphor/L, respectively. Hence, the increment percentage of these traits attained total sugars (9.99 and 8.98%) and reducing sugars (8.99 and 7.93%) due to spray with 4 cm^3 omega potas/L and 4 cm^3 mega phosphor/L over control, respectively. On the other hand, the highest values of beta carotene (0.90 mg/100g DW as an average of two seasons were recorded due to spray with 4 cm^3 omega cal-mag/L. Hence, the corresponding increment percentage of these traits attained (25.00%) and (86.56%) due to spray with 4 cm^3 omega cal-mag/L over control, respectively. Moreover, the data indicated that the highest values of N% (0.52%), P (3.33 mg/kg) and K (8122 mg/kg) as an average of two seasons were recorded due to treating with 4 cm^3 omega cal-mag, 4 cm^3 mega phosphor and 4 cm^3 omega potas, respectively.

Generally, the above results disclosed that the omega potas spray revealed the highest improvement of the considered chemical fruit properties.

Discussion

Fertilization is an important and limiting factor of growth, nutritional status and fruiting of fruit trees. It is one of the tools of main practices that improving the soil fertility and in increasing fruit trees productivity. Foliar application may be a possible alternative for highly mobile nutrient such as, potassium, nitrogen and micronutrients **(Mengel, 2001)**. Foliar fertilization has the advantage of low application rates, uniform distribution of fertilizer materials and quick responses to applied nutrients **(Umar *et al.*, 1999)**. Nitrogen plays a key role in the nutrition of fruit trees. It is responsible for the biosynthesis of proteins, enzymes, organic nutrients, enhancing cell division and chlorophylls, building cellulose and lignin which play an important role in forming plant structure **(Mengel and Kirkby, 1987 and Miller *et al.*, 1990)**. Potassium is an important and essential element for the growth and fruiting of date palm trees, where dates

Table (3): Effect of some nutrients spray on TSS, total sugars and reducing sugars of Sewy dates during 2019 and 2020 seasons.

Treatments	TSS %			Total Sugars %			Reducing Sugars %		
	2019	2020	Mean	2019	2020	Mean	2019	2020	Mean
T1	72.14d	72.64d	72.39	63.45d	64.65d	64.05	56.69d	57.26c	56.98
T2	74.13c	74.18c	74.16	67.11c	67.36c	67.24	59.23c	58.87b	59.05
T3	75.53b	76.11ab	75.82	68.88b	69.81a	69.35	60.89ab	61.76a	61.33
T4	76.16ab	75.98ab	76.07	69.64ab	69.96ab	69.80	61.48ab	61.52ab	61.50
T5	74.11c	74.39c	74.25	67.35c	68.19b	67.77	59.54bc	59.71b	59.63
T6	75.82ab	75.95ab	75.89	68.93ab	69.32ab	69.13	60.86ab	60.79ab	60.83
T7	76.98a	77.11a	77.05	70.21a	70.69a	70.45	62.03a	62.00a	62.02
T8	73.62c	73.81c	73.72	66.71c	67.18c	66.95	58.84c	58.93b	58.89
T9	74.88bc	75.13bc	75.01	68.64b	68.93b	68.79	60.41bc	60.15b	60.28
T10	75.73b	76.10ab	75.92	69.52ab	69.63ab	69.58	61.22ab	61.06ab	61.14
Revised LSD 5%	1.23	1.36		1.28	1.49		1.18	1.42	

Table (4): Effect of some nutrients spray on Acidity%, b. carotene and phenols of Sewy dates during 2019 and 2020 seasons.

