EVALUATION OF ''EARLY SWEET'' GRAPEVINE CV ON SOME ROOTSTOCKS GROWN UNDER SANDY SOIL

Ahmed, A.E.M. Silem
Hort. Dept. Fac. of Agric. Al-Azahar Univ. Assuit, Egypt

ABSTRACT

This study was carried out during two successive seasons of 2016 and 2017 to evaluate the influence of five grape rootstocks namely (Harmony, Salt Creek, Freedom, Rechter or Poulson) on growth and productively for "Early sweet" grapevine cv grown under sandy soil.

A great variation was observed in growth, nutritional status, yield and fruit quality characteristics of "Early sweet" grapevines.

Grafting on Salt Creek, Freedom, Harmony, Poulson and Rechter, in descending order gave the best results on all the above mentioned investigated parameters.

It can be recommended that for producing an economical yield and berries quality of "Early sweet" grapevine cv grown under sandy soil conditions it is necessary to select transplants grafted on Salt Creek or Freedom grape rootstocks.

Keywords: Harmony, Salt Creek, Freedom, Rechter, Poulson, Sandy soil, "Early sweet" grapevines, Growth, Yield and Berries quality.

INTRODUCTION

Yield and both physical and chemical characteristics of different grapevine cvs are materially affected by varying grape rootstocks. The sensitivity of these grapevine rootstocks grown under sandy soil to tolerate and with stand biotic and a biotic stresses is greatly differentiated. Selecting the best grape rootstock for the specific scion is highly realized for obtaining higher yield and berries of good quality parameters. Nowadays, these are numerous grape rootstocks are introduced to Egypt. Therefore, it essential to evaluate these grape rootstocks applied with various grapevine cvs.

Selecting the best grape rootstock under soil textures and climatic conditions was very necessary for promoting yield and fruit quality. The use of suitable grape rootstock surely reflected on alleviating the adverse effects of salinity, drought, $CaCO_3$ and the incidence of nematodes on fruiting on fruiting of different grapevine cvs. In this respect freedom grape rootstock is resistant to nematodes and makes scions more vigorous. Salt creek (Ramsy) is resistant to salinity and nematodes. Grape rootstocks namely Paulson 1103, Richter 110 and Harmony are highly resistant to drought, well adapted to acidic soils and moderate resistant to salinity.

Growth, vine nutritional status, yield and berries quality of grape cvs were different according to the grape rootstock (**Main *et al*., 2002; Striegler *et al*., 2004; Somkuwar *et al*., 2006; Gaser, 2007; Stino *et al*., 2011; Rizk-**

Alla *et al*., 2013; El-Gendy, 2013; Kidman *et al*., 2013; Cakir *et al*., 2013; Somkuwar *et al*., 2015; Mahmoudzadeh, 2015 and Desouky *et al*., 2015).

The target of this study was choosing the appropriate grape rootstocks for "Early sweet" grapevines grown under sandy soil.

MATERIALS AND METHODS

This study was conducted during 2016 and 2017 seasons on 75 "Early sweet" vines (12 –years old) grafted on five grape rootstocks namely (Harmony, Salt Creek, Freedom, Richter 110 or Poulson 1103) on the basis of 15 12-years old Flame seedless grapevines onto each grape rootstock. The selected vines on different grape rootstocks were grown in a private vineyard located at West Malawy, Malawy district, Minia governorate. The texture of the soil is sandy. The vines were supported by Gable system. Long pruning system (Cane pruning) was conducted on the first week of Jan. during both seasons leaving 72 eyes/vine (on the basis of 6 fruiting canes X 10 eyes plus 6 renewal spurs X 2 eyes). The vines were planted at 3 X 2 meters apart. Drip irrigation system using well water (1.5 ds/m) was used. The selected vines received regular and common horticultural practices. Soil analysis was done according to **Wilde *et al*., (1985)** and the data are shown in Table (1).

