Trials for Replacing Inorganic N Partially in Superior Vineyard by Using Slow Release N Fertilizers, Humic Acid and EM

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Abstract: During 2012 and 2013 seasons, Superior grapevines were supplied with N (50 g / vine / year) via 19 to 56% of the three slow release N fertilizers namely sulphur-coated urea, phosphorus-coated urea and urea-formaldehyde besides the check treatment in which the vines fertilized with N as 75% urea the fast release N fertilizer. In addition to the fast and slow release N fertilizers, the vines received humic acid and/ or effective microorganisms (EM) each at 10 ml/ vine/ year. Leaf area, totals chlorophylls, N, P and K, berry setting %, yield, berries quality , juice content of nitrate and nitrite, soil content of CO_2 and total counts of bacteria and wood ripening coefficient in response to slow and fast release N fertilizers, humic acid and EM treatments were investigated. Application of N through 19 to 56% any one of the slow release N fertilizers effectively enhanced the leaf area, total chlorophylls , N, P and K in the leaves, berry setting %, yield, berries quality , soil content of CO_2 and total counts of bacteria , while reduced both nitrate and nitrite in the juice relatively to using N as 75% urea. Single and combined applications of humic acid and/ or EM each at 10 ml / vine considerably improved leaf area, vine nutritional status, yield, berries quality and soil content of CO_2 and total counts of bacteria. Using EM was superior than using humic acid in this respect. The best results with regard to yield and quality of Superior grapes were obtained with supplying the vines with N (50 g / vine / year) via 38% phosphorus- coated urea + 5 kg farmyard manure + humic acid and EM each at 10 ml/ vine year. Pollution with nitrate and nitrite was greatly reduced with using such promised treatment.

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1.Introduction

Nowadays, many attempts were accomplished for reducing environment pollution through reducing inorganic N fertilizers in vineyards partially by using slow release N fertilizers as well as organic N, humic substances and effective microorganisms (EM). Using slow or controlled release N fertilizers was followed by enhancing the efficiency of N uptake as well as reducing nitrate and nitrite pollution and continuous supplement of N to the trees at longer periods. Controlling the release of N for Superior vines is very potent for solving the problems of shot berries and producing good berries quality (**Wang and Alva, 1996**). Organic and biofertilization with using humic acid and EM are responsible for enhancing both physical and chemical fertility of the soil which surely reflected on enhancing and adjusting growth characters and vine nutritional status in favour of producing good yield with better fruit quality. (**Nijjar, 1985; Simon *et al.,* 1999 ; David, 2002 and Lofredo *et al.,* 2007**).

Previous studied showed that using slow release N fertilizers are considered an important partial replacement for inorganic N in vineyards and they are responsible for enhancing growth, vine nutritional status, yield and quality of the berries in various grapevine cvs. (**Mansour, 1998; Ali- Mervet , 2000 , Ibrahim- Asmaa , 2001; Rabie and Negm, 2012 , Uwakiem, 2011 and Ahmed and Abada, 2012**), humic acid (**Eman *et al.,* 2008; Abada, 2009; Abada *et al.,* 2010; Abd El- Aziz, 2011; Mekawy, 2012 and Abdelaal *et al.,* 2013**) and effective microorganisms (**Wang and Ranawade, 1997; Ischac and Moustafa, 1998; Dahama, 1999; Joo *et al.,* 1999; Farag, 2006; Abada *et al.,* 2010 and Abdelaal *et al.,* 2013**)

The target of this was elucidating the possibility of replacing inorganic N in Superior vineyards partially by using some slow release N fertilizers, humic acid and effective microorganisms.

2. Material and Method

This study was carried out during two consecutive seasons 2012 and 2013 on one hundred and twenty uniform in vigour of 9- years old Superior grapevines. The selected vines are grown in a private vineyard located at El- Sheikh Hassan Village; Matay district, Minia Governorate where the texture of the soil is sandy loam as shown in Table (1). Soil analysis was done according to the procedures that outlined by

Wilde *et al.*, (1985). The selected vines are planted at 3.0 m (between rows) x 1.5 m (between vines) apart. The chosen vines were trained by cane system leaving 104 eyes / vine (eight fruiting canes x 12 eyes plus four renewal spur x two eyes) using Gable supporting method. Winter pruning was carried out at the first week of January 2012 and 2013 seasons. Drip irrigation system using Nile waters was followed.

Table (1): Analysis of the tested vineyard soil

Characters	Values
Particle size distribution	55.0
Sand %	22.0
Silt %	23.0
Clay %	Loam
Texture	Sandy
pH (1: 2.5 extract)	7.97
EC(1: 2.5 extract) mmhos/ 1cm/ 25°C	1.41
O.M. %	0.9
Total N %	0.05
Available P (ppm)	2.3
Available K (ppm)	95

The selected vines (120 vines) received the same horticultural practices that were already applied in the vineyard except those dealing with the application of N via all sources (inorganic, organic and bioforms), slow release N fertilizers, humic acid and EM.

This experiment included forty treatments from two factors (A & B). The first factor (A) consisted from the following ten treatments from fast and slow release N fertilizers namely a_1) Using the suitable N as 75% urea; a_2) Using the suitable N as 56% urea formaldehyde ; a_3) Using the suitable N as 56% sulphur coated urea , a_4) Using the suitable N as 56% phosphorous-coated urea, a_5) Using the suitable N as 38% urea- formaldehyde; a_6) Using the suitable N as 38% sulphur-coated urea, a_7) Using the suitable N as 38 % phosphorus-coated urea, a_8) Using the suitable N as 19% urea-formaldehyde, a_9) Using the suitable N as 19% phosphorous-coated urea. The second factor (B) contained treatments of humic acid and / or EM namely b_1) Non application of four humic acid and EM (untreated vines); b_2) application of humic acid at 10 ml/ vine / year; b_3) application of Effective microorganisms (EM) at 10ml / vine/ year and b_4) application of both humic acid and EM each at 10ml/ vine/ year. Therefore, this experiment included forty treatments. Each treatment was replicated three times, one vine per each. Therefore, 120 uniform in vigour vines were selected for achieving of this investigation. The suitable and recommended N namely 50 g N / vine/ year for superior grapevines under Minia conditions was examined (according to **Abada, 2009**).

Urea (46.5 N) as a fast release N fertilizer was applied at four unequal batches 40% at growth start (1st week of March) ; 20 % before blooming (last week of March) , 20% just after berry setting (third week of April) and 20% after harvesting (last week of July).

The three slow release N fertilizers namely urea formaldyhyde (41% N); sulphur-coated area (41% N + 10% S) and phosphorous-coated urea (37.11% N + 10 % P_2O_5) were added once at growth start (1st week of March). All the tested vines received organic N at fixed rate namely 25% of the suitable N (i.e. 12.5 g N/ vine/ year) in the source of farmyard manure (0.25% N, 1.2 % K_2O) and .4% P_2O_5) (5 kg farmyard manure). It was added once at the last week of January. Humic acid in the form of Humita 25 (25 % humic acid) was added at 10 ml / vine / year. Effective microorganisms (EM) (each ml contains 10^7 bacterial cells) was added once at growth start (1st week of March) during both seasons.

During both seasons, the following measurements were recorded:

1- Leaf area (cm^2) (mid. May) (**Ahmed and Morsy, 1999**).
2- Total chlorophylls (mg/ 100 g F.W.) (**Von-Wettstein, 1957**).
3- Percentages of N, P and K in the leaves (**Wilde *et al.*, 1985**).
4- Percentages of berry setting.
5- Yield expressed in weight (kg.) and number of cluster per vine (last week of June).
6- Berry weight (g.) , T.S.S. %, total acidity % as g tartaric acid/ 100 ml juice (**A.O.A.C., 2000**).
7- Juice content of nitrate and nitrite (as ppm) (**Ridnour- Lisa *et al.*, 2000**).
8- Soil content of CO_2 (mg/ 100 g soil) (**Paul and Clark, 1996**) and total counts of bacteria (cfu/ 1.0 g soil) (**Alexander, 1997**).
9- Wood ripening coefficient (**Bouard , 1966**).