Treatments	Acidity %			B. Carotene (mg/100g DW)			Phenols (mg/100g)		
	2019	2020	Mean	2019	2020	Mean	2019	2020	Mean
T1	0.219^{a}	0.215^{a}	0.217	0.71^{e}	0.72^{e}	0.72	868^{ab}	829^{ab}	848.5
T2	0.192^{b}	0.190^{b}	0.191	0.78^{d}	0.78^{d}	0.78	886^{a}	842^{a}	864.0
T3	0.181^{c}	0.178^{bc}	0.180	0.80^{c}	0.81^{cd}	0.81	853^{b}	819^{b}	836.0
T4	0.173^{c}	0.169^{c}	0.171	0.81^{cd}	0.82^{cd}	0.82	798^{c}	768^{c}	783.0
T5	0.193^{b}	0.189^{bc}	0.191	0.82^{c}	0.81^{cd}	0.82	548^{f}	527^{f}	537.5
T6	0.186^{bc}	0.182^{bc}	0.184	0.84^{bc}	0.85^{bc}	0.85	527^{f}	512^{f}	519.5
T7	0.173^{c}	0.176^{c}	0.175	0.85^{bc}	0.86^{bc}	0.86	606^{j}	485^{j}	495.5
T8	0.195^{b}	0.181^{bc}	0.188	0.86^{b}	0.86^{bc}	0.86	725^{d}	699^{d}	712.0
T9	0.185^{bc}	0.181^{bc}	0.183	0.88^{ab}	0.89^{ab}	0.89	684^{e}	658^{e}	671.0
T10	0.185^{bc}	0.184^{bc}	0.185	0.89^{ab}	0.90^{ab}	0.90	675^{e}	653^{e}	664.0
Revised LSD 5%	0.011	0.013		0.03	0.04		22.18	18.96	

accumulate with a high sugar content of about 44-88%, and this depends on the cultivar, stage of maturity and environmental conditions, **(Al-Shahib and Marshall, 2003 and Awad *et al.*, 2011)**. Potassium is an important element in the formation and function of proteins, fats, carbohydrates and chlorophyll and in maintaining the balance of salts and water in the plant cell **(Marschner, 1995)**. Potassium activates a lot of physiological processes as occur in plants such as maintaining cell organization, cell hydration and permeability. It activates many enzymes system that occurs in protein synthesis and the formation of carbohydrates **(Nijjar, 1985; and Abdel-Rahman, 2010)**. Calcium plays a main role in protecting the structure and quality of the cell wall by preventing the germination of fungal spores and by blocking destructive enzymatic reactions, thus helping to fruit firmness **(Biggs, 1999)**. Boron has a main role in many processes, especially transport of sugars and carbohydrate and proteins metabolism that increased cell divisions and cell enlargement leading to increase the fruit weight and dimensions, as well as hasten the maturation of fruits **(Nijjar, 1985).** The present results are nearly in the same line with these obtained by **Omar *et al.*, 2018, Mostafa 2019 and Khodair *et al.*, 2021.**

Conclusions

Generally, it is concluded that spraying either 2 cm^3/L omega potas or 2 cm^3/L omega cal-mag has a positive effect on fruiting of Sewy date palm, hence high value marketing.

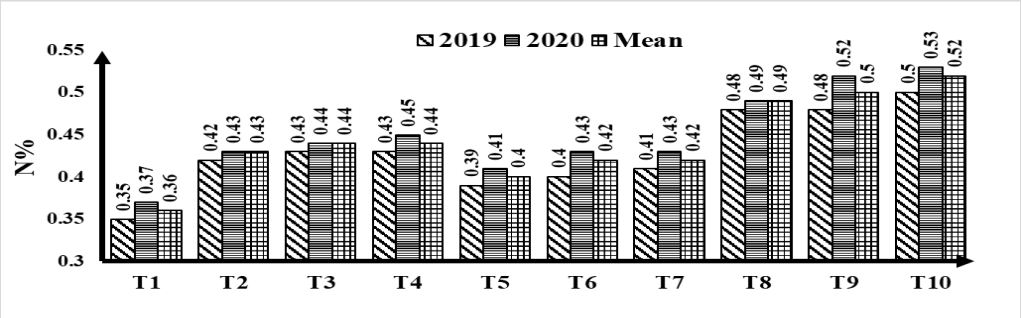

Fig. (1): Effect of some nutrients spraying on N % of Sewy date palm during 2019 and 2020 seasons.

