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Effect of Pollen Grains and Growth Regulator NAA on Some Fruit Characterization of Date Palm Phoenix Dactylifera *L Cultivar.* Sultani

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Abstract: **This research was conducted in orchard belong to Al-Mahawel date palm station (Abo Sderah) / Ministry of Agriculture located in governorate of Babylon, during the season 2015-2016. Twenty four uniform date palm Phoenix dactylifera. L. Sultani cultivar were used , to study the effect of the pollinator type(P1: Ghannamiakhder , P2: Ghannamiahmer and P3:khukri), the concentration of Naphthalene Acetic Acid NAA(0 , 50 and 100) mg.L-1 and their interaction on fruits setting up , fruits drop and some of physical and chemical characteristics of fruits of date palm Sultani cultivar .Experiment carried out as factorial experiment(3×3) by Randomized Complete Block Design (RCBD) with three replications in each treatment , and the means were compared using LSD level of significant test at $P \leq 0{\cdot}05$. The results can be summarized as that Ghannamiahmer (P2)cultivar and 50 mg.L-1 NAA application showed a significant increase in the fruit setting% , while Khukri cultivar(P3) showed significantly increased fruit size and weight as compared with the other cultivars.Furthermore the cultivar(P1) obtained a significant increase in the bunch weight in Rutab stage as compared with the other cultivars. While the cultivar (P2) with 100 mg.L-1 NAA application showed significant increase in bunch weight in Rutab stage as compared with the other interactions. Ghannamiakhder (P1) cultivar had a significant increase in the fruit content of reducing sugars and non-reducing sugars, while khukri showed significant increase in fruit content of dry matter% and total sugars as compared with the other cultivars.**

Keyword: **Fruits Set up , Phoenix dactyliferaL. , Physical and chemical characters, Pollinator effect.**

I. INTRODUCTION

Date palm (Phoenix dactylifera L.) is one of the oldest fruit crops known around the world. The date palm can grow well in harsh environmental conditions, such as poor soils, drought, salinity, and high temperature. As date palm is considered as one of the suitable trees for new reclaimed desert regions, it is the most successful and important subsistence crop in most of the hot arid desert regions .

Their high energy value and good storability make dates a wise choice of crop in places where they can be grown and it had been used as a major staple food ,therefore it has been considered one of the most important fruits in Middle East. Dates are important traditional crops in Iraq . Their cultivers has been growing on more than fifteen governorates in Iraq. According [1], Babylon classified as the second of the governorates date producers (96350 tones). Economically, Sultani cultivar date is the most important soft cultivar grown in Babylon. It is usually harvested and consumed at Ruttab stage when fruits reach the end of full maturity during the loss of yellow color .There is a real problem in the pollination of this cultivar . The female flowers' acceptability differs between varieties, this is due to the sexual incompatibility or other genetical reasons which prevent the flower's fertilization and fruit's set [2] , [3] .In other study Fattahi et al.[4] assured that pollination of fruitful trees is a vital step for having a good product. Also many researches proved that the fruit set percentage differ between cultivars and that pollen grains effect directly the female flowers. [5] , [6] , [7] Furthermore [8] confirmed that there are morphological differences between the male palms' vegetative characteristics and the spathes . In addition pollen grains effected directly the quality and the quantity of the fruits. [9],[10],[11]. Furthermore the fruits' set related with plant hormones content in pollen grains, spraying bunches of date palm with the mixture of GA3 at 50 ppm + salicylic acid (SA) at 1000 ppm significantly increased fruit retention, bunch weight, fruit weight, fruit size and fruit length, total soluble solids and total sugars [12].

Plant growth regulator play an important role in regulating fruit growth and development. Some of these substances were used in improve fruit set up , delaying ripening date and improvement fruit's quality. Synthetic auxins are effective on enhancing fruit growth [13]. These auxins are known by their ability to increase the cell size [13] ,[14] and enhance fruit growth of Clementine, date palm . Naphthalene acetic acid(NAA) was found to increase fruit size , weight and delayed ripping of dates [15]. Application of (NAA) between 50 to 200 ppm concentrations during the depressed period of fruit growth caused an increase in fruit size and weight and improved fruit quality in Zahdi, Sayer and Khemazi cvs [15],[16] in Barhee cv.[17] and in Khadrawy cv.10 and Shahani cv. [18]. The aim was to study effect of the pollinator

type , the concentration of Naphthalene Acetic Acid NAA and their interaction on fruits setting up , fruits drop and some of physical and chemical characteristics of fruits of date palm Sultani cultivar.

