

**EFFECT OF NITROGEN AND POTASSIUM FERTILIZATION
ON YIELD, FRUIT QUALITY AND SOME NUTRIENTS
CONTENT OF SAMANY DATE PALM**

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ABSTRACT

The present investigation was carried out during 2000 and 2001 seasons to study the effect of nitrogen (as ammonium nitrate) and potassium (as potassium sulphate) fertilization on yield, fruit quality and some nutrients content of Samany date palm grown in El-Kanater El-Khairia, El-Kaliobia Governorate. Applying N_3K_3 (2.0+ 2.0) kg/palm caused the highest yield and bunch weight, whereas N_1K_1 (1.5 + 1.5) kg/palm gave the highest fruit and flesh weight and fruit volume in both seasons. Treatments, N_2K_3 (1.75 + 2.0) kg/palm gave the highest fruit length in the two seasons, while N_1K_1 (1.5 + 1.5) and N_2K_3 (1.75 + 2.0) kg/palm gave the highest fruit diameter in the first and second seasons, respectively. N_1K_1 (1.5 + 1.5) kg/palm gave the highest TSS and total sugars in both seasons. While, N_2K_2 (1.75 + 1.75) kg/palm gave the highest reducing sugars in both seasons. Treatments N_3K_3 (2.0+ 2.0) and N_3K_2 (2.0 + 1.75) caused the highest non-reducing sugars in the first and second seasons, respectively. The results indicated that the N and K contents increased significantly, while Fe and Zn contents decreased significantly with increasing the rate of nitrogen and potassium fertilization in both seasons. N_1K_1 (1.5 + 1.5) kg/palm gave the highest P content in the two seasons. While, N_3K_3 (2.0+ 2.0) kg/palm gave the highest Ca and Cu contents in the first and second seasons, respectively.

Key words: Fertilization, Samany date, Nutrients content

INTRODUCTION

Date palm (*Phoenix dactylifera* L.) is considered one of the leading fruit crops. Samany is the most important cultivar of

soft dates in Egypt. It can grow well under drastic environmental conditions. The variations in the soil types and orchard management have their influence on the characteristics of both tree growth

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and fruit quality. Several investigators have studied the effect of nitrogen and potassium fertilization on the fruit physical and chemical properties and some nutrient contents of different date palm varieties was reported by Shawky and Moughcith 1975; Awada and Long 1980; Bacha and Abou-Hassan 1983; Smith *et al* 1985; Abdalla *et al* 1987; El-Hammady *et al* 1987 and 1994; Ibrahim and Sinbel 1989; Al-Juburi *et al* 1991; Al-Juburi 1996 and Kassem *et al* 1997.

The objective of this research was to illustrate the effect of nitrogen fertilizer (as ammonium nitrate) and potassium fertilizer (as potassium sulphate) on palm production, fruit quality and some nutrient contents of Samany date palm cultivar.

MATERIAL AND METHODS

This study was conducted at Ministry of Agriculture Experiment Stations at El-Kanater El-Khairia, El-Kaliobia Governorate, Egypt for two successive seasons, 2000 and 2001 on Samany date palm, of about 30 years old grown on clay soil. The experimental palms were healthy, as they were uniform in growth, vigour, height and fruiting capacity in the preceding years. Only 8 bunches were left on each experimental tree. All cultural practices were carried out according to the traditional schedule for experimental palms. Soil and water used for irrigation were analyzed according to the method of Chapman and Pratt (1961), and the data are presented in Table (1). Nitrogen and potassium fertilizers, at different rates, were added to the experimental

trees in combination with each other. Nitrogen fertilizer as ammonium nitrate (33.5% N) and potash fertilizer as potassium sulphate (48% K₂O), were applied to trees at ten different rates, i.e., N₀K₀ (control), N₁K₁ (1.5 + 1.5), N₁K₂ (1.5 + 1.75), N₁K₃ (1.5 + 2.0), N₂K₁ (1.75 + 1.5), N₂K₂ (1.75 + 1.75), N₂K₃ (1.75 + 2.0), N₃K₁ (2.0 + 1.5), N₃K₂ (2.0 + 1.75) and N₃K₃ (2.0 + 2.0) kg per palm.