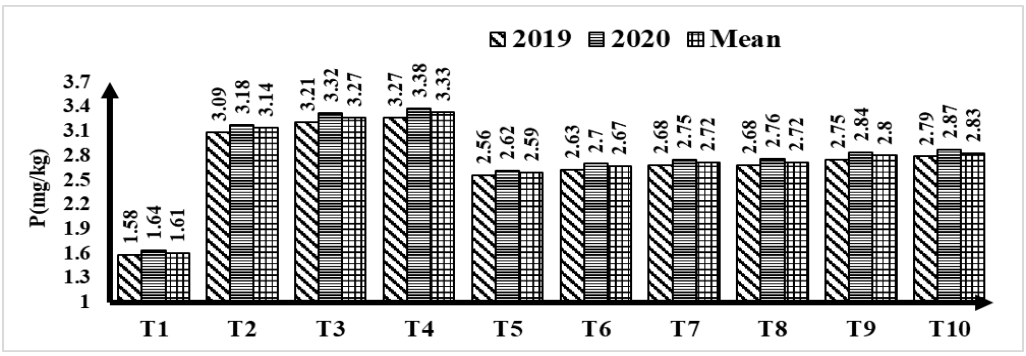

Fig. (2): Effect of some nutrients spraying on P (mg/kg) of Sewy date palm during 2019 and 2020 seasons.

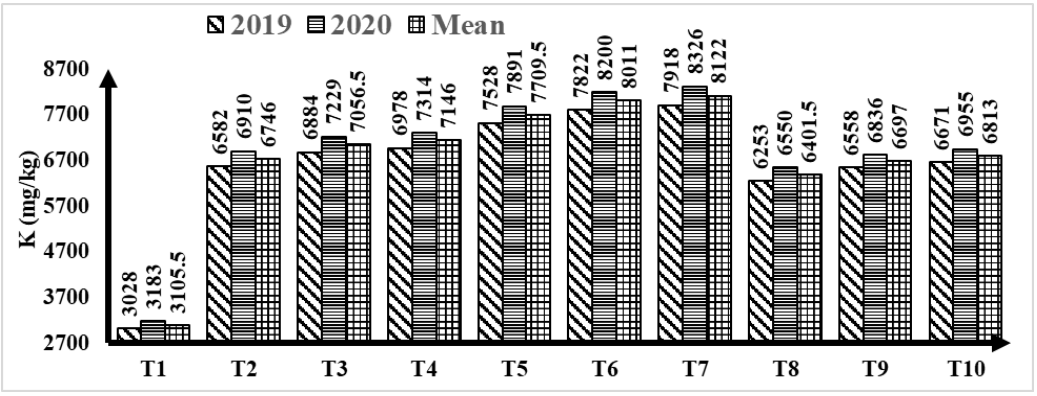

Fig. (3): Effect of some nutrients spraying on K (mg/kg) of Sewy date palm during 2019 and 2020 seasons.

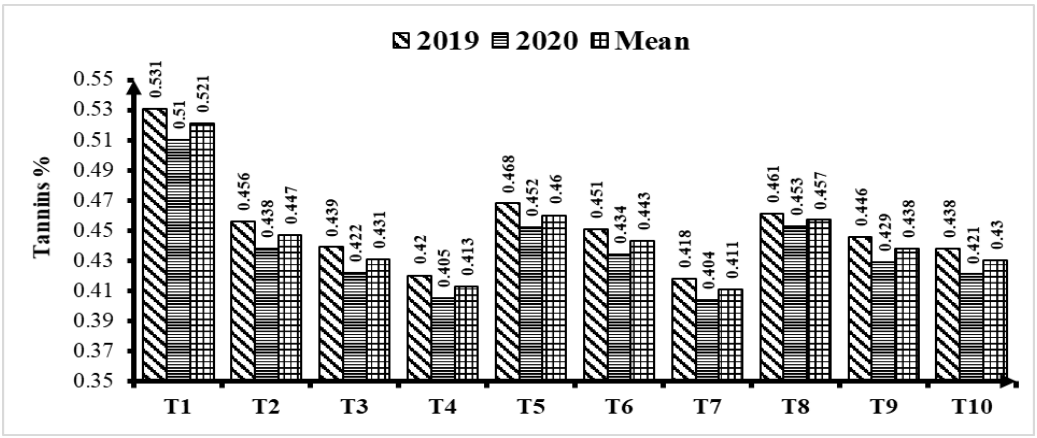

Fig. (4): Effect of some nutrients spraying on Tannins of Sewy date palm during 2019 and 2020 seasons.