II. Materials and Methods

Agriculture located in Governorate of Babylon.The experiment was carry out during the growing seasons of 2015-2016. Twenty four 'Sultani " female trees were chosen, they were at similar age (8 years old), uniform in growth and subjected to the same management and cultural practices, six spaths were randomly chosen per female (8 strands/spathe) . To determine the influence of pollen source, the concentration of Naphthalene Acetic Acid "NAA" and their interaction on fruit set, yield and quality. Using (pollen extraction 5g.L-1),three males were chosen (P1: Ghannamiakhder , P2: Ghannamiahmer and P3:khukri) on Sultani cultivar, three concentration of "NAA" (N0 : Pollen extraction only , N1: 50 mg.L-1 and N2: 100 mg.L-1). The trees are grown in loamy clay soil at 5 m apart. Hand pollination was carried out by placing desired male pollen strands within female. All spathes were bagged with a big craft paper bag after pollination. Experiment carried out as factorial experiment (3 × 3) by Randomized Complete Block Design (RCBD) with three replications in each treatment , and the means were compared using L.S.D. of significant test at $\boldsymbol{P} \leq 0{\cdot}05$.

III. Measurements and Determination of fruit characteristics:

Fruit set (%) Fruit set was calculated every two weeks (during May and June months) using the following equation: Fruit set (%) =No. of retained fruits on the strand/No. of retained fruits + No. of flowers scars on the same strand×100 [19].

To determine the total yield at harvest, each spath was weighed separately using weighing balance and was expressed in kilogram (kg). At the end of the khalal stage (maturity stage), bunch weight was recorded and 20 fruits per bunch were randomly collected and immediately transported to the Laboratory of the College of Agricultural for quality measurements. The moisture percentage was determined in fruit flesh. The percentage of total soluble solids content (TSS) was determined in fruit juice using BRX-242 digital refractometer. Fruit size (cm^3). Titratable acidity was determined in juice by titrating with 0.1 N sodium hydroxide in the presence of phenolphthalein as an indicator and results were expressed as a percentage of maleic acid [15]. Reducing, non–reducing and total sugars were determined according to A.O.A.C.1995.

IV. Result and discussion :

1. Fruit setting percentage

The data in(table-1) revealed that Ghannamiahmer (P2) cultivar showed a significant increase in the fruit setting %, agreement with ,furthermore 50 mg.L-1 NAA application had significant differences were obtained among the NAA applications, while, the interference of Ghannami akhder (P1)cultivar with 50 mg.L -1 NAA application showed significant increase in this character . the cultivar(P1) obtained a significant increase in fruit maturation (%) as compared with the other cultivars and 50 mg.L -1 NAA application showed significant increase in this character more ever the interaction between50 mg.L-1 NAA application with Ghannamiakher (P1) cultivar were obtained significant increase in fruit maturation (%) as compared with the other interactions.

2. Fruit physical characteristics

Data obtained are presented that Khukri cultivar(P3) showed significantly increased fruit size (table -2) and fruit weight (table-3)when compared with the other cultivars , while no significant differences were obtained among the NAA applications in the size and weight of the fruit . In addition , 50 mg.L-1 NAA application showed significant increase in the seed weight in Rutab stage as compared with the other concerations. The interference of Khukri cultivar (P3) with50 mg.L -1NAA application showed significant increase in the weight of the fruit .Moreever data in(table -5) showed that the cultivar(P1) obtained a significant increase in the bunch weight in Rutab stage as compared with the other cultivars.While the cultivar(P2)with 100 mg.L-1 NAA application showed significant increase in bunch weight in Rutab stage as compared with the other interactions .

