

Relation of Spraying Urea with Some Vitamins on Productivity of Bartemuda Date Palms

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Abstract

This study was undertaken during 2016 & 2017 seasons to examine the effect of using urea at 1 % with some vitamins (C & B₁& B₂& B₆& B₁₂) at 500 ppm on enhancing the uptake of these vitamins, growth, palm nutritional status, yield and fruit quality of Bartemuda date palms. The selected palms received three sprays at the first of March, May and July. Using urea at 1 % and / or vitamins (C & B complex) at 500 ppm was very effective in promoting growth aspects, palm nutritional status, yield and quality of fruits relative to the control. Using urea at 1 % alone was preferable than using vitamin C and/or B complex in enhancing all the parameters. Combined application of urea with these vitamins was substantially superior than using urea or vitamins singly. Three sprays of a mixture of urea at 1% besides vitamins C + B₁+ B₂+B₆+B₁₂ each at 500 ppm was responsible for improving yield and fruit quality of Bartemuda date palms. Results showed that vitamins must be applied with urea in date palm orchards.

Key words: Vitamins C, B₁, B₂, B₆, B₁₂, urea, Bartemuda date palms, growth, palm nutritional status, yield, fruit quality.

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Introduction

Vitamins participate an obvious roles in enhancing the biosynthesis of cytokinins and GA₃, water and nutrient uptake, translocation of organic foods, cell division, the tolerance of plants to biotic and abiotic stresses, photosynthesis, plant pigments, proteins and amino acids. They are responsible for preventing the induction of reactive oxygen species (Robinson, 1973; Oretili, 1987; Samiullah *et al.*, 1987 and Bertshinger and Stadler, 1997). Using urea via foliage as mentioned by the previous studies was responsible for enhancing the uptake of other materials applied with it. It considers an important carrier necessary for enhancing the efficiency uptake of other materials (Nijjar, 1985; El-Sisy, 2000 and Saied, 2015). Abd El-Hady, (1995) and El-Morsy *et al.*, (1993) who worked on Red Roomy grapevines disclosed that using via leaves had an obvious promotion on yield and fruit quality. Subjecting date palms, bananas, mangoes, grapevines, pomegranates and citrus to different vitamin treatments was accompanied with improving growth aspects, nutrients, pigments, yield and fruit characteristics relative to the control treatment (Mostafa, 2004; Ragab, 2004; Gamal, 2006; Badran and Ahmed, 2009; Sayed *et al.*, 2011; Gad El-Kareem, 2012; Al-Wasfy, 2013; El-Khwaga, 2014; Abd El-Latif, 2014; Al-Wasfy, 2014; Omar, 2015; Mohamed, 2015; Ahmed-Samah, 2015 and Ahmed-Nada, 2017). This study was initiated to throw some lights on the effect of spraying urea with some vitamins on growth, palm nutritional status, yield and fruit quality of Bartemuda date palms.

Materials and methods

This study was conducted during 2016 and 2017 seasons in a private date palm orchard situated at Kom Ombo district, Aswan Governorate on 24 Bartemuda date palms. These palms were produced through conventional propagation by offshoots as well as characterized by regular bearing. Also, they are uniform in vigour, healthy, good physical conditions, free from insects, diseases and damages. They planted at 7x7 meters apart and irrigated with well water through drip irrigation system. The texture of the tested soil is sandy loam. Soil analysis was done according to Wilde *et al.*, (1985) and the obtained data are illustrated in Table (1).

Table (1): Physical and chemical analysis of the tested soil

Parameters	Values
Particle size distribution:	
Sand %	60.9
Silt %	20.9
Clay %	18.2
Texture	Sandy loam
O.M %	0.25
pH (1:5 extract)	7.81
EC (1:5 extract) mmlios/cm/25 ⁰ C)	1.11
CaCO ₃ %	3.15
Total N %	0.009
Available P (ppm)	2.1
Available K (ppm)	198.3

All the selected palms (24 palms) received the common and usual horticultural practices that already applied in the orchard except those dealing with urea and vitamin application. Bunches /leaf was adjusted to 101.1 (according to Mohamed *et al.*, 2017). Hand pollination was carried out inserting five spaces into 1 female spathe after two days from spathe cracking.

This experiment included the following eight treatments:

- 1- Control
- 2- Spraying urea at 1 %.
- 3- Spraying vitamins B complex (B₁+ B₂+ B₆+ B₁₂) at 500 ppm.