Statistical analysis was done and treatment means were compared using new L.S.D. at 5 % (**Mead *et al.*, 1993**).

3. Results and Discussion

1- Leaf area and its content of total chlorophylls N, P and K

It is clear from the data in Tables (2 to 6) that application of the suitable N (50g / vine / year) through 19 to 56% of any one of the three show release N fertilizers namely urea- formaldehyde (UF), sulphur- coated urea (SCU) and phosphorus- coated urea (PCU) significantly stimulated the leaf area and its content of total chlorophylls, N, P and K relatively to using N via 75% urea the fast release N fertilizer. The promotion was associated with increasing percentages of the three slow release N fertilizers from 19 to 56% . No significant promotion on these

parameters was observed among using the slow release fertilizers at 38% or 56%. Reducing the percentages of using these fertilizers from 38 to 19% of the suitable N resulted in significant reduction on the leaf area and its contents of total chlorophylls, N, P and K. The perferability of the slow release fertilizers in this respect could be arranged as follows in ascending ard UF, SCU and PCU. The maximum values were recorded on the vines that fertilized with N as 56% PCU. Using N as 75% urea gave the lowest values.

Application of humic acid and/ or effective microorganisms EM each at 10 ml/ vine/ year significantly was accompanied with enhancing the leaf area and its content of total chlorophylls, N, P and K rather than untreated vines. Using EM was significantly superior than using humic acid in this respect. Combined application of humic acid and EM gave the maximum values.

The highest values of leaf area (123.6 and 124.1 cm^2) , total chlorophylls (41.4 and 46 mg/ 100, F.W.), N(2.38 & 2.48 %0 , P (0.48 & 0.45 %) and K (1.98 & 1.96 %) were recorded on the vines that received N as 56% PCU + humic acid + EM each at 10 ml / vine. Using N via 75% urea without the application of humic acid and EM gave the lowest values. These results were true during both seasons.

2- Berry setting %, yield and cluster weight:

Data listed in Tables (7 to 10) obviously reveal that the percentage of berry setting, yield expressed in weight and number of clusters per vine (2^{nd} season) and cluster weight were significantly increased in response to application of N via the three slow release N fertilizers namely UF, SCU and PCU each at 19 to 56% of the suitable N rather than using N as 75% urea the fast release N fertilizer. There was a gradual promotion on these parameters with increasing percentages of each slow release N fertilizer from 19 to 56%. However, a slight and insignificant promotion was observed on berry setting %, yield and cluster weight with increasing percentages of using UF, SCU and PCU from 38 to 56%. Therefore, from economical point of view it is suggested to use these fertilizers as 38% of the suitable N. The best slow release N fertilizer was PCU followed by SCU and UF occupied the last position in this respect. The highest values were recorded on the vines that fertilized with N as 38% of N from economical point of view as previously mentioned. Using N as 75% urea gave the lowest values.

It is worth to mention that supplying Superior grapevines with humic acid and / or EM each at 10 ml/ vine significantly was accompanied with improving berry setting %, yield , number of clusters per vine (in the second season) and cluster weight over the check treatment. The promotion was significantly associated with using EM relatively to using humic acid. Using humic acid plus EM each at 10 ml/ vine gave the maximum values when compared with using any one of both alone. The lowest values were recorded on the vines that unorganic and unbiofertilized. Similar results were announced during both seasons.

From economical point of view, the best results with regard to berry setting, yield and cluster weight were obtained on the vines that received N as 38% PCU + humic acid + EM each at 10 ml/ vine / year. Under such promised treatment, values of berry setting, yield and cluster weight were 13.9 & 14.8 %, 9.5 & 13.4 kg and 394 & 395 g during both seasons, respectively. The control vines (received only N as 75% urea) produced the lowest values of berry setting (7.8 & 8.1), yield (6.6 & 7.4 kg) and cluster weight (315 & 321 g) during both seasons, respectively. Accordingly, the percentage of increase on the yield (kg) due to using the previous recommended treatment reached 43.9 and 81.1 % over the check treatment, during both seasons, respectively. The studied fast and slow release N fertilizer, humic acid and EM treatments failed significantly to show material promotion on the number of clusters/ vine in the first season of study.

3- Fruit quality and juice content of nitrate and nitrite:

It is evident from the obtained data in Tables (11 to 15) that application of the suitable N via 19 to 56% of any one of the three slow release N fertilizers significantly was followed by improving fruit quality in terms of increasing berry weight and , T.S.S. % and reducing total acidity%, nitrate and nitrite in the juice relatively to using N as 75% urea. The promotion on fruit quality was significantly associated with increasing percentages of the three slow release N fertilizers from 19 to 56%. Both nitrate and nitrite in the juice were significantly tended to reduce with reducing percentage of the three slow release N fertilizers form 56 to 19% . No significant effect on these parameters was recorded among using the two percentages namely 38 and 56% of each slow release N fertilizer. Reducing the percentages of the three slow N fertilizers from 56 to 19% resulted in significant adverse effects on fruit quality and at the same caused a significant reduction on both nitrate and nitrite in the juice. The best results with regard to fruit quality were obtained on the vines that fertilized with N via 38% PCU (since no significant effect was detected among 38 and 39% of each fertilizer). The lowest values of nitrate and nitrite were recorded on the vines that fertilized with N as 19% PCU. Unfavourable effects on fruit quality and juice content of both nitrate and nitrite were detected on the vines that were fertilized with N as 75% urea.

Application of humic and/ or EM each at 10 ml/ vine significantly improved quality of the berries in terms of increasing berry weight and T.S.S. % and reducing total acidity %, nitrate and nitrite in the juice over the check treatment. Using EM was significantly favourable than using humic acid in this respect. The best results with regard to quality of the berries were obtained on the vines that received humic acid and EM together. The untreated vines produced unfavourable effects on quality of the berries. From economical point of view, the best results with regard to quality of the berries were obtained on the vines that received N as 38% PCU + humic acid + EM each at 10 ml/ vine. Under such promised treatment berry weight, T.S.S., nitrate and nitrite reached 3.31 , 3.9 g & 21.6 & 21.6 % , 1.22 & 1.15 ppm and 0.64 & 0.95 ppm during both seasons, respectively. The vines fertilized with N as 75% urea without application of humic acid + EM gave the lowest values of berry weight and T.S.S. % and the highest values of total acidity, nitrate and nitrite in the juice. Similar results were announced during both seasons.

4-The amount of CO_2 and total counts of bacteria in the soil

Tables (16 & 17) show that application of UF, SCU and PCU each at 19 to 56% of N significantly enhanced the amount of CO_2 and total counts of bacteria in the soil relatively to using N as 75% urea. Using PCU, SCUI and UF , in descending order was very effective in enhancing such two parameters in the soil. The maximum values were recorded due to using N as 56% PCU. The minimum values were recorded owing to using N as 75% urea.

Single and combined application of humic acid and EM was significantly very effective in enhancing the amount of CO_2 and total counts of bacteria rather than non- application. Using EM was significantly favourable than using humic acid. Combined application of humic acid and EM gave the maximum values.

The maximum values of CO_2 and total counts of bacteria were recorded on the soil that fertilized with N as 56% PCU + humic acid + EM. Application of N as 75% urea without the use of both humic acid and EM gave the lowest values. Similar results were announced during both seasons.

