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SELECTING THE BEST METHOD AND AMOUNT OF YEAST FOR SUPERIOR VINEYARDS

H. M. Abd El Hameed and Asmaa A. Ibrahim.
Viticulture Dept. Hort. Res. Instit. ARC, Egypt

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ABSTRACT: ***During 2008 and 2009 seasons Superior grapevines treated with yeast either via soil or via foliage at 0.0, 5.0, 10.0 , 20 or 40 g/ vine. The effects of yeast treatments on the leaf area, leaf content of N, P and K , yield as well as physical and chemical properties of the berries were investigated. Results showed that using yeast via soil at 5 to 40 g / vine was preferable than using it via leaves in improving the leaf area and leaf content of N, P, K, yield as well as physical and chemical characters of the berries.***

Supplying Superior grapevines four times with yeast via soil at 20 g/ vine gave the best results with regard to yield and quality of the berries

Key Words*: Yeast, grapes, fruit quality, yield, foliage and soil .*

INTRODUCTION

Superior grapevine cv is a prime and popular grape cv. successfully grown under Egyptian conditions. It ripens early in the last week of May. In addition, it has a great potentiality for export to foreign markets due to its early ripening characters. Reducing shot berries % in such grape cv is considered an important target for pomologists and exporters.

Biofertilization for fruit crops has called the attention of research workers particularly grapevine growers and it has become in the last few decades a positive alternative to chemical fertilizers. Biofertilizers are very safe for human, animal and environment, since they reduce at the lower extent the great pollution happened in our environment (Kannaiyan, 2002),

Clean cultivation is greatly achieved by using biofertilizers especially yeast. Nowadays, application of yeast to enhance growth, nutritional status, yield and quality of grapevine cvs is getting much importance for its own higher nutritional value. Yeast contains IAA and cytokinins which effectively promote growth in plants and delays leaf aging. In addition, it contains 44.4 % proteins, different amino acids (2.19 % argnine , 2.09 % glycine, 1.07% histidine, 244% isolysine, 3.19 % laucine, 3.23% lysine, 0.70% methioine, 0.50% cystine , 1.81% phenylalanine, 1.47 %, tyrosine, 2.06% threonine, and 0.19% treptophan) and 2.32% vitamins B . Also, it contains 7.5- 8.5 % N , 2.6% fat, 8- 9.5 % ash, 6- 12% nucleic acid and 45- 51.5% crude protein. Furthermore, it contains glutathione, lecithin, enzymes, B6 (pyridoxine) and glycine. It is very beneficial and essential for the synthesis of amino leulinic acid (AA) and it is necessary for the building of protopeophyrin the precursor of chlorophylls. It aids in activating photosynthesis process through enhancing the release of CO_2 (N. R. P. 1977 and Abou – Zaid, 1984).

Application of yeast either via soil or via foliage was accompanied with stimulating growth , vine nutritional status , yield and quality of the berries in different grapevine cvs (Mahmoud, 1996; Ahmed *et al.,* 1997; El- Mougi *et al.,* 1998; Ahmed- Amin Kamilia *et al.*, 2001a and 2001b; El Sayed , 2001a and 2001b ; Abd El- Ghany *et al.,* 2001; Abada , 2002; Gobara *et al.*, 2002; Omran *et al.,* 2003; Abd El- Hameed, 2005; Ibrahim, 2007 ; Masoud, 2008 and Abd El-Hameed *et al.,* 2010).

This study was initiated to throw some lights on the optimum method and amount of yeast that was responsible for gaining an economical yield and producing better quality clusters of Superior grapevines.

MATERIALS AND METHODS

This investigation was carried out during two consecutive seasons of 2008 and 2009 on 90 uniform in vigour own – rooted 6 year old Superior grapevines in a private vineyard located at Matay district, Minia Governorate where the soil is clay (Table 1). The selected vines are trained according to cane pruning system (66 eyes for each vine as 6 fruiting canes x 9 eyes + 6 renewal spurs x 2 eyes) using Gable shape supporting system. The vines are planted at 2x3 meters apart. Irrigation was done by drip system. Analysis of the tested soil was done according to the procedures of Black (1962); Page *et al.,* (1982) and Bremner and Malvaney (1982).

