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Effect of Some Organic, Inorganic and Biofertilization Treatments on Fruiting of Early Sweet Grapevines

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Abstract

During 2013, 2014 and 2015 seasons, Early sweet grapevines received N as 100% mineral N or as 25% to 75% mineral N with 12.5 to 37.5 % plant compost and Minia Azotene biofertilizer. The target was selecting the best ratio between different N sources.

Using N as 50 to 75% mineral N besides 12.5 to 25% plant compost and Minia Azotene biofertilizer gave the best results with regard to growth and yield. An obvious reduction on yield was observed with using N as 25% mineral N + 37.5% plant compost + 37.5 % Minia Azotene biofertilizer.

For improving yield of Early sweet grapevines, it is suggested to use N as 50% mineral N plus 25% plant compost and 25% Minia Azotene, for promoting physical and chemical characteristics of the berries, it is recommended to use N as 25% mineral N + 37.5 % plant compost + 37.5 % Minia Azotene biofertilizer.

Keywords: *Inorganic, organic and biofertilization nitrogen, Early sweet grapevines, yield, berries quality.*

Introduction

Early sweet grapevine cv. is considered a prime and outstanding grapevine cv. grown under Egypt conditions. It ripens early especially when treated with breakages and easily marketing to most foreign countries. Reducing pollution in such grapevines cv. during production is accompanied with facilitating marketing of such grapevine cv. Reducing mineral N fertilization and at the same time increasing organic and biofertilizations is considered a backbone of enhancing exportation process.

Organic and biofertilization are essential for enhancing soil fertility and increasing the availability of most nutrients to the vine. Accumulation of toxic N compounds was lowered at the higher extent with using these stimulators. (*Mengel, 1984*).

Madian *(2010) suggested that using all sources of N was* favourable in enhancing yield and berries quality of Red Roomy grapevines relative to using mineral N alone.

Refaai *(2011)* supported the beneficial effects of using N in all sources at suitable proportions on improving yield and quality of Thompson seedless grapes.

The results of Uwakiem (*2011)*; Mekawy (*2012);* El- Khafagy (2013); Shaaban (2014); Alam (2014); Abd El- Kareem(2014) and Abd El- Razek (2014) confirmed the essential of using N via inorganic and bioforms at balanced rate on yield and fruit quality of various grapevine cvs.

The target of this study was examining the effect of using plant compost and Minia Azotene biofertilizer as a partial replacement of mineral N fertilizer in Early sweet grapevine vineyards.

Materials and Methods

This study was carried out during 2013 & 2014 and 2015 seasons on thirty – six nearly uniform in vigour 8- years old early sweet grapevines grown in a private vineyards located at west Matay, Matay district, Minia Governorate where the texture of the soil is sandy Table (1) well clrained the selected vines are planted at 1.5 x 3.0 m apart. Winter pruning was done on 1st, 3rd and 5th Jan. during the three seasons using short pruning system. The vines were trellises by Gable system. Vine load was 78 eyes (22 fruiting spurs x 3 eyes + six replacement spurs x two eyes). Drip irrigation system was followed Table (1) shows the results of soil analysis (Black *et al*., 1965).

Table 1. Analysis of the tested soil

Constituents	Values
Particle size distribution	
Sand %	71.9
Silt %	18.0
Clay %	10.1
Texture	Sandy
pH (1: 2.5 extract)	7.66
O.M. %	0.24
CaCO3 %	1.94
Total N %	0.04
Available P (Olsen method) ppm	1.1
Available K (ammonium acetate) ppm	22.2
EDTA extractable micronutrients (ppm)	
Fe	0.9
Zn	0.7
Mn	2.2
Cu	0.71

This study included the following four treatments:

Application of the recommended N (60 g N/ vine / year) via 100% mineral N (179 g ammonium nitrate 33.5 % N / vine / year).

Application of 75% of the recommended N via mineral N (134.3 g ammonium nitrate / vine / year) + 12.5 % plant compost 2% N (375 g plant compost / vine / year) + 12.5 % Minia Azotene (7.5 ml/ vine / year).

Application of 50% of the recommended N via mineral N (89.5 g ammonium nitrate / vine / year) + 25 % plant compost (750 g plant compost / vine / year) + 25 % Minia Azotene (15 ml/ vine / year).

