Effect of using slow release N and humic substances as a partial replacement of inorganic N on flowering, fruit setting, yield and fruit quality of Bartemuda date palms

Moawad A. Mohamed[1]; Abbas S.A. Saad [2] and Ahmed Abd El- Aaty A. Badawi[1]

[1]Hort. Dept. Fac. of Agric, Minia Univ. Egypt.
[2]Tropical Fruits Res. Dept. Hort. Res. Instit. ARC, Egypt.
Faissalfadel@yahoo.com

Abstract: This study was undertaken during 2016 & 2017 seasons to examine the effect of reducing inorganic N partially by using some slow release and humic fertilizers on flowering, fruit setting, yield and fruit quality of Bartemuda date palms grown under Aswan region conditions. Using N as 60 to 80 inorganic N, 20- 40 % slow release N fertilizers or 20- 40 ml/ palm/ year humic or fulvic acids considerably was followed by enhancing girth and length of spathe and number of flowers and fruits / strand, initial fruit setting %, fruit retention %, yield and bunch weight relative to using N as 40% inorganic N or when N was added completely via inorganic N. There was a gradual promotion on weight, height and diameter of fruit, fruit flesh %, T.S.S. %, total and non reducing sugars % and reduction on seed weight %, total acidity %, total fibre % and total soluble tannins with reducing the percentages of inorganic N from 100 to 40% and increasing slow release fertilizers from 0.0 to 60% and levels of humic and fulvic acids from 0.0 to 60 ml/ palm/ year. The best results with regard to yield of Bartemuda date palms were obtained due to supplying the palms with N as 60% inorganic N + 40 ml humic acid/ palm/ year. However, for obtaining good quality parameters, it is recommended to supply the palm with N as 40 % inorganic N + 60 ml humic acids.

[Moawad A. Mohamed; Abbas S.A. Saad and Ahmed Abd El- Aaty A. Badawi. **Effect of using slow release N and humic substances as a partial replacement of inorganic N on flowering, fruit setting, yield and fruit quality of Bartemuda date palms.** *World Rural Observ* 2018;10(2):12-18]. ISSN: 1944-6543 (Print); ISSN: 1944-6551 (Online). http://www.sciencepub.net/rural. 3. doi:10.7537/marswro100218.03.

Keywords: Inorganic N; slow release fertilizers SCU, UF, PCU, humic substances, yield, fruit quality Bartemuda date palms.

1. Introduction

For alleviating the adverse and inferior effects of excessive use of mineral N fertilization on yield and fruit quality, the idea of using slow release N fertilizers (**Wang and Alva, 1996**) and humic substances (**El- Sisys, 2000**) was arised.

Using slow release N fertilizers (**Ali- Mervat, 2000, Ibrahim, 2001, Kamel, 2002; Abd El-Hameed and Rabeea, 2005; Shaalan- Nashwa, 2008, Uwakiem, 2011; Ahmed and Abada, 2012; Allam, 2014 anmd Ahmed *et al.,* 2017**) and humic substances (**Manio *et al.,* 2001; Abo- Nukta and Parkisnon, 2007, El- Shenawi *et al.,* 2008, El-Mohamedy and Ahmed, 2009, Fathy *et al.,* 2010; Ahmed *et al.,* 2014 and Saied, 2015**) were very effective in improving flowering fruit setting, yield and fruit quality in different fruit crops.

The target of this study was examining the effect of using some slow release N fertilizers and humic substance as partial replacement of mineral N on flowering, fruit setting, yield and fruit quality of Bartemuda date palms grown under Aswan region conditions.

Table (1): Mechanical, physical and chemical analysis of the tested orchard soil:

Characters	values
Particle size distribution:	
Sand %	10.60
Silt %	58.00
Clay %	31.40
Texture grade	Silty clay
pH (1:2.5 extract)	8.00
E.C (1: 2.5 extract) (mmhos/ 1 cm/ 25^{o}C)	0.91
Organic matter %	2.09
$CaCO_3$ %	1.22
Macronutrients values	
Total N %	0.11
P (ppm, Olsen method)	20.00
K (ppm, ammonium acetate)	419.00
Mg (ppm)	79.00
S (ppm)	6.90
B (ppm hot water extractable)	0.27
EDTA extractable micronutrients (ppm)	
Zn	1.31
Fe	11.00
Mn	10.18
Cu	1.60