- 4- Spraying ascorbic acid at 500 ppm.
- 5- Spraying vitamins B + vitamin C each at 500
- 6- Spraying urea at 1 % + vitamin B complex at 500 ppm
- 7- Spraying urea at 1 % + ascorbic acid at 500 ppm
- 8- Spraying urea at 1 % + vitamin B complex+ ascorbic acid each at 500 ppm

Each treatment was replicated three times, one palm per each. Urea, vitamins B complex and ascorbic acid were sprayed three times on the first week of March, May and July by the assistance of Triton B a wetting agent at 0.05% till runoff.

Generally, during both seasons the following measurements were taken:

- 1- Leaf area (m^2) by multiplying the leaflet area (Ahmed and Morsy, 1999) by the total number of leaflets/leaf.
- 2- Total chlorophylls (a & b) as mg/g F.W in the middle fresh leaflets (Hiscox and Israistam, 1979).
- 3- Percentages of N, P and K in the middle leaflets on dry weight, basis (Summer, 1985 and Wilde *et al.*, 1985).
- 4- Bunch weight and yield/palm

At ripening bunch weight was recorded 50 fruits from each bunch were randomly selected to determine fruit weight (g.); flesh %; T.S.S.%; total reducing and non-reducing sugars (Lane and Eynon, 1965 and A.O.A.C., 2000), total acidity % (as g malic acid/100 g pulp), total fibre % (A.O.A.C., 2000) and total soluble tannins % (Balbaa, 1981). The experiment was set up as a randomized complete block design (RCBD). The analysis various (ANOVA) was used according to Mead *et al.*, (1993). Treatment means of the eight treatments were compared using new L.S.D test at 5 % level.

Results and discussion

1- Leaf area

Data in Table (2) clearly show that single and combined applications of vitamins B complex and C each at 500 ppm and urea at 1 % significantly was followed by stimulating the leaf area relative to the control. The promotion on the leaf area was associated with using urea, vitamin C and vitamin B complex, in descending order. Using urea at 1 % was significantly superior than using the two vitamins namely C and B complex in enhancing such growth trait. Treating the palms with vitamin C at 500 ppm significantly was superior than using vitamins B. Combined applications of urea and both vitamins (C & B) was significantly preferable than using each alone in enhancing the leaf area. Using urea at 1 % plus vitamins C and B each at 500 ppm gave the maximum values. The untreated palms produced the minimum values. Similar trend was noticed during both seasons.

2- Leaf chemical components

Data in Table (2) clearly show that single and combined application of vitamins B complex and C each at 500 ppm and urea at 1 % significantly was followed by stimulating the total

chlorophylls, N, P and K relative to the control. The promotion on these chemical components was associated with using urea, vitamin C and vitamin B complex, in descending order. Using urea at 1 % was significantly superior than using the two vitamins namely C and B complex in enhancing such parameters. Treating the palms with vitamin C at 500 ppm was significantly superior than using vitamins B. Combined applications of urea and both vitamins (C & B) was significantly preferable than using each alone in enhancing these components. Using urea at 1 % plus vitamins C and B each at 500 ppm gave the maximum values. The untreated palms produced the minimum values. Similar trend was noticed during both seasons.

3- Bunch weight

It is clear from the data in Table (2) that bunch weight of Bartemuda date palms was significantly improved due to using urea at 1 % and/or both vitamins (C & B) each at 500 ppm relative to the control treatment. The promotion on bunch weight was significantly correlated to the application of urea alone, vitamin C and vitamin B, in descending order. Combined applications were favourable than using each material alone in improving bunch weight. The maximum bunch weights (10.4 & 10.6 kg) were observed on the palms that received three sprays of a mixture of urea at 1 % and both vitamins C and B complex each at 500 ppm during both seasons, respectively. The untreated palms produced the minimum values of bunch weight 8.1 & 8.0 kg during both seasons, respectively. These results were true during both seasons.

4- Yield/palm

One can state from the data in Table (2) that treating Bartemuda date palms three times with urea at 1 % and / or vitamins C & B complex each at 500 ppm was significantly followed by enhancing the yield per palm. The promotion on the yield was significantly correlated with using urea at 1 % and both vitamins C and B complex each at 500 ppm, in descending order. Combined applications of these materials (urea and vitamins C and B) were significantly preferable than using each material alone in improving the yield. Using urea at 1 % was significantly superior than using vitamin C and/or vitamin B alone in improving the yield/palm. The maximum values of yield (104 & 101 kg) were recorded on the palms that treated with a mixture of urea at 1 % plus both vitamins C & B complex each at 500 ppm. The yield of the untreated palms reached 81 & 80 kg during both seasons, respectively. These results were true during both seasons.