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

Characteristics	Values
Particle size distribution	
Sand %	:77.7
Silt %	:11.3
Clay %	:11
Texture garde	Sandy
pH (1:2.5 extract)	:8.00
E.C. (1 : 2.5 extract) (mmhos/ 1cm/ 25^{o}C)	:0.96
O.M. %	:0.25
$CaCO_3$ %	:2.41
Macronutrients values	
Total N%	:0.02
P (Olsen method, ppm)	:2.1
K (ammonium acetate, ppm)	:19.00
Mg (ppm)	:5.00
S (ppm)	:1.4
EDTA extractable micronutrients (ppm):	
Zn	:0.79
Fe	:1.11
Mn	:1.9
Cu	:0.72

The selected vines were grafted into the following five grape rootstocks:

1. Richter110
2. Poulson 1103
3. Harmony
4. Salt Creek
5. Freedom

During both seasons, the following parameters were recorded:

1- Vegetative growth aspects namely leaf area $(cm)^2$ (**Ahmed and Morsy, 1999)**, wood ripening coefficient (**Bouard, 1966**), cane thickness and pruning wood weight (kg/vine.

2- Percentages of N, P and K in the leaves on dry weight basis (**Cotteni *et al*., 1982 and Balo *et al*., 1988**).

3- Yield / vine expressed in yield (kg), number of cluster per vine and cluster weight (g).

4- Percentage of shot berries.

5- Physical and chemical characteristics of the berries namely berry weight, T.S.S.%, total sugars % (**A.O.A.C., 2000)**, and total acidity % (**A.O.A.C.)** as g tartaric acid/100 ml juice.

Statistical analysis was done A randomized complete block design (RCBD) with 3 replicates used. Each replicate consisted 5 uniform vigour. Treatment means were compared using new L.S.D at 5 % (**Mead *et al*., 1993**).

RESULTS AND DISCUSSION

1- Vegetative growth characteristics:

Data in Table (2) clearly show that varying grape rootstocks had significant effects on all growth characteristics (Leaf area (cm^2), Wood ripening coefficient, Cane thickness (cm) and Pruning wood weight/vine (kg)) of "Early sweet" grapevines. Significant differences on these growth aspects were observed among the five grape rootstocks. The highest values of these growth aspects were recorded when "Early sweet" grapevines were grafted on 100 Richter, Poulson, Harmony, Freedom and Salt Creek, in ascending order. The maximum values of leaf area (11.7 & 113.8 cm^2), wood ripening coefficient (0.94 & 0.96), cane thickness (1.25 & 1.28 cm) and pruning wood weight (1.81 & 1.75 kg) were recorded on "Early sweet" grapevine on Salt Creek rootstock during both seasons, respectively. The lowest values of these growth aspects were recorded on the vines onto 110 Richter grape rootstock. These results were true during both seasons.

2- Percentages of N, P and K in the leaves:

Data in Tables (2 & 3) clearly exhibit that varying grape rootstocks of "Early sweet" grapevine had significant effect on the percentages of N, P and K in the leaves of "Early sweet" grapevines. Grafting "Early sweet" grapevines into the five grape rootstocks namely Salt Creek, Freedom, Harmony, Poulson

and 110 Richter, in descending order significantly enhanced these nutrients. Grafting "Early sweet" grapevine on Salt Creek rootstock gave the maximum values of N (2.11 & 2.01 %), P (0.231 & 0.219%) and K (1.51 & 1.47 %) during both seasons, respectively. The lowest values of N (1.66 & 1.61 %), P (0.141 & 0.139 %) and K (1.11 & 1.08 %) were recorded when "Early sweet" grapevines was grafted onto 110 Richter grape rootstock grape. These results were true during both seasons.

