Plant Archives Volume 20 No. 1, 2020 pp. 1059-1065 **e-ISSN:2581-6063 (online), ISSN:0972-5210**

EFFECT OF THE METHOD ADDING OF MODIFIED NUTRIENT SOLUTION (FOLIA STIM ULTRA) AND ITS INTERACTIONS ON SOME CHEMICAL TRAITS AND THE YIELD OF DATE PALM (*PHOENIX DACTYLIFERA* L.) ZAHDI CULTIVAR

Abbas Hadi Hashim* and Thamer H. Khaleel Al-Salihi

Al-Mussaib Technical College, Al-Furat Al-Awsat Technical University, Iraq.

Abstract

This experiment was conducted in one of the orchards of Saddat al Hindiyah city of the north of Babylon province on date palm *Phoenix dactylifera* L. Al-Zahdi cultivar. At the age of twenty-five years during the seasons 2017 and 2018. To know the effect of spraying leaves, trunk injections and ground adding (without, surface, depth of 25 cm, depth of 50 cm) with organic composite modification at a concentration (10) $ml.L^{-1}$ that consists organic fertilizer Folia Stim Ultera and add Licorice extract 20 $ml.L^{-1}$, clove extract and extracts of *Cyperus rotundus* L. at a concentration (20, 10, 10) $ml.L^{-1}$ and control treatment. Fertilization was conducted three times(Before flowering , Hababuk and Chemri stage). It was conducted as a factorial experiment (2×2×4) by using The Randomized Complete Block Design with three replicates with one palm per experimental unit and the averages were compared to according to the test of less significant difference (L.S.D) under 5% probability level. Data were analyzed using the statistical program Gen Stat. The results showed that the treatment of sprayed leaves with organic fertilizer and trunk injection significantly affected the chemical traits of the percentage of nitrogen which gave the average amounted to (1.66%), the percentage of chlorophyll (2.90)g and total yield (72.38)kg/palm, respectively. Soil treatment at a depth of (50) cm had a significant effect and gave the yield amounted to (75.46) kg. Bi-interaction treatment of the experimental factors had a significant effect on all studied traits. Also, the triple interaction treatment between the experimental factors (spraying leaves, trunk injections and soil at a depth of 50 cm showed a significant effect in all studied traits which gave a yield amounted to (84.47) kg/palm.

Key words: spraying leaves, trunk injection, soil treatment, modified organic fertilizer, palm.

Introduction

The date palm(*Phoenix dactylifera* L.) belongs to the Acaraceae family. It is a Monocotyledon. This blessed tree, which was called in the ancient texts Tree of Life. The Arabs value the wealth of the farms by the number of palm trees in its land and because of their economic and nutritional importance mentioned in the Holy Quran (21) times. And mentioned by the greatest Prophet, peace be upon him and God by saying serve your aunt Palm. It is evidenced by the high nutritional value that the Arabs ate the fruit and lived for long periods without the emergence of symptoms of under nutrition and also uses nuclei and poor varieties in feeding livestock (Ibrahim, 2014). The production of the Zuhdi cultivar in Babylon province amounted to 68.156 thousand tons of the total production of 98.722 thousand tons (Central Statistical Organization). The development and increased production of dates can contribute to the diversification of exports as the dates are the only national product where there is a surplus for export, but suffers from a decline in the number of palm and the amount of production for many reasons, most important of the phenomenon of neglecting palm groves and lack of service and lack of special agricultural equipment. Think deeply about the ways of serving this historic tree, In order to give the best quality of fruits and more quantity of the yield and in order to service of palm in terms of nutrition and soil aeration and to facilitate the service operations due to the high height of the trees we thought about the technique of soil injection and trunk injections with organic solutions manufactured to ensure the availability of nutrients monthly, especially during the flowering and fruit set .in adding to spraying palm leaves with nutrients. The use of natural and synthetic organic fertilizers. In addition to its significant

