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## **EFFECT OF SOME VITAMINS ON FRUITING OF ZAGHLOUL DATE PALMS**

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### **ABSTRACT**

This trail was conducted during 2010 and 2011 seasons to examine the effect of single and combined applications of four vitamins namely K, E, A and B<sub>12</sub> each at 100 ppm on total surface area per palm, palm nutritional status, yield and fruit quality of Zaghloul date palms. The vitamins were sprayed four times at growth start, just after fruit setting and at one month intervals.

Results revealed that single and combined applications of the four vitamins (K, E, A and B<sub>12</sub>) each at 100 ppm were very effective in enhancing total surface area per palm, N, P, K and Mg control in the leaves, bunch weight, yield and fruit quality compare with the control treatment. The promotive effects of these vitamins on the investigated parameters could be arranged; in descending order as follows B<sub>12</sub>, A, E and K. Combined application of these vitamins was superior than the use of each vitamin alone.

The best results with regard to yield and fruit quality of Zaghloul date palms were obtained with using vitamins K, E, A and B<sub>12</sub> together each at 100 ppm.

**E. F. S. Ahmed *et al.***

## **INTRODUCTION**

Recently, it was suggested that all vitamins participate in plant growth and development. Most studies showed that most essential physiological processes such as photosynthesis, building of all organic foods, enzymes, nutrient, water uptake and cell division depended more or less on the availability of vitamins (Robinson, 1973). Vitamins with their antioxidative properties play an important role in plant defense against oxidative stress induced by all chemicals. The beneficial effects of vitamins were attributed to their positive action on enhancing cell division and various growth factors, such as cytokinins and gibberellins (Oertili, 1987; Samiullah *et al.*, 1988 and Bertschinger and Stadler, 1997).

A remarkable promotion was observed on growth, fruiting as well as physical and chemical characteristics of the fruits in different fruit crops (Tzeng and Devay, 1989; Farage, 1996; Buchala and Schmid, 1997; Numair- Safaa, 2001; Abd El- Wahab, 1999; Abd El-Kariem, 2009 and El- Kady- Hanaa, 2011).

The objective of this study was to elucidate the effect of some vitamins on fruiting of Zaghoul date palms.

## **MATERIALS AND METHODS**

This study was carried out during 2010 and 2011 seasons on 22 years old Zaghoul date palms in a private orchard located at Samalout district, Minia Governorate. Soil texture is clay and the distance between each palm was 5 m. Surface irrigation was followed. Pruning was carried out to maintain leaf bunch ratio at 8: 1 (Sayed, 2002). Number of female spathes per palm was adjusted to 10 spathes. Artificial ripening was conducted by inserting five male strands into the female bunch using known high activity pollen source throughout 2 – 3 days after female spa the cracking followed by bagging. Each selected palm received the common horticultural practices that are already applied in the orchard except those dealing with using vitamins.

## Effect of vitamin on zaghoul date palms

The study included sixteen treatments from the control as well as single and combined applications of four vitamins: K, E, A and B<sub>12</sub> each at 100 ppm.

- ١- Control.
- ٢- Spraying B<sub>12</sub> vitamin at 100 ppm.
- ٣- Spraying A vitamin at 100 ppm.
- ٤- Spraying E vitamin at 100 ppm.
- ٥- Spraying K vitamin at 100 ppm.
- ٦- Spraying B<sub>12</sub> + A vitamins each at 100 ppm.
- ٧- Spraying B<sub>12</sub> + E vitamins each at 100 ppm.
- ٨- Spraying B<sub>12</sub> + K vitamins each at 100 ppm.
- ٩- Spraying A + E vitamins each at 100 ppm.
- ١٠- Spraying A + K vitamins each at 100 ppm.
- ١١- Spraying E + K vitamins each at 100 ppm.
- ١٢- Spraying B<sub>12</sub> + A + E vitamins each at 100 ppm.
- ١٣- Spraying B<sub>12</sub> + A + K vitamins each at 100 ppm.
- ١٤- Spraying A + E + K vitamins each at 100 ppm.
- ١٥- Spraying B<sub>12</sub> + E + K vitamins each at 100 ppm.
- ١٦- All vitamins each at 100 ppm.

Each treatment was replicated three times, one palm per each. All vitamins were dissolved in Ethyl alcohol and were sprayed four times at growth start, just after fruit setting and at one month intervals. Triton B as a wetting agent at 0.05 % was added to all vitamin solutions. Control palms were sprayed with water containing Triton B and Ethyl alcohol. Completely randomized block design was followed.