Nitrogen and potassium fertilizers were divided into three equal doses and added to the trees at middle of February, May and July in both seasons. Each treatment was added through as broad casting on the soil surface, 1.5 meters from the palm trunk.

The experimental treatments (10) were arranged in a randomized complete block design with three replications (one palm tree for each replication = 30 palms). The yield of experimental palms was harvested through the second half of September in each season to determine the following estimates:

- 1- The averages yield and bunch weight.
- 2- Fruit physical properties: Samples of 80 fruits per tree (10 fruits/bunch) were taken for the determination of fruit, flesh and seed weight, fruit size and fruit dimensions (length & diameter).
- 3- Fruit chemical properties: Preparation of sample for chemical analysis:

Ten date fruits from each treatment were divided into pieces and seeds were omitted. Fifty grams of pieces were mixed with 100-ml. distilled water using special electric mixer for extraction, then filtered and the filtrate was used for determinations.

Table 1. Analysis of soil and irrigation water sample from the experimental orchard (as average of two years)

Soil analysis at depth 40 cm		Water analysis	
Character	Value	Character	Value
EC (dsm-1)	0.67	EC (dsm-1)	1.70
pH	7.80	pH	8.10
CaCO ₃ (%)	3.50		
Organic matter (%)	1.20	Cations (meq./l)	
		Ca ⁺⁺	3.00
Mechanical analysis (%)		Mg ⁺⁺	2.55
Sand	22.20	N ⁺	3.41
Silt	42.15	K ⁺	0.01
Clay	35.65		
Soluble cations (meq./l)		Anions (meq./l)	
Ca ⁺⁺	3.8	CO ₃ ⁻	1.00
Mg ⁺⁺	2.8	HCO ₃ ⁻	3.75
N ⁺	1.4	SO ₄	1.81
K ⁺	0.12	Cl ⁻	3.42
Microelements (ppm)			
Fe	2.90		
Mn	3.61		
Zn	0.91		
Cu	0.95		

Moisture, total soluble solids (TSS) as a percentage were recorded by using hand refractometer, acidity (%) as malic acid, reducing, non-reducing and total sugars percentages were determined according to A.O.A.C. (1995).

4- Leaf mineral analysis

For leaf mineral analysis, newly emerged leaf was selected from each palm and composted for three palms of Samany cultivar. Leaflets samples were

taken during November and washed with tap water and then with distilled water to remove the dust and any chemical spray residues. After washing, they were dried in an electric oven at 70°C for 72 hours. The dried material was ground in an electric mill to be stored in paper bags for analysis:

Wet washing of plant material was carried out using hydrogen peroxide and sulfuric acid as recommended by Parkinson and Allen (1975).

Total nitrogen was determined in ground material by semi-micro Kjeldahl methods as recommended by Bremner (1965).

Phosphorus was colorimetrically determined using the molybdenum blow method according Chapman and Pratt (1961).

Potassium was determined by the flame photometer as outlined in Jackson (1958). Fe, Mn, Zn were determined using the Elmer atomic absorption spectrophotometer. The results were subjected to statistical analysis according to Snedecor and Cochran (1980). Treatment means were compared using the Duncan least significant rang (LSR) at 5 percent level of significance in both seasons of experimentation.

RESULTS AND DISCUSSION

a- Effect of nitrogen and potassium fertilization treatments on the yield and bunch weight

1- Yield per palm (kg)

The results in Table (1) clearly indicate the effect nitrogen and potassium fertilization treatments on the fruit yield per palm. Result showed that, in the two seasons, all fertilization treatments significantly produced higher yield compared with the unfertilized (control). N_3K_3 treatment (2.0+ 2.0) kg/palm gave the highest yield per palm, followed by N_3K_2 treatment (2.0 + 1.75) kg/palm in both seasons.