impact on the quality and quantity of production, it affects the environmental aspect positively, especially in the recent age where we suffer from the high rate of environmental pollution and a large number of diseases and pathogens as a result of wars and the use of weapons and chemicals in an unbalanced manner contributed to the increase of pollution (Al-Gizani, 2010). AL- Hamdani, (2016) found that the total vegetative spray 2 g. L^{-1} Humic Acid and add 4g. L^{-1} K-Humic Acid to the soil which gave the highest fruit weight and total yield. Al-Zubaidi, (2018) also found that spraying and injecting palm trees of Kstawi cultivar and treating soil with organic fertilizers resulted in a significant increase in the average of fresh fruit weight, seed weight, The average bunch weight and the quantity of the yield for the cultivar. Therefore, this study aims to find out the effect of foliar spraying and trunk injection with nutrients on growth and yield. Also, the techniques of feeding palm trees through injecting nutrients into the soil in several ways, revealing the nature of horizontal and vertical diffusion of the ascetic total palm root and determining the area where the largest total root is spread and delivering nutrients to this area.

Materials and Methods

This experiment was conducted in one of the orchards of Saddat al Hindiyah city of the north of Babylon province for the season 2017 and 2018 and with three factors are:

The first factor: - Spraying the total vegetative

The palm leaves were sprayed with nutrient solution Folia Stim converted at a concentration of 10 ml / liter at average of five liters per palm and was sprayed before the opening of flower buds on 21/3/2017 and was re-sprayed on 12/5/2017 in Hababuk stage and a third sprayed was Chemri stage in the pyramid One month from the second Chemri stage on 12/6/2017 and the solution was re-sprayed the following year on 10/3/2018, before the opening of the flower buds and on 3/5/2018 in the Habbouk stage and after a month on the second Chemri stage was the third Chemri stage in 3/6/2018, the untreated trees were sprayed with distilled water only.

The second factor: - Trunk injection

A hole was made in the trunk of the palm tree at a height of (1.5) m and by a diameter of (10) mm and a depth of (15) cm and sloping downward at an angle of 45°C so that the solution can enter smoothly and according to the method (Al-Jebori, 2001) modified by the method of Mauget Used in the treatment of infected palm trees (Schionning and Christensen, 2004). The solution was injected with an injector and after each adding, the end of the tube was blocked with cotton and then covered with mud to keep it from blockage. The three adding dates of after spraying palm leaves a week and the same concentration (10) ml/l and the amount of fertilizer added (20) ml per palm each date and for two years.

The third factor: - Soil injection

Folia Stim was injected with a nutrient solution at a concentration of 10 ml/L and a quantity of 10 L for each method and was added three times on 1/4/2017 and on 22/5/2017 and 22/6/2017 and in the second year the fertilizer was added on 20/3/2018 and 13/5/2018 and 136/ 2018 The nutrient solution was injected into the soil in four ways:

Control treatment C1

Treatment of surface drip on soil C2:- It was made of a pot of aluminum capacity of 10 L out of the bottom two connecting pipes on each faucet to control the speed and quantity of the solution has been linked this system on the trunk of the palm at an altitude (1 m) was added 10 L of Nutrient solution with slow dripping.

Treatment of circular drip on a depth of (25) cm C3:- The soil surrounding the trunk was drilled (25) cm and width (20) cm and away (90 -100) cm from the trunk. With this hole was placed a plastic tube in the form of a perforated circle from the bottom and the distance between the hole and another about (10cm). Palm fibers have been placed under the pipe to protect the holes from blockage and out of a pipe to the top to pour nutrients and the process of feeding the soil with the same solution and the same concentration and the amount we mentioned and the same dates above.

Soil injection at a depth of (50) cm C4:- where four plastic pipes were installed diameter (3) Inch and away from the trunk (90-100) cm has been closed end of the bottom of the tube with a plastic plug has been made holes in each tube number two on the one hand the trunk and the distance from one hole to another (17 cm) The distance from to ensure the spread of nutrients was placed dense fiber in these openings to prevent clogging.

Fertilizer used and experiment treatments:

We used Folia Stim Ultra Liquid organic fertilizer, In addition, licorice extract was added by 20 ml/L and 10 ml/L of extracts of *Cyperus rotundus* L. and cloves extract.

It was conducted as a factorial experiment (2×2×4) by using The Randomized Complete Block Design with three replicates for each treatment and the averages were compared to according to the test of less significant difference (L.S.D.) under 5% probability level (Al Sahoki

and Waheeb, 1990). Data were analyzed using the statistical program Gen Stat.