References

Abdalla, M. (2016). *Effect of horticultural practices on fruiting of some date palm cultivars under Assiut conditions.'* Ph. D. Thesis, Fac. Agric., Assiut Univ].

Abdel-Rahman, M. (2010). *Effect of different sources of nitrogen and potassium fertilizers on growth and fruiting of Balady mandarin trees* Ph. D. Thesis, Fac. of Agric., Assiut Univ].

Ahmed, F., Ali, A., Sayed, E., & Sayed-Ola, M. (2014). Using some amino acids enriched with certain nutrients for improving productivity of El-Saidy date palms. *World Rural Observations*, *6*(2), 20-27.

Al-Hamoudi, A. (2006). Studies on fruit set of date palm. *Ain Shams University: Cairo, Egypt*.

Al-Khateeb, A., Al-Jabr, A., & Al-Jabr, A. (2006). Date Palm in Saudi Arabia. *Date Palm Research Center, Ministry of Agriculture, Al-Hassa, Saudi Arabia 138p*.

A.O.A.C. (1995). Association of Official Agricultural Chemists. Official Methods of Analysis. 4th ed. pp. 495-510. Benjamin Franklin Station, Washington. D.C., U.S.A.

Al-Shahib, W., & Marshall, R. J. (2003). The fruit of the date palm: its possible use as the best food for the future? *International journal of food sciences and nutrition*, *54*(4), 247-259.

Archer, J. (1985). *Crop nutrition and fertiliser use*. Farming Press.

Asami, D. K., Hong, Y. J., Barrett, D. M., & Mitchell, A. E. (2003). Processing-induced changes in total phenolics and procyanidins in clingstone peaches. *Journal of the Science of Food and Agriculture*, *83*(1), 56-63.

Attalla, A., Etman, A., El-Kobbia, A., & El-Nawam, S. (2007). Influence of foliar Boron Spray and Soil Application with some Micronutrients in Calcareous Soil on: 2. Yield, Quality and Mineral Content of Zaghloul Dates in Egypt. The Fourth Symposium on Date Palm,

Awad, M. A., Al-Qurashi, A. D., & Mohamed, S. A. (2011). Biochemical changes in fruit of an early and a late date palm cultivar during development and ripening. *International Journal of Fruit Science*, *11*(2), 167-183.

Balbaa S L (1981). Chemistry of Drugs Laboratory Manual*, Chapter 6, Faculty of pharmacy, Cairo University, Egypt,* pp127-132

Biggs, A. R. (1999). Effects of calcium salts on apple bitter rot caused by two Colletotrichum spp. *Plant disease*, *83*(11), 1001-1005.

Chapman, H., & Pratt, P. (1975). Methods of analysis for soil, plant and water Calif. *Univ. Division of Agric. Sci*, 172-174.

Darwesh, R., Madbolly, E., & Abd-El Hameed, K. (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), 191-197.

Dinnes, D. L., Karlen, D. L., Jaynes, D. B., Kaspar, T. C., Hatfield, J. L., Colvin, T. S., & Cambardella, C. A. (2002). Review and interpretation: Nitrogen management strategies to reduce nitrate leaching in tile-drained Midwestern soils.

El-Rahman, A., & Radwan, E. M. A. (2021). Role of Potassium Fertilization in Improving of Hayani Date Palm Fruiting. *Journal of Plant Production*, *12*(3), 299-304.

El-Salhy, A., Abdel-Galil, H., El-Akkad, M., & Diab, Y. (2008). Effect of mineral and organic nitrogen fertilization on vegetative growth, yield and fruit characteristics of Seewy date palms', 3rd Inter. Conf. for Date palms Agric. *Sci. and Environ. Fac. Suez Canal University*.