2. Material and Methods

This study was carried out in a private orchard located at El- Bosylia village Edfu district, Aswan governorate in which fourty – eight Bartemuda date palms (produced from offshoots) were selected for achieving of this study. The uniform in vigour date palms were planted at 7x7 meters apart. The texture of the soil is silty clay (Table 1). The selected palms were 10 years old at the start of experiment, good physical conditions and free from pests and damages. Surface irrigation system using Nile water was followed. Number of female spathes / palm was adjusted to nine spathes and bunch / leaf was 8: 1. Pollination was achieved by inserting five fresh male strands into the female bunch throughout two days after female spathe cracking. Soil analysis was done (**Wilde *et al.*, 1985**).

The selected palms (48) were subjected to the common horticultural practices that are already applied in the orchard except those dealing with N fertilization and using slow release and humic substances.

This experiment included the following sixteen treatments:

1- Application of N as 100% inorganic N (2985 g ammonium nitrate / palm).

2- Application of N as 80 % inorganic N (2388 g ammonium nitrate / palm) + 20 % urea – formaldyhyde (41% N) (488 g/ palm/ year).

3- Application of N as 80% inorganic N + 20 % phosphour coat urea (37.11 % N) (539 g / palm/ year)

4- Application of N as 80% inorganic N + 20 % sulphur – coated urea (41 % N) (488 g / palm/ year)

5- Application of N as 80% inorganic N + 20 ml/ palm fulvic acid.

6- Application of N as 80% inorganic N + 20 ml/ palm humic acid.

7- Application of N as 60 % inorganic N (1791 g ammonium nitrate) + 40 % urea formaldehyde (976 g / palm/ year)

8- Application of N as 60 % inorganic N (1791 g ammonium nitrate) + 40 % phosphour coated urea (1078 g/ palm/ year).

9- Application of N as 60 % inorganic N (1791 g ammonium nitrate) + 40 % sulphor coated urea (976 g/ palm/ year).

10-Application of N as 60 % inorganic N + 40 ml fulvic acid/ palm.

11-Application of N as 60 % inorganic N + 40 ml humic acid/ palm.

12-Application of N as 40% (1194 g ammonium nitrate) + 60 % urea formaldehyde (1463 g / palm/ year).

13-Application of N as 40% (1194 g ammonium nitrate) + 60 % phosphour- coated urea (1617 g / palm/ year).

14-Application of N as 40% (1194 g ammonium nitrate) + 60 % sulphur – coated urea (1463 g / palm/ year).

15-Application of N as 40 % inorganic N + 60 ml fulvic acid/ palm.

16-Application of N as 40 % inorganic N + 60 ml humic acid/ palm.

Each treatment was replicated three times, one palm/ each. The three slow release N fertilizers (urea – formaldehyde 41% N, sulphur – coated urea, 41% N and phosphour coated urea 37.11 % N) and humic and fulvic acids were applied once at growth start (last week of Feb.)

Mineral N sourcs namely ammonium nitrate (33.5 % N) were splitted into three equal batches and added at the first week of March, May and July.,

During both seasons, the following parameters were recorded:

1- Length and girth of spathe, number of strands/ spathe and number of flowers and fruits/ strand.

2- Percentages of initial fruit setting, and fruit retention, yield (kg.) and bunch weight (kg.)

3- Physical and chemical, characteristics of the fruits namely weight (g.), height and diameter (cm) of fruit, seed weight %, fruit flesh %, T.S.S. %, total, reducing and non- reducing sugars %, total acidity %, total crude fibre % and total soluble tannins % (**A.O.A.C., 2000**).

Statistical analysis was done (**Mead *et al.*, 1993**). New L.S.D. measurement was used to make all comparisons among treatment means.

3. Results and Discussion

1- Flowering aspects:

Data in Table (2) clearly show that girth and length of spathe, number of strands/ spathe and number of flowers and fruits / strand were significantly improved in response to subjecting the palms to N as 60 to 80% mineral N plus 20 to 40% any slow release N fertilizers (UF, SCU, PCU) or 20 to 40 ml humic or fulvic acid compared to using N as 100% mineral N or when mineral N was added as 40 % of the suitable N. A significant reduction on these flowering aspects was observed when N was added as 40% mineral N regardless slow release and humic acid substances application. There was a gradual promotion on these flowering aspects with reducing the percentages of mineral N from 100 to 40 % and at the same time increasing the percentages of slow release N fertilizers from 0.0 to 40% and the levels of humic and fulvic acids from 0.0 to 40 ml / palm/ year. Using humic substances was significantly superior than using slow release fertilizers in enhancing these flowering aspects. Varying the slow release fertilizers applied with inorganic N had significant differences on these flowering aspects.