During both seasons, total surface area per palm (m<sup>2</sup>) (according to Ahmed and Morsy, 1999), percentages of N, P, K and Mg in the dried leaves (according to Chapman and Pratt, 1960), bunch weight (kg.), yield, fruit weight (g.), T.S.S %, total and reducing sugars % (A.O.A.C, 1990), total acidity % (as g malic acid/ 100 g pulp A.O.A.C, 1990), crude fibre %, total soluble tannins %, fruit K % and fruit Fe (as ppm) were determined according to the procedures that outlined in A.O.A.C (1990).

**E. F. S. Ahmed *et al.***

The obtained data were subjected to the proper statistical analysis using new L.S.D at 5 % according to Gomez and Gomez (1984).

## **RESULTS AND DISCUSSION**

### **Total surface area per palm and percentages of N, P, K and Mg in the leaves:**

Data in Tables 1 and 2 clearly show that single and combined applications of the four vitamins namely K, E, A and B<sub>12</sub> significantly enhanced the total surface area per palm as well as N, P, K and Mg control in relative to the control treatment. Foliar application of K, E, A and B<sub>12</sub> vitamins each at 100 ppm, in ascending order was significantly very effective in enhancing these parameters. Combined applications of these vitamins was superior than using each vitamin alone in enhancing these parameters. Triple application surpassed double one in this respect. The maximum values were recorded on palms that sprayed four times with the four vitamins K, E, A and B<sub>12</sub>. Untreated palms gave the minimum values. Similar trend was observed during both seasons.

The beneficial of vitamins on enhancing cell division and the biosynthesis of organic foods surely reflected on improving growth and nutritional status (Robinson, 1973). The present results are in harmony with those obtained by Ahmed *et al.*, (2003); Gobara (2004); Gamal (2006); Ahmed *et al.*, (2007) and Badran and Ahmed (2009).

### **Bunch weight and yield per palm:**

Data in Tables 3 and 4 clearly show that single and combined applications of the four vitamins (K, E, A and B<sub>12</sub>) significantly improved bunch weight and yield per palm comparing with control treatment. In ascending order, foliar application of vitamins namely K, E, A and B<sub>12</sub> significantly improved bunch weight and yield per palm. Combined applications of these vitamins significantly improved bunch weight and yield per palm comparing with single ones. The maximum values were recorded on the palms received the four vitamins (K, E, A and B<sub>12</sub>) together. The minimum values were

### Effect of vitamin on zaghoul date palms

recorded on the untreated palms. Similar trend was observed during both seasons.

The profit of these vitamins on growth and nutritional status of the palms surely reflected on improving fruit retention % and yield per palm.

**Table 1: Effect of some vitamins on the total surface area per palm as well as percentages of N, P and K in the leaves of Zaghoul date palms during 2010 and 2011 seasons.**

Different vitamin treatments	Total surface area (m <sup>2</sup> )/ palm		Leaf N %		Leaf P %		Leaf K %	
	2010	2011	2010	2011	2010	2011	2010	2011
1- Control.	10.0	10.2	1.49	1.01	0.10	0.11	1.31	1.49
2- B <sub>12</sub> vit. At 100 ppm.	17.6	17.8	1.72	1.70	0.18	0.19	1.49	1.79
3- A vit. at 100 ppm.	17.0	17.1	1.76	1.79	0.16	0.16	1.44	1.74
4- E vit. at 100 ppm.	16.3	16.4	1.70	1.72	0.14	0.10	1.40	1.70
5- K vit. at 100 ppm.	10.6	10.7	1.00	1.08	0.12	0.12	1.36	1.07
6- B <sub>12</sub> + A vit.	21.6	21.6	2.06	2.09	0.30	0.30	1.80	2.00
7- B <sub>12</sub> + E vit.	21.0	21.0	1.99	2.02	0.29	0.30	1.74	1.94
8- B <sub>12</sub> + K vit.	20.1	20.2	1.94	1.97	0.27	0.27	1.70	1.90
9- A + E vit.	19.0	19.6	1.90	1.93	0.20	0.20	1.74	1.84
10- A + K vit.	18.8	18.9	1.84	1.87	0.22	0.22	1.08	1.78
11- E + K vit.	18.2	18.3	1.78	1.81	0.20	0.20	1.04	1.70
12- B <sub>12</sub> +A+E vit.	23.4	23.4	2.40	2.44	0.37	0.37	1.99	2.19
13- B <sub>12</sub> +A+K vit.	22.6	22.7	2.31	2.33	0.36	0.36	1.94	2.14
14- A+E+K vit.	21.6	21.8	2.12	2.10	0.32	0.32	1.80	2.00
15- B <sub>12</sub> +E+K vit.	22.0	22.1	2.20	2.23	0.34	0.34	1.89	2.09
16- All vitamins.	24.1	24.4	2.47	2.00	0.40	0.39	2.06	2.26
New L.S.D at 0	0.6	0.7	0.04	0.04	0.02	0.02	0.04	0.04