Studied traits

1. Total Soluble solids (T.S.S):

The ratio of total T.S.S to fruits was measured depending on its method (Shirokov, 1968).

2. Leaves content of total chlorophyll (mg/g fresh tissue):

A method (Mackinney, 1941) was used to measure chlorophyll content in leaves.

3. The leaves content of carbohydrate

The total carbohydrate content was estimated according to the method described (Joslyn, 1970)

4. Nitrogen and phosphorus concentration in leaves:

Nitrogen concentration in leaves was estimated using the Microkjedhal method (Black, 1965). while Phosphorus was measured by soft digestion using ammonium and ascorbic acid in Spectrophotometer (John, 1970).

5. Total yield quantity:

After harvesting the fruits for each palm separately weighed by field balance and then extracted the average weight of the total yield each treatment (kg).

Results and Discussion

The results in Table 1 shows that the spraying treatment of palm leaves has a significant effect on increasing the percentage of total soluble solids (T.S.S) . The treated Trees gave the average amounted (74.6) mg/g compared with the control trees that gave (70.6) mg/g. These results agree with (Balaket, 2014). This is due to the accumulation of nutrients, especially the sugars in the tissues of the plant and thus the transfer to the fruit, which led to an increase in its concentration and thus led to an increase in the proportion of T.S.S. The results in Table 1 shows that the adding of modified organic fertilizer through the trunk had a different behavior in the fruit content of total soluble solids (T.S.S) as there was no significant difference between treated and untreated trees. The above table also indicated that the treatment of date palm trees through the soil with a nutrient-concentrated solution with a depth of 50cm had a significant effect on increasing the total soluble solids average in fruit pith juice (74.9 mg/g). As noted in the table above the results of bi-interaction between the factors of the experiment in the content of fruits from the T.S.S, until the spraying of leaves and trunk injection gave the average amounted (75.3) mg/g significantly excelled to the other treatments. The results of the statistical analysis showed significant differences in total soluble solids average for soil treatment at 25 cm depth, spray the leaves and soil treatment at 25 cm depth with trunk injection which gave amounted to (75.5) mg/g and (75.5) mg/g respectively with other treatment. as shown from the table above, there is a significant difference for the triple interaction for the factors of experiment and a significant increase in the amount of T.S.S compared with the untreated trees and a significant difference with some significant interaction treatments . It is noted in the above table that the spraying of palm leaves with modified organic fertilizer (Folia Stim) had a significant effect on the average of total chlorophyll. It has reached in the leaves of sprayed trees 2.90 mg/g compared to non-sprayed trees which gave 2.65 mg/g. In addition, the trunk injection showed significant differences in the average of total chlorophyll amounted to 2.84 mg/g compared with the non-injection trees which gave amounted to 2.71 mg/g. Also, the treatment of soil with Folia Stim fertilizer showed a significant effect on increasing the average of total chlorophyll compared to the leaves of the control treatment trees. The maximum values were 25 cm (3.02 mg/g). As noted in table 1, the effect of bi-interaction and triple interactions gave the highest average compared to untreated trees. The increase in the leaves content of chlorophyll may be due to the presence of modified fertilizer on the necessary nutrients, especially (NPK) and its effect on the activation of enzymes and the formation of amino acids and protein, which have an

Table A: Chemical Composition of Folia Stim Ultra Liquid %.

Zn	Mo	Mn	Cu	B	K2O	P2O5	N	Algae	Element
0.6	0.05	0.6	0.2	0.6	5	5	5	15	Concentration%

Table B: Components of licorice extract based on dry weight (micro g/g).

Cu	Zn	Mn	Fe	Mg	P	Ca	Na	K	Element
0.07	3.5	5	35	230	520	500	700	1230	Concentration MG/G

Table C: Some chemical and physical properties of the orchard soil of the study.