The best release N fertilizers were urea-formaldehyde, phosphour- coated urea and sulphur – coated urea, in ascending order. Using humic acid was significantly superior than using fulvic acid in enhancing these flowering aspects. The maximum values were recorded on the palms that received N as 60% inorganic N + 20 ml /humic acid/ palm/ year. The palms received N as 40% inorganic N + 40 ml / palm/ year urea formaldehyde gave the lowest values. Similar trend was noticed during both seasons.

The beneficial effects of using the slow release N fertilizers and humic substances on growth and tree nutritional status surely reflected on enhancing flowering aspects.

These results regarding the benefits of slow release N fertilizers on flowering aspects are in harmony with those obtained by **Ali- Mervet (2000); Ibrahim- Asmaa (2010); Ahmed and Abada (2012) and Alam (2014)**.

The results of **El- Sehnawi *et al.*, (2008); El-Mohamedy and Ahmed (2009); Fathy *et al.*, (2010); Ahmed *et al.*, (2014) and Saied (2015)** supported the beneficial effects of humic substances on flowering aspects of different fruit crops.

2- Percentages of initial fruit setting and fruit retention:

Percentages of initial fruit and fruit retention as shown in Table (3) were significantly enhanced due to supplying the palms with N as 60 to 80% mineral N + 20 to 40% any slow release N fertilizers or fulvic and humic acids relative to using N at 100% inorganic N or when mineral N fertilizer was added at 40% of the suitable N. Using mineral N as 40% of N significantly reduced percentages of initial fruit retting and fruit retention. Using humic substances significantly enhanced percentages of initial fruit setting and fruit retention relative to the use of slow release N fertilizers in enhancing such two parameters. Using the fertilizer sulphur coated urea was significantly superior than using the other two slow release fertilizers namely urea formaldehyde and phosphour – coated urea in enhancing the percentages of initial fruit setting and fruit retention urea- formaldehyde ranked the last position in this respect. Using N as 100% inorganic N was significantly favourable than using N as 40% mineral N regardless the application of slow release fertilizers and humic substances. The highest values were recorded on the palms that received N as 60% inorganic N + 40 ml humic acid / palm. The palms received N as 40% inorganic N + 60% urea formaldehyde produced the lowest values. These results were true during both seasons.

The beneficial effects of slow release N fertilizers and humic substances on growth, tree nutritional status and flowering surely reflected on enhancing fruit setting.

These results regarding the benefits of slow release N fertilizers on fruit setting are in harmony with those obtained by **Ali- Mervet (2000); Ibrahim- Asmaa (2010); Ahmed and Abada (2012) and Alam (2014)**.

The results of **El- Sehnawi *et al.*, (2008); El-Mohamedy and Ahmed (2009); Fathy *et al.*, (2010); Ahmed *et al.*, (2014) and Saied (2015)** supported the beneficial effects of humic acid on fruit setting of different fruit crops.

3-Yield/ palm and bunch weight:

Data in Table (3) clearly show that supplying Bartemuda date palms with N as 60 to 80% mineral N plus 20 to 40% any slow release N fertilizers (UF, PCU or SCU) or humic substances (fulvic or humic acids) at 20 to 40 ml/ palm/ year significantly improved the yield/ palm and bunch weight relative to the use of N as 100% or 40% inorganic N regardless the use of slow release N fertilizers and humic substances. A signficiant reduction on yield and bunch weight was observed when N was added as 40% inorganic N regardless the application of slow release N fertilizers and humic substances. Using humic substances significantly surpassed the application of the slow release N fertilizers in improving yield and bunch weight. The best slow release N fertilizers in this respect were SCU, PCU and UF, in descending order. The best yield (373.5 & 364.5 kg and bunch weight (41.5 & 40.5 kg) were recorded on the palms that received N as 60% inorganic N + 40 ml humic acid / palm / year. The palms received N completely via mineral N produced yield reached 182.7 and 174.6 kg and bunch weight 20.3 & 19.4 kg during both seasons, respectively. The lowest yield (137.7 & 123.2) kg and bunch weight (15.3 & 14.5 kg) were recorded on the palms that received N as 40% inorganic N + 40% urea-formaldehyde. These results were true during both seasons.