3. Fruit chemical characteristics

The data reported in(tables - 6, 7, 8 , 9 and 10) showed that Ghannamiakhder (P1) cultivar had a significant increase in the fruit content of reducing sugars and non-reducing sugars, while khukri (P3)showed significant increase in fruit content of dry matter% and total sugars as compared with the other cultivars ,more ever no significant differences were reported among the cultivars in total soluble solids TSS values in fruits . In addition , 50 mg.L-1 NAA application showed significant increase in total soluble solids TSS values in fruits while , 100 mg.L-1 NAA application showed significant increase in fruit content of dry matter%. Data reported no significant differences were obtained among the

NAA applications in the fruit content of total sugars , reducing sugars and non-reducing sugars ,while the cultivar(P1)with 50 mg.L-1 NAA application showed significant increase in total soluble solids TSS values in fruits ,on the other hand the interaction between100 mg.L-1 NAA application with Ghannamiahmer (P2) cultivar and khukri (P3)showed significant increase in fruit content of dry matter%, while Ghannamiakhder (P1) without NAA applications were obtained significant differences in the fruit content of total sugars , reducing sugars and non-reducing sugars.

The improvement in fruit physical properties as a result of the growth regulators NAA treatments might be due to their influence in enlarging the cells size and enhancing the strength of carbohydrate sink, thus increasing fruit size and weight. Similarly to [20] reported that NAA is essential for cell growth and differentiation. In general, the data obtained in our study showed that application extraction of pollination with NAA growth regulators had positive influences in increasing fruit weight and size of Sultani dates. This increment in fruit physical characteristics was also reported by numerous investigations working on different fruit trees [15], [16], [18], Minimum fruit set may be the cause of the increment in fruit physical characteristics pollinator KhuKri .

Table 1: The effect of the type of male pollinator application of naphthalene acetic acid (NAA) and their interaction on the fruit set up (%)

application of naphthalene acetic acid (NAA)				
Mean (p)	**N2**	**N1**	**N0**	**male pollinator(P)**
70.5	68.9	79.9	62.6	P1
67.5	63.4	74.5	64.6	P2
63.5	62	74.2	54.1	P3
LSDP=N.S	64.8	76.2	60.4	Mean (NAA)
	LSDP*N=12.61		LSDN=7.28	

Table 2: The effect of the type of male pollinator ,application of naphthalene acetic acid (NAA) and their interaction on the fruit size (cm3)

application of naphthalene acetic acid (NAA)								male pollinator (P)
Mean (p)	**fruit size (cm3)in Ruttab Stg.**			**Mean (p)**	**fruit size (cm3)in Biser Stg.**			
	N2	**N1**	**N0**		**N2**	**N1**	**N0**	
8.56	8.33	9.40	7.93	11.02	11.67	11.13	10.27	P1
9.78	10.13	10.33	8.87	12.40	12.07	13.47	11.67	P2
10.53	11.20	10.07	10.33	11.84	10.87	12.47	12.20	P3
LSDp=1.20	9.89	9.93	9.04	LSDP=1. 26	11.53	12.36	11.38	Mean (NAA)
LSDP*N =2.07		SDN =N.SL		LSDP*N=N.S			LSD N =N.S	

Table 3: The effect of the type of male pollinator , application of naphthalene acetic acid (NAA) and their interaction on the fruit weight (g)

application of naphthalene acetic acid (NAA)								male pollinator (P)
Mean (P)	fruit weight (g)in Ruttab Stg.			Mean (P)	fruit weight (g)in Biser Stg.			
	N2	N1	N0		N2	N1	N0	
9.45	9.42	10.03	8.89	9.37	9.62	9.13	9.38	P1
8.84	9.25	8.58	8.68	9.30	9.92	9.17	8.80	P2
10.58	10.29	10.81	10.63	8.73	8.77	8.51	8.92	P3
LSDp=1.26	9.66	9.81	9.40	LSDP=N.S	9.44	8.93	9.03	Mean (NAA)
LSDP*N = 1.48		SD N = N.SL		LSDP*N =N.S			LSD N = N.S	

