Effect of using slow release N and humic substances as partial replacement of inorganic N on growth and nutritional status 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 some vegetative growth aspects, leaf photosynthetic pigments and N, P, K and Mg in the leaves of Bartemuda date palms grown under Aswan region conditions. Three slow release N fertilizers namely urea formaldehyde (UF) sulphur coated urea (SCU) and phosphorus coated urea (PCU) were used at 20 to 60 %from inorganic N as well as humic and fulvic aids were applied at 20 to 60 ml/ palm. Replacing 60- 80 % inorganic N partially by using 20 to 40% any slow release N fertilizers (UF, SCU or PCU) or 20 to 40 ml humic or fulvic acids had an announced promotion on all growth characteristics relative to the use of Nas 100% inorganic N form. Using inorganic N as 40% besides any one of the there slow release fertilizers at 60% or humic and fulvic acids each at 60ml / palm caused an obvious reduction on these growth, aspects. Reducing inorganic N percentages growth from 100 to 40% and at the same time enhancing percentages of the slow release N fertilizers from 0.0 to 60% and both humic and fulvic acid levels from 0.0 to 60 ml / vine caused a gradual promotion on chlorophyll a & b, total chlorophylls, total carotenoids N, P, K and Mg. The minimum values of these leaf chemical components were recorded on the palm that received N as 100% inorganic N. For enhancing growth and tree nutritional status of Bartemuda date palms, it is necessary to fertilize the palms with N (1000 g / palm/ year) as 60 % inorganic N + 40 ml humic acid per palm/ year.

[Moawad A. Mohamed; Abbas S.A. Saad and Ahmed Abd El- Aaty A. Badawi. **Effect of using slow release N and humic substances as partial replacement of inorganic N on growth and nutritional status of Bartemuda date palms.** *Stem Cell* 2018;9(2):10-15]. ISSN: 1945-4570 (print); ISSN: 1945-4732 (online). http://www.sciencepub.net/stem. 2. doi:10.7537/marsscj090218.02.

Keywords: Inorganic N, SCU, PCU, UF, humic acid, fulvic acid Bartemuda date palms, growth nutritional status.

1. Introduction

To counteract\ the severe and adverse effects of excessive mineral N – fertilization on our environment as well as the great development on growth at the expense of fruiting state many attempts were conducted to finding out some replacements of these fertilizers. Nowadays, slow release N fertilizers (**Wang and Alva, 1996**) and humic substances (**Eissa Fawzia *et al.,* 2007**) were used as partial replacement of mineral N fertilizers. In most date palm orchards slow release fertilizers were development mainly to improve the efficiency of N used by the palms, minimize the loss of nutrients via leaching and to reduce to the lower extent the great pollution occurred in our environment and they considered new approaches for amending the palms with their requirements from nutrients (**Wang and Alva, 1996**).

Humic substances are responsible for enhancing N fixation, organic matter, water retention, availability of nutrients, root development, the biosynthesis of natural hormones and antibiotics and reducing soil pH (**El- Sisy, 2000**; **Manio *et al.,* 2001 and Abu- Nukta and Parkinson, 2007**).

Previous studies showed that using slow release N fertilizers (**Ali –Mervet, 2000; Ibrahim- Asmaa, 2001; Kamel, 2002; Abd El- Hameed and Rabeea, 2005; Shaalan- Nashwah, 2008; Uwakiem, 2011; Ahmed and Abada, 2012; Alam, 2014 and Ahmed *et al.,* 2017)** and humic substances (**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 enhancing growth and tree nutritional status 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 growth and tree nutritional status of Bartemuda date palms grown under Aswan region conditions.

2. Materials 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**).

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°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

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 sources 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 measurements were recorded:

1- Growth aspects namely length, width and area **(Ahmed and Morsy, 1999)** of leaflet, number of leaflet/ leaf, leaf area (m^2), leaf length (m), number of spines / leaf and spine length (cm)

2- Leaf chemical components namely chlorophylls a, b, total chlorophylls, total carotenoid (**Hiscox and Isralstam, 1979**), N, P, K and Mg (on dry weight basis) (**Summer, 1985 Wilde *et al.*, 1985 and A.O.A.C., 2000**).