Table (1): Analysis of the soil at the trial location:

Characters	Values
Sand %	4.2
Silt %	41.0
Clay %	54.8
Texture	Clay
pH (1: 2.5 suspension)	7.92
O.M. %	2.5
$CaCO_3$ %	1.98
E.C. (1:2.5 extract) (mmhos/1cm/25^{o}C)	0.98
Total N %	0.09
Available P (Olsen method, ppm)	4.1
Available K (ammonium acetate, ppm)	410

The present experiment involved two factors (A & B). The first factor (A) included two methods of yeast applications namely a_1) via soil and a_2) via foliage. The second factor (B) involved five amounts of yeast namely b_1) 0.0 , b_2) 5 g, b_3) 10 g , b_4) 20 g and b_5) 40 g / vine, therefore, the experiment contained ten treatment. Each treatment was replicated three times, three vines per each replicate. Each amount of yeast was divided into four equal batches and added either via soil or via foliage. Dates of the addition of yeast were growth start (2nd week of Feb.), just berry setting (2nd week of Mar.) and at two weeks intervals (4th week of Mar. , 2nd week of Apr.and 4th week of April). Yeast was activated before application by using sugar solution and warm water.

The complete randomized block design in split plot arrangement was adopted. The two methods of yeast application occupied the main plots. The subplots were the five amounts of yeast.

Other horticultural practices namely 400 kg ammonium sulphate 250 kg calcium superphosphate (15.5 % P_2O_5) and 200 kg potassium sulphate per fed. as well as irrigation, hoeing and pest management were carried out as usual. Phosphatic fertilizer was added equally twice, the first with F.Y.M. and the second just after berry setting. Potassium fertilizer was applied at two equal batches before first bloom and just after berry setting. Inorganic N was added at three unequal batches 40% at growth start, 30% just after berry setting and 30% at one month later.

During both seasons the following parameters were recorded :

1- Leaf area (cm^2) was estimated in the twenty leaves opposite to basal clusters by using the equation reported by Ahmed and Morsy (1999) and the average leaf area was estimated.

2-Leaf analysis:

The selected leaf petioles in the same previous leaves (Summer, 1985, and Prilesky, *et al.,* 1988) were oven dried at 70°C and digested with H_2SO_4 and H_2O_2 according to the method of Bremner and Malvaney, (1982). Total nitrogen % was determined coloimetrically using spectrophotometer (PYE UNICAM, spectrophotometer, Model: Sp6-200) (Novoramsky *et al.,* 1974). Phosphorus % was determined calorimetrically using spectrophotometer according to Wilde *et al.*, (1985). Potassium % was determined using the flame photometer according to Black *et al.,* (1965) and Chapman and Pratt (1987).

3-Yield, as well as physical and chemical characters of the berries

Yield expressed in weight (kg) and number of clusters per vine was recorded at harvesting date (middle of July) when T.S.S. / acid ratio in berries of the control reached at least 24 : 1.

Five clusters were taken from each vine for measuring average cluster weight (g), average berry weight (g), total soluble solids %, total acidity % (as g tartaric acid per 100 ml juice (A.O.A.C., 1995).

Data were statistically analyzed according to Mead *et al.*, (1993) New L.S.D. test was used to determine the differences between the various treatment means.

RESULTS AND DISCUSSION

1-Effect of yeast on the leaf area and leaf content of N, P and K:

It is clear from the obtained data in Table (2) that using yeast via soil was superior the application of yeast via foliage in enhancing the leaf area and percentages of N, P and K in the leaves. Varying methods of yeast applications caused significant differences on the leaf area.

Table (2)

Application of yeast at 5 to 40 g / vine significantly stimulated the leaf area and the three nutrients in the leaves as compared with control treatment. The promotion was associated with increasing concentration of yeast. Significant differences on such parameters were observed among all amounts of yeast except among the higher two rates namely 20 and 40 g/ vine.

Supplying the vines with yeast via soil at 40 g/ vine gave the maximum values. These results were true during both seasons.

These results are in agreement with those obtained by El- Sayed (2001a) and (2001b), Abada (2002); Masoud (2008) and Abd El- Hameed *et al.,* (2010).