Generally, Bacha and Abou-Hassan (1983) who reported that the best yields of Khudari date palm cultivar were ob-

tained with 1500 g N/palm annually in agreement with those report these results. While, Kassem *et al* (1997) found that high N rates (0.3,4.5 and 6 kg/palm annually) increased yield of all cultivars than the control in the second season only. On the other side, Al-Juburi *et al* (1991) found that N application at 600 g/palm annually increased fruit yield/tree. Abdalla *et al* (1987), El-Hammady *et al* (1994) and Kassem *et al* (1997) found that the yield was significantly increased by potassium fertilization.

2- Bunch weight (kg)

Table (1) show the effect of nitrogen and potassium fertilization treatments on Samany bunch weight during the present study. It is noticed from the obtained results that during in the two seasons of Samany cultivar the bunch weight exhibits similar trend as the yield.

Fruits characteristics

The results concerning the physical and chemical properties in the two seasons are presented in Tables (1, 2).

Physical properties

1- Fruit weight (g)

Concerning the fruit weight, the results obtained indicated that, there were significant differences between fertilization treatments in both seasons. N_1K_1 treatment (1.5 + 1.5) kg/palm gave the highest fruit weight, followed by N_2K_1 (1.75 + 1.5) kg/palm as the compared

with the control and other fertilization treatments in the two seasons, (Table 1).

These results are generally in agreement with those found by **Al-Juburi *et al* (1991)**, **El-Hammady *et al* (1994)** and **Kassem *et al* (1997)** on several date cultivars.

2- Flesh weight (g)

The obtained results (Table, 1) indicated that, the flesh weight shows similar trend as the fruit weight, Table (1).

3- Fruit dimensions (cm)

Result of fruit dimensions (length and diameter) in the two seasons showed that fruit length and diameter were significantly affected by fertilization treatments. Where N_2K_3 (1.75 + 2.0) & N_2K_1 (1.75 + 1.5) kg/palm and N_2K_3 (1.75 + 2.0) & N_1K_2 (1.5 + 1.75) kg/palm treatments gave the highest fruit length as compared with the control and other fertilization treatments in the first and second seasons. Concerning fruit diameter, N_1K_1 (1.5 + 1.5) & N_2K_3 (1.75 + 2.0) kg/palm and N_2K_3 (1.75 + 2.0) & N_2K_2 (1.75 + 1.75) kg/palm treatments gave the highest fruit diameter than the control and other treatments in the first season and second seasons.

These results are in agreement with those reported by **Abdalla *et al* (1987)**, **El-Hammady *et al* (1994)** and **Kassem *et al* (1997)** they found that potassium fertilization increased fruit length and diameter. While, **El-Hammady *et al* (1987)** and **Kassem *et al* (1997)** reported contradicting results. They found that the addition of nitrogen fertilizer did not affect fruit length and diameter.

4- Fruit volume (cm³)

The Samany fruit volume was significantly affected by fertilization treatments in both seasons. N_1K_1 (1.5 + 1.5) kg/palm gave the highest fruit volume in the two seasons, followed by N_1K_2 (1.5 + 1.75) and N_2K_1 (1.75 + 1.5) kg/palm as compared with the control and other fertilization treatments in the first and second seasons. **Al-Juburi *et al* (1991)** on Khasab cultivar.

Chemical properties

1- Moisture content (%)

Significant effect was found on moisture content of Samany fruit due to the nitrogen and potassium fertilization in both seasons. N_2K_3 (1.75 + 2.0) kg/palm gave the highest moisture content followed by N_3K_2 (2.0 + 1.75) kg/palm than the control and the other fertilization treatments in the two seasons of investigation.

2- Total soluble solids (%)

Regarding the effect of nitrogen and potassium fertilization on total soluble solids percentage (TSS), results showed that was significantly effect between fertilization treatments. Treatment N_1K_1 (1.5 + 1.5) kg/palm gave higher values of TSS as compared with the control and other fertilization treatments in both seasons.

Abdalla *et al* (1987), **El-Hammady *et al* (1987 & 1994)** and **Kassem *et al* (1997)** in partial agreement with those report these results.