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

3. Results & Discussion

1- Growth aspects:

It is clear from the data in Tables (2 & 3) that fertilizing, Bartemuda date palms width N via 60-80 % mineral N plus 20 to 40% any slow release N fertilizers (urea formaldehyde UF; phosphour coated urea PCU or sulphur – coated urea SCU) or

humic and fulvic acids each at 20 to 40 ml/ palm significantly stimulated the eight growth traits namely length, width and area of leaflet, number of pinnae/ leaf, leaf area, leaf length, number of spines/ leaf and spine length relative to the use of N completely via inorganic N or when mineral N was added at 40% even with the application of slow release fertilizers or humic substances. Reducing percentages of inorganic N to 40 % regardless the application of slow release and humic substances had significant reduction on these growth traits. Application of humic substances (humic or fulvic acids) was significantly superior than using slow release fertilizers as a partial replacement of mineral N fertilizer. Using humic acid significantly surpassed the application of fulvic acid in replacing mineral N and enhancing growth aspects. The best slow release N fertilizers in this respect were urea formaldehyde, phosphorus coated urea and sulphur coated urea, in ascending order. The maximum values were recorded on the palms that received N as 60% inorganic N + 40ml humic acid. Using N as 100% inorganic N was significantly responsible for enhancing growth traits than using N as 40% inorganic N with any slow release N fertilizers or humic substances. Using N as 40% inorganic N + 60% urea formaldehyde gave the minimum values. Similar trend was noticed during both seasons.

The beneficial effects of slow release N fertilizers on amending the palms with their requirement from nutrients at longer times could result in enhancing growth aspect (**Wang and Alva, 1996**). The promoting effect of sloe release N fertilizers on growth was supported by the results of **Alam (2014) and Ahmed *et al.*, (2017)**.

The outstanding effect of humic substances on growth might be attributed to their positive action on reducing soil pH and enhancing organic matter, availability of nutrient and root development (**El-Sisy, 2000**).

These results are in harmony with those obtained by **Fathy *et al.*, (2010); Ahmed *et al.*, (2014) and Saied (2015)**.

2- Leaf chemical components:

Data in Tables (4 & 5) clearly show that using slow release N fertilizers (UF, PCU or SCU) at 20 to 60% as well as humic or fulvic acids each at 20 to 60 ml/ palm with 40 to 60 mineral N significantly stimulated chlorophylls a & b, total chlorophylls, total carotenoids, N, P, K and Mg in the leaves relative to the use of N completely via mineral N. There was a gradual promotion on these pigments and nutrients with reducing the percentages of inorganic N from 100 to 40% and increasing slow release N fertilizers from 0.0 to 60% and both humic and fulvic acids from 20 to 60 ml/ palm/ year. Using humic substances was significantly superior than using slow release N fertilizers in enhancing these leaf chemical components. Using humic acid significantly enhanced these leaf chemical components than using fulvic acid. Varying slow release N fertilizers significantly varied these leaf components. The best slow release fertilizers were sulphur coated urea followed by phosphour coated urea and urea formaldehyde occupied the last position in this respect. Supplying the palms with N via 40 % mineral N + 60 ml humic acid gave the maximum values. The palms received N as 100% inorganic N gave the lowest values. These results were true during both seasons.

The positive action of the slow release N fertilizers in enhancing root development (**Wang and Ala, 1996**) as well as humic substances on reducing soil pH and enhancing the availability of different nutrients could explain the present results.

The promoting effect of the three slow release N fertilizers on leaf chemical components was emphasized by the results of **Uwakiem (2011); Ahmed and Abada (2012); Alam (2014) and Ahmed *et al.*, (2017)**.

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

Treatments	Leaflet length (cm)		Leaflet width (cm)		Leaflet area (cm)2		No. of leaflet / leaf	
	2016	2017	2016	2017	2016	2017	2016	2017
N as 100% inorganic N	38.6	38.9	2.71	2.80	87.9	91.5	151.0	149.0
N as 80% inorganic N + 20 % UF	39.0	39.4	2.81	2.90	92.1	96.0	154.0	152.0
N as 80% inorganic N + 20 % PCU	39.3	39.7	2.90	3.00	95.7	100.0	157.0	155.0
N as 80% inorganic N + 20 % SCU	39.6	40.0	3.00	3.09	99.8	103.8	160.0	160.0
N as 80% inorganic N + 20 ml Fulvic	40.1	40.5	3.10	3.20	104.4	108.9	162.0	162.0
N as 80% inorganic N + 20 ml humic	40.5	41.0	3.19	3.30	108.5	113.7	164.0	165.0
N as 60% inorganic N + 40 % UF	41.0	41.4	3.30	3.41	113.7	118.6	166.0	168.0
N as 60% inorganic N + 40 % PCU	41.5	41.9	3.40	3.51	118.5	123.5	169.0	171.0
N as 60% inorganic N + 40 % SCU	42.0	42.4	3.50	3.60	123.5	128.2	171.0	174.0
N as 60% inorganic N + 40 ml Fulvic	42.4	42.7	3.59	3.71	127.9	133.1	173.0	177.0
N as 60% inorganic N + 40 ml humic	43.0	43.4	3.68	3.78	132.9	137.8	176.0	180.0