Table 4: NAA The effect of the type of male pollinator, application of naphthalene acetic acid (NAA) and their interaction on the fruit maturation (%)

application of naphthalene acetic acid (NAA)				
Mean (p)	N2	N1	N0	male polinater (P)
38.07	37.93	40.78	35	P1
34.95	33.33	38.46	33.33	P2
31.51	33.35	36.36	24.81	P3
LSDP=0.01	34.87	38.53	31.12	Mean (NAA)
	LSDP*N= 0.019		LSDN=0.011	

Table 5: The effect of the type of male pollinator ,application of Naphthalene acetic acid (NAA) and their interaction on the spath weight (kg)

application of naphthalene acetic acid (NAA)				
Mean (p)	N2	N1	N0	male pollinator (P)
14.25	15.64	14.11	13.02	P1
12.11	12.67	12.93	10.72	P2
11.59	13.39	13.64	7.73	P3
LSD= N.S	13.90	13.56	10.49	Mean (NAA)
	LSDP*N=2.91		LSDN=N.S	

Table 6: The effect of the type of male pollinator, application of naphthalene acetic acid (NAA) and their interaction on the fruit acidity (%)

application of naphthalene acetic acid (NAA)								male pollinator (P)
Mean (P)	fruit acidity(%)in Ruttab Stg.			Mean (P)	fruit acidity(%)in Biser Stg.			
	N2	N1	N0		N2	N1	N0	
0.377	0.447	0.35	0.337	0.41	0.38	0.45	0.41	P1
0.449	0.337	0.363	0.65	0.48	0.35	0.51	0.59	P2
0.381	0.390	0.363	0.390	0.39	0.39	0.37	0.41	P3
LSDp=0.07	0.391	0.358	0.458	LSDP=0.035	0.37	0.44	0.47	Mean (NAA)
LSDP*N =0.12		LSDN =N.S		LSDP*N =N.S			LSD N =0.035	

Table(7): The effect of the tybe of male polinater,application of naphthalene acetic acid (NAA) and their interaction on the fruit Total soluble solids (TSS Ratio %)

application of naphthalene acetic acid (NAA)				
Mean (p)	N2	N1	N0	male polinater (P)
33.92	33.67	38.67	29.43	P1
35.22	32	39	34.67	P2
34.56	35.33	36	32.33	P3
LSDP=N.S	33.67	37.89	32.14	Mean (NAA)
	LSDP*N=4.19		LSDN=2.42	

Table (8): NAA The effect of the type of male pollinator ,application of naphthalene acetic acid (NAA) and their interaction on the total sugared content of fruit (%).

application of naphthalene acetic acid (NAA)				
Mean (p)	N2	N1	N0	male pollinator (P)
60.86	59.04	64.66	58.88	P1
61.54	65.52	57.80	61.30	P2
65.45	66.27	63.43	66.56	P3
LSDP=2.05	63.61	61.96	62.28	Mean (NAA)
	LSDP*N=3.55		LSDN=N.S	

Table 9: The effect of the type of male pollinator, application of naphthalene acetic acid (NAA) and their interaction on the reeducates sugared content of fruit (%).

application of naphthalene acetic acid (NAA)				
Mean (p)	**N2**	**N1**	**N0**	**male pollinato(P)**
42.24	42.77	41.50	43.05	P1
37.27	37.12	36.35	38.33	P2
39.07	41.30	38.06	37.85	P3
LSDP=3.75	40.20	38.64	39.74	Mean (NAA)
	LSDP*N=6.50		LSDN= N.S	

Table 10: The effect of the type of male pollinator, application of naphthalene acetic acid (NAA) and their interaction on the nonreeducates sugared content of fruit (%).

application of naphthalene acetic acid (NAA)				
Mean (p)	**N2**	**N1**	**N0**	**male pollinator (P)**
18.60	16.81	23.16	15.83	P1
24.26	28.35	21.45	22.97	P2
26.38	24.96	25.36	28.80	P3
LSDP=4.29	23.38	23.33	22.54	Mean (NAA)
	LSDP*N=7.43		LSDN= N.S	

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