2- Effect of yeast on yield and cluster weight:

It is evident from the data in Table (3) that number of clusters per vine did not alter significantly with methods and amounts of yeast in the first season of study. Methods of yeast applications had significant effect on number of clusters / vine (in the second season), yield and cluster weight in both seasons. Soil addition of yeast was favourable in enhancing yield and cluster weight rather than foliar application. Amending the vines with yeast at 5 to 40 g/ vine caused significant promotion on yield and cluster weight as compared with non- application. There was a gradual promotion on yield and cluster weight with increasing the amounts of yeast from 5 to 40 g / vine/. Increasing rates of yeast from 20 to 40 g/ vine failed significantly to show any measurable increase on yield and cluster weight. This means that from economical point of view using yeast at 20 g/ vine is recommended. Supplying the vines with yeast at 20g vine via soil gave the best results with regard to yield. Under such promised treatment, yield reached 12.4 and 14.1 kg compared with 8.6 and 8.4 kg produced by untreated vines in both seasons, respectively. The increase on the yield / vine over the check treatment with application of such promised treatment reached 34.5% and 67.9% in both seasons, respectively.

These results are in harmony with those obtained by Gobara *et al.,* (2002), Omran *et al.,* (2003) , Ibrahim (2007) and Masoud (2008).

3-Effect of yeast on some physical and chemical characters of the grapes:

Data in Tables (3 & 4) clearly show that application of yeast through soil was significantly essential in improving fruit quality in terms of increasing berry weight , total soluble solids % and total sugars % and in reducing shot berries % and total acidity as compared with the application of yeast via foliage.

Treating the vines with yeast at 5 to 40 g/ vine significantly improved quality of the berries rather than non- application. The promotion was associated with increasing yeast rates. No significant differences on such quality parameters were observed among the higher two levels namely 20 and 40 g/ vine.

Table (3)

Table (4)

The best results from economical point of view on fruit quality were observed when the vines were treated with yeast at 20g / vine via soil. These results were true during both seasons.

The promoting effect of yeast on quality of the berries was supported by the results of Abd El- Ghany *et al.,* (2001); Abada (2002); Abd El- Hameed (2002) and Abd El- Hameed *et al.,* (2010).

The previous positive action of yeast on fruiting of Superior grapevines was attributed to its higher own from different nutrients, IAA, cytokinins and antibiotics. Its higher own from B vitamins did not neglect in this respect. In addition, it aids in enhancing building of pigments (N.R.P., 1977 and Abou-Zaid, 1984).

As a conclusion, treating Superior grapevines with yeast at 20 g/ vine via soil at four equal batches was favourable for improving yield quantitively and qualitively.

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اختيار الطريقة والكمية المثلى من الخميرة فى كروم العنب السوبيريور

حسن محمد عبد الحميد – أسماء أنور إبراهيم

قسم بحوث العنب – معهد بحوث البساتين– مركز البحوث الزراعية– الجيزة– مصر

الملخص العربي

خلال موسمي ٢٠٠٨ ، ٢٠٠٩ تم معاملة كرمات العنب السوبيريور بالخميرة إما من خلال التربة أو رشا بمعدلات صفر ، ٥ ، ١٠ ، ٢٠ ، ٤٠ جرام للكرمة ، ولقد تم دراسة تأثير معاملات الخميرة على مساحة الورقة ومحتوى الورقة من عناصر النيتروجين والفوسفور والبوتاسيوم وكمية محصول الكرمة وكذلك الخصائص الطبيعية والكيميائية للحبات.

أشارت نتائج الدراسة إلى أن استخدام الخميرة من خلال التربة بمعدل ما بين ٥ إلى ٤٠ جرام / كرمة كان مفضلا عن استخدامها رشا في تحسين مساحة الورقة ومحتوى الورقة من النيتروجين والفوسفور والبوتاسيوم وكمية محصول الكرمة وكذلك الخصائص الطبيعية والكيميائية للحبات.

أدى معاملة كرمات العنب السوبيريور أربعة مرات بالخميرة من خلال التربة بمعدل ٢٠ جرام إلى إعطاء أفضل النتائج بخصوص كمية المحصول وكذلك الخصائص الطبيعية والكيميائية للحبات.