5- Fruit characteristics

Data in Tables (2 & 3) obviously clear that treating Bartemuda date palm with urea at 1 % and/or vitamins C and B complex each at 500 ppm had significant promotion on the fruit quality in terms of increasing fruit weight, fruit flesh, T.S.S. % and reducing and total sugars and decreasing the percentages of total acidity, total fibre and total soluble tannins relative to the control treatment. The promotion on fruit quality characteristics was significantly

associated with using urea, vitamin C and B, in descending order. Combined applications were significantly favourable in improving fruit quality than using each material alone. Treating the palms with urea at 1 % was significantly superior than using vitamin B and/or vitamin C in enhancing quality characteristics. The best results were obtained due to supply the palms three times with a mixture of urea at 1 % plus vitamin C and B complex each at 500 ppm. Similar trend was noticed during both seasons.

Discussion

The promoting effect of urea on growth and productivity might be attributed to the effect of N on enhancing cell division, plant metabolism, photosynthesis water and nutrients uptake and the formation of plant cells (Nijjar, 1985). Our results are in agreement with those obtained by Nijjar, (1985); El-Sisy, (2000) and Saied, (2015). The beneficial effects of vitamins on the investigated parameters might be attributed to their effects in enhancing the biosynthesis of cytokinins and GA₃, water and nutrient uptake, translocation of organic foods, cell division, the tolerance of plants to biotic and abiotic stresses, photosynthesis, plant pigments, proteins and amino acids. They are responsible for preventing the induction of reactive oxygen species (Robinson, 1973; Oretili, 1987; Samiullah *et al.*, 1987 and Bertshinger and Stadler, 1997). The results of Mostafa, (2004); Ragab, (2004); Gamal, (2006); Badran and Ahmed, (2009); Sayed *et al.*, (2011); Gad El-Kareem, (2012); Al-Wasfy, (2013); El-Khwaga, (2014); Abd El-Latif, (2014); Al-Wasfy, (2014); Omar, (2015); Mohamed, (2015); Ahmed-Samah, (2015) and Ahmed-Nada, (2017) supported the present study.

Conclusion

Three sprays of a mixture of urea at 1% besides vitamins C + B₁+ B₂+B₆+B₁₂ each at 500 ppm was responsible for improving yield and fruit quality of Bartemuda date palms.

**Table (2):** Effect of spraying vitamin B complex and vitamin C and/or urea on the leaf area, total chlorophylls, percentages of N, P and K, bunch weight, yield and fruit weight of Bartemuda date palms during 2016 & 2017 seasons

Treatments	Leaf area (cm) ²		Total chlorophylls (mg/g F.W)		Leaf N %		Leaf P %		Leaf K %		Bunch weight (kg)		Yield/palm (kg)		Fruit weight (g)	
	2016	2017	2016	2017	2016	2017	2016	2017	2016	2017	2016	2017	2016	2017	2016	2017
Control	1.11	1.10	8.1	7.9	1.60	1.58	0.12	0.13	1.11	1.11	8.1	8.0	81	80	4.8	11.9
Vitamin B complex at 500 ppm	1.16	1.16	8.5	8.6	1.66	1.64	0.17	0.17	1.16	1.17	8.5	8.6	85	86	12.1	12.2
Vitamin C at 500 ppm	1.23	1.24	9.0	9.1	1.75	1.70	0.21	0.21	1.21	1.22	8.8	8.9	88	89	12.4	12.5
Urea at 1 %	1.36	1.39	10.2	10.4	1.94	1.91	0.29	0.29	1.34	1.35	9.4	9.5	94	95	12.9	13.0
Vitamin B complex + vitamin C	1.31	1.35	9.6	9.8	1.85	1.79	0.25	0.25	1.27	1.28	9.1	9.2	91	92	12.6	12.7
Vitamin B complex + urea at 1 %	1.42	1.50	11.0	11.0	1.99	2.00	0.34	0.35	1.41	1.42	9.7	9.8	97	98	13.1	13.1
Vitamin C + urea at 1 %	1.51	1.57	11.5	11.6	2.11	2.08	0.38	0.40	1.45	1.46	10.0	10.1	100	101	13.4	13.5
Vitamin B + C + urea	1.57	1.62	12.1	12.1	2.17	2.16	0.42	0.45	1.50	1.51	10.4	10.6	104	103	13.7	13.9
New L.S.D. at 5%	0.05	0.03	0.4	0.4	0.06	0.05	0.04	0.04	0.03	0.04	0.3	0.3	0.3	0.3	0.2	0.2