The great benefits of the slow release N fertilizers and humic substances on flowering and fruit setting surely reflected on enhancing bunch weight and yield/ palm.

These results regarding the benefits of slow release N fertilizers on yield are in harmony with those obtained by **Ali- Mervet (2000); Ibrahim-Asmaa (2010); Ahmed and Abada (2012) and Alam (2014)**.

The results of **El- Sehnawi *et al.*, (2008); El-Mohamedy and Ahmed (2009); Fathy *et al.*, (2010); Ahmed *et al.*, (2014) and Saied (2015)** supported the beneficial effects of humic acid on yield of different fruit crops.

4- Physical and chemical characteristics of the fruits:

Data in Tables (4 & 5 & 6) clearly show that using N as 40 to 80% inorganic N plus 20 to 60 % any slow release N fertilizers or 20 to 60 ml humic substances succeeded in improving fruit quality in terms of increasing fruit weight, height and diameter, fruit flesh %, T.S.S. %, total and non- reducing sugars and decreasing seed weight %, total acidity %, total fibre % and total soluble tannins relative to the application of N as 100% inorganic N. Reducing sugars tended to reduce significantly with reducing inorganic N percentages and increasing the percentage of slow release N fertilizers and humic substances. The promotion on fruit quality was significantly related to the reduction on the percentages of inorganic N and the increase in the percentages of slow release N fertilizers and humic substance levels. Using humic substances was significantly favourable than using the three slow release N fertilizers in enhancing fruit quality. Using humic acid was significantly favourable than using fulvic acid in this respect. The best slow release fertilizers applied with mineral N were SCU followed by PCU and UF occupied the last position in this respect. The best results with regard to fruit quality were obtained due to supplying the palms with N as 40% inorganic N plus 60 ml humic acid. Unfourable effects on fruit quality were recorded on the palms that received N completely via inorganic N. These results were true during both seasons.

The beneficial effects of the slow release N fertilizers and humic substances on pigments surely related on enhancing the biosynthesis of sugars and maturity of fruits consequently advancing ripening and fruit quality.

These results regarding the benefits of slow release N fertilizers on fruit quality are in harmony with those obtained by **Ali- Mervet (2000); Ibrahim- Asmaa (2010); Ahmed and Abada (2012) and Alam (2014)**.

The results of **El- Sehnawi *et al.*, (2008); El-Mohamedy and Ahmed (2009); Fathy *et al.*, (2010); Ahmed *et al.*, (2014) and Saied (2015)** supported the beneficial effects of humic acid on fruit quality of different fruit crops.

Table (2): Effect of using some slow release fertilizers, fulvic and humic acids as partial replacement of inorganic N on some flowering and fruit setting aspects of Bartemuda date palms during 2016, 2017 seasons.

Treatments	Spathe girth (cm)		Spathe length (cm)		No. of strands / spathe		No. of flowers per strand		No. of fruits per strand	
	2016	2017	2016	2017	2016	2017	2016	2017	2016	2017
N as 100% inorganic N	21.0	20.9	47.0	47.2	83.0	81.0	40.1	39.1	21.1	20.7
N as 80% inorganic N + 20 % UF	21.7	21.6	47.6	48.0	84.0	82.0	41.2	40.2	21.8	21.3
N as 80% inorganic N + 20 % PCU	22.5	22.5	48.2	48.6	86.0	84.0	42.4	41.4	23.1	22.3
N as 80% inorganic N + 20 % SCU	23.2	23.2	49.0	49.2	88.0	86.0	43.5	42.6	23.9	23.3
N as 80% inorganic N + 20 ml Fulvic	24.0	24.1	49.5	49.9	90.0	88.0	44.7	43.6	25.0	24.4
N as 80% inorganic N + 20 ml humic	24.6	24.7	50.0	50.8	92.0	90.0	46.0	45.0	26.3	25.7
N as 60% inorganic N + 40 % UF	25.2	25.3	50.5	51.4	94.0	92.0	47.0	46.0	27.3	26.6
N as 60% inorganic N + 40 % PCU	25.8	25.8	51.0	52.0	96.0	94.0	48.1	47.1	28.4	27.7
N as 60% inorganic N + 40 % SCU	26.4	26.3	52.0	52.6	98.0	96.0	49.2	48.2	29.5	28.9
N as 60% inorganic N + 40 ml Fulvic	27.0	27.0	52.6	53.3	99.0	97.0	50.0	49.0	30.5	29.9
N as 60% inorganic N + 40 ml humic	27.6	27.5	53.5	53.9	101.0	99.0	52.2	51.3	32.4	32.1
N as 40% inorganic N + 60 % UF	18.0	17.9	44.1	44.2	72.0	70.0	35.0	34.0	16.5	16.0
N as 40% inorganic N + 60 % PCU	18.6	18.4	44.7	44.8	74.0	72.0	36.0	35.0	17.3	16.8
N as 40% inorganic N + 60 % SCU	18.9	19.0	45.3	45.4	76.0	74.0	37.1	36.1	18.1	17.8
N as 40% inorganic N + 60 ml Fulvic	19.8	19.6	46.0	46.0	78.0	76.0	38.2	37.1	19.1	18.5
N as 40% inorganic N + 60 ml humic	20.4	20.1	46.5	46.6	80.0	78.0	39.0	38.1	19.9	19.4
New L.S.D. at 5%	0.6	0.5	0.5	0.6	1.8	2.0	1.0	1.0	0.7	0.6