5- Wood ripening coefficient:

It is evident from the obtained data in Table (18) that fertilizing the vines with N as 19 to 56% of any one of the three slow release N fertilizer significantly enhanced wood ripening coefficient rather than using N as 75% urea. The advancement in wood ripening coefficient was significantly depended on increasing percentages of the three slow release N fertilizers. Increasing percentages from 38 to 56% of each fertilizer had no significant promotion on wood ripening coefficient. A significant reduction on wood ripening coefficient was observed with reducing the percentages of the three slow release N fertilizers from 38 to 19%. The best enhancement on wood ripening coefficient was observed on the vines that received with UF, SCU and PCU, in ascending order. Fertilizing the vines with N via 56% PCU gave the best results. The lowest values of such character were observed on the vines that fertilized with N as 75% urea.

Using humic acid and/ or EM each at 10 ml/ vine significantly advanced wood ripening coefficient rather than the control treatment. The best wood ripening coefficient was observed due to using EM comparing with using humic acid. When humic acid and EM were applied together, wood ripening coefficient was significantly enhanced relatively to using each biostimulant alone. An obvious promotion was detected due to using humic acid incorporated with EM. Untreated vines produced the lowest values.

Supplying the vines with N as 56% % PCU + humic acid + EM gave the maximum wood ripening coefficient (0.910 & 0.901) during both seasons, respectively. The lowest values (0.792 and 0.800) of wood ripening coefficient were recorded on the vines that fertilized with N as 75% urea alone (without using humic acid + EM). These results were true during both seasons.

4.Discussion

Current research indicates that EM cultures can suppress soil borne pathogens, accelerate the decomposition of organic wastes, increase the availability of mineral nutrients and useful organic compounds to plant, as well as enhance CO_2, total counts of bacteria, the activities of beneficial microorganisms namely mycorhizal, nitrogen fixing bacteria, yeast and other microorganisms (**Kannaiyan , 2002**).

Humic substances namely humic acid, fulvic acid and humin act as conditioners for the soil and as bio catalyst and improve soil structure, and increase root development. Also, addition of organic matter to organically deficient soils, increase root vitality, improve nutrient uptake, chlorophyll synthesis, fertilizer retention, and beneficial microbial activity and produce healthier plants and improve yield (**Nijjar, 1985; Simon *et al.*, 1999; and Lofredo *et al.*, 2007**).

The positive action of the slow release N fertilizers on growth and fruiting of Superior grapevines might be attributed to their essential role on enhancing the efficiency of N uptake , controlling the release of N and reducing leaching of N, which were surely reflected on adjusting growth and saving

organic and mineral nutrients for fruiting process **(Wang and Alva, 1996 and David , 2002**).

The results regarding the beneficial effects of the slow release N fertilizers on growth, vine nutritional status, yield and fruit quality are in harmony with those obtained by **Mansour (1998); Ali – Mervet (2000); Uwakiem (2011) and Ahmed and Abada (2012)** on different grapevine cvs.

The promoting effect of EM on fruiting of Superior grapevines was supported by the results of **Farag (2006); Abada *et al.*, (2010) and Abdelaal *et al.*, (2013)**.

The results of **Eman *et al.*, (2008); Abada (2009); Abada *et al.*, (2010); Abd El- Aziz (2011); Mekawy (2012) and Abdelaal (2013)** confirmed the beneficial effect of humic substance son growth, vine nutritional status, yield and fruit quality in different grapevine cvs.

Table (2): Effect of some fast and slow release N fertilizers, humic acid and effective microorganisms on the leaf area(cm^2) of Superior grapevines during 2012 and 2013 seasons.

Fast and slow release N fertilizers (A)	2012					2013				
	Humic acid and EM treatments (B)									
	b_1 Untreated vines	**b_2 Humic acid**	**b_3 EM**	**b_4 Humic acid + EM**	**Mean (A)**	**b_1 Untreated**	**b_2 Humic acid**	**b_3 EM**	**b_4 Humic acid + EM**	**Mean (A)**
a_1- Using N* as 75% U	108.0	109.2	110.5	112.0	**109.9**	106.5	108.3	110.0	112.0	**109.2**
a_2- Using N as 56% UF	116.0	117.3	118.6	120.1	**118.0**	114.0	116.3	118.0	120.0	**117.1**
a_3- Using N as 56% SCU	117.3	118.8	120.0	121.0	**119.4**	116.3	118.5	120.2	122.2	**119.3**
a_4- Using N as 56% PCU	118.5	119.9	122.0	123.6	**121.0**	119.0	120.3	122.0	124.1	**121.4**
a_5- Using N as 38 % UF	115.8	117.0	118.4	120.0	**117.8**	113.9	116.0	117.7	119.8	**116.9**
a_6- Using N as 38 % SCU	117.0	118.4	119.8	121.5	**119.2**	116.0	118.2	120.0	122.2	**119.1**
a_7- Using N as 38 % PCU	118.3	120.0	121.4	123.3	**120.8**	118.7	120.0	121.7	123.8	**121.1**
a_8- Using N as 19 % UF	109.4	110.7	112.0	113.3	**111.4**	108.3	110.0	111.8	113.9	**111.0**
a_9- Using N as 19 % SCU	111.6	112.9	114.6	115.9	**113.8**	110.0	112.0	113.9	116.0	**113.0**
a_{10}- Using N as 19 % PCU	112.9	114.1	116.0	118.0	**115.3**	111.5	114.0	116.0	118.3	**115.0**
Mean (B)	**114.5**	**115.8**	**117.3**	**118.9**		**113.4**	**115.4**	**117.1**	**119.2**	
New L.S.D. at 5 %		**A** 1.0	**B** 1.0	**AB** 3.6			**A** 1.0	**B** 1.0	**AB** 3.6	

* N = (50 g N / year) , U = urea (46.5 % N), UF = urea – formaldehyde (40% N) , SCU sulphur coated urea (41 % N) and PCU = phosphorus coated urea (37.11%N)

Table (3): Effect of some fast and slow release N fertilizers, humic acid and effective microorganisms on the total chlorophylls (mg/100g F.W)in the fresh leaves of Superior grapevines during 2012 and 2013 seasons.

Fast and slow release N fertilizers (A)	2012					2013				
	Humic acid and EM treatments (B)									
	b_1 Untreated vines	**b_2 Humic acid**	**b_3 EM**	**b_4 Humic acid + EM**	**Mean (A)**	**b_1 Untreated**	**b_2 Humic acid**	**b_3 EM**	**b_4 Humic acid + EM**	**Mean (A)**
a_1- Using N* as 75% U	20.1	21.9	24.3	27.8	**23.5**	20.7	23.4	26.9	29.8	**25.2**
a_2- Using N as 56% UF	28.6	30.6	33.1	36.5	**32.3**	30.3	33.0	36.5	39.3	**34.8**
a_3- Using N as 56% SCU	31.2	33.4	35.7	39.1	**34.9**	33.5	36.3	39.8	42.8	**38.1**
a_4- Using N as 56% PCU	33.6	36.0	37.3	41.4	**37.1**	36.5	39.3	43.1	46.0	**41.2**
a_5- Using N as 38 % UF	28.3	30.7	33.0	36.1	**32.1**	39.9	32.7	36.2	39.1	**34.7**
a_6- Using N as 38 % SCU	31.1	33.5	35.9	37.9	**34.8**	43.1	35.9	39.3	42.1	**37.6**
a_7- Using N as 38 % PCU	33.4	35.8	38.0	40.7	**37.0**	36.0	38.8	42.0	44.8	**40.4**
a_8- Using N as 19 % UF	22.3	24.8	27.0	30.4	**26.2**	23.5	26.4	30.0	32.9	**28.2**
a_9- Using N as 19 % SCU	24.7	27.0	29.2	32.6	**28.4**	26.5	28.9	32.8	36.0	**31.0**
a_{10}- Using N as 19 % PCU	28.4	31.1	33.7	37.3	**32.6**	29.8	32.2	36.3	39.2	**34.4**
Mean (B)	**28.2**	**30.5**	**32.5**	**36.1**		**30.0**	**32.7**	**36.3**	**39.2**	
New L.S.D. at 5 %		**A**	**B**	**AB**			**A**	**B**	**AB**	

* N = (50 g N / year) , U = urea (46.5 % N), UF = urea – formaldehyde (40% N) , SCU sulphur coated urea (41 % N) and PCU = phosphorus coated urea (37.11%N)

Table (4): Effect of some fast and slow release N fertilizers, humic acid and effective microorganisms on the percentage of nitrogen in the leaves of Superior grapevines during 2012 and 2013 seasons.