Treatments	Leaflet length (cm)		Leaflet width (cm)		Leaflet area (cm)2		No. of leaflet / leaf	
	2016	2017	2016	2017	2016	2017	2016	2017
N as 40% inorganic N + 60 % UF	36.0	36.3	2.20	2.30	66.5	70.1	140.0	141.0
N as 40% inorganic N + 60 % PCU	36.5	36.8	2.30	2.39	70.5	73.9	142.0	144.0
N as 40% inorganic N + 60 % SCU	37.0	37.3	2.40	2.50	74.6	78.3	144.0	145.0
N as 40% inorganic N + 60 ml Fulvic	37.5	38.0	2.49	2.60	78.4	83.0	146.0	146.0
N as 40% inorganic N + 60 ml humic	38.0	38.4	2.60	2.70	86.2	87.1	148.0	146.0
New L.S.D. at 5%	0.3	0.3	0.09	0.10	1.0	0.9	0.2	0.8

Table (3): Effect of using some slow release fertilizers, fulvic and humic acids as partial replacement of inorganic N on some vegetative growth characteristics of Bartemuda date palms during 2016, 2017 seasons.

Treatments	Leaf area (m2)		leaf length (m)		No. of spines / leaf		Spine length (cm)	
	2016	2017	2016	2017	2016	2017	2016	2017
N as 100% inorganic N	1.33	1.36	3.32	3.20	26.0	23.0	9.6	9.7
N as 80% inorganic N + 20 % UF	1.42	1.46	3.38	3.26	28.0	25.0	9.9	10.0
N as 80% inorganic N + 20 % PCU	1.50	1.55	3.46	3.34	30.0	27.0	10.2	10.3
N as 80% inorganic N + 20 % SCU	1.60	1.66	3.51	3.39	31.0	28.0	10.5	10.6
N as 80% inorganic N + 20 ml Fulvic	1.69	1.76	3.57	3.45	31.0	29.0	10.8	10.9
N as 80% inorganic N + 20 ml humic	1.77	1.88	3.64	3.52	33.0	30.0	11.0	11.1
N as 60% inorganic N + 40 % UF	1.89	1.99	3.71	3.59	33.0	30.0	11.2	11.3
N as 60% inorganic N + 40 % PCU	2.00	2.11	3.76	3.64	33.0	30.0	11.5	11.6
N as 60% inorganic N + 40 % SCU	2.11	2.23	3.82	3.70	35.0	32.0	11.8	12.0
N as 60% inorganic N + 40 ml Fulvic	2.21	2.36	3.90	3.78	35.0	33.0	12.0	12.2
N as 60% inorganic N + 40 ml humic	2.34	2.48	3.95	3.83	35.0	33.0	12.3	12.5
N as 40% inorganic N + 60 % UF	0.93	0.99	3.00	2.88	16.0	12.0	8.1	8.0
N as 40% inorganic N + 60 % PCU	1.00	1.06	3.06	2.93	18.0	14.0	8.4	8.2
N as 40% inorganic N + 60 % SCU	1.07	1.14	3.13	3.01	20.0	16.0	8.7	8.4
N as 40% inorganic N + 60 ml Fulvic	1.14	1.21	3.20	3.09	22.0	18.0	9.0	8.6
N as 40% inorganic N + 60 ml humic	1.28	1.27	3.26	3.14	24.0	20.0	9.2	8.8
New L.S.D. at 5%	0.04	0.06	0.05	0.04	2.0	2.0	0.2	0.2