3- Total acidity (%)

Result (Table, 2) indicated that the total acidity percentage was significantly affected by nitrogen and potassium fertilization in both seasons. Treatment N_3K_2 (2.0 + 1.75) kg/palm gave the highest total acidity as compared with the control and other treatments in the two seasons, followed by N_2K_1 (1.75 + 1.5) and N_1K_3 (1.5 + 2.0) kg per palm in the first and second seasons, respectively than those the control and other fertilization treatments. These results are in partial agreement with those reported by Kassem *et al* (1997).

4- Sugar contents (%)

a- Total sugars (%)

The obtained results (Table, 2) indicated that, the total sugars percentage was significantly affected by nitrogen and potassium fertilization. Treatment N_1K_1 (1.5 + 1.5) kg per palm gave the highest total sugars percentage as compared with the control and other treatments in both seasons. Hussein (1972), Aly (1993) and Kassem *et al* (1997) in partial agreement with those report these results.

b- Reducing sugars (%)

Regarding the effect of nitrogen and potassium fertilization on reducing sugars, the results (Table 2) indicated that N_2K_2 (1.75 + 1.75) followed by N_1K_1 (1.5 + 1.5) kg per palm gave the highest reducing sugars as compared with the control and other studied treatments in

both seasons. Generally, these results agreed with those found by Kassem *et al* (1997).

C- Non-reducing sugars (%)

Treatments, of N_3K_3 (2.0+ 2.0) and N_3K_2 (2.0 + 1.75) kg per palm gave the highest non-reducing sugars than those of the control and other fertilization treatments as compared with the control and other treatments (Table 2).

Contradicting results were reported by Kassem *et al* (1997), who found that the nitrogen and potassium fertilizer did not affect greatly, the percentage of fruit non-reducing sugars, in both seasons.

b- Effect of nitrogen and potassium fertilization treatments on the leaf mineral content

The results regarding the effect of nitrogen and potassium fertilization on pinnae mineral content of Samany date palm in the two seasons are presented in Table (3).

1- Pinnae nitrogen content (%)

The results (Table, 3) of both seasons showed that the nitrogen content significantly increased with increasing the level of fertilization rate in the two seasons. Treatment of N_3K_3 (2.0+ 2.0) kg per palm gave the highest nitrogen concentration in pinnae as compared with the control and other treatments of nitrogen and potassium fertilization in the two seasons.

These results are supported by those reported by Bacha & Abou-Hassan (1983) and El-Hammady *et al* (1987). They reported that increasing the level of

Table 2. Effect of N and P fertilization on yield and some fruit physical properties of Samany date palm during 2000 and 2001 seasons