Application of 25% of the recommended N via mineral N (44.8 g ammonium nitrate / vine / year) + 37.5 % plant compost (1125 g plant compost / vine / year) + 37.5 % Minia Azotene (22.5 ml/ vine / year).

Each treatment was replicated three times, three vines per each. All the tested vines received N at fixed rate namely 60 g / vine/ year. Mineral N in the form of ammonium nitrate (33.5 % N) was splitted into three unequal batches added as 40% at growth start, 30% just after berry setting and at 30% 30 days later. It was broadcast around each vine under canopy and 40 cm for farm trunk. Plant compost was added once at the last week of January in the shallow trenches (10 cm length x 10 cm depth x 10 cm width) around each vine under vine canopy. Minia Azotene biofertilizer (each ml contains 0.6 x 10^8 bacterial cell) was added once at growth start (Mid. of March) and it was applied in shallow trenches (10x 10 x 10 cm) and covered with most soil. Randomized complete block design (RCBD) was followed where the study included four treatments, each treatment was replicated three times, three vines per each.

Table 2. Analysis of plant compost

Constituents	Values
pH (1 : 2.5 extract	8.5
O.M. %	31.0
Total N %	2.0
Total P %	0.52
Total K %	1.12
Total Fe (ppm)	320.0
Total Mn (ppm)	45.0
Total Cu (ppm)	42.0
Total Zn (ppm)	34.0

During the three seasons, the following measurements were recorded

Main shoot length (cm).

Number of leaves/ shoot.

Leaf area (cm2) (Ahmed and Morsy, 1999).

Wood ripening coefficient (Bouard, 1966).

Cane thickness (cm.)

Wood pruning weight kg/ vine.

Leaf pigments namely chlorophylls a, b, total chlorophylls and total carotenoids (mg/ 100 g F.W.) (Von- Wettstein, 1957).

Percentages of N, P, K and Mg (Summer, 1985, Chapman and Pratt, 1987 and Balo *et al*., 1988).

Berry setting %.

Yield expressed in number of clusters per vine and weight (kg.) vine.

Cluster weight.

Berry weight (g.) and dimension (longitudinal and equatorial, in cm)

Shot berries %.

Chemical characteristics of the berries namely T.S.S., total sugars and total acidity (A.O.A.C., 2000) as a tartaric acid / 100 ml juice, nitrate and nitrite in the juice (Rindnour – Lisa *et al*., 2000).

Total counts of bacteria (Cochran, 1950). (cfu/ 1 g soil).

Statistical analysis was done according to *Mead et al.,* (1993). Treatment means were compared using new L.S.D. 5%.

Results and Discussion

1- Vegetative growth characteristics:

It is clear from the data in Table (3) that supplying Early sweet grapevines with N as 50 to 75% mineral N besides 12.5 to 25% plant compost and Minia Azotene biofertilizer significantly stimulated main shoot length, number of leaves/ shoot, leaf area, wood ripening coefficient, cane thickness and wood pruning weight comparing with using N as 100% mineral N or when mineral N was added at 25% with 37.5% plant compost or Minia Azotene. Using N as 25% mineral N besides 37.5% plant compost and Minia Azotene significantly reduced these growth characteristics. Using N as 100% mineral N significantly enhanced these growth aspects, over the application of N as 25% mineral N plus 37.5% plant compost or Minia Azotene. The maximum values were recorded on the vines that fertilized with N as 50% mineral N + 25% plant compost + 25% Minia Azotene biofertilizer. Supplying the vines with N as 25% mineral N + 37.5% plant compost + 37.5 % Minia Azotene gave the lowest values. These results were true during the three seasons.

The beneficial effects of organic and biofertilization on enhancing soil fertility and the availability of most nutrients could result in enhancing growth traits (Mengel, 1984).

Enhancing cell division and the biosynthesis of carbohydrates could give another explanation.

These results are in harmony with those obtained by Madian (2010), Refaai (2011), Uwakiem (2011), El- Khafagy (2013), Shaaban (2014) and Abd El- Razek (2014) who worked in various grapevines cvs.