Fast and slow release N fertilizers (A)	2012					2013				
	Humic acid and EM treatments (B)									
	b_1 Untreated vines	**b_2 Humic acid**	**b_3 EM**	**b_4 Humic acid + EM**	**Mean (A)**	**b_1 Untreated**	**b_2 Humic acid**	**b_3 EM**	**b_4 Humic acid + EM**	**Mean (A)**
a_1- Using N* as 75% U	1.69	1.76	1.85	1.95	**1.81**	1.59	1.69	1.79	1.90	**1.74**
a_2- Using N as 56% UF	1.91	1.98	2.07	2.18	**2.03**	1.91	2.00	2.10	2.21	**2.05**
a_3- Using N as 56% SCU	1.97	2.05	2.14	2.25	**2.10**	2.00	2.10	2.20	2.32	**2.15**
a_4- Using N as 56% PCU	2.03	2.12	2.21	2.38	**2.18**	2.12	2.22	2.32	2.48	**2.28**
a_5- Using N as 38 % UF	1.90	1.99	2.07	2.18	**2.03**	1.90	2.00	2.10	2.22	**2.05**
a_6- Using N as 38 % SCU	1.96	2.05	2.14	2.24	**2.09**	1.99	2.09	2.19	2.31	**2.14**
a_7- Using N as 38 % PCU	2.02	2.11	2.20	2.30	**2.15**	2.11	2.21	2.31	2.42	**2.26**
a_8- Using N as 19 % UF	1.78	1.88	1.98	2.06	**1.92**	1.71	1.81	1.91	2.01	**1.86**
a_9- Using N as 19 % SCU	1.87	1.96	2.06	2.16	**2.01**	1.78	1.88	1.99	2.09	**1.93**
a_{10}- Using N as 19 % PCU	1.94	2.04	2.14	2.25	**2.09**	1.86	1.96	2.06	2.16	**2.01**
Mean (B)	**1.90**	**1.99**	**2.08**	**1.97**		**1.89**	**1.99**	**2.09**	**2.21**	
New L.S.D. at 5 %		**A** 0.06	**B** 0.05	**AB** 0.16			**A** 0.06	**B** 0.05	**AB** 0.16	

* N = (50 g N / year) , U = urea (46.5 % N), UF = urea – formaldehyde (40% N) , SCU sulphur coated urea (41 % N) and PCU = phosphorus coated urea (37.11%N)

Table (5): Effect of some fast and slow release N fertilizers, humic acid and effective microorganisms on the percentage of phosphorus in the leaves of Superior grapevines during 2012 and 2013 seasons.

Fast and slow release N fertilizers (A)	2012					2013				
	Humic acid and EM treatments (B)									
	b_1 Untreated vines	**b_2 Humic acid**	**b_3 EM**	**b_4 Humic acid + EM**	**Mean (A)**	**b_1 Untreated**	**b_2 Humic acid**	**b_3 EM**	**b_4 Humic acid + EM**	**Mean (A)**
a_1- Using N* as 75% U	0.18	0.21	0.23	0.25	**0.21**	0.17	0.20	0.22	0.26	**0.21**
a_2- Using N as 56% UF	0.30	0.33	0.36	0.38	**0.34**	0.27	0.30	0.33	0.37	**0.31**
a_3- Using N as 56% SCU	0.34	0.37	0.40	0.44	**0.38**	0.30	0.33	0.36	0.41	**0.35**
a_4- Using N as 56% PCU	0.37	0.41	0.44	0.48	**0.42**	0.33	0.36	0.39	0.45	**0.38**
a_5- Using N as 38 % UF	0.29	0.33	0.36	0.37	**0.33**	0.26	0.29	0.33	0.36	**0.31**
a_6- Using N as 38 % SCU	0.33	0.36	0.40	0.43	**0.38**	0.29	0.32	0.36	0.40	**0.34**
a_7- Using N as 38 % PCU	0.36	0.40	0.43	0.47	**0.41**	0.33	0.36	0.40	0.44	**0.38**
a_8- Using N as 19 % UF	0.22	0.26	0.29	0.32	**0.27**	0.21	0.24	0.27	0.31	**0.25**
a_9- Using N as 19 % SCU	0.26	0.30	0.33	0.36	**0.31**	0.24	0.28	0.31	0.35	**0.29**
a_{10}- Using N as 19 % PCU	0.29	0.34	0.37	0.40	**0.35**	0.27	0.30	0.33	0.37	**0.31**
Mean (B)	**0.29**	**0.33**	**0.36**	**0.39**		**0.26**	**0.29**	**0.33**	**0.37**	
New L.S.D. at 5 %		**A** 0.03	**B** 0.02	**AB** 0.06			**A** 0.03	**B** 0.02	**AB** 0.06	

* N = (50 g N / year) , U = urea (46.5 % N), UF = urea – formaldehyde (40% N) , SCU sulphur coated urea (41 % N) and PCU = phosphorus coated urea (37.11%N)

Table (6): Effect of some fast and slow release N fertilizers, humic acid and effective microorganisms on the percentage of potassium in the leaves of Superior grapevines during 2012 and 2013 seasons.

Fast and slow release N fertilizers (A)	2012					2013				
	Humic acid and EM treatments (B)									
	b_1 Untreated vines	**b_2 Humic acid**	**b_3 EM**	**b_4 Humic acid + EM**	**Mean (A)**	**b_1 Untreated**	**b_2 Humic acid**	**b_3 EM**	**b_4 Humic acid + EM**	**Mean (A)**
a_1- Using N* as 75% U	1.38	1.43	1.48	1.54	**1.45**	1.31	1.36	1.41	1.48	**1.39**
a_2- Using N as 56% UF	1.67	1.73	1.78	1.84	**1.75**	1.56	1.61	1.66	1.74	**1.64**
a_3- Using N as 56% SCU	1.72	1.76	1.81	1.87	**1.79**	1.64	1.71	1.76	1.85	**1.74**
a_4- Using N as 56% PCU	1.77	1.82	1.87	1.98	**1.86**	1.71	1.76	1.82	1.96	**1.81**
a_5- Using N as 38 % UF	1.66	1.71	1.76	1.83	**1.74**	1.55	1.61	1.66	1.73	**1.63**
a_6- Using N as 38 % SCU	1.72	1.77	1.83	1.86	**1.79**	1.63	1.68	1.74	1.80	**1.71**
a_7- Using N as 38 % PCU	1.76	1.81	1.87	1.97	**1.85**	1.70	1.76	1.82	1.96	**1.81**
a_8- Using N as 19 % UF	1.44	1.50	1.55	1.62	**1.52**	1.38	1.44	1.51	1.56	**1.47**
a_9- Using N as 19 % SCU	1.51	1.57	1.63	1.70	**1.60**	1.44	1.51	1.57	1.63	**1.53**
a_{10}- Using N as 19 % PCU	1.58	1.64	1.71	1.78	**1.67**	1.51	1.57	1.64	1.70	**1.60**
Mean (B)	**1.62**	**1.67**	**1.72**	**1.79**		**1.54**	**1.60**	**1.65**	**1.74**	
New L.S.D. at 5 %		**A** 0.05	**B** 0.04	**AB** 0.13			**A** 0.06	**B** 0.04	**AB** 0.13	

* N = (50 g N / year) , U = urea (46.5 % N), UF = urea – formaldehyde (40% N) , SCU sulphur coated urea (41 % N) and PCU = phosphorus coated urea (37.11%N)

Table (7): Effect of some fast and slow release N fertilizers, humic acid and effective microorganisms on the percentage of berry setting of Superior grapevines during 2012 and 2013 seasons.