Value	Unit	Property
505.9	$g.Kg^{-1}$	Silt
223.5	$g.Kg^{-1}$	Sand
270.6	$g.Kg^{-1}$	Clay
1.20		
sandy silt loam	----	Soil texture
7.1	----	(pH)
4.3	$dS.m^{-1}$	Electrical conductivity (Ec)
1.33	Mg / Kg^{-1}	Total N
7.01	Mg / Kg^{-1}	Total P
281	Mg / Kg^{-1}	Total K
1.39	%	Organic matter

important role in the construction of chlorophyll (Marr *et al.*, 1998). Percentage of carbohydrates increased in palm tree leaves treated with modified fertilizer spraying to the leaves and by trunk injection and significantly excelled to the control treatments which gave the average amounted to (15.01)%, (14.72)% respectively. Also, the use of organic fertilizer and all the depths (surface. 25 cm depth, depth of 50 cm) increased the leaves content of carbohydrates, which is shown in the results in table 2, where the average percentage of them respectively (14.10%, 15.47%, 15.32%). The interaction between the two factors and the triple factors also had a significant effect on the increase in the average of carbohydrate. The reason for the high carbohydrate in fertilizer treatments is the polarization of nutrients to the total vegetative, thus improving the growth of the total vegetative and increasing its efficiency in the process of photosynthesis and then increase the activity and growth of the leaves and then the accumulation of carbohydrates in the leaves and not depend on their food storage. Abdel

Table 1: Effect of spraying of leaves, trunk injections and soil treatment with organic fertilizer (Folia Stim) in soluble solids(T.S.S) and total chlorophyll.

A × B	Total chlorophyll				A × B	T.S.S				Injection trunk	foliar spray
	the soil additive) ml. l-1 (C)					the soil additive) ml. l-1 (C)					
	C4	C3	C2	C1		C4	C3	C2	C1		A
2.55	2.48	2.92	2.45	2.35	69.5	75.5	70.0	68.7	63.7	B1	A1
2.75	3.00	3.00	2.57	2.44	71.7	74.7	73.6	71.7	66.9	B2	
2.86	3.04	3.06	2.91	2.43	73.7	73.3	73.7	70.0	77.7	B1	A2
2.94	3.08	3.09	3.03	2.54	75.3	76.0	77.3	73.2	75.3	B3	
0.02	(A*B*C) 0.03				3.13	(A*B*C) 6.27				L.S.D 0.05	
A					A						
2.65	2.74	2.96	2.51	2.40	70.6	75.1	71.8	70.2	65.3	A1	AxC
2.90	3.06	3.08	2.97	2.49	74.6	74.7	75.5	71.6	76.5	A2	
0.01	0.02				2.22	4.43				L.S.D 0.05	
B					B						
2.71	2.76	2.99	2.68	2.39	71.6	74.4	71.9	69.3	70.7	B1	BxC
2.84	3.04	3.05	2.80	2.49	73.6	75.3	75.5	72.5	71.1	B2	
0.01	0.02				2.22	4.43				L.S.D 0.05	
	2.90	3.02	2.74	2.44		74.9	73.7	70.9	70.9	(C)	
	0.02					3.13				L.S.D 0.05	

Table 2: Effect of spraying of leaves, trunk injections and soil treatment with organic fertilizer (Folia Stim) in the amount of carbohydrates and nitrogen.

A × B	Total N				A × B	CHO				Injection trunk	foliar spray
	the soil additive) ml. l-1 (C)					the soil additive) ml. l-1 (C)					
	C4	C3	C2	C1		C4	C3	C2	C1		A
1.47	1.51	1.54	1.58	1.37	13.43	14.13	14.63	13.35	11.60	B1	A1
1.53	1.58	1.58	1.44	1.51	13.82	15.10	14.85	13.38	11.95	B2	
1.61	1.65	1.61	1.65	1.54	14.29	15.18	15.18	13.85	12.95	B1	A2
1.72	1.72	1.79	1.72	1.63	15.73	16.85	17.20	15.83	13.05	B3	
0.05	(A*B*C) 0.11					(A*B*C) 0.13				L.S.D 0.05	
A											
1.51	1.55	1.56	1.51	1.44	13.62	14.62	14.74	13.37	11.78	A1	AxC
1.66	1.69	1.70	1.69	1.59	15.01	16.02	16.19	14.84	13.00	A2	
0.04	0.08				0.05	0.09				L.S.D 0.05	
B					B						
1.56	1.58	1.58	1.62	1.46	13.86	14.66	14.91	13.60	12.28	B1	BxC
1.62	1.65	1.69	1.58	1.57	14.72	15.73	16.03	14.61	12.50	B2	
0.04	0.08				0.05	0.09				L.S.D 0.05	
	1.62	1.63	1.60	1.51		15.32	15.47	14.10	12.39	(C)	
	0.05					0.07				L.S.D 0.05	

Qader *et al.,* (1982) indicate that plants need mineral elements to complete many different biological processes. This is results agree with (Alkhalifa and Almeer, 2016) and (Al-Zubaidi, 2018).