**E. F. S. Ahmed *et al.***

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These results are in agreement with those obtained by Ahmed *et al.*, (٢٠٠٣); Gobara (٢٠٠٤); Gamal (٢٠٠٦); Ahmed *et al.*, (٢٠٠٧) and Badran and Ahmed (٢٠٠٩).

## Effect of vitamin on zaghoul date palms

**Table ٧: Effect of some vitamins on the percentage of Mg in the leaves, bunch weight (kg), yield/ palm (kg.) and fruit weight (g.) of Zaghoul date palms during ٢٠١٠ and ٢٠١١ seasons.**

Different vitamin treatments	Leaf Mg %		Bunch weight (kg.)		Yield/ palm (kg.)		Fruit weight (g.)	
	٢٠١٠	٢٠١١	٢٠١٠	٢٠١١	٢٠١٠	٢٠١١	٢٠١٠	٢٠١١
١- Control.	٠.٢٢	٠.٢٣	١٢.٠	١٢.١	١٢٠.٠	١٢١.٠	٢١.٠	٢١.٠
٢- B <sub>١٢</sub> vit. at ١٠٠ ppm.	٠.٣٠	٠.٣١	١٣.٠	١٣.١	١٣٠.٠	١٣١.٠	٢٢.٥	٢٢.٦
٣- A vit. at ١٠٠ ppm.	٠.٢٨	٠.٢٩	١٢.٩	١٣.٠	١٢٩.٠	١٣٠.٠	٢٢.٤	٢٢.٥
٤- E vit. at ١٠٠ ppm.	٠.٢٦	٠.٢٦	١٢.٦	١٢.٦	١٢٦.٠	١٢٦.٠	٢١.٩	٢٢.٠
٥- K vit. at ١٠٠ ppm.	٠.٢٤	٠.٢٥	١٢.٣	١٢.٤	١٢٣.٠	١٢٤.٠	٢١.٥	٢١.٦
٦- B <sub>١٢</sub> + A vit.	٠.٤٢	٠.٤٤	١٤.٧	١٤.٨	١٤٧.٠	١٤٨.٠	٢٥.١	٢٥.٢
٧- B <sub>١٢</sub> + E vit.	٠.٤٠	٠.٤١	١٤.٤	١٤.٥	١٤٤.٠	١٤٥.٠	٢٤.٧	٢٤.٧
٨- B <sub>١٢</sub> + K vit.	٠.٣٨	٠.٣٩	١٤.١	١٤.٢	١٤١.٠	١٤٢.٠	٢٤.٣	٢٤.٤
٩- A + E vit.	٠.٣٦	٠.٣٧	١٣.٩	١٤.٠	١٣٩.٠	١٤٠.٠	٢٣.٨	٢٣.٩
١٠- A + K vit.	٠.٣٣	٠.٣٤	١٣.٦	١٣.٦	١٣٦.٠	١٣٦.٠	٢٣.٤	٢٣.٥
١١- E + K vit.	٠.٣١	٠.٣٢	١٣.٣	١٣.٤	١٣٣.٠	١٣٤.٠	٢٢.٩	٢٣.٠
١٢- B <sub>١٢</sub> +A+E vit.	٠.٥١	٠.٥٢	١٥.٣	١٥.٣	١٥٣.٠	١٥٣.٠	٢٧.٠	٢٧.١
١٣- B <sub>١٢</sub> +A+K vit.	٠.٤٨	٠.٥٠	١٥.٢	١٥.٢	١٥٢.٠	١٥٢.٠	٢٦.٤	٢٦.٥
١٤- A+E+K vit.	٠.٤٤	٠.٤٦	١٥.٠	١٥.١	١٥٠.٠	١٥١.٠	٢٥.٥	٢٥.٥
١٥- B <sub>١٢</sub> +E+K vit.	٠.٤٦	٠.٤٨	١٥.١	١٥.١	١٥١.٠	١٥١.٠	٢٥.٩	٢٦.٠
١٦- All vitamins.	٠.٥٦	٠.٥٨	١٥.٧	١٥.٨	١٥٧.٠	١٥٨.٠	٢٧.٨	٢٧.٩
New L.S.D at ٥ %	٠.٠٢	٠.٠٢	٠.٠٣	٠.٠٣	١.٩	٢.٠	٠.٤	٠.٤