Table (3): Effect of using some slow release fertilizers, fulvic and humic acids as partial replacement of inorganic N on the percentages of initial fruit setting and fruit retention, yield / palm and bunch weight of Bartemuda date palms during 2016, 2017 seasons.

Treatments	Initial fruit setting %		Fruit retention %		Yield/ palm (kg.)		Av. Bunch weight (kg.)	
	2016	2017	2016	2017	2016	2017	2016	2017
N as 100% inorganic N	52.0	51.9	30.0	29.9	182.7	174.6	20.3	19.4
N as 80% inorganic N + 20 % UF	53.0	52.9	31.1	31.0	193.5	185.4	21.5	20.6
N as 80% inorganic N + 20 % PCU	53.9	53.9	32.1	31.9	216.0	200.7	24.0	22.3
N as 80% inorganic N + 20 % SCU	55.0	54.8	33.1	33.0	229.5	216.0	25.5	24.0
N as 80% inorganic N + 20 ml Fulvic	56.0	55.9	34.1	34.1	248.4	234.0	27.6	26.0
N as 80% inorganic N + 20 ml humic	57.1	57.0	35.1	35.1	265.5	254.7	29.5	28.3
N as 60% inorganic N + 40 % UF	58.0	57.9	36.0	36.1	283.5	270.9	31.5	30.1
N as 60% inorganic N + 40 % PCU	59.0	58.8	37.0	37.1	303.3	290.7	33.7	32.3
N as 60% inorganic N + 40 % SCU	60.0	59.9	38.0	38.1	324.9	312.3	36.1	34.7
N as 60% inorganic N + 40 ml Fulvic	60.9	61.0	39.1	39.1	342.0	329.4	38.0	36.6
N as 60% inorganic N + 40 ml humic	62.0	61.9	40.1	40.2	373.5	364.5	41.5	40.5
N as 40% inorganic N + 60 % UF	47.1	47.0	24.1	24.0	137.7	123.2	15.3	14.5
N as 40% inorganic N + 60 % PCU	48.0	47.9	25.2	25.1	149.4	143.1	16.6	15.9
N as 40% inorganic N + 60 % SCU	48.9	49.0	26.4	26.1	162.0	155.7	18.0	17.3
N as 40% inorganic N + 60 ml Fulvic	50.0	49.9	27.6	27.1	171.0	164.7	19.0	18.3
N as 40% inorganic N + 60 ml humic	51.0	50.9	28.8	28.1	171.9	162.9	19.1	18.1
New L.S.D. at 5%	0.9	0.7	1.1	1.0	10.1	11.0	1.1	1.0

Table (4): Effect of using some slow release fertilizers, fulvic and humic acids as partial replacement of inorganic N on some physical characteristics of the fruits of Bartemuda date palms during 2016, 2017 seasons.