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

	Chlorophyll a (mg/ 1.0 g F.W.)		Chlorophyll b (mg/ 1.0 g F.W.)		Total Chlorophylls (mg/ 1.0 g F.W.)		Total carotenoids (mg/ 1.0 g F.W.)	
	2016	2017	2016	2017	2016	2017	2016	2017
N as 100% inorganic N	4.11	4.20	1.37	1.40	5.48	5.60	1.25	1.28
N as 80% inorganic N + 20 % UF	4.21	4.30	1.40	1.43	5.61	5.73	1.28	1.31
N as 80% inorganic N + 20 % PCU	4.32	4.40	1.44	1.46	5.76	5.86	1.32	1.34
N as 80% inorganic N + 20 % SCU	4.44	4.59	1.49	1.50	5.93	6.09	1.37	1.38
N as 80% inorganic N + 20 ml Fulvic	4.55	4.65	1.55	1.54	6.10	6.19	1.43	1.42
N as 80% inorganic N + 20 ml humic	4.66	4.76	1.60	1.59	6.26	6.35	1.48	1.46
N as 60% inorganic N + 40 % UF	4.81	4.92	1.63	1.62	6.44	6.54	1.57	1.51
N as 60% inorganic N + 40 % PCU	4.91	4.99	1.66	1.66	6.57	6.65	1.54	1.56
N as 60% inorganic N + 40 % SCU	5.11	5.20	1.70	1.70	6.81	6.90	1.58	1.60
N as 60% inorganic N + 40 ml Fulvic	5.22	5.32	1.74	1.74	6.96	7.06	1.62	1.65
N as 60% inorganic N + 40 ml humic	5.32	5.43	1.78	1.77	7.10	7.20	1.66	1.70
N as 40% inorganic N + 60 % UF	5.49	5.60	1.82	1.80	7.31	7.40	1.70	1.74
N as 40% inorganic N + 60 % PCU	5.69	5.80	1.86	1.83	7.55	7.63	1.75	1.79
N as 40% inorganic N + 60 % SCU	5.80	5.90	1.89	1.87	7.69	7.72	1.77	1.83
N as 40% inorganic N + 60 ml Fulvic	5.91	5.99	1.92	1.90	7.83	7.89	1.81	1.87
N as 40% inorganic N + 60 ml humic	5.98	6.06	1.95	1.94	7.92	7.97	1.85	1.92
New L.S.D. at 5%	0.06	0.05	0.03	0.03	0.07	0.06	0.03	0.04

Table (5): Effect of using some slow release fertilizers, fulvic and humic acids as partial replacement of inorganic N on the percentages of N, P, K and Mg in the leaves of Bartemuda date palms during 2016, 2017 seasons.

Treatments	Leaf N %		Leaf P %		Leaf K %		Leaf Mg %	
	2016	2017	2016	2017	2016	2017	2016	2017
N as 100% inorganic N	1.49	1.52	0.201	0.199	1.01	1.04	0.46	0.45
N as 80% inorganic N + 20 % UF	1.58	1.61	0.220	0.218	1.08	1.11	0.49	0.49
N as 80% inorganic N + 20 % PCU	1.64	1.67	0.241	0.239	1.13	1.16	0.53	0.53
N as 80% inorganic N + 20 % SCU	1.71	1.74	0.259	0.256	1.18	1.21	0.56	0.57
N as 80% inorganic N + 20 ml Fulvic	1.79	1.82	0.281	0.279	1.23	1.27	0.60	0.61
N as 80% inorganic N + 20 ml humic	1.86	1.90	0.301	0.299	1.30	1.34	0.65	0.66
N as 60% inorganic N + 40 % UF	1.93	1.97	0.321	0.319	1.39	1.43	0.69	0.70
N as 60% inorganic N + 40 % PCU	1.99	2.05	0.341	0.339	1.43	1.47	0.74	0.75
N as 60% inorganic N + 40 % SCU	2.06	2.11	0.361	0.359	1.48	1.52	0.80	0.81
N as 60% inorganic N + 40 ml Fulvic	2.14	2.18	0.381	0.378	1.52	1.56	0.85	0.87
N as 60% inorganic N + 40 ml humic	2.20	2.25	0.400	0.398	1.57	1.61	0.90	0.92
N as 40% inorganic N + 60 % UF	2.27	2.33	0.416	0.414	1.63	1.67	0.95	0.98
N as 40% inorganic N + 60 % PCU	2.35	2.41	0.432	0.430	1.70	1.74	1.00	1.02
N as 40% inorganic N + 60 % SCU	2.12	2.48	0.451	0.449	1.75	1.80	1.05	1.07
N as 40% inorganic N + 60 ml Fulvic	2.52	2.55	0.471	0.469	1.80	1.85	1.10	1.10
N as 40% inorganic N + 60 ml humic	2.59	2.61	0.490	0.488	1.85	1.91	1.13	1.15
New L.S.D. at 5%	0.05	0.06	0.016	0.014	0.04	0.05	0.03	0.04

Conclusion

For enhancing growth and tree nutritional status of Bartemuda date palms, it is necessary to fertilize the palms with N (1000 g / palm/ year) as 60 % inorganic N + 40 ml humic acid per palm/ year.

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