The results in table 2 showed that spraying of leaves and injecting the trunk with the organic fertilizer has a significant effect in increasing the nitrogen content in the leaves as the trees which gave the highest average compared to the untreated trees with the lowest average. As shown in the table, soil treatment with organic fertilizer had a significant effect on the leaves content of nitrogen . All fertilizer treatments showed a significant effect on the leaves content of nitrogen amounted to (1.63%) compared with control treatment which gave the lowest average amounted to (1.51) mg/g. nitrogen. The increase in the leaves content of nitrogen with the fertilizer treatments was due to that the organic fertilizer content of the nutrients contributed to increasing the efficiency of photosynthesis process, which reflected on a clear improvement in the overall growth traits including the increase of the proportion of nitrogen, which is the cornerstone of building A protein that has a role in Hill Reaction is the conversion of light energy into chemical energy. These results agree with (Balaket, 2014) and (Alkhalifa and Almeer, 2016). As for the effect of bi-interaction, the above table indicates that there was a significant effect and gave it the highest average in the percentage of nitrogen amounted to (1.72) mg/g, (1.70) mg/g and (1.69) mg/g for the interaction of spraying leaves with trunk injection, spraying leaves and soil treatment in depth. 25 and 50 cm and soil treatment depth (25) cm and trunk injection respectively, while the triple interaction between the treatments, table 2 showed a significant effect on the percentage of nitrogen and gave the soil treatments and trunk injection and spraying leaves the highest percentage of nitrogen (1.79) compared to Untreated treatment which gave the lowest average.

The results in table 3 shows that the effect of adding organic fertilizer in the percentage of the phosphorus element in the leaves, as the treatments that have sprayed leaves with organic fertilizer led to a significant effect which gave the highest percentage amounted to (0.56)% while the control treatment recorded (0.46)%. Also, the treatments that trunk injected had a significant effect in increasing this percentage, where the trees gave the highest treatment average amounted to (0.54)%, while the untreated trees gave (0.48)%. The above table shows that all fertilizer treatments had a significant effect on the phosphorus which gave the highest average when adding fertilizer to the soil surface amounted to (0.55%) while control treatment gave 0.41%. Table 3 indicates that there was a significant effect of bi-interaction which gave the average amounted to (0.60)% for the treatment of spraying leaves with injection which gave the average amounted to (0.64)% and (0.63)% for the interaction of spraying leaves with soil treatment at a depth of 25 cm and soil treatment at a depth of 50 cm and trunk injection respectively Compared with untreated trees that gave the lowest average. Table 3 also showed that the triple interaction had a significant effect in this percentage, where the treatment of soil with a depth of (25) cm and spraying leaves and trunk injections gave the highest

Table 3: Effect of spraying of leaves, trunk injections and soil treatment with organic fertilizer (Folia Stim) in the amount of total yield and phosphorus.

A × B	Total productin the soil additive) ml. l-1 (C)				A × B	Total P the soil additive) ml. l-1 (C)				Injection trunk	foliar spray A
	C4	C3	C2	C1		C4	C3	C2	C1		
60.50	66.82	65.66	59.49	50.04	0.43	0.42	0.45	0.45	0.38	B1	A1
67.14	71.60	69.96	65.85	61.17	0.49	0.61	0.44	0.50	0.39	B2	
72.66	78.95	74.22	72.74	64.73	0.53	0.48	0.59	0.63	0.43	B1	A2
77.61	84.47	80.97	73.98	71.01	0.60	0.65	0.69	0.61	0.43	B3	
2.94	(A*B*C) 5.88				0.01	(A*B*C) 0.01				L.S.D 0.05	
A					A						
63.82	69.21	67.81	62.67	55.60	0.46	0.52	0.45	0.48	0.39	A1	AxC
75.13	81.71	77.59	73.36	67.87	0.56	0.57	0.64	0.62	0.43	A2	
2.08	4.16				0.01	0.01				L.S.D 0.05	
B					B						
66.58	72.88	69.94	66.11	57.39	0.48	0.45	0.52	0.54	0.41	B1	BxC
72.38	78.03	75.46	69.91	66.09	0.54	0.63	0.57	0.62	0.43	B2	
2.08	4.16				0.01	0.01				L.S.D 0.05	
	75.46	72.70	68.01	61.74		0.54	0.54	0.55	0.41	(C)	
	2.94					0.01				L.S.D 0.05	