Treatments	Av. Fruit weight (g.)		Av. Fruit height (cm)		Av. Fruit diameter (cm)		Seed weight %	
	2016	2017	2016	2017	2016	2017	2016	2017
N as 100% inorganic N	11.60	11.59	4.41	4.32	1.80	1.70	13.55	13.50
N as 80% inorganic N + 20 % UF	11.70	11.69	4.51	4.42	1.88	1.76	13.35	13.30
N as 80% inorganic N + 20 % PCU	11.81	11.81	4.62	4.52	1.95	1.82	13.10	13.05
N as 80% inorganic N + 20 % SCU	11.92	11.91	4.71	4.63	2.02	1.89	12.90	12.85
N as 80% inorganic N + 20 ml Fulvic	12.00	12.01	4.80	4.73	2.10	1.95	12.70	12.85
N as 80% inorganic N + 20 ml humic	12.10	12.13	4.90	4.83	2.17	2.01	12.40	12.65
N as 60% inorganic N + 40 % UF	12.20	12.23	4.99	4.94	2.25	2.07	12.10	12.35
N as 60% inorganic N + 40 % PCU	12.30	12.33	5.09	5.05	2.32	2.14	11.90	11.85
N as 60% inorganic N + 40 % SCU	12.41	12.45	5.19	5.15	2.40	2.21	11.60	11.55
N as 60% inorganic N + 40 ml Fulvic	12.52	12.55	5.28	5.20	2.47	2.27	11.90	11.45
N as 60% inorganic N + 40 ml humic	12.63	12.66	5.39	5.29	2.49	2.35	11.20	11.15
N as 40% inorganic N + 60 % UF	12.72	12.77	5.49	5.30	2.56	2.41	11.00	10.94
N as 40% inorganic N + 60 % PCU	12.82	12.89	5.58	5.40	2.63	2.48	10.80	10.72
N as 40% inorganic N + 60 % SCU	12.92	13.00	5.60	5.49	2.66	2.55	10.60	10.54
N as 40% inorganic N + 60 ml Fulvic	13.02	13.010	5.61	5.52	2.69	2.67	10.40	10.33
N as 40% inorganic N + 60 ml humic	13.12	13.26	5.62	5.59	2.76	2.68	10.20	10.15
New L.S.D. at 5%	0.09	0.10	0.09	0.10	0.07	0.06	0.17	0.19

Table (5): Effect of using some slow release fertilizers, fulvic and humic acids as partial replacement of inorganic N 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 %	
	2016	2017	2016	2017	2016	2017	2016	2017
N as 100% inorganic N	86.45	86.50	70.0	69.0	66.0	66.1	15.1	16.0
N as 80% inorganic N + 20 % UF	86.65	86.70	70.5	69.4	66.5	66.5	14.9	15.9
N as 80% inorganic N + 20 % PCU	86.90	86.95	71.0	70.0	67.0	67.0	15.0	16.0
N as 80% inorganic N + 20 % SCU	87.10	87.15	71.5	70.5	67.9	68.0	15.3	16.4
N as 80% inorganic N + 20 ml Fulvic	87.30	87.35	72.1	71.0	68.9	69.0	15.7	16.8
N as 80% inorganic N + 20 ml humic	87.60	87.65	72.6	71.5	70.0	69.7	16.0	16.7
N as 60% inorganic N + 40 % UF	87.90	87.95	73.1	72.0	70.5	70.4	15.5	16.4
N as 60% inorganic N + 40 % PCU	88.10	88.15	73.6	72.6	71.0	71.0	15.3	16.4
N as 60% inorganic N + 40 % SCU	88.40	88.45	74.1	73.2	71.6	71.5	15.0	15.9
N as 60% inorganic N + 40 ml Fulvic	88.60	88.55	74.6	74.0	72.2	72.0	14.3	15.1
N as 60% inorganic N + 40 ml humic	88.80	88.85	75.1	74.5	73.0	72.5	14.1	14.7
N as 40% inorganic N + 60 % UF	89.00	89.06	75.6	75.0	73.4	73.0	13.9	14.0
N as 40% inorganic N + 60 % PCU	89.20	89.28	76.1	75.5	73.6	73.5	13.0	12.6
N as 40% inorganic N + 60 % SCU	89.40	89.46	76.6	76.0	74.0	74.0	12.8	12.0
N as 40% inorganic N + 60 ml Fulvic	89.60	89.67	77.3	76.6	74.6	74.4	12.7	11.5
N as 40% inorganic N + 60 ml humic	89.80	89.85	78.0	77.5	75.0	74.8	12.0	11.2
New L.S.D. at 5%	0.18	0.19	0.5	0.5	0.4	0.4	0.3	0.3

Table (6): Effect of using some slow release fertilizers, fulvic and humic acids as partial replacement of inorganic N on some chemical characteristics of the fruits of Bartemuda date palms during 2016, 2017 seasons.