Table 3. Effect of organic, inorganic and biofertilization on some egetative growth characteristics of Early sweet grapevines during 2013, 2014 and 2015 seasons

Treatments	Main shoot length (cm)			No. of leaves / shoot			Leaf area $(cm)^2$		
	2013	2014	2015	2013	2014	2015	2013	2014	2015
1- 100 % mineral N. (MN)	88.0	90.0	91.7	15.0	15.0	14.0	105.0	106.1	105.7
2- 75% (MN) + 12.5 % Compost + 12.5 % M.A.*	91.9	93.3	95.0	17.0	17.0	16.0	108.0	110.0	111.0
3- 50% (MN) + 25 % Compost + 25 % M.A.	95.6	97.0	97.9	19.0	19.0	18.0	110.0	112.2	113.3
4- 25% (MN) + 37.5 % Compost + 37.5 % M.A.	79.0	77.0	73.9	13.0	12.0	12.0	101.0	102.0	101.7
New L.S.D. at 5%	2.1	1.9	2.2	2.0	2.0	1.9	1.9	2.0	2.0
Treatments	**Wood ripening coefficient**			**Cane thickness (cm)**			**Wood pruning weight (kg/ vine)**		
	2013	2014	2015	2013	2014	2015	2013	2014	2015
1- 100 % mineral N. (MN)	0.70	0.71	0.71	0.87	0.88	0.88	1.95	1.91	1.93
2- 75% (MN) + 12.5 % Compost + 12.5 % M.A.*	0.76	0.77	0.77	0.95	0.99	1.01	2.11	2.13	2.20
3- 50% (MN) + 25 % Compost + 25 % M.A.	0.83	0.82	0.84	1.02	1.06	1.08	2.22	2.31	2.33
4- 25% (MN) + 37.5 % Compost + 37.5 % M.A.	0.62	0.60	0.60	0.81	0.79	0.80	1.81	1.79	1.79
New L.S.D. at 5%	0.05	0.04	0.05	0.06	0.06	0.06	0.09	0.10	0.10

* M.A = Minia Azotene.

2- Leaf chemical composition:

It is clear from the data Table (4 & 5) that fertilizing Early sweet grapevines with N as 25 to 75% mineral N plus 12.5 to 37.5 % plant compost and Minia Azotene significantly enhanced chlorophylls a, b, total chlorophylls, total carotenoides P, K and Mg in the leaves over the application of N via mineral source alone. The reduction on the percentage of N was significantly associated with reducing the percentage of mineral N from 100 to 25%. The maximum values of leaf pigments, P, K and Mg were recorded on the vine that fertilized with N as 25% mineral N + 37.5 % plant compost and 37.5 % Minia Azotene. The highest values of N were recorded on the vine that received N completely via mineral N and the lowest values of leaf pigments P, K and Mg were recorded on the vines that received N via 100% mineral N alone (unorganic and biofertilization). These results were true during the three seasons.

The effect of organic and biofertilizers on enhancing organic matter and reducing soil pH surely reflected on enhancing the availability of most nutrients. The great stimulation on root development due to application of these biostimulants surely reflected on enhancing the uptake of most nutrients (Mengel, 1984).

These results are in harmony with those obtained by Madian (2010), Refaai (2011), Uwakiem (2011) and Abd El- Razek (2014) who worked in different grapevines cvs.

3- Percentage of berry setting, yield and cluster weight:

Data in Table (5) clearly show that supplying Early sweet grapevines with N as 50 to 75% mineral N plus 12.5 % to 25% plant compost and Minia Azotene significantly was effective in improving the percentage of berry setting, yield and cluster weight over the application of N as 100% mineral N or when mineral N was applied at 25% of the suitable N even with the application of organic and biofertilization significant reduction on these parameters was observed when mineral N was added as 25% mineral N. Using N completely via inorganic N was significantly superior that using N as 25% mineral N plus 37.5% plant compost and Minia Azotene. Number of clusters per vine was unsignificantly affected by different N management in the first season of study. The best results with regard to yield were obtained with using N as 50% mineral N + 25% plant compost + 25% Minia Azotene . Under such promised treatment yield per vine reached 12.8 & 14.6 and 14.9 kg during 2013& 2014 and 2015 seasons, respectively. Vine fertilized with N completely via mineral N produced 11.8 & 11.0 and 11.5 kg during the three seasons, respectively. These results were true during the three seasons.

The positive action of organic and biofertilization on growth, vine nutritional status, number of clusters/ vine, berry setting % and cluster weight surely reflected on improving yield.

These results are in harmony with those obtained by Madian (2010); Abd El- Kareem (2014); Alam (2014) and Abd El- Razek (2014) who worked on different grapevines cvs.