average amounted to (0.69)% compared to control treatment that gave the lowest average. The increase in the phosphorus content may be due to the vegetative growth activity caused by the fertilizer which contains the nutrients necessary for plant growth, including phosphorus and its role in increasing the growth of the root system, which increases the absorption and increases the nutrients (Gobara *et al.*, 2002). The results in table 3 indicate that the treatment of trees with modified organic fertilizer has a significant effect on increasing the total yield quantity. The spray treatment on the leaves which gave the yield amounted to (75.13) kg compared to the untreated trees which gave (63.82) kg/tree. Table 3 shows that the trunk injection has significant effect in increasing the total yield, where the amount of the yield in the treated trees amounted to (72.38) kg/tree. It also shows from the table that the treatment of soil with fertilizer (Folia Stim) had a significant effect on the amount of yield and gave fertilizer treatment at a depth of 50 cm rate (75.46) kg/tree. The above table shows that the bilateral interactions had a positive effect on increasing the final yield, especially the treatment of fronds spraying with fertilization at a depth of 50 cm which gave (80.17) kg. The triple interaction of the experimental treatments showed a significant increase as the total yield amounted to 84.47 kg/Tree. These results agree with (Shabana *et al.*, 2006) when they were studied on Al-Sayer palms cultivar and Jasim and Al-Arab, (2016) in their study on date palm trees (Halawi). The reason is due to the increase in the amount of elements in the tissues of the plant and as a result of the delivery of nutrients to the active area responsible for the absorption of nutrients and water, which is called Feeder Roots and Located at a depth of 50 cm. This results agree with (Abdul Hussein, 1995) and (Ibrahim, 2016) that the highest proportion of root activity is confined at a depth of 60cm where the average of absorption is about 50% followed by a depth of 120 cm where the average of absorption is about 30% and the other Absorption ratio is distributed to distant depths and (Ghaleb, 1980) that the cultivar, root spread, number of green leaves, fertilization and other factors affect palm yield. Through this experiment can be conclusions, It's the necessity of liquid organic fertilization for the possibility of adding in several ways and is effective in stimulating growth and production. The process of spraying the leaves or injecting the trunk or soil with organic fertilizer individually or bi-interaction or triple interaction has greatly improved the quantity and quality of date production. The treatment of organic fertilization at a depth of 50 cm was significantly excelled in most growth and yield traits.

Based on the results of this experiment we can recommend the following:-

1. Organic fertilization of palm annually or every two years in small quantities of organic fertilizers because they greatly improved growth and yield.
2. The method of injection and development of the trunk because it is an effective, easy and inexpensive process and does not harm the palm stem cellulose.
3. Conduct studies and research to determine the best effect of the interaction between spraying with other organic nutrients and the addition of pesticides to combat diseases.
4. Conducting other researches to develop and facilitate the operations of palm service of fertilization, control and others.

References

Abdul Hussein, Ali. (1995). Plam, digging and pests. printing University of Basrah.

Abdel Qader, Faisal, Fahima Abdel Latif, Ahmed Shawky, Abbas Abu Tabikh and Ghassan Khatib (1982). Plant Physiology. Dar Al Kutub Printing Press, Mosul University, Iraq.

Al-Gizani Sadiq Abdul Jabbar Abbas (2010). Principles of Organic Agriculture in Iraq. Master of Principles of Organic Agriculture from the Barry Institute in Italy. www.iraqi-datepalms.net.

Al-Jebori, Ibrahim Jadou. Alsamarei, Adnan Ibrahim. Wahib, Jamal Fadel. Al-Mashhadani, wissam Ali (2001). Test efficiency of the Thiamethoxam. In different ways to combat the Dusk Palm insect (*Ommatissus lybicus* Bergevin) *Arab Journal of Plant Protection,* **19(2):**.