Fast and slow release N fertilizers (A)	2012					2013				
	Humic acid and EM treatments (B)									
	b_1 Untreated vines	**b_2 Humic acid**	**b_3 EM**	**b_4 Humic acid + EM**	**Mean (A)**	**b_1 Untreated**	**b_2 Humic acid**	**b_3 EM**	**b_4 Humic acid + EM**	**Mean (A)**
a_1- Using N* as 75% U	7.8	8.3	9.0	10.5	**8.9**	8.1	8.7	9.3	10.0	**9.0**
a_2- Using N as 56% UF	10.1	10.6	11.0	12.5	**11.0**	11.1	11.7	12.5	13.5	**12.2**
a_3- Using N as 56% SCU	10.7	11.2	11.7	13.2	**11.7**	11.6	12.2	13.0	14.0	**12.7**
a_4- Using N as 56% PCU	11.6	12.1	12.8	14.0	**12.6**	12.1	12.7	13.8	14.9	**13.3**
a_5- Using N as 38 % UF	10.0	10.5	10.9	12.4	**12.6**	11.0	11.6	12.4	13.4	**12.1**
a_6- Using N as 38 % SCU	10.6	11.0	11.6	13.0	**11.5**	11.5	12.1	12.9	13.9	**12.6**
a_7- Using N as 38 % PCU	11.5	12.0	12.7	13.9	**12.5**	12.0	12.6	13.7	14.8	**13.2**
a_8- Using N as 19 % UF	8.4	9.0	10.0	12.1	**9.8**	8.7	9.3	11.3	12.3	**10.4**
a_9- Using N as 19 % SCU	9.0	9.4	10.5	13.0	**10.4**	9.5	10.2	12.2	14.2	**11.5**
a_{10}- Using N as 19 % PCU	9.5	10.0	11.0	14.9	**11.3**	10.1	10.9	13.0	15.0	**12.2**
Mean (B)	**9.9**	**10.4**	**11.1**	**12.8**		**10.5**	**11.2**	**12.4**	**13.6**	
New L.S.D. at 5 %		**A** 0.4	**B** 0.3	**AB** 0.9			**A** 0.4	**B** 0.3	**AB** 0.9	

* N = (50 g N / year) , U = urea (46.5 % N), UF = urea – formaldehyde (40% N) , SCU sulphur coated urea (41 % N) and PCU = phosphorus coated urea (37.11%N)

Table (8): Effect of some fast and slow release N fertilizers, humic acid and effective microorganisms on the yield per vine (kg.) of Superior grapevines during 2012 and 2013 seasons.

Fast and slow release N fertilizers (A)	2012					2013				
	Humic acid and EM treatments (B)									
	b_1 Untreated vines	**b_2 Humic acid**	**b_3 EM**	**b_4 Humic acid + EM**	**Mean (A)**	**b_1 Untreated**	**b_2 Humic acid**	**b_3 EM**	**b_4 Humic acid + EM**	**Mean (A)**
a_1- Using N* as 75% U	6.6	7.1	7.3	7.5	**7.1**	7.4	7.9	8.4	8.9	**8.1**
a_2- Using N as 56% UF	8.3	8.4	8.6	8.8	**8.5**	10.2	10.8	11.4	12.1	**11.1**
a_3- Using N as 56% SCU	8.4	8.6	8.8	9.0	**8.7**	10.4	11.8	12.8	13.0	**12.0**
a_4- Using N as 56% PCU	8.6	8.8	8.9	9.4	**9.0**	10.7	12.4	13.4	13.5	**12.5**
a_5- Using N as 38 % UF	8.1	8.4	8.6	9.1	**8.5**	9.6	10.8	11.4	12.1	**10.9**
a_6- Using N as 38 % SCU	8.3	8.6	9.2	9.3	**8.8**	10.6	11.7	12.4	13.0	**11.9**
a_7- Using N as 38 % PCU	8.5	8.7	9.3	9.5	**9.0**	10.9	12.4	13.4	13.4	**12.5**
a_8- Using N as 19 % UF	7.1	7.6	8.1	8.3	**7.7**	7.9	8.8	9.7	10.2	**9.1**
a_9- Using N as 19 % SCU	7.3	7.8	8.1	8.3	**7.8**	8.5	9.3	10.3	10.9	**9.7**
a_{10}- Using N as 19 % PCU	7.5	8.1	8.3	8.4	**8.0**	9.0	9.9	10.5	11.1	**10.1**
Mean (B)	**7.9**	**8.2**	**8.5**	**8.7**		**9.5**	**10.5**	**11.3**	**11.8**	
New L.S.D. at 5 %		**A** 0.2	**B** 0.2	**AB** 0.6			**A** 0.5	**B** 0.04	**AB** 1.3	

* N = (50 g N / year) , U = urea (46.5 % N), UF = urea – formaldehyde (40% N) , SCU sulphur coated urea (41 % N) and PCU = phosphorus coated urea (37.11%N)

Table (9): Effect of some fast and slow release N fertilizers, humic acid and effective microorganisms on the number of clusters per vine of Superior grapevines during 2012 and 2013 seasons.

Fast and slow release N fertilizers (A)	2012					2013				
	Humic acid and EM treatments (B)									
	b_1 Untreated vines	**b_2 Humic acid**	**b_3 EM**	**b_4 Humic acid + EM**	**Mean (A)**	**b_1 Untreated**	**b_2 Humic acid**	**b_3 EM**	**b_4 Humic acid + EM**	**Mean (A)**
a_1- Using N* as 75% U	21.0	22.0	22.0	23.0	**21.8**	23.0	24.0	25.0	26.0	**24.5**
a_2- Using N as 56% UF	23.0	23.0	23.0	23.0	**23.0**	28.0	29.0	30.0	31.0	**29.5**
a_3- Using N as 56% SCU	23.0	23.0	23.0	23.0	**23.0**	28.0	31.0	33.0	33.0	**31.2**
a_4- Using N as 56% PCU	23.0	23.0	23.0	24.0	**23.2**	28.0	32.0	34.0	34.0	**32.0**
a_5- Using N as 38 % UF	23.0	23.0	23.0	24.0	**23.2**	27.0	29.0	30.0	31.0	**29.2**
a_6- Using N as 38 % SCU	23.0	23.0	24.0	24.0	**23.5**	29.0	31.0	32.0	33.0	**31.2**
a_7- Using N as 38 % PCU	23.0	23.0	24.0	24.0	**23.5**	29.0	32.0	34.0	34.0	**32.2**
a_8- Using N as 19 % UF	22.0	23.0	24.0	24.0	**23.2**	24.0	26.0	28.0	29.0	**26.7**
a_9- Using N as 19 % SCU	22.0	23.0	23.0	23.0	**22.7**	25.0	27.0	29.0	30.0	**27.7**
a_{10}- Using N as 19 % PCU	22.0	23.0	23.0	23.0	**22.7**	26.0	28.0	29.0	30.0	**28.2**
Mean (B)	**22.5**	**22.9**	**23.2**	**23.4**		**26.7**	**28.9**	**30.4**	**31.1**	
New L.S.D. at 5 %		**A** NS	**B** NS	**AB** NS			**A** 1.7	**B** 1.2	**AB** 3.8	

* N = (50 g N / year) , U = urea (46.5 % N), UF = urea – formaldehyde (40% N) , SCU sulphur coated urea (41 % N) and PCU = phosphorus coated urea (37.11%N)

Table (10): Effect of some fast and slow release N fertilizers, humic acid and effective microorganisms on the average cluster weight (g.) of Superior grapevines during 2012 and 2013 seasons.