Table 4. Effect of organic, inorganic and biofertilization on leaf pigments and percentages of N and P in the leaves of Early sweet grapevines during 2013, 2014 and 2015 seasons.

Treatments	Chlorophyll a (mg/ 100 g F.W.)			Chlorophyll b (mg/ 100 g F.W.)			Total chlorophyll (mg/ 100 g F.W.)		
	2013	2014	2015	2013	2014	2015	2013	2014	2015
1- 100 % mineral N. (MN)	6.1	6.2	6.3	3.3	3.0	3.0	9.4	9.2	9.3
2- 75% (MN) + 12.5 % Compost + 12.5 % M.A.*	6.9	7.0	7.1	3.9	3.6	3.4	10.8	10.6	10.5
3- 50% (MN) + 25 % Compost + 25 % M.A.	7.5	7.7	8.0	4.5	4.1	4.0	12.0	11.8	12.0
4- 25% (MN) + 37.5 % Compost + 37.5 % M.A.	8.2	8.5	8.6	5.0	4.7	4.6	13.2	13.2	13.2
New L.S.D. at 5%	0.5	0.4	0.5	0.3	0.4	0.4	0.5	0.5	0.5
Treatments	**Total carotenoides (mg/ 100 g F.W.)**			**Leaf N %**			**Leaf P %**		
	2013	2014	2015	2013	2014	2015	2013	2014	2015
1- 100 % mineral N. (MN)	2.9	3.0	2.9	1.71	1.75	1.72	0.15	0.14	0.15
2- 75% (MN) + 12.5 % Compost + 12.5 % M.A.*	3.3	3.4	3.3	1.60	1.64	1.62	0.18	0.16	0.18
3- 50% (MN) + 25 % Compost + 25 % M.A.	3.7	3.8	3.7	1.50	1.55	1.51	0.21	0.19	0.20
4- 25% (MN) + 37.5 % Compost + 37.5 % M.A.	4.0	4.2	4.0	1.39	1.44	1.41	0.23	0.22	0.23
New L.S.D. at 5%	0.3	0.3	0.3	0.06	0.05	0.05	0.02	0.02	0.02

* M.A = Minia Azotene.

Table 5. Effect of organic, inorganic and biofertilization on the percentages of K and Mg in the leaves, berry setting %, yield/ vine and weight of Early sweet grapevines during 2013, 2014 and 2015 seasons.

Treatments	Leaf K %			Leaf Mg %			Berry setting %		
	2013	2014	2015	2013	2014	2015	2013	2014	2015
1- 100 % mineral N. (MN)	1.41	1.39	1.38	0.55	0.56	0.57	7.3	8.0	8.0
2- 75% (MN) + 12.5 % Compost + 12.5 % M.A.*	1.51	1.48	1.50	0.61	0.61	0.62	8.2	8.9	9.1
3- 50% (MN) + 25 % Compost + 25 % M.A.	1.61	1.59	1.60	0.66	0.67	0.67	9.3	10.0	10.3
4- 25% (MN) + 37.5 % Compost + 37.5 % M.A.	1.71	1.69	1.71	0.69	0.71	0.72	6.6	7.3	7.0
New L.S.D. at 5%	0.05	0.05	0.05	0.04	0.03	0.04	0.5	0.5	0.4
Treatments	**No. of clusters / vine**			**Average cluster weight (g.)**			**Yield/ vine (kg.)**		
	2013	2014	2015	2013	2014	2015	2013	2014	2015
1- 100 % mineral N. (MN)	23.0	22.0	23.0	511.0	501.0	500.0	11.8	11.0	11.5
2- 75% (MN) + 12.5 % Compost + 12.5 % M.A.*	23.0	24.0	25.0	523.0	519.0	520.0	12.0	12.5	13.0
3- 50% (MN) + 25 % Compost + 25 % M.A.	24.0	27.0	27.0	535.0	541.0	550.0	12.8	14.6	14.9
4- 25% (MN) + 37.5 % Compost + 37.5 % M.A.	23.0	20.0	21.0	481.0	471.0	461.0	11.1	9.4	9.7
New L.S.D. at 5%	NS	2.0	2.0	11.1	12.0	12.0	0.2	0.4	0.5

* M.A = Minia Azotene

4- Shot berries %:

It was significantly recorded with using N as 50 to 75% mineral N besides 12.5 to 25% plant compost and Minia Azotene comparing with using N as 100% mineral N or when N was added as 25% + 37.5% plant compost + 37.5% Minia Azotene biofertilizer. Using N as 100% mineral N was significantly superior than using N as 25% mineral N plus 37.5% plant compost + 37.5% Minia Azotene biofertilizer. The lowest values of shot berries (3.7 & 3.1 and 2.8%) were recorded on the vines that fertilized with N as 50 % mineral N + 25% plant compost + 25% Minia Azotene biofertilizer vines fertilized with N as 100% mineral N produced 7.0 & 6.7 and 6.5% during 2013 & 2014 and 2015 seasons, respectively. These results were true during the three seasons.