FAO (2016): Quarterly Bulletin of Statistics 6 No. 113. 32 *Year Book Annual 10 Prod. 46*: 155-157.

Gomez, K. A., & Gomez, A. A. (1984). *Statistical procedures for agricultural research*. John Wiley & Sons.

Hänsch, R., & Mendel, R. R. (2009). Physiological functions of mineral micronutrients (cu, Zn, Mn, Fe, Ni, Mo, B, cl). *Current opinion in plant biology*, *12*(3), 259-266.

Harhash, M., & Abdel-Nasser, G. (2010). Improving of fruit set, yield and fruit quality of" Khalas" tissue culture derived date palm through bunches spraying with potassium and/or boron. *Australian Journal of Basic and Applied Sciences*, *4*(9), 4164-4172.

Jaradat, A., & Zaid, A. (2004). Quality traits of date palm fruits in a center of origin and center of diversity.

Khayyat, M., Tafazoli, E., Eshghi, S., & Rajaee, S. (2007). Effect of nitrogen, boron, potassium and zinc sprays on yield and fruit quality of date palm. *Am Eurasian J Agric Environ Sci*, *2*, 289-296.

M.A.L.R. (2019). *Ministry of Agriculture and Land Reclamation Publishes. Economic Affairs Sector*.

Marschner, H. (1995). Mineral nutrition of higher plants 2nd edition. *Academic, Great Britain*.

Mengel, K. (2001). Alternative or complementary role of foliar supply in mineral nutrition. International Symposium on Foliar Nutrition of Perennial Fruit Plants 594,

Mengel, K., & Kirkby, E. (1987). Principles of plant nutrition, Int. *Potash Inst., Bern*, 436-437.

Miller, E.W.; D.L. Donahue and J.U. Miller (1990). Soils "An Introduction to soils and plant Growth" (5th ed.). Prentice Hall, International Inc. *Englewood Cliffs, New Jersey*, pp 303- 339.

Mostafa, R. (2019). Effects of zinc, boron and active dry yeast sprays on yield and fruit quality of Zaghloul date palm.

Ngkok, S., & Solcha, I. (1991). Carotenoid and contents of papaya and pineapple: Influence of hanching and predrying treatment. *Food Chemistry*, *39*, 175-179.

Nijjar, G. S. (1985). *Nutrition of fruit trees*. Kalyani Pub.

Omar, A., Al-Obeed, R. S., & Ahmed, M. A. (2018). Effect of foliar spraying with potassium dehydrogenase phosphate and yeast extract on yield and fruit quality of Sukary date palm (Phoenix dactylifera L.) in Saudi Arabia. *Agric. Sci*, *6*(3), 25-32.

Omar, A. E.-D. K., Ahmed, M., & Al-Obeed, R. (2015). Improving fruit set, yield and fruit quality of date palm (phoenix dactylifera, l. cv. mnifi) through bunch spray with boron and zinc. *Journal of Testing and Evaluation*, *43*(4), 717-722.

Peach, K., & Tracey, I. (1968). Modern Methods of Plant Analysis, Vol. I1p. 36–38. *Inter Sci. New York*.

Piper, C. (1950). Soil and plant analysis. Interscience Pub. *Inc., New York*, 212.

Rizzi, E., & Abruzzese, A. (1990). Effects of calcium treatment on some biochemical indexes during the developing of apple fruit. *Hort. Abst*, *60*(7), 4966-4973.

Sarrwy, S., Gadalla, E., & Mostafa, E. (2012). Effect of calcium nitrate and boric acid sprays on fruit set, yield and fruit quality of cv. Amhat date palm. *World Journal of Agricultural Sciences*, *8*(5), 506-515.

Selim, H., El-Mahdi, M., & El-Hakeem, M. (1970). Studies on the evaluation of fifteen local date varieties grown under desert condition in Siwa Oasis. *UAR Bulletin de l'Institut du désert d'Égypte*, *18*(1), 137-155.