Treatments	Non- reducing sugars %		Total acidity %		Total crude fibre %		Total soluble tannins %	
	2016	2017	2016	2017	2016	2017	2016	2017
N as 100% inorganic N	50.9	50.0	0.310	0.313	1.11	1.14	0.89	0.87
N as 80% inorganic N + 20 % UF	51.6	50.6	0.295	0.300	1.08	1.11	0.85	0.83
N as 80% inorganic N + 20 % PCU	52.0	51.0	0.280	0.285	1.04	1.07	0.80	0.78
N as 80% inorganic N + 20 % SCU	52.6	51.6	0.285	0.270	1.00	1.03	0.76	0.74
N as 80% inorganic N + 20 ml Fulvic	53.2	52.2	0.250	0.255	0.97	1.00	0.71	0.70
N as 80% inorganic N + 20 ml humic	54.0	53.0	0.235	0.241	0.94	0.97	0.64	0.62
N as 60% inorganic N + 40 % UF	55.0	54.0	0.220	0.225	0.90	0.91	0.60	0.58
N as 60% inorganic N + 40 % PCU	55.7	54.6	0.205	0.210	0.87	0.85	0.55	0.53
N as 60% inorganic N + 40 % SCU	56.6	55.6	0.190	0.200	0.84	0.80	0.51	0.49
N as 60% inorganic N + 40 ml Fulvic	57.9	56.9	0.175	0.190	0.80	0.75	0.47	0.45
N as 60% inorganic N + 40 ml humic	58.9	57.8	0.160	0.175	0.70	0.70	0.43	0.41
N as 40% inorganic N + 60 % UF	60.0	59.0	0.145	0.160	0.64	0.62	0.40	0.39
N as 40% inorganic N + 60 % PCU	60.6	60.9	0.130	0.145	0.60	0.57	0.36	0.34
N as 40% inorganic N + 60 % SCU	61.2	62.0	0.125	0.130	0.56	0.52	0.31	0.29
N as 40% inorganic N + 60 ml Fulvic	62.2	62.9	0.110	0.115	0.52	0.48	0.27	0.25
N as 40% inorganic N + 60 ml humic	63.0	63.8	0.105	0.102	0.41	0.44	0.24	0.22
New L.S.D. at 5%	0.4	0.5	0.013	0.013	0.03	0.02	0.02	0.02

Conclusion:

The best results with regard to yield of Bartemuda date palms were obtained due to supplying the palms with N as 60% inorganic N + 40 ml humic acid/ palm/ year. However, for obtaining good quality parameters, it is recommended to supply the palm with N as 40 % inorganic N + 60ml humic acid.