Physical properties	Yield (Kg)	Bunch weight (Kg)	Fruit weight (g)	Flesh weight (g)	Fruit length (cm)	Fruit diameter (cm)	Fruit volume (cm ³)
Treatments							
	2000 season						
N0K0	125.3 g	15.66 g	22.03 c	19.6 c	4.87 e	2.9 b	21.0 d
N1K1	134.0 fg	16.75 fg	29.93 a	27.00 a	5.47 ab	3.40 a	25.87 a
N1K2	148.0 def	18.50 def	28.90 a	26.00 a	5.33 abcd	3.13 bc	24.40 ab
N1K3	158.7 cde	19.84 cde	28.67 a	25.87 a	5.20 cd	3.07 cd	24.00 ab
N2K1	136.3 eff	17.04 eff	29.67 a	26.93 a	5.49 a	3.13 bc	24.1 ab
N2K2	166.2 bc	20.78 bc	28.20 a	25.80 a	5.27 bcd	3.23 abc	24.00 ab
N2K3	188.0 ab	23.50 ab	24.67 bc	22.10 b	5.51 a	3.30 ab	23.0 bc
N3K1	168.5 bcd	21.06 bcd	28.03 a	25.53 a	5.40 abc	3.20 abc	23.33 abc
N3K2	197.33 a	24.67 a	25.23 b	22.70 b	5.27 bcd	3.17 bc	22.00 cd
N3K3	200.00 a	25.00 a	23.70 bc	21.33 bc	5.13 d	3.03 cd	21.67 cd
	2001 season						
N0K0	130.00 f	16.25 f	23.77 d	21.27 d	4.93 c	2.83 c	21.47 d
N1K1	140.40 ef	17.55 ef	31.63 a	29.17 a	5.23 b	3.07 b	27.97 cd
N1K2	151.67 de	18.95 de	30.57 a	27.87 a	5.43 ab	3.10 b	25.67 bcd
N1K3	167.67 cd	20.95 cd	30.53 a	27.67 a	5.37 ab	3.37 a	25.27 abc
N2K1	149.07 ef	18.63 ef	31.50 a	28.67 a	5.40 ab	2.83 c	26.20 a
N2K2	182.10 bc	22.76 bc	30.27 a	27.63 a	5.00 c	3.40 a	25.30 d
N2K3	198.33 ab	24.79 ab	27.30 bc	24.70 bc	5.47 a	3.43 a	23.70 ab
N3K1	177.23 c	22.15 c	29.83 ab	27.37 ab	5.03 c	2.91 c	24.97 cd
N3K2	205.00 a	25.63 a	25.57 cd	23.20 cd	5.00 c	3.33 a	23.90 ab
N3K3	207.33 a	25.91 a	25.27 cd	22.83 cd	5.30 ab	3.33 a	24.20 a

Table 3. Effect of nitrogen and potassium fertilization on some fruit chemical properties of Samany date palm during 2000 and 2001 seasons.

Chemical properties	Moisture content (%)	Total soluble solids (%)	Total acidity (%)	Total sugars (%)	Reducing sugars (%)	Non-reducing sugars (%)
Treatments						
	2000 season					
N0K0	73.10 ab	22.20 cd	0.014 bc	44.53 c	21.03e	23.50 d
N1K1	71.00 bc	27.30 a	0.013 bc	64.23 a	36.00 b	28.23 c
N1K2	68.30 c	23.70 abcd	0.011 c	51.43 d	20.73 e	30.70 b
N1K3	71.40 bc	24.10 abcd	0.014 ab	43.70 e	22.67 de	24.37 d
N2K1	72.50 ab	25.40 abc	0.015 ab	60.33 b	27.10 c	33.23 a
N2K2	71.60 bc	23.40 bcd	0.013 bc	62.03 b	49.37 a	12.67 e
N2K3	76.30 a	20.80 d	0.012 c	36.63 f	26.10 cd	10.53 f
N3K1	70.00 bc	26.70 ab	0.011 c	53.47 d	25.87 cd	27.60 c
N3K2	73.30 ab	22.80 cd	0.016 c	53.00 d	25.03 cd	27.97 c
N3K3	72.10 bc	25.50 abc	0.012 c	58.23 c	24.33 cde	33.90 a
	2001 season					
N0K0	69.70 e	20.80 c	0.016 ab	51.67 bc	23.80 cd	27.87 bc
N1K1	66.60 f	26.40 a	0.015 bcd	56.13 a	31.43 b	24.70 bcd
N1K2	72.10 cd	22.90 d	0.013 d	45.43 d	22.60 cd	22.83 d
N1K3	68.90 ef	25.40 ab	0.017 abc	46.10 d	22.20 d	23.90 cd
N2K1	70.40 de	23.50 cd	0.014 cd	54.00 ab	30.43 b	23.57 cd
N2K2	74.10 c	24.50 bc	0.015 bcd	52.20 abc	41.80 a	10.40 e
N2K3	83.40 a	20.10 e	0.014 cd	40.37 e	31.23 b	09.17 e
N3K1	73.60 c	24.10 bcd	0.013 d	48.53 cd	23.80 cd	24.73 bcd
N3K2	81.00 b	25.00 ab	0.018 a	55.53 ab	22.97 cd	32.60 a
N3K3	74.40 c	24.70 bc	0.014 bcd	55.33 ab	26.03 c	29.30 ab

N fertilization, generally, increased the N content in the pinnae.