Fast and slow release N fertilizers (A)	2012					2013				
	Humic acid and EM treatments (B)									
	b_1 Untreated vines	**b_2 Humic acid**	**b_3 EM**	**b_4 Humic acid + EM**	**Mean (A)**	**b_1 Untreated**	**b_2 Humic acid**	**b_3 EM**	**b_4 Humic acid + EM**	**Mean (A)**
a_1- Using N* as 75% U	315.0	323.0	330.0	340.0	**327.0**	321.0	328	336.0	343.0	**332.0**
a_2- Using N as 56% UF	360.0	367.0	374.0	381.0	**370.5**	366.0	373.0	381.0	391.0	**377.7**
a_3- Using N as 56% SCU	367.0	375.0	383.0	390.0	**378.7**	373.0	380.0	388.0	395.0	**384.0**
a_4- Using N as 56% PCU	374.0	381.0	388.0	393.0	**384.0**	381.0	388.0	395.0	396.0	**390.0**
a_5- Using N as 38 % UF	350.0	366.0	373.0	380.0	**367.2**	356.0	372.0	380.0	390.0	**374.5**
a_6- Using N as 38 % SCU	360.0	374.0	382.0	389.0	**376.2**	366.0	379.0	387.0	393.0	**381.2**
a_7- Using N as 38 % PCU	369.0	380.0	387.0	394.0	**382.5**	375.0	387.0	394.0	395.0	**387.7**
a_8- Using N as 19 % UF	323.0	330.0	337.0	344.0	**333.5**	330.0	337.0	344.0	351.0	**340.5**
a_9- Using N as 19 % SCU	332.0	341.0	350.0	359.0	**345.5**	338.0	346.0	355.0	362.0	**350.2**
a_{10}- Using N as 19 % PCU	340.0	350.0	359.0	365.0	**353.5**	347.0	354.0	362.0	371.0	**358.5**
Mean (B)	**349.0**	**358.7**	**366.3**	**373.5**		**355.3**	**364.4**	**372.2**	**378.7**	
New L.S.D. at 5 %		**A** 7.1	**B** 6.9	**AB** 21.8			**A** 7.0	**B** 6.9	**AB** 21.8	

* N = (50 g N / year) , U = urea (46.5 % N), UF = urea – formaldehyde (40% N) , SCU sulphur coated urea (41 % N) and PCU = phosphorus coated urea (37.11%N)

Table (11): Effect of some fast and slow release N fertilizers, humic acid and effective microorganisms on the average berry weight (g.) of Superior grapevines during 2012 and 2013 seasons.

Fast and slow release N fertilizers (A)	2012					2013				
	Humic acid and EM treatments (B)									
	b_1 Untreated vines	**b_2 Humic acid**	**b_3 EM**	**b_4 Humic acid + EM**	**Mean (A)**	**b_1 Untreated**	**b_2 Humic acid**	**b_3 EM**	**b_4 Humic acid + EM**	**Mean (A)**
a_1- Using N* as 75% U	2.81	2.86	2.93	3.01	**2.90**	2.84	2.91	3.00	3.07	**2.96**
a_2- Using N as 56% UF	2.99	3.05	3.12	3.20	**3.09**	3.01	3.08	3.17	3.24	**3.13**
a_3- Using N as 56% SCU	3.06	3.11	3.18	3.26	**3.15**	3.10	3.17	3.26	3.33	**3.22**
a_4- Using N as 56% PCU	3.12	3.18	3.24	3.32	**3.22**	3.16	3.23	3.32	3.39	**3.28**
a_5- Using N as 38 % UF	2.98	3.03	3.10	3.18	**3.07**	3.00	3.07	3.16	3.23	**3.12**
a_6- Using N as 38 % SCU	3.05	3.11	3.18	3.26	**3.15**	3.08	3.15	3.22	3.29	**3.19**
a_7- Using N as 38 % PCU	3.11	3.16	3.23	3.31	**3.20**	3.15	3.23	3.32	3.39	**3.27**
a_8- Using N as 19 % UF	2.88	2.93	3.00	3.08	**2.97**	2.92	2.99	3.08	3.15	**3.04**
a_9- Using N as 19 % SCU	2.95	3.00	3.06	3.14	**3.04**	3.00	3.08	3.17	3.24	**3.12**
a_{10}- Using N as 19 % PCU	3.01	3.06	3.13	3.21	**3.10**	3.07	3.14	3.25	3.31	**3.19**
Mean (B)	**3.00**	**3.05**	**3.12**	**3.20**		**3.03**	**3.11**	**3.20**	**3.26**	
New L.S.D. at 5 %		**A** 0.05	**B** 0.04	**AB** 0.13			**A** 0.04	**B** 0.04	**AB** 0.13	

* N = (50 g N / year) , U = urea (46.5 % N), UF = urea – formaldehyde (40% N) , SCU sulphur coated urea (41 % N) and PCU = phosphorus coated urea (37.11%N)

Table (12): Effect of some fast and slow release N fertilizers, humic acid and effective microorganisms on the percentage of total soluble solids in the berries of Superior grapevines during 2012 and 2013 seasons.

Fast and slow release N fertilizers (A)	2012					2013				
	Humic acid and EM treatments (B)									
	b_1 Untreated vines	**b_2 Humic acid**	**b_3 EM**	**b_4 Humic acid + EM**	**Mean (A)**	**b_1 Untreated**	**b_2 Humic acid**	**b_3 EM**	**b_4 Humic acid + EM**	**Mean (A)**
a_1- Using N* as 75% U	18.0	18.4	18.8	19.2	**18.6**	18.1	18.5	18.9	19.3	**18.7**
a_2- Using N as 56% UF	19.0	19.5	20.0	20.6	**19.8**	19.1	19.6	20.0	20.6	**19.8**
a_3- Using N as 56% SCU	19.3	20.0	20.5	21.1	**20.2**	19.5	20.1	20.6	21.2	**20.4**
a_4- Using N as 56% PCU	19.7	20.4	21.0	21.7	**20.7**	19.9	20.6	21.1	21.7	**20.8**
a_5- Using N as 38 % UF	18.9	19.4	19.9	20.5	**19.7**	19.0	19.5	19.9	20.5	**19.7**
a_6- Using N as 38 % SCU	19.3	19.9	20.4	21.0	**20.2**	19.4	20.0	20.5	21.1	**20.3**
a_7- Using N as 38 % PCU	19.6	20.3	20.9	21.6	**20.6**	19.8	20.5	21.0	21.6	**20.7**
a_8- Using N as 19 % UF	18.3	18.6	18.9	19.2	**18.8**	18.5	18.8	19.1	19.4	**19.0**
a_9- Using N as 19 % SCU	18.7	19.0	19.3	19.6	**19.2**	18.8	19.1	19.4	19.7	**19.3**
a_{10}- Using N as 19 % PCU	19.0	19.3	19.6	20.0	**19.5**	19.2	19.5	19.7	20.1	**19.6**
Mean (B)	**19.0**	**19.5**	**19.9**	**20.5**		**19.1**	**19.6**	**20.0**	**20.6**	
New L.S.D. at 5 %		**A** 0.3	**B** 0.2	**AB** 0.6			**A** 0.3	**B** 0.2	**AB** 0.6	

* N = (50 g N / year) , U = urea (46.5 % N), UF = urea – formaldehyde (40% N) , SCU sulphur coated urea (41 % N) and PCU = phosphorus coated urea (37.11%N)

Table (13): Effect of some fast and slow release N fertilizers, humic acid and effective microorganisms on the percentage of total acidity (as g. tartaric acid/100 ml juice) in the berries of Superior grapevines during 2012 and 2013 seasons.