Al-Zubaidi, Shaymaa Mohammed Jibair (2018). Effect of fertilizers and application methods in vegetative growth and yield of date palm *cv.* Khastawi. Ph. D. Thesis. University of Baghdad.

Alkhalifa, Aqeel A.S. Almeer and N.J. Osama (2016). Effect of fertilizer type and added method at some growth properties and Improve the productivity of careless date palm (*Phoenix dactylifera* L.) In The Basra Province. University of Basrah15(1-2).

Balaket, Raad Taha Mohammed Ali (2014). Effect of pollen source and spraying of licorice root extract in some products and some date palm fruits. *Phoenix dactylifera* L. *Tech Magazine,* **27(3):** 2014.

Black, C.A. (1965). Methods of soil analysis . Part 1. Physical properties. Amer.Soc. Agron. Inc. Publisher, Madison, Wisconsin, U.S.A.

Central Statistical Organization (2017). The Department of Agricultural Statistics Ministry Of Planning. Department of Publication and Public Relation. Bagdad. Iraq.

Ghaleb, Hossam Ali. (1980). Practical Palm. University of Basrah

College of Agricultural. Ministry of Higher Education and Scientific Research. Iraq.

Gobara, A.A., A.M. Aki, A.M. Wassel and M.A. Abada (2002). Effect of yeast and some micronutrients on the yield and quality of red roomy grape vines. 2nd Inter. Conf. Hort. Sci., 10-12 Sept. Kafr El –Sheikh Tanta Univ. Egypt, PP: 709-718.

Ibrahim, Abdel Basset Audah (2014). Date plam of Agriculture Service Care Technical . Issa Culture Center.

Jasim Abbas M. and AL-Arab. Emad H.A. (2016). Effect of NPK fertilizer and culture of legume plants in some of the chemical characteristics of the fruits and the concentration of nitrogen, phosphorus and potassium elements in the leaves of date palm (*Phoenix dactylifera* L.) *cv.* Sayer. *Thi-Qar University Journal*, **5(1):**.

John, M.K. (1970). Colorimetric determination of phosphorus in soil and plant materials with ascorbic acid. *soil science* **109:** 214-214.

Joslyn, M.A. (1970). Method in food analysis: Physical, Chemical and instrumental method of analysis. 2nd Ed. Academic Press New York and London.

Kh. A.S. AL-Hamdani (2016). Effects Of Humic Acid And K-Humate Treatment On Vegetative Growth, Fruits Quantitative Characters And Nutrients Content Of Date Palm *cv.* Khastawi Grown In Gypsifrious Soil. *Diyala Journal of Agriculture*, **8(1):** 218-231

Mackinney, G. (1941). Absorption of light by chlorophyll solution. *J. Biological Chem.*, **140:** 315-322.

Marr, C.W., F.D. Morrison and D.A. Whitney (1998). Fertilizing gardens in Kansas. KSU Horticulture report. Kansas state university agricultural experiment station and cooperative extension service. USA.

Moussa, Tariq Nasser, Al-Hadithi, Abdul Jabbar Wahib Abd. Kalboui and Abdul majed Nasser (2002). Study some ingredient Powder roots sweat sorrow (*Glycrrhiza glabra*). *Iraqi Journal of Agriculture*, **34(4):** 9. Al-sahuki, Medhat Majid and Kareema Wahib. 1990. Applications in designing and analyzing experiments. Dar Al-Hikma for Printing and Publishing.

Plakt, Raad Taha Mohammed Ali (2014). Effect of pollen source and spraying of licorice root extract in some products and some date palm fruits. *Phoenix dactylifera* L. *Tech Magazine*, **27(3):** 2014.

Schionning, P., S. Elmholt and B.T. Christensen (2004). Managing Soil Quality - challenges in modern Agriculture CABI publishing. 344 pages.

Shabana, Hassan Rahman, Abdul Wahab Zayed, Abdul Qader Ismail Alsenbel (2006). The fruits of date palm physiological, Trading and care for the after math and Agriculture Organization of the United Nations (FAO).

Shirokov, H.E.P. (1968). Practical course in storage and processing of fruit and vegetables. USDA/NSF. Washington, D.C. U.S.A.