2- Pinnae phosphorus content (%)

Phosphorus concentration in pinnae decreased as the level of nitrogen and potassium fertilization increased. It is evident that the highest values of P content were associated with the N_1K_1 (1.5 + 1.5), followed by N_1K_2 (1.5 + 1.75) and N_1K_3 (1.5 + 2.0) kg per palm as compared with the control and other treatments of nitrogen and potassium fertilization in both seasons. These results are in partial agreement with those reported by Younis (1987) who found that N fertilization decreased the P content in leaves of Seewy date palm. While, in the same study, he showed that P concentration in leaves of Hayany did not significantly that of affected by N levels. However, these findings are disagreed with El-Hammady *et al* (1987) who reported that P concentration in leaves of Seewy date palm increased as a result of increasing the amount of nitrogen. It seems obvious that, these differences may be due to varieties (Shawky and Mougheith, 1975) as decided the variety constitutes an important factor affect leaf mineral content. Bacha and Abou-Hassan (1983) who found that the N fertilization did not affect the pinnae P content.

3- Pinnae potassium content (%)

Regarding the effect of nitrogen and potassium fertilization, (Table, 3) on pinnae K% it was found that the concentration of potassium in pinnae of Samany

date palm responded positively to the level of nitrogen and potassium fertilization. N_3K_3 (2.0+ 2.0) kg per palm gave the highest potassium concentration in pinnae as compared with the control and other treatments of nitrogen and potassium fertilization in the two seasons.

These results are in agreement with those obtained by El-Hammady *et al* (1987) who reported that K concentration in leaves of date palm cv. Seewy increased as the N fertilization increased. On the other hand, Bacha and Abou-Hassan (1983) found that no significant differences were found among the N fertilization treatments in pinnae K in both seasons.

4- Pinnae Calcium content (%)

Results (Table, 3) indicated that N and K fertilization in pinnae of Samany cv. in the second season did not significantly affect the Ca content. However, in the first season, such differences were statistically significant. Treatments, N_3K_3 (2.0+ 2.0) and N_3K_2 (2.0 + 1.75) kg per palm gave the highest Ca content as compared with the control and other treatments of nitrogen and potassium fertilization. These results are in agreement with Kassem *et al* (1997).

5- Pinnae iron content (ppm)

Iron concentration in pinnae of Samany date palm, in both seasons, (Table, 3) significantly decreased with increasing the level of N and K fertilization rates. Treatment, N_3K_3 (2.0+ 2.0) kg per Samany date palm gave the lowest iron concentration, than those of control

Table 4. Effect of nitrogen and potassium fertilization on leaf mineral content of Samany date palm during 2000 and 2001 seasons