Shahin, M., 2007. Effect of Potassium Fertilization on Growth, Leaves Nutrient Content, and Yield of "Khalas" Date Palm in Al-Hassa Oasis (K.S.A). *The Fourth Symposium on Date Palm in Saudi Arabia (Challenges of Processing, Marketing, and Pests Control), Date Palm Research Center, King Faisal University, Al-Hassa. 5-8 May, Abstracts Book,* pp: 77.

Sharma, L. (2016). Effect of nutrients sprays on growth, yield and fruit quality of apple under cold desert condition of Himachal Pradesh. *Journal of Applied and Natural Science*, *8*(1), 297-300.

Stebbins, R., Dewey, D., & Shull, V. (1972). Calcium crystals in apple stem, petiole and fruit tissue. *HortScience*.

Steel, R., & Torrie, J. (1980). Principles and Procedures of Statistics a Biometrical Approach. 2nd Mc Graw Hill. *New York*, *27*.

Umar, S., Bansal, S., Imas, P., & Magen, H. (1999). Effect of foliar fertilization of potassium on yield, quality, and nutrient uptake of groundnut. *Journal of plant nutrition*, *22*(11), 1785-1795.

Velioglu, Y., Mazza, G., Gao, L., & Oomah, B. (1998). Antioxidant activity and total phenolics in selected fruits, vegetables, and grain products. *Journal of agricultural and food chemistry*, *46*(10), 4113-4117.

Wilde, S.A.; R.B. Corey; J.G. Layer and G.K. Voigt (1985): Soils and Plant Analysis for Tree Culture. *Oxford,IBH. Publishing Co., New Delhi, India* 224p.

Wrigley, G. (1995). Date palm (Phoenix dactylifera L.) palmea pp. 399-403. *Evaluation of crop plants*, *2*.

تأثير رش بعض العناصر الغذائية علي إثمار نخيل البلح السيوي تحت ظروف الوادي الجديد

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الملخص العربى

أجريت هذه الدراسة خلال موسمي 2019 ، 2020 لدراسة تأثير رش بعض العناصر الغذائية علي محصول وخصائص ثمار نخيل البلح السيوي النامية بالمزرعة البحثية بكلية الزراعة بالوادي الجديد – الخارجة – الوادي الجديد – مصر. وقد صممت التجربة بنظام القطاعات كاملة العشوائية.

ويمكن تلخيص النتائج كالتالي:

- سبب رش السوباطات بأي من ميجا فوسفات (مصدر فوسفات) أو ميجا بوتاس (مصدر بوتاسيوم) أو أوميجا كال ماج (مصدر نيتروجين وكالسيوم وبورن) زيادة مؤكدة في نسبة العقد النهائي ووزن السوباطة مقارنة بعدم الرش (معاملة الكنترول).
- أظهرت النتائج أفضلية رش أوميجا بوتاس مقارنة بالمعاملات الأخرى.
- سبب الرش بالمعاملات السابقة مرتين تحسن واضح ومؤكد في الصفات الطبيعية والكيميائية للثمار حيث سببت زيادة مؤكدة في وزن الثمرة ومحتواها من المواد الصلبة الكلية والسكريات والكاروتينات وكذلك النيتروجين والفوسفور والبوتاسيوم مع نقص مؤكد لكل من الحموضة والفينولات والتانينات مقارنة بعدم المعاملة (الكنترول).
- سجلت أفضل النتائج لرش السوباطات مرتين أوميجا بوتاس بمعدل 4 سم^3/لتر.
- لم تسجل فروق معنوية نتيجة الرش بمعدل 2 سم^3 أو 4 سم^3 لكل من المعاملات تحت الدراسة لذا من الناحية الاقتصادية يفضل استخدام الرش بمعدل 2 سم^3 من أوميجا بوتاس/لتر.

من نتائج هذه الدراسة يمكن التوصية بأهمية رش 2 سم^3 أوميجا بوتاس/لتر أو 2 سم^3 أوميجا كال ماج/لتر وذلك لإنتاج محصول عال ذو خصائص ثمرية جيدة وتحسين القيمة التسويقية للمنتج.

الكلمات الافتتاحية: نخيل البلح، العناصرالغذائية، جودة الثمار.