References

1. Abd El-Hameed, H. M. and Rabeea, M. (2005): Effect of some slow and fast release N fertilizers on growth, nutritional status and fruiting in Ruby seedless grapevines. Minia J. of Agric. Res. & Dev. Vol. (25) No. 5 pp. 843-862.
2. Abu- Nukta, F. and Parkinson, R. (2007): Effect of humic substances on micronutrients availability in soils. Dameskh Univ. J. of Agric. Sci. (23): 2: 163-178.
3. Ahmed, F.F. and Abada, M.A.M. (2012): Response of Thompson seedless grapevines to some slow release N, P and K fertilizers. Egypt. J. Agric. Res., 90 (3): 1-16.
4. Ahmed, F.F. and Morsy, M.H. (1999): A new methods for measuring leaf area in different fruit species. Minia, J. of Agric. Res., Develop. 19 pp. 97- 105.
5. Ahmed, F.F.; Ibrahim, H.M.I. and Kamel, M. Kh. (2014): Reducing inorganic N partially in Zaghloul date palm orchards by using humic acid and effective microorganisms. World Rural Observations 6 (2): 102-110.
6. Ahmed, F.F.; Dakhly, O.F.; Abada, M.A.M. and Uwakiem, M. Kh. (2017): Effect of some zospirillum strains as a partial replacement of inorganic N fertilizers on yield and quality of Superior grapevines. Menoufia J. Plant Prod. Vol. 2 Dec.: 495-514.
7. Alam, H.M.M. (2014): Productive capacity of Superior grapevines in relation to application of some slow release fertilizers, effective microorganisms and humic acid. Ph. D. Thesis Fac. of Agric. Minia Univ. Egypt.
8. Ali-Mervet, A. (2000): Response of Flame seedless grapevines to slow release nitrogen fertilizers. Minia J. of Agric. Res. & Develop. 20(2): 239-255.
9. Association of Official Agricultural Chemists (2000): Official Methods of Analysis 14th ed. (A. O. A. C.) Benjamin Franklin Station, Washington D. E. U.S.A., pp. 490 – 510.
10. Eissa Fawzia, M., M.A. Faith and S.A. EI-Shall (2007): The role of humic acid and rootstock in enhancing salt tolerance of "Le-Conte" pear seedlings. J. Agric. Sci. Mansoura Univ., 32: 3651-3666.
11. El- Mohamedy, R. S. R. and Ahmed, M. A. (2009): Effect of biofertilizers and humic acid on control of dry root rot disease and improvement yield and quality of mandarin *(Citrus reticulata* Blanco). Res. J. of Agric. and Biol. Sci. 5 (2): 127 – 137.
12. El- Shenawi, M.R.; Ali, H.S. and Mohamed, B.A.F. (2008): Response of Grand Naine banana to humic acid, potassium and magnesium fertilization. Alex. Sci. Exchange J., 29:244-251.
13. El-Sisy, I.M.H. (2000): Assessing the pollution cause by excessive nitrogen fertilization J. Agric. Sci Mansoura Univ. 25 (19): 7297-9313.
14. Fathy, M.A.; Gaber, M.A. and El- aall S.A. (2010): Effect of humic acid treatments on

canino apricot growth, yield and fruit quality New York Sci. J. 3: 109-115.
15. Hiscox, A. and Isralstam, B. (1979): A method for the extraction of chlorophyll from leaf tissue without maceration. Can. J. Bot. 57: 1332 - 1334.
16. Ibrahim- Asmaa, A. H. (2001): Effect of some slow and fast release nitrogen fertilizers and pinching on yield and quality of Red Roomy grapevines. M. Sc. Thesis Fac. of Agric. Minia Univ. Egypt.
17. Kamel, M. K. (2002): Physiological studies on pruning and fertilization of Flame seedless grapevines *(Vitis vimfera* L.) Ph. D Thesis, Fac. of Agric., Minia Univ., Egypt.
18. Manio, V.; Bacher, C. Stentiford, E. and Lopez-Real, J. (2001): Humic substances stimulate plant growth and nutrient accumulation in grape rootstock. proc. Inter Symp. On composting of organic matter. Acta Hort. No. Sug: 131-126.
19. Mead, R.; Currnow, R. N. and Harted, A. M. (1993): Methods in Agricultural and Experimental and Biology2 nd Ed Hall, London pp. 10-44.
20. Saied, H.H.M. (2015): Influence of replacing inorganic N fertilizer partially of Sakkoti date palm orchards by using some natural organic and bio stimulants. Ph. D. Thesis Fac. of Agric. Minia Univ. Egypt.
21. Shaalan- Nashwh, G. M. (2008): Response of Balady mandarin trees to application of some bio, organic, inorganic and slow release N fertilizers. Ph. D. Thesis, Fac. of Agric. Minia Univ. Egypt.
22. Summer, M.E. (1985): Diagnosis and recommendation Integrated system (DRIS) as a guide to orchard fertilization. Hort. Abst. 55(8): 7502.
23. Uwakiem, M. Kh. (2011): Effect of some organic, bio and slow release N fertilizers as well as some antioxidants on vegetative growth, yield and berries quality of Thompson seedless grapevines Ph. D, Thesis. Fac. of Agric. Minia Univ. Egypt.
24. Wang, F.F. an Alva, A.K. (1996): Leaching of nitrogen from slow release urea sources in sandy soil. Soil Sci. Am. J. 60: 1454-1458.
25. Wilde, S. A.; Corey, R. B.; Layer, J. G. and Voigt, G. K. (1985): Soils and Plant Analysis for Tree Culture. Oxford, and 1131-1, publishing Co., New Delhi, pp. 96-106.

4/17/2018