Fast and slow release N fertilizers (A)	2012					2013				
	Humic acid and EM treatments (B)									
	b_1 Untreated vines	**b_2 Humic acid**	**b_3 EM**	**b_4 Humic acid + EM**	**Mean (A)**	**b_1 Untreated**	**b_2 Humic acid**	**b_3 EM**	**b_4 Humic acid + EM**	**Mean (A)**
a_1- Using N* as 75% U	0.721	0.671	0.641	0.601	**0.659**	0.725	0.699	0.651	0.600	**0.669**
a_2- Using N as 56% UF	0.599	0.541	0.500	0.480	**0.530**	0.610	0.584	0.550	0.499	**0.561**
a_3- Using N as 56% SCU	0.569	0.509	0.481	0.457	**0.504**	0.579	0.550	0.520	0.462	**0.528**
a_4- Using N as 56% PCU	0.549	0.494	0.440	0.411	**0.474**	0.554	0.520	0.491	0.419	**0.496**
a_5- Using N as 38 % UF	0.600	0.542	0.501	0.481	**0.531**	0.611	0.585	0.551	0.501	**0.562**
a_6- Using N as 38 % SCU	0.571	0.510	0.482	0.458	**0.505**	0.580	0.551	0.521	0.463	**0.529**
a_7- Using N as 38 % PCU	0.550	0.495	0.470	0.412	**0.482**	0.555	0.521	0.492	0.420	**0.497**
a_8- Using N as 19 % UF	0.666	0.640	0.610	0.590	**0.627**	0.695	0.670	0.645	0.592	**0.651**
a_9- Using N as 19 % SCU	0.630	0.616	0.581	0.561	**0.597**	0.671	0.647	0.620	0.566	**0.626**
a_{10}- Using N as 19 % PCU	0.600	0.591	0.550	0.520	**0.565**	0.641	0.606	**0.581**	0.525	**0.588**
Mean (B)	**0.606**	**0.561**	**0.526**	**0.497**		**0.622**	**0.593**	**0.562**	**0.505**	
New L.S.D. at 5 %		**A** 0.020	**B** 0.019	**AB** 0.060			**A** 0.021	**B** 0.020	**AB** 0.063	

* N = (50 g N / year) , U = urea (46.5 % N), UF = urea – formaldehyde (40% N) , SCU sulphur coated urea (41 % N) and PCU = phosphorus coated urea (37.11%N)

Table (14): Effect of some fast and slow release N fertilizers, humic acid and effective microorganisms on the juice content of nitrate (as ppm) of Superior grapevines during 2012 and 2013 seasons.

Fast and slow release N fertilizers (A)	2012					2013				
	Humic acid and EM treatments (B)									
	b_1 Untreated vines	**b_2 Humic acid**	**b_3 EM**	**b_4 Humic acid + EM**	**Mean (A)**	**b_1 Untreated**	**b_2 Humic acid**	**b_3 EM**	**b_4 Humic acid + EM**	**Mean (A)**
a_1- Using N* as 75% U	6.11	5.80	5.00	4.06	**5.24**	6.22	5.00	4.00	3.81	**4.76**
a_2- Using N as 56% UF	3.95	3.60	3.11	2.00	**3.17**	3.89	3.50	3.00	1.95	**3.09**
a_3- Using N as 56% SCU	3.55	2.55	2.00	1.30	**2.35**	3.39	2.50	2.00	1.11	**2.25**
a_4- Using N as 56% PCU	3.14	2.00	1.50	1.11	**1.94**	3.09	2.00	1.41	1.00	**1.88**
a_5- Using N as 38 % UF	2.95	2.60	2.10	1.65	**2.33**	2.89	2.00	1.55	1.11	**1.96**
a_6- Using N as 38 % SCU	2.55	2.00	1.95	1.41	**1.98**	2.50	1.90	1.41	1.22	**1.76**
a_7- Using N as 38 % PCU	2.00	1.95	1.5	1.22	**1.68**	2.01	1.71	1.31	1.15	**1.55**
a_8- Using N as 19 % UF	1.95	1.70	1.45	1.21	**1.58**	1.90	1.40	1.11	1.01	**1.36**
a_9- Using N as 19 % SCU	1.55	1.41	1.21	1.11	**1.32**	1.50	1.11	1.04	0.95	**1.15**
a_{10}- Using N as 19 % PCU	1.00	1.30	1.18	1.05	**1.13**	1.10	1.00	0.95	0.84	**0.97**
Mean (B)	**2.88**	**2.50**	**2.11**	**2.61**		**2.85**	**2.01**	**1.78**	**1.45**	
New L.S.D. at 5 %		**A** 0.07	**B** 0.06	**AB** 0.19			**A** 0.08	**B** 0.06	**AB** 0.19	

* N = (50 g N / year) , U = urea (46.5 % N), UF = urea – formaldehyde (40% N) , SCU sulphur coated urea (41 % N) and PCU = phosphorus coated urea (37.11%N)

Table (15): Effect of some fast and slow release N fertilizers, humic acid and effective microorganisms on the juice content of nitrite (as ppm) of Superior grapevines during 2012 and 2013 seasons.

Fast and slow release N fertilizers (A)	2012					2013				
	Humic acid and EM treatments (B)									
	b_1 Untreated vines	**b_2 Humic acid**	**b_3 EM**	**b_4 Humic acid + EM**	**Mean (A)**	**b_1 Untreated**	**b_2 Humic acid**	**b_3 EM**	**b_4 Humic acid + EM**	**Mean (A)**
a_1- Using N* as 75% U	2.96	2.60	2.00	1.92	**2.37**	3.03	2.67	2.07	1.99	**2.44**
a_2- Using N as 56% UF	1.96	1.50	1.00	0.91	**1.34**	2.03	1.58	1.07	0.98	**1.42**
a_3- Using N as 56% SCU	1.58	1.30	0.90	0.71	**1.12**	1.65	1.39	0.96	0.78	**1.20**
a_4- Using N as 56% PCU	1.39	1.11	0.80	0.51	**0.95**	1.46	1.18	0.87	0.59	**1.03**
a_5- Using N as 38 % UF	1.66	1.31	0.95	0.80	**1.18**	1.71	1.41	1.22	1.11	**1.36**
a_6- Using N as 38 % SCU	1.28	1.22	0.80	0.74	**1.01**	1.51	1.22	1.14	1.00	**1.22**
a_7- Using N as 38 % PCU	1.00	0.90	0.70	0.64	**0.81**	1.31	1.14	1.00	0.95	**1.10**
a_8- Using N as 19 % UF	1.00	0.94	0.88	0.71	**0.88**	1.51	0.95	0.80	0.71	**1.01**
a_9- Using N as 19 % SCU	0.90	0.81	0.71	0.61	**0.76**	1.31	0.88	0.72	0.62	**0.88**
a_{10}- Using N as 19 % PCU	0.80	0.71	0.60	0.53	**0.66**	1.00	0.75	0.66	0.53	**0.74**
Mean (B)	**1.45**	**0.24**	**0.93**	**0.81**		**1.65**	**1.32**	**1.05**	**0.93**	
New L.S.D. at 5 %		**A** 0.06	**B** 0.05	**AB** 0.16			**A** 0.06	**B** 0.05	**AB** 0.16	

* N = (50 g N / year) , U = urea (46.5 % N), UF = urea – formaldehyde (40% N) , SCU sulphur coated urea (41 % N) and PCU = phosphorus coated urea (37.11%N)

Table (16): Effect of some fast and slow release N fertilizers, humic acid and effective microorganisms on the soil content of CO_2 (mg/100g soil) of Superior grapevines during 2012 and 2013 seasons.