### Some physical and chemical characteristics of the fruits:

From the data in Tables ٣ and ٤ one can state that single and combined applications of the four vitamins namely K, E, A and B<sub>١٢</sub> each at ١٠٠ ppm significantly was accompanied with improving fruit quality in terms of increasing fruit weight, total soluble solids % and

**E. F. S. Ahmed et al.**

total and reducing sugars % as well as K and Fe in the fruits and decreasing total acidity % relative to control treatment. The stimulation on quality of the fruits was associated with using vitamins K, E, A and B<sub>12</sub>, in ascending order. Combined applications of these vitamins were favourable than single ones in enhancing fruit quality. Significant differences on these parameters were observed among all vitamin treatments.

**Table 3: Effect of some vitamins on some chemical characteristics of the fruits of Zaghoul date palms during 2010 and 2011 seasons.**

Different vitamin treatments	T.S.S %		Total sugars %		Reducing sugars %		Total acidity %	
	2010	2011	2010	2011	2010	2011	2010	2011
1- Control.	27.0	27.1	20.0	19.9	13.0	13.1	0.010	0.016
2- B <sub>12</sub> vit. At 100 ppm.	27.0	27.1	21.0	21.0	14.2	14.3	0.418	0.416
3- A vit. at 100 ppm.	27.9	27.0	20.9	21.0	13.9	14.0	0.440	0.438
4- E vit. at 100 ppm.	27.7	27.7	20.0	20.7	13.7	13.7	0.477	0.476
5- K vit. at 100 ppm.	27.3	27.4	20.3	20.4	13.3	13.3	0.490	0.488
6- B <sub>12</sub> + A vit.	28.9	29.0	22.0	22.0	17.0	17.1	0.300	0.299
7- B <sub>12</sub> + E vit.	28.7	28.7	22.3	22.3	10.8	10.9	0.318	0.316
8- B <sub>12</sub> + K vit.	28.3	28.4	22.0	22.0	10.0	10.0	0.340	0.339
9- A + E vit.	28.0	28.1	21.9	22.0	10.2	10.2	0.370	0.309
10- A + K vit.	27.7	27.7	21.7	21.7	14.8	14.9	0.380	0.379
11- E + K vit.	27.3	27.4	21.3	21.3	14.0	14.0	0.400	0.399
12- B <sub>12</sub> +A+E vit.	29.7	29.7	23.1	23.1	17.7	17.8	0.290	0.289
13- B <sub>12</sub> +A+K vit.	29.7	29.7	23.0	23.0	17.7	17.8	0.290	0.289
14- A+E+K vit.	29.0	29.0	22.0	22.0	17.2	17.3	0.299	0.297
15- B <sub>12</sub> +E+K vit.	29.3	29.4	22.8	22.9	17.0	17.0	0.297	0.294
16- All vitamins.	30.0	30.0	23.0	23.0	17.9	17.1	0.280	0.271
New L.S.D at 0 %	0.3	0.3	0.3	0.3	0.3	0.3	0.020	0.002



## Effect of vitamin on zaghoul date palms

The best results with regard to quality of the fruits were obtained using all vitamins (K, E, A and B<sub>12</sub>) together. Untreated palms gave unfavourable effects on fruit quality. These results were true during both seasons.

The promoting effect of vitamins on the biosynthesis of sugars and plant pigments could explain the present results (Robinson, 1973).

These results are in agreement with those obtained by Ahmed *et al.*, (2003); Gobara (2004); Gamal (2006); Ahmed *et al.*, (2007) and Badran and Ahmed (2009).

As a conclusion, treating Zaghoul date palms four times with a mixture containing the four vitamins namely K, E, A and B<sub>12</sub> was responsible for improving yield quantitatively and qualitatively.