Chemical properties	Nitrogen (%)	Phosphorus (%)	Potassium (%)	Calcium (%)	Iron (ppm)	Zinc (ppm)	Manganese (ppm)	Copper (ppm)
Treatments								
	2000 season							
N0K0	1.85 g	0.25 ab	0.63 e	1.10 d	121 a	70 a	45 c	29 a
N1K1	2.02 f	0.28 a	0.63 e	1.18 c	115 ab	70 a	46 c	29 a
N1K2	2.10 ef	0.27 a	0.65 de	1.19 bc	110 bc	69 a	48 bc	29 a
N1K3	2.14 de	0.26 a	0.67 cde	1.20 bc	109 bc	67 ab	49 bc	30 a
N2K1	2.21 cd	0.25 ab	0.70 cd	1.20 bc	108 bc	66 ab	50 abc	30 a
N2K2	2.23 cd	0.22 bc	0.72 c	1.21 bc	107 bc	65 ab	51 abc	30 a
N2K3	2.24 c	0.22 bc	0.79 b	1.21 bc	103 cd	64 ab	51 abc	30 a
N3K1	2.28 c	0.21 c	0.81 b	1.22 abc	99 cde	61 b	52 abc	31 a
N3K2	2.45 b	0.20 cd	0.83 b	1.23 ab	95 de	59 b	55 ab	31 a
N3K3	2.57 a	0.18 d	0.92 a	1.26 a	92 e	58 b	56 a	32 a
	2001 season							
N0K0	1.97 e	0.23 cde	0.62 e	1.10 a	118 a	78 a	48 a	33 b
N1K1	2.00 e	0.29 a	0.61 e	1.16 a	115 ab	70 ab	49 a	34 ab
N1K2	2.12 d	0.27 ab	0.63 e	1.18 a	110 bc	69 abc	49 a	34 ab
N1K3	2.18 cd	0.26 bc	0.67 d	1.19 a	105 cd	67 bcd	50 a	38 ab
N2K1	2.22 bc	0.24 bcd	0.69 cd	1.19 a	102 de	65 bcd	50 a	40 a
N2K2	2.22 bc	0.24 bcd	0.70 cd	1.20 a	100 de	62 bcd	51 a	33 b
N2K3	2.24 bc	0.23 cde	0.79 b	1.21 a	99 de	61 bcd	51 a	32 b
N3K1	2.27 b	0.21 def	0.80 b	1.21 a	98 de	58 cd	52 a	33 b
N3K2	2.35 a	0.20 ef	0.88 a	1.22 a	97 e	57 d	53 a	34 ab
N3K3	2.39 a	0.19 f	0.90 a	1.26 a	95 e	56 d	53 a	40 a

and other treatments. These data are in agreement with those reported by Aly (1993) who found that the lowest Fe content was observed with N fertilization.

6- Pinnae zinc content (ppm)

It is noticed from the obtained result (Table, 3) that during the two seasons the Zn content exhibits similar trend as the Iron content. Contradicting results were reported by El-Hammady *et al* (1987), who found that the pinnae Zn was not affected.

7- Pinnae manganese content (ppm)

As the nitrogen and potassium fertilization increased, the content of Mn in pinnae significantly increased during the first season. Treatment, N_3K_3 (2.0+ 2.0) kg per palm gave the highest Mn content and followed by the treatment of N_3K_2 (2.0 + 1.75) kg per palm as compared with the control and other treatments of nitrogen and potassium fertilization. Mn content for pinnae of Samany cv. in the second season did not significantly differ by nitrogen and potassium fertilization treatments.

8- Pinnae copper content (ppm)

The obtained results (Table, 3) indicated that, the copper content in pinnae of Samany date palm were significantly affected by nitrogen and potassium fertilization in the second season only. Treatments, of N_3K_3 (2.0+ 2.0) and N_2K_1 (1.75 + 1.5) kg per palm gave the highest Cu concentration as compared

with the control and other treatments of nitrogen and potassium fertilization.

These data are in partial agreement with those reported by Kassem *et al* (1997) on some soft date varieties, reported that K fertilization did not affect of Cu content.

In conclusion, nitrogen and potassium fertilization treatments of N_1K_1 (1.5 + 1.5) or N_3K_3 (2.0+ 2.0) kg per palm were the most effective fertilization treatments for Samany date palm cultivar under El-Kaliobia Governorate conditions in improving the fruit quality and leaf mineral content than did the control and the other fertilization treatments.

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مجلة حوليات العلوم الزراعية ، كلية الزراعة ، جامعة عين شمس ، القاهرة ، ٤٨٣ ، ع(١) ، ٢٨٣-٢٩٦ ، ٢٠٠٣
تأثير التسميد النيتروجيني والبوتاسي على المحصول وجودة الثمار ومستوى
بعض العناصر في نخيل البلح السمانى

[٢١]

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سماد بوتاسي) أعلى محصول وأعلى وزن للسويطة ، والمعاملة (١,٥ كجم سماد نيتروجيني + ١,٥ كجم سماد بوتاسي) أعطت أعلى وزن للثمرة واللحم/ثمرة وحجم الثمرة ، والمعاملة (١,٧٥ كجم سماد نيتروجيني + ٢ كجم سماد بوتاسي) أعطت أفضل طول للثمرة خلال موسمي الدراسة، أما أفضل قطر للثمرة تحقق مع المعاملة (١,٥ كجم سماد نيتروجيني + ١,٥ كجم سماد بوتاسي) خلال الموسم الأول والمعاملة (١,٧٥ كجم سماد نيتروجيني + ٢ كجم سماد بوتاسي) خلال الموسم الثانى من الدراسة.