Table (2): Effect of methods and concentrations of yeast on the leaf area (cm^2) and percentages of N, K and K in the leaves of Superior grapevines during 2008 and 2009 seasons.

Conc. of yeast (B)	Leaf area (cm^2)						Leaf N %					
	2008			2009			2008			2009		
	Methods of application (A)											
	a_1 soil	a_2 foliar	Mean (B)	a_1 soil	a_2 foliar	Mean (B)	a_1 soil	a_2 foliar	Mean (B)	a_1 soil	a_2 foliar	Mean (B)
b_1 0.0 g/vine	99.3	99.1	99.2	103.0	103.4	103.2	1.63	1.62	1.63	1.68	1.66	1.67
b_2 5.0 g/vine	103.3	101.4	102.4	108.5	105.0	106.8	1.86	1.72	1.79	1.91	1.78	1.85
b_3 10.0 g/vine	105.8	103.3	104.6	111.9	108.0	110.0	1.97	1.83	1.90	1.99	1.88	1.94
b_4 20.0 g/vine	111.5	108.6	110.1	114.0	110.2	112.1	2.09	1.94	2.02	2.15	2.00	2.08
B_5 40.0 g/vine	112.0	109.0	110.5	114.2	110.5	112.4	2.11	1.97	2.04	2.17	2.03	2.10
Mean (A)	106.4	104.3		110.3	107.4		1.93	1.82		1.98	1.87	
New L.S.D. at 5%	A	B	AB	A	B	AB	A	B	AB	A	B	AB
	1.0	1.3	1.8	1.1	1.7	2.4	0.05	0.06	0.08	0.07	0.07	0.10
	Leaf P %						Leaf K %					
b_1 0.0 g/vine	0.16	0.16	0.16	0.18	0.18	0.18	1.55	1.55	1.55	1.51	1.52	1.52
b_2 5.0 g/vine	0.26	0.20	0.23	0.29	0.23	0.26	1.76	1.65	1.71	1.67	1.60	1.64
b_3 10.0 g/vine	0.31	0.24	0.28	0.34	0.28	0.31	1.85	1.76	1.81	1.78	1.69	1.74
b_4 20.0 g/vine	0.36	0.29	0.33	0.38	0.33	0.36	1.94	1.87	1.91	1.84	1.78	1.81
B_5 40.0 g/vine	0.37	0.30	0.34	0.39	0.34	0.37	1.95	1.88	1.92	1.87	1.80	1.84
Mean (A)	0.29	0.24		0.32	0.27		1.81	1.74		1.73	1.68	
New L.S.D. at 5%	A	B	AB	A	B	AB	A	B	AB	A	B	AB
	0.03	0.02	0.03	0.03	0.03	0.04	0.06	0.05	0.07	0.05	0.04	0.06

Table (3): Effect of methods and concentrations of yeast on the number of clusters / vine, yield and weights of cluster and berry of Superior grapevines during 2008 and 2009 seasons.