The great balance on N nutrition due to organic and biofertilization surely reflected on reducing shot berries.

These results are in harmony with those obtained by Madian (2010); Abd El Kareem (2014); Abd El- Razek (2014) and Alam (2014).

5- Physical and chemical characteristics of the berries:

It is clear from the data in Tables (6 & 7) that supplying Early sweet grapevines with N as 25 to 75% mineral N plus 37.5% plant compost + 37.5% Minia Azotene significantly improved quality of the berries in terms of increasing berry weight and dimensions, T.S.S. % and reducing sugars and reducing total acidity %, nitrate and nitrite over the application of N via 100% mineral N. The promotion on quality of the berries was significantly associated with reducing the percentages of mineral N from 100 to 25% and at the same time increasing the percentages of plant compost and Minia Azotene from 0.0 to 37.5%. The best results were obtained with using N via 25% mineral N + 37.5% plant compost + 37.5 Minia Azotene. Unfavourable effects on quality of the berries were recorded on the vines that received N as 100% mineral N. Similar results were announced during the three seasons.

The effect of organic and biofertilziation on advancing maturity could explain the present results.

These results are in harmony with those obtained by Madian (2010); Abd El- Kareem (2014) and Alam (2014).

6- Total counts of bacteria:

It is revealed from the data in Table (7) that fertilizing the vines with N as 25 to 75% mineral N plus 37.5 % plant compost + 37.5% Minia Azotene rather than application of N completely via inorganic N. The promotion on the total counts of bacteria in the soil was significantly related to the reduction in the percentages of mineral N and at the same time increasing the percentages of plant compost and Minia Azotene from 0.0 to 37.5%. The highest values were recorded on the soil that supplied with N as 25% mineral N + 37.5% plant compost + 37.5% Minia Azotene. Fertilizing of the vines with N as 100% mineral N gave the lowest values. These results were true during the three seasons.

The beneficial effects of organic and biofertilization on activating the activity of microorganisms and organic matter could explain the present results.

These results are in harmony with those obtained by El- Khafagy (2013) and Alam (2014).

Table 6. Effect of organic, inorganic and biofertilization on the percentage of shot berries as well as some physical and chemical characteristics of Early sweet grapevines during 2013, 2014 and 2015 seasons.

Treatments	Shot berries %			Berry weight (g.)			Berry longitudinal (cm)		
	2013	2014	2015	2013	2014	2015	2013	2014	2015
1- 100 % mineral N. (MN)	7.0	6.7	6.5	5.00	5.01	5.00	2.00	2.00	1.99
2- 75% (MN) + 12.5 % Compost + 12.5 % M.A.*	5.1	4.8	4.5	5.30	5.31	5.33	2.25	2.22	2.25
3- 50% (MN) + 25 % Compost + 25 % M.A.	3.7	3.1	2.8	5.62	5.59	5.64	2.41	2.39	2.41
2- 25% (MN) + 37.5 % Compost + 37.5 % M.A.	8.9	8.7	9.0	5.90	5.91	5.97	2.64	2.63	2.66
New L.S.D. at 5%	0.5	0.6	0.6	0.25	0.27	0.24	0.06	0.06	0.06
Treatments	**Berry equatorial (cm)**			**T.S.S. %**			**Reducing sugars %**		
	2013	2014	2015	2013	2014	2015	2013	2014	2015
1- 100 % mineral N. (MN)	1.81	1.79	1.80	18.0	18.0	18.0	16.0	15.5	15.8
2- 75% (MN) + 12.5 % Compost + 12.5 % M.A.*	1.95	1.94	1.99	18.5	19.0	19.0	16.5	16.0	16.1
3- 50% (MN) + 25 % Compost + 25 % M.A.	2.25	2.22	2.26	19.0	19.4	19.4	17.0	16.6	16.8
2- 25% (MN) + 37.5 % Compost + 37.5 % M.A.	2.50	2.47	2.52	19.6	19.8	20.0	17.5	17.0	17.2
New L.S.D. at 5%	0.06	0.06	0.06	0.4	0.4	0.3	0.3	0.3	0.4

* M.A = Minia Azotene.