Table (2): Effect of different grapes rootstocks on some vegetative growth aspects and percentage of N in the leaves of "Early sweet" grapevines during 2016 and 2017 seasons

Different grape rootstocks	Leaf area $(cm)^2$		Wood ripening coefficient		Cane thickness (cm)		Pruning wood weight/vine (kg)		Leaf N %	
	2016	2017	2016	2017	2016	2017	2016	2017	2016	2017
110 Richter	101.0	102.7	0.61	0.59	0.91	0.94	1.11	1.14	1.66	1.61
Poulson	103.9	104.9	0.70	0.71	0.98	1.01	1.41	1.39	1.76	1.71
Harmony	106.3	107.8	0.79	0.81	1.08	1.12	1.53	1.50	1.90	1.81
Freedom	108.9	110.7	0.87	0.88	1.16	1.20	1.69	1.64	1.97	1.91
Salt Creek	111.7	113.8	0.94	0.96	1.25	1.28	1.81	1.75	2.11	2.01
New L.S.D at 5%	**1.7**	**2.1**	**0.07**	**0.07**	**0.05**	**0.06**	**0.11**	**0.10**	**0.06**	**0.08**

3-Yield/vine and cluster weight:

It is evident from the data in Table (3) that yield expressed in weight and number of clusters/vine and cluster weight were significantly affected by varying grape rootstocks applied with "Early sweet" grapevines. The best grape rootstocks for "Early sweet" grapevines regarding the yield and cluster weight were Salt Creek, freedom, Harmony, Poulson and 110 Richter, in descending order. Significant differences on these parameters were observed among the five rootstocks. Yield per vine of "Early sweet" grapevines onto 110 Richter, Poulson, Harmony, Freedom and Salt Creek was 8.9 & 9.5 & 10.5 & 11.6 and 13.1 kg in the first season and was 7.9 & 9.8 & 10.9 & 12.3 and 13.9 kg in the second one, respectively. Cluster weight was maximize (395.5 & 396.0 g) in "Early sweet" grapevine grafted on Salt Creek during both seasons, respectively. These results were true during both seasons.

Table (3): Effect of different grapes rootstocks on the percentages P and K in the leaves, yield/vine and average cluster of "Early sweet" grapevines during 2016 and 2017 seasons

Different grape rootstocks	Leaf P %		Leaf K %		Number of clusters/vine		Yield/vine (kg)		Average cluster weight (g)	
	2016	2017	2016	2017	2016	2017	2016	2017	2016	2017
110 Richter	0.141	0.139	1.11	1.08	25.0	24.0	8.3	7.9	331.0	329.9
Poulson	0.161	0.157	1.21	1.19	27.0	28.0	9.5	9.8	350.0	348.7
Harmony	0.189	0.183	1.32	1.29	29.0	30.0	10.5	10.9	362.0	363.6
Freedom	0.219	0.201	1.41	1.39	31.0	33.0	11.6	12.3	374.0	373.7
Salt Creek	0.231	0.219	1.51	1.47	33.0	35.0	13.1	13.9	395.5	376.0
New L.S.D at 5%	**0.008**	**0.006**	**0.05**	**0.07**	**2.0**	**2.0**	**0.9**	**0.8**	**11.9**	**12.0**

4-Quality of the berries:

Data in Table (4) obviously reveal that varying grape rootstocks had significant effect on average berry weight, T.S.S. %, total sugars % and total acidity %. The promotion on berries quality expressed in increasing berry weight, T.S.S. % and total sugars and reducing total acidity % was observed when "Early sweet" grapevines was grafted on 110 Richter, Poulson, Harmony, Freedom and Salt Creek in ascending order. Significant differences on these quality parameters were observed among the five grape rootstocks. The best results were recorded on "Early sweet" cv on Salt Creek followed by Freedom. Grafting on 110 Richter grape root gave the worst effects on fruit quality. Similar results were noticed during both seasons.

5-Shot berries %:

As shown in Table (4) shot berries % was significantly varied with varying grape rootstocks applied with "Early sweet" grapevines. It was significantly minimized with grafting 110 Richter, Poulson, Harmony, Freedom and Salt Creek, in ascending order. Varying grape rootstocks caused significant differences on shot berries %. The lowest values of shot berries (6.3 & 7.6 %) in "Early sweet" grapevines were recorded when grafter on Salt Creek grape rootstock. Grafting on 110 Richter gave the highest values (14.1 & 15.2 %). Similar trend was noticed during both seasons.