Conc. of yeast (B)	No. of clusters / vine						Yield / vine (kg.)					
	2008			2009			2008			2009		
	Methods of application (A)											
	a_1 soil	a_2 foliar	Mean (B)	a_1 soil	a_2 foliar	Mean (B)	a_1 soil	a_2 foliar	Mean (B)	a_1 soil	a_2 foliar	Mean (B)
b_1 0.0 g/vine	30.0	31.0	30.5	28.0	28.0	28.0	8.4	8.7	8.6	8.4	8.4	8.4
b_2 5.0 g/vine	31.0	31.0	31.0	31.2	29.0	30.1	10.04	9.7	10.1	11.0	9.3	10.2
b_3 10.0 g/vine	31.0	31.0	31.0	32.5	30.2	31.4	11.5	10.8	11.2	12.4	10.6	11.5
b_4 20.0 g/vine	31.0	31.0	31.0	34.0	31.6	32.8	12.4	11.5	12.0	14.1	11.9	13.0
B_5 40.0 g/vine	31.0	31.0	31.0	34.5	32.0	33.3	12.7	11.8	12.3	14.5	12.2	13.4
Mean (A)	30.8	31.0		32.0	30.2		11.1	10.5		12.1	10.5	
New L.S.D. at 5%	A	B	AB	A	B	AB	A	B	AB	A	B	AB
	NS	NS	NS	1.8	1.0	1.4	0.5	0.5	0.8	1.1	1.0	1.4
	Cluster weight (g.)						Berry weight (g.)					
b_1 0.0 g/vine	281.0	281.0	281.0	301.0	301.0	301.0	2.71	2.71	2.71	2.81	2.80	2.81
b_2 5.0 g/vine	337.0	313.0	325.0	351.0	322.0	336.5	2.90	2.82	2.86	3.00	2.91	2.96
b_3 10.0 g/vine	371.0	347.0	359.0	381.0	350.0	365.5	3.11	2.90	2.94	3.15	3.00	3.08
b_4 20.0 g/vine	401.0	371.0	386.0	416.0	375.0	395.5	3.14	2.99	3.05	3.30	3.18	3.24
B_5 40.0 g/vine	109.0	382.0	395.5	419.0	381.0	400.0	2.98	3.02	3.08	3.33	3.20	3.27
Mean (A)	359.8	338.8		373.8	345.8		2.97	2.89		3.12	3.02	
New L.S.D. at 5%	A	B	AB	A	B	AB	A	B	AB	A	B	AB
	22.0	19.0	26.6	20.0	18.0	25.2	0.07	0.06	0.08	0.06	0.06	0.08

Table (3): Effect of methods and concentrations of yeast on the percentage of shot berries as well as some chemical characters of the berries of Superior grapevines during 2008 and 2009 seasons.

Conc. of yeast (B)	Shot berries %						T.S.S. %					
	2008			2009			2008			2009		
	Methods of application (A)											
	a_1 soil	a_2 foliar	Mean (B)	a_1 soil	a_2 foliar	Mean (B)	a_1 soil	a_2 foliar	Mean (B)	a_1 soil	a_2 foliar	Mean (B)
b_1 0.0 g/vine	11.3	11.4	11.4	10.7	10.9	10.8	17.6	17.5	17.6	18.0	18.0	18.0
b_2 5.0 g/vine	6.8	9.0	7.9	6.8	8.9	7.9	18.5	18.0	18.3	19.1	18.4	18.8
b_3 10.0 g/vine	4.7	6.7	5.7	4.4	6.5	5.5	19.1	18.5	18.8	19.7	18.9	19.3
b_4 20.0 g/vine	2.6	4.7	3.7	2.1	4.2	3.2	19.6	19.0	19.3	20.3	19.4	19.9
B_5 40.0 g/vine	2.2	4.3	3.3	2.2	4.0	3.0	19.7	19.2	19.5	20.4	19.5	20.0
Mean (A)	5.5	7.2		2.0	6.9		18.9	18.4		19.5	18.8	
New L.S.D. at 5%	A	B	AB	A	B	AB	A	B	AB	A	B	AB
	1.6	1.5	2.1	1.6	1.5	2.1	0.4	0.4	0.6	0.3	0.4	0.6
	Total acidity %						Total sugars %					
b_1 0.0 g/vine	0.711	0.736	0.724	0.705	0.730	0.718	17.0	16.5	16.8	17.1	16.4	16.8
b_2 5.0 g/vine	0.681	0.711	0.696	0.679	0.700	0.690	18.0	17.4	17.7	18.2	16.9	17.6
b_3 10.0 g/vine	0.655	0.677	0.666	0.650	0.673	0.662	18.6	18.0	18.3	18.8	18.0	18.4
b_4 20.0 g/vine	0.631	0.650	0.641	0.625	0.646	0.636	19.2	18.6	18.9	19.5	18.5	19.0
B_5 40.0 g/vine	0.630	0.648	0.639	0.620	0.642	0.631	19.3	18.8	19.1	19.8	18.6	19.2
Mean (A)	0.662	0.684		0.656	0.678		18.4	17.9		18.7	17.7	
New L.S.D. at 5%	A	B	AB	A	B	AB	A	B	AB	A	B	AB
	0.020	0.021	0.029	0.022	0.021	0.029	0.4	0.3	0.4	0.4	0.4	0.6