**Table 4: Effect of some vitamins on some chemical characteristics of the fruits of Zaghoul date palms during 2010 and 2011 seasons.**

Different vitamin treatments	Crude fibre %		Total soluble tannins %		Fruit K %		Fruit Fe (ppm)	
	2010	2011	2010	2011	2010	2011	2010	2011
1- Control.	0.76	0.76	0.71	0.72	0.50	0.51	0.7	0.7
2- B <sub>12</sub> vit. at 100 ppm.	0.70	0.70	0.70	0.76	0.78	0.70	7.8	7.9
3- A vit. at 100 ppm.	0.72	0.72	0.77	0.78	0.74	0.76	7.0	7.0
4- E vit. at 100 ppm.	0.74	0.70	0.79	0.70	0.70	0.72	7.2	7.2
5- K vit. at 100 ppm.	0.70	0.70	0.70	0.70	0.56	0.58	0.9	7.0
6- B <sub>12</sub> + A vit.	0.50	0.50	0.50	0.50	0.84	0.80	8.7	8.7
7- B <sub>12</sub> + E vit.	0.51	0.51	0.56	0.56	0.82	0.83	8.0	8.7

**E. F. S. Ahmed *et al.***

٨- B <sub>١٢</sub> + K vit.	٠.٥٣	٠.٥٤	٠.٥٨	٠.٥٨	٠.٨١	٠.٨٢	٨.٢	٨.٢
٩- A + E vit.	٠.٥٥	٠.٥٥	٠.٦٠	٠.٦١	٠.٨٠	٠.٨٠	٧.٨	٧.٩
١٠- A + K vit.	٠.٥٦	٠.٥٧	٠.٦١	٠.٦١	٠.٧٦	٠.٧٦	٧.٤	٧.٤
١١- E + K vit.	٠.٥٨	٠.٥٨	٠.٦٣	٠.٦٣	٠.٧٢	٠.٧٢	٧.١	٧.١
١٢- B <sub>١٢</sub> +A+E vit.	٠.٤٣	٠.٤٣	٠.٤٨	٠.٤٨	٠.٩١	٠.٩١	٩.٢	٩.٢
١٣- B <sub>١٢</sub> +A+K vit.	٠.٤٥	٠.٤٥	٠.٥٠	٠.٥٠	٠.٩١	٠.٩١	٩.٢	٩.٣
١٤- A+E+K vit.	٠.٤٩	٠.٥٠	٠.٥٤	٠.٥٥	٠.٨٨	٠.٨٩	٨.٨	٨.٩
١٥- B <sub>١٢</sub> +E+K vit.	٠.٤٧	٠.٤٧	٠.٥٢	٠.٥٢	٠.٩٠	٠.٩١	٩.٠	٩.٠
١٦- All vitamins.	٠.٤٠	٠.٣٩	٠.٤٥	٠.٤٥	٠.٩٥	٠.٩٥	٩.٤	٩.٥
<b>New L.S.D at ° %</b>	<b>٠.٠٢</b>	<b>٠.٠٢</b>	<b>٠.٠٢</b>	<b>٠.٠٢</b>	<b>٠.٠٤</b>	<b>٠.٠٥</b>	<b>٠.٢</b>	<b>٠.٢</b>

## Effect of vitamin on zaghoul date palms

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**E. F. S. Ahmed *et al.***

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## Effect of vitamin on zaghoul date palms

### تأثير رش بعض الفيتامينات على الإثمار في نخيل البلح الزغلول

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تم إجراء هذه التجربة خلال موسمي ٢٠١٠، ٢٠١١ لاختبار تأثير الاستخدام الفردي والمشارك لأربعة فيتامينات هي فيتامين ك، هـ، أ، ب١٢ بتركيز ١٠٠ جزء في المليون على المساحة الكلية لأوراق النخلة والحالة الغذائية للنخلة وكمية محصول النخلة وجودة الثمار في نخيل البلح الزغلول ولقد تم رش هذه الفيتامينات أربعة مرات في بداية النمو وبعد مرحلة عقد الثمار وبعدها وبفاصل شهر.

أوضحت نتائج الدراسة أن الاستخدام الفردي و المشارك للأربعة فيتامينات ك، هـ، أ، ب١٢ كان فعالا جدا في تحسين المساحة الكلية لأوراق النخلة وعناصر النيتروجين والفوسفور والبوتاسيوم والماغنيسيوم في الأوراق ووزن السويطة وكمية محصول النخلة وخصائص الجودة للثمار وذلك بالمقارنة بمعاملة الكنترول وكان التحسن مرتبنا باستخدام فيتامينات ب١٢ ، هـ، أ، ك مرتبة ترتيبا تنازليا. ولقد تفوق الاستخدام المشارك لهذه الفيتامينات عن الاستخدام الفردي في هذا الصدد.

أمكن الحصول على أفضل النتائج بخصوص كمية المحصول وخصائص الجودة للثمار في نخيل البلح الزغلول عند استخدام التوليفة المشتركة من فيتامينات ك، هـ، أ، ب١٢ بتركيز ١٠٠ جزء في المليون أربعة مرات.