Table 7. Effect of organic, inorganic and biofertilization on total acidity %, nitrate and nitrite (ppm) in the juice and total counts of bacteria in the soil of Early sweet grapevines during 2013, 2014 and 2015 seasons.

Treatments	Total acidity %			Nitrate (ppm)			Nitrite (ppm)			Total counts of bacteria cfu / 1 g soil		
	2013	2014	2015	2013	2014	2015	2013	2014	2015	2013	2014	2015
1- 100 % mineral N. (MN)	0.650	0.660	0.657	2.11	2.24	2.13	1.11	1.12	1.11	5.0^{6}	5.1^{6}	4.9^{6}
2- 75% (MN) + 12.5 % Compost + 12.5 % M.A.*	0.610	0.609	0.603	1.71	1.51	1.47	0.96	0.87	0.85	5.6^{6}	5.5^{6}	5.5^{6}
3- 50% (MN) + 25 % Compost + 25 % M.A.	0.580	0.588	0.584	1.11	1.05	1.00	0.87	0.70	0.63	6.0^{6}	6.0^{6}	6.1^{6}
2- 25% (MN) + 37.5 % Compost + 37.5 % M.A.	0.541	0.550	0.540	0.90	0.88	0.71	0.70	0.60	0.51	6.5^{6}	6.6^{6}	6.6^{6}
New L.S.D. at 5%	0.027	0.025	0.024	0.09	0.10	0.10	0.11	0.11	0.11	-	-	-

M.A = Minia Azotene.

Conclusion

The best results with regard to yield of Early sweet grapevines were recorded on the vines that fertilized with N as 50% mineral N + 25% plant compost + 25% Minia Azotene. Net return with the application of such treatment in one feddan contains 900 veins reached 4500, 5500 and 6000 LE over the check treatment during the three seasons respectively. But when we desired to promote berries quality, it is suggested to use N as 25% mineral N + 37.5 % plant compost + 37.5 % Minia Azotene. In spite of the reduction on net return when such treatment was applied in one feddan the higher prices of organic grapes could compensate such loss.

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تأثير بعض معاملات التسميد العضوى والغير عضوى والحيوى على الاثمار فى كرمات العنب الايرلى سويت

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الملخص

خلال مواسم ٢٠١٣ ، ٢٠١٤ ، ٢٠١٥ تم تسميد كرمات العنب الايرلى سويت بالنتروجين فى صورة ١٠٠% نتروجين معدنى أو فى صورة من ٢٥ الى ٧٥% نتروجين معدنى مع ١٢,٥ الى ٣٧,٥ % كمبوست النبات والسماد الحيوى منيا ازوتين وكان الهدف اختيار أفضل نسبة من مصادر النتروجين المختلفة .

أدى استخدام النتروجين فى صورة من ٥٠ الى ٧٥% نتروجين معدنى بالاضافة الى ١٢,٥ الى ٢٥% كمبوست النبات والسماد الحيوى منيا أزوتين الى الحصول على أفضل النتائج بخصوص النمو وكمية المحصول وكان هناك نقص واضح فى كمية المحصول عند استخدام النتروجين بنسبة ٢٥% نتروجين معدنى و ٣٧,٥% كمبوست النبات و ٣٧,٥% السماد الحيوى منيا أزوتين.

لأجل تحسين المحصول فى كرمات العنب الايرلى سويت فانه ينصح باستخدام النتروجين على اساس ٥٠% نتروجين معدنى و ٢٥% كمبوست النبات و ٢٥% منيا أزوتين. ولأجل تحسين الخصائص الطبيعية والكيميائية للحبات فانه ينصح باستخدام النتروجين على اساس ٢٥% نتروجين معدنى و ٣٧,٥ % كمبوست كمبوست النبات و ٣٧,٥% السماد الحيوى منيا أزوتين.

الكلمات الدالة: *السماد الغير عضوى – العضوى والحيوى- العنب الايرلى سويت- كمية المحصول- خصائص الجودة للحبات*