Table (4): Effect of different grapes rootstocks on the percentage of shot berries and some physical and chemical characteristics of the berries of "Early sweet" grapevines during 2016 and 2017 seasons

Different grape rootstocks	Shot berries %		Average berry weight (g)		T.S.S. %		Total sugars %		Total acidity %	
	2016	2017	2016	2017	2016	2017	2016	2017	2016	2017
110 Richter	14.1	15.2	.41	4.37	17.1	17.3	15.2	15.3	0.683	0.691
Poulson	12.0	13.1	4.60	4.56	17.6	18.0	15.9	16.1	0.681	0.671
Harmony	10.1	11.2	4.76	4.86	18.1	18.6	16.9	16.9	0.661	0.654
Freedom	8.0	9.2	4.90	4.91	18.6	19.2	17.4	17.7	0.641	0.632
Salt Creek	6.3	7.6	5.05	5.06	19.4	19.9	17.8	18.1	0.618	0.614
New L.S.D at 5%	**1.7**	**1.5**	**0.11**	**0.09**	**0.4**	**0.5**	**0.3**	**0.4**	**0.018**	**0.016**

The great variation on growth, vine nutritional status, yield, physical and chemical characteristics of the berries of Flame seedless grapevines according to grape rootstock may be attributed the compatibility between fusion of the adjoin cambial tissues is critical to effective translocation of water, nutrients and natural hormones.

Effects on tree vigour, precocity fruit production and maturity are achieved through complex in relationship between the roots and canopy of the trees. Rootstocks directly affect the ability of the trees to take up the water and nutrients from the soil. They are able to cause significant alter the pattern of canopy development and factious such as photosynthesis. Besides giving anchorage to the trees, rootstock is also responsible for the absorption of water and nutrients, storage of photosynthetic and synthesis of hormones making the scion part more tolerable. Mineral nutrients are greatly influenced affect the growth production, fruit quality by

the differential ratio of absorption and translocation of mineral elements from soil which ultimately effect the overall performance of the plants (**Richardson *et al*., 2003**).

These results are in agreement with those obtained by **Main *et al*., (2002); Striegler *et al*., (2004); Somkuwar *et al*., (2006); Gaser, (2007); Stino *et al*., (2011); Rizk-Alla *et al*., (2013); El-Gendy, (2013); Kidman *et al*., (2013); Cakir *et al*., (2013); Somkuwar *et al*., (2015); Mahmoudzadeh, (2015) and Desouky *et al*., (2015).**

CONCLUSION

Under sandy soil conditions for producing an economical yield with good quality and berries it is necessary to select "Early sweet" grapevines transplants grafted on Salt Creek or Freedom grape rootstock.

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اختيار أفضل أصل لصنف العنب الإيرلي سويت النامى فى التربة الرملية

أحمد عبد الفتاح السيد محمد سليم

قسم البساتين – كلية الزراعة – جامعة الازهر (فرع اسيوط)– مصر

اجريت هذه الدراسة خلال موسمى ٢٠١٦ و ٢٠١٧ لاختيار افضل اصل عنب (هارمونى، السولت جريك، فريدوم، ريختر، والبولسن) للعنب الايرلى سويت النامى فى التربة الرملية.

كانت هناك اختلافات واضحة فى صفات النمو الخضرى والحالة الغذائية للكرمات وكمية المحصول وخصائص الجودة للعنب الايرلى سويت المطعوم علي اصول العنب الخمسة السابقة. وتم تحقيق افضل نتائج بالنسبة للعنب الايرلي سويت المطعوم علي (السولت جريك، فريدوم هارمونى، والبولسن، ريختر) مرتبة ترتيبا تنازليا.

لتحقيق أفضل النتائج من وجهة النظر الاقتصادية بخصوص كمية المحصول وخصائص الجودة لحبات العنب الايرلى سويت النامى فى التربة الرملية فانه من الضرورى استخدام شتلات مطعومة علي اصل العنب السولت جريك او الفريدوم.

الكلمات الدالة: هارمونى، السولت جريك، فريدوم، ريختر، والبولسن – التربة الرملية – العنب الايرلى سويت– صفات النمو – كمية المحصول – خصائص الجودة للحبات.