Fast and slow release N fertilizers (A)	2012					2013				
	Humic acid and EM treatments (B)									
	b_1 Untreated vines	**b_2 Humic acid**	**b_3 EM**	**b_4 Humic acid + EM**	**Mean (A)**	**b_1 Untreated**	**b_2 Humic acid**	**b_3 EM**	**b_4 Humic acid + EM**	**Mean (A)**
a_1- Using N* as 75% U	8.1	8.7	9.7	11.0	**9.4**	8.3	9.0	10.0	11.2	**9.6**
a_2- Using N as 56% UF	11.1	12.1	13.3	14.4	**12.7**	11.8	12.8	14.0	15.1	**13.4**
a_3- Using N as 56% SCU	12.0	13.1	14.3	15.4	**13.7**	12.8	13.9	15.0	16.2	**14.5**
a_4- Using N as 56% PCU	13.0	14.1	15.2	16.2	**14.6**	13.7	14.5	16.0	17.0	**15.3**
a_5- Using N as 38 % UF	11.0	12.0	13.2	14.3	**12.6**	11.7	12.7	13.8	15.0	**13.3**
a_6- Using N as 38 % SCU	11.8	13.0	14.2	15.3	**13.6**	12.5	13.8	14.8	16.0	**14.3**
a_7- Using N as 38 % PCU	12.9	14.0	15.0	16.0	**14.5**	13.7	14.4	15.9	16.9	**12.2**
a_8- Using N as 19 % UF	9.0	10.0	11.0	12.0	**10.5**	9.8	10.7	11.7	12.6	**11.2**
a_9- Using N as 19 % SCU	9.9	11.1	12.2	13.2	**11.6**	10.7	11.8	12.9	13.8	**12.3**
a_{10}- Using N as 19 % PCU	10.9	12.0	13.0	14.1	**12.5**	11.8	12.7	13.7	14.8	**13.3**
Mean (B)	**10.0**	**12.0**	**13.1**	**14.2**		**11.7**	**12.6**	**13.8**	**14.9**	
New L.S.D. at 5 %		**A** 0.6	**B** 0.5	**AB** 1.6			**A** 0.6	**B** 0.4	**AB** 1.3	

* N = (50 g N / year) , U = urea (46.5 % N), UF = urea – formaldehyde (40% N) , SCU sulphur coated urea (41 % N) and PCU = phosphorus coated urea (37.11%N)

Table (17): Effect of some fast and slow release N fertilizers, humic acid and effective microorganisms on the total counts of bacteria in the soil (cfu/1.0 g soil) of Superior grapevines during 2012 and 2013 seasons.

Fast and slow release N fertilizers (A)	2012					2013				
	Humic acid and EM treatments (B)									
	b_1 Untreated vines	**b_2 Humic acid**	**b_3 EM**	**b_4 Humic acid + EM**	**Mean (A)**	**b_1 Untreated**	**b_2 Humic acid**	**b_3 EM**	**b_4 Humic acid + EM**	**Mean (A)**
a_1- Using N* as 75% U	4.6^6	4.9^6	5.2^6	5.5^6	**5.1^6**	5.1^6	5.3^6	5.5^6	5.7^6	**5.4^6**
a_2- Using N as 56% UF	5.2^6	5.5^6	5.8^6	6.0^6	**5.6^6**	6.1^6	6.1^6	6.1^6	6.4^6	**6.2^6**
a_3- Using N as 56% SCU	5.4^6	5.8^6	6.1^6	6.4^6	**5.9^6**	6.3^6	6.4^6	6.6^6	6.9^6	**6.6^6**
a_4- Using N as 56% PCU	5.7^6	6.3^6	6.6^6	6.9^6	**6.4^6**	6.4^6	6.6^6	6.1^6	7.1^6	**6.8^6**
a_5- Using N as 38 % UF	5.2^6	5.4^6	5.7^6	5.9^6	**5.6^6**	6.1^6	6.1^6	6.6^6	6.3^6	**6.2^6**
a_6- Using N as 38 % SCU	5.4^6	5.7^6	6.0^6	6.3^6	**6.0^6**	6.3^6	6.5^6	6.5^6	6.8^6	**6.5^6**
a_7- Using N as 38 % PCU	5.7^6	6.2^6	6.5^6	6.9^6	**6.3^6**	6.4^6	6.5^6	6.8^6	7.0^6	**6.7^6**
a_8- Using N as 19 % UF	4.8^6	4.9^6	5.0^6	5.1^6	**5.0^6**	5.3^6	5.6^6	5.8^6	5.9^6	**6.7^6**
a_9- Using N as 19 % SCU	5.0^6	5.1^6	5.2^6	5.3^6	**5.2^6**	5.6^6	5.8^6	6.1^6	6.2^6	**5.9^6**
a_{10}- Using N as 19 % PCU	5.1^6	5.2^6	5.3^6	5.5^6	**5.3^6**	5.9^6	6.1^6	6.4^6	6.5^6	**6.2^6**
Mean (B)	**5.2^6**	**5.5^6**	**5.7^6**	**6.0^6**		**6.1^6**	**6.1^6**	**6.3^6**	**6.5^6**	
New L.S.D. at 5 %		**A** -	**B** -	**AB** -			**A** -	**B** -	**AB** -	

* N = (50 g N / year) , U = urea (46.5 % N), UF = urea – formaldehyde (40% N) , SCU sulphur coated urea (41 % N) and PCU = phosphorus coated urea (37.11%N)

Table (18): Effect of some fast and slow release N fertilizers, humic acid and effective microorganisms on the wood ripening coefficient of Superior grapevines during 2012 and 2013 seasons.

Fast and slow release N fertilizers (A)	2012					2013				
	Humic acid and EM treatments (B)									
	b_1 Untreated vines	**b_2 Humic acid**	**b_3 EM**	**b_4 Humic acid + EM**	**Mean (A)**	**b_1 Untreated**	**b_2 Humic acid**	**b_3 EM**	**b_4 Humic acid + EM**	**Mean (A)**
a_1- Using N* as 75% U	0.792	0.802	0.811	0.820	**0.806**	0.800	0.807	0.815	0.823	**0.811**
a_2- Using N as 56% UF	0.843	0.854	0.863	0.872	**0.858**	0.838	0.845	0.853	0.861	**0.849**
a_3- Using N as 56% SCU	0.860	0.870	0.879	0.888	**0.874**	0.850	0.858	0.867	0.875	**0.863**
a_4- Using N as 56% PCU	0.873	0.884	0.893	0.910	**0.890**	0.863	0.870	0.878	0.910	**0.880**
a_5- Using N as 38 % UF	0.840	0.851	0.860	0.868	**0.855**	0.837	0.840	0.848	0.856	**0.845**
a_6- Using N as 38 % SCU	0.856	0.867	0.876	0.885	**0.871**	0.848	0.855	0.863	0.870	**0.859**
a_7- Using N as 38 % PCU	0.870	0.880	0.889	0.909	**0.887**	0.860	0.867	0.873	0.908	**0.877**
a_8- Using N as 19 % UF	0.803	0.813	0.822	0.830	**0.817**	0.810	0.818	0.825	0.834	**0.822**
a_9- Using N as 19 % SCU	0.820	0.833	0.842	0.841	**0.834**	0.819	0.838	0.846	0.855	**0.839**
a_{10}- Using N as 19 % PCU	0.833	0.850	0.860	0.878	**0.855**	0.830	0.840	0.850	0.858	**0.845**
Mean (B)	**0.839**	**0.850**	**0.860**	**0.870**		**0.836**	**0.844**	**0.852**	**0.865**	
New L.S.D. at 5 %		**A** 0.007	**B** 0.006	**AB** 0.019			**A** 0.007	**B** 0.006	**AB** 0.019	

* N = (50 g N / year) , U = urea (46.5 % N), UF = urea – formaldehyde (40% N) , SCU sulphur coated urea (41 % N) and PCU = phosphorus coated urea (37.11%N)

Conclusion

For promoting yield and quality of Superior grapes and reducing pollution with nitrate and nitrite, it is suggested to fertilize the vines with N as 38% phosphorus coated urea + 25% organic (5 kg F.Y.M.) + humic acid + E.M each at 10 ml/ vine/ year.

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