بالنسبة للصفات الكيميائية فقد أعطت المعاملة (١,٧٥ كجم سماد نيتروجيني +

أجريت هذه الدراسة خلال موسمي ٢٠٠٠ ، ٢٠٠١ وذلك لدراسة تأثير التسميد النيتروجيني في صورة (نترات الأمونيوم) والتسميد البوتاسي في صورة (كبريتات البوتاسيوم) على المحصول وجودة الثمار ومستوى بعض العناصر في أوراق نخيل البلح السمانى النامى بمنطقة القناطر الخيرية.

أوضحت النتائج المتحصل عليها الآتي

بالنسبة للصفات الطبيعية فقد أعطت أشجار النخيل المسمدة بالمعدلات المختلفة من السماد النيتروجيني والبوتاسي محصولا عاليا عن أشجار المقارنة، حيث أعطت المعاملة (٢ كجم سماد نيتروجيني + ٢ كجم

والزنك فقد انخفض انخفاضاً معنوياً بزيادة معدلات التسميد النيتروجيني والبوتاسي خلال موسم الدراسة. المعاملة (١,٥ كجم سماد نيتروجيني + ١,٥ كجم سماد بوتاسي) أدت إلى زيادة محتوى الأوراق من الفوسفور خلال موسم الدراسة، في حين أن محتوى الأوراق من النحاس أزداد مع المعاملة (١,٧٥ كجم سماد نيتروجيني + ١,٥ كجم سماد بوتاسي) والمعاملة (٢ كجم سماد نيتروجيني + ١,٥ كجم سماد بوتاسي) خلال الموسم الثاني. أيضاً أدت المعاملة (٢ كجم سماد نيتروجيني + ٢ كجم سماد بوتاسي) إلى زيادة محتوى الثمار من الكالسيوم خلال الموسم الأول .

بناء على النتائج المتحصل عليها فإنه يمكن التوصية بإضافة (١,٥ كجم سماد نيتروجيني في صورة نترات الأمونيوم + ١,٥ كجم سماد بوتاسي في صورة كبريتات البوتاسيوم) أو (٢ كجم سماد نيتروجيني في صورة نترات الأمونيوم + ٢ كجم سماد بوتاسي في صورة كبريتات البوتاسيوم) /شجرة/سنة تحت ظروف الدراسة.

٢ كجم سماد بوتاسي) أعلى نسبة رطوبة في الثمار بينما المعاملة (١,٥ كجم سماد نيتروجيني + ١,٥ كجم سماد بوتاسي) أعطت أعلى نسبة من المواد الصلبة الذائبة والمعاملة (٢ كجم سماد نيتروجيني + ١,٧٥ كجم سماد بوتاسي) أعطت أعلى نسبة حموضة وذلك خلال موسم الدراسة. المعاملة (١,٥ كجم سماد نيتروجيني + ١,٥ كجم سماد بوتاسي) أدت إلى زيادة محتوى الثمار من السكريات الكلية والمعاملة (١,٧٥ كجم سماد نيتروجيني + ١,٧٥ كجم سماد بوتاسي) أدت إلى زيادة محتوى الثمار من السكريات المختزلة خلال موسم الدراسة، أما محتوى الثمار من السكريات غير المختزلة فقد أزداد مع المعاملة (٢ كجم سماد نيتروجيني + ٢ كجم سماد بوتاسي) خلال الموسم الأول والمعاملة (٢ كجم سماد نيتروجيني + ١,٧٥ كجم سماد بوتاسي) خلال الموسم الثاني.

أوضحت النتائج أن هناك زيادة معنوية في محتوى الأوراق من النيتروجين والبوتاسيوم أما محتوى الأوراق من الحديد

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