Vitamin B complex = B₁+ B₂+ B₆+ B₁₂

**Table (3):** Effect of spraying vitamin B complex and vitamin C and/or urea on some physical and chemical characteristics of the fruits of Bartemuda date palms during 2016 & 2017 seasons

Treatments	Fruit flesh %		T.S.S. %		Total sugars %		Reducing sugars %		Non reducing sugars %		Total acidity %		Total fibre %		Total soluble tannins	
	2016	2017	2016	2017	2016	2017	2016	2017	2016	2017	2016	2017	2016	2017	2016	2017
Control	88.0	88.0	71.1	71.3	60.5	61.0	11.5	11.7	49.0	49.3	0.281	0.277	1.11	1.12	0.60	0.59
Vitamin B complex at 500 ppm	88.5	88.7	71.5	71.9	60.8	61.9	11.9	12.6	50.0	49.3	0.270	0.266	1.05	1.09	0.55	0.54
Vitamin C at 500 ppm	89.0	89.3	72.0	72.5	61.3	62.5	12.3	14.0	45.9	48.5	0.257	0.255	1.00	1.04	0.49	0.47
Urea at 1 %	89.9	90.1	73.3	73.3	63.0	64.0	13.1	16.1	48.5	49.9	0.231	0.231	0.90	0.96	0.35	0.33
Vitamin B complex + vitamin C	89.4	90.5	72.6	72.9	62.0	63.0	12.8	15.2	59.2	50.8	0.247	0.241	0.95	1.00	0.40	0.39
Vitamin B complex + urea at 1 %	89.7	90.9	74.8	73.3	63.9	64.5	13.5	15.7	50.3	49.2	0.240	0.240	0.85	0.94	0.30	0.29
Vitamin C + urea at 1 %	90.3	91.2	79.3	74.0	65.0	65.0	14.0	16.0	51.0	49.0	0.230	0.231	0.79	0.81	0.25	0.26
Vitamin B + C + urea	90.6	91.6	81.0	77.0	66.1	65.9	15.1	16.3	51.0	49.6	0.210	0.220	0.73	0.73	0.20	0.22
New L.S.D. at 5%	0.3	0.3	0.3	0.3	0.2	0.3	0.3	0.3	NS	NS	0.009	0.10	0.2	0.2	0.2	0.2

Vitamin B complex = B₁+ B₂+ B₆+ B₁₂

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علاقة رش اليوريا مع بعض الفيتامينات علي انتاجية البلح البرتمودا

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الملخص العربي

أجريت هذه الدراسة خلال موسمي ٢٠١٦، ٢٠١٧ وذلك لاختبار تأثير استخدام اليوريا بتركيز ١% مع بعض الفيتامينات (فيتامين ج ، ب_١، ب_٢، ب_٦، ب_{١٢}) بتركيز ٥٠٠ جزء في المليون في تحسين امتصاص هذه الفيتامينات، النمو الخضري، الحالة الغذائية للنخلة، كمية المحصول وخصائص الجودة للثمار في نخيل البلح البرتمودا وقد تم الرش ثلاث مرات في الاسبوع الأول من مارس، مايو، يوليو. كان رش اليوريا بتركيز ١% والفيتامينات بتركيز ٥٠٠ جزء في المليون سواء في الصورة الفردية أو المشتركة فعالا جدا في تحسين النمو الخضري والحالة الغذائية للنخلة وكمية المحصول وخصائص الجودة للثمار وذلك مقارنة بمعاملة الكونتروال وكان استخدام اليوريا بتركيز ١% أفضل من الاستخدام الفردي والمشارك للفيتامينات وحدها في تحسين جميع المقاييس ولقد تفوق الاستخدام المشترك لليوريا مع هذه الفيتامينات عن الاستخدام الفردي لليوريا وهذه الفيتامينات. ان رش نخيل البلح البرتمودا ثلاث مرات بخليط من اليوريا بتركيز ١% جنباً الى جنب مع فيتامينات (فيتامين ج ، ب_١، ب_٢، ب_٦، ب_{١٢}) بتركيز ٥٠٠ جزء في المليون يكون فعالا جدا لتحسين كمية المحصول وجودة الثمار وقد أشارت نتائج الدراسة الى ضرورة استخدام الفيتامينات مع اليوريا في بساتين نخيل البلح.

الكلمات الدالة: (فيتامين ج، ب_١، ب_٢، ب_٦، ب_{١٢}) - اليوريا - نخيل البلح البرتمودا - النمو الخضري - الحالة الغذائية للنخلة - كمية المحصول - خصائص الجودة للثمار.