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THE EFFECT OF FOLIAR APPLICATION OF SOME TRACE ELEMENTS AND ACTIVE DRY YEAST ON VEGETATIVE GROWTH, YIELD, FRUIT QUALITY AND LEAF CHEMICAL COMPOSITION OF FLAME SEEDLESS GRAPEVINES GROWN IN CALCAREOUS SOIL CONDITIONS.

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ABSTRACT: *Flame seedless grapevines, grown in calcareous soil at El-Nobaria area, were subjected to foliar of active dry yeast 0.1% and three micronutrients in chelated form Fe 0.04%, Zn 0.05% and Mn 0.05% in 2001 and 2002 seasons. Foliar sprays were applied three times in each season.*

Results indicated that the great stimulation on growth criteria (shoot and internode length, number of leaves / shoot and leaf area), was attributed to using 0.1% yeast and the three micronutrients together, while yield / vine as well as cluster weight, berry weight berry dimensions and T.S.S. content were significantly increased, the most pronounced effect was attributed to the spraying solutions with active dry yeast compared with the solitary application of all nutrients.

The great promotion on leaf contents of chlorophyll A and B, total carotenoides was corresponded with increasing number of sprayed nutrients, spraying Flame seedless vines with chelated Mn either alone or in combination with Fe, and Zn significantly increase Fe concentration in leaf petioles as compared with the untreated. The only treatment that significantly increased Mn content in petioles was Mn spray treatment or using Fe, Zn and Mn treatment. Leaf indoles and phenols contents increased with all treatments.

Therefore, the tested foliar sprays are of great importance for growth and fruiting of "Flame seedless" grapevines grown in calcareous soil condition.

Kay words: *Flame seedless grapevines, trace elements, active dry yeast, vegetative growth, yield, fruit, calcareous soil.*

INTRODUCTION

European grapevines (*vitis vinifera* L.) grow successfully under the prevailing conditions of North Western Zone of Delta (Nobaria area), where the soil is calcareous type. Under such soil, deficiencies of iron, zinc and manganese are expected. This is due to the change of these nutrients to unavailable forms in soil El-Sherif *et al.*, (1970) and Mohamed, (1973).

It is well known that macro and micronutrients plays an important role in growth and fruiting of fruit trees.

Using foliar fertilization has been increased in nutrition of fruit trees, especially, in Egyptian soils where the loss through leaching or fixation of the applied fertilizers seemed higher. Therefore, foliar application of nutrients to fruit trees in new reclaimed sandy or sandy calcareous soils is suggested to be more efficient than that of soil dressing.

Furthermore, foliar spray of active dry yeast on fruit trees has recently received apparent interest. The various positive effects of applying active dry yeast more attributed to it's content of different nutrients, higher percentage of proteins, large amount of vitamin B and natural plant growth hormones, namely cytokinins. In addition, application of active dry yeast is very effective in releasing Co_2 which improves net photosynthesis, Larson *et al.*, (1962) and Idso *et al.*, (1995).

These effects of biofertilizer agents were superb when micronutrients where applied with them (Ahmed *et al.*, 1991; El-Dawwey & Ahmed, 1992; Ibrahim, 1993; Ahmed *et al.*, 1994; and Abdel Aziz, 1995).

The objective of this study was to add more light on the effect of foliar sprays of Iron, Zinc and Manganese and yeast on vegetative growth, mineral content in leaf petioles, yield and fruit quality in Flame seedless grapevines grown at Nobaria area.

MATERIALS AND METHODS

This investigation has been carried out during the two consecutive seasons of 2001 and 2002, on 12 years old "Flame seedless" grapevines grown under drip irrigation system in sandy clay calcareous soil at El-Nobaria area. Vines were spaced 2 × 3 meters apart and pruned in winter according to the cane training system with load of 56 buds/vine (4 cane × 14 buds) beside 5 renewal spurs with 2 buds for each.

Ninety vines, nearly uniform in vigour, were selected and randomly shared between ten treatments including the control and arranged in a randomized complete block design. Each treatment was replicated three times with three vines for each replicate.

Representative soil sample were collected, before proceeding of the experiment, from the successive depths (0-30, 30-60 and 60-90cm)for the determinations of $CaCo_3$ (Piper, 1950), organic matter and PH (Jackson, 1958), available Mn and Zn, Fe (Chapman and Parker, 1964). The experimental soil analysis is presented in Table (1).

Table (1): Experimental soil analysis

Depth (cm)	$CaCO_3$ (%)	Organic matter (%)	PH	Available			Textural class
				Fe (ppm)	Zn (ppm)	Mn (ppm)	
0-30	29.33	0.65	8.3	2.16	1.00	1.99	Sandy clay loam
30-60	31.31	0.45	7.8	1.85	0.68	1.58	Sandy clay loam
60-90	32.23	0.38	7.7	1.68	0.23	0.83	Sandy clay loam

Chemical analysis of dry active yeast and Egyptian Treacle are presented in Tables (2) and (3), respectively:

Table (2): Chemical analysis of the used active dry yeast.

Protein %	34.87
Ash %	7.55
Glycogen %	6.54
Fats %	2.09
Cellulose %	4.92

Active dry yeast sprayed at 10g/L.

Table (3): Chemical analysis of the used Egyptian treacle.

Moistare	22.50
Total soluble solids %	77.50
Sucrose %	42.50
Reducing sugar %	35.00
Ash %	2.41
Volatile acidity % (acetic acid)	0.32

Ten treatments were investigated for each season:

1- Control (Sprayed vines with water).
2- Spraying chelated Iron at 0.04%.
3- Spraying chelated Zinc at 0.05%.
4- Spraying chelated Manganese at 0.05%.
5- Spraying Iron 0.04% and Zinc 0.05% in chelated.
6- Spraying Iron 0.04 and Manganese 0.05% in chelated
7- Spraying Zinc at 0.05% and Manganese 0.05% in chelated.
8- Spraying the three nutrient together.
9- Spraying active dry yeast at 10 g/L.
10-Spraying active dry yeast at 10 g/L. and the three nutrients together.

All treatments were sprayed at April 1st (as growth start), immediately after berry set (May 1st) and 3 week after the second foliar spray.

All the chosen vines received the common and regular fertilization program as recommended by Ministry of Agriculture (except yeast and the studied micronutrients).

Activated dry yeast used were carefully prepared before spraying by the accessory addition of the Egyptian treacle (as a source of sugars, N and P and vitamins B) at 0.3% to such solutions for activating the reproduction of yeast. The definite amount of active dry yeast was dissolved in 10 L warm water (38°C) followed by the addition of 0.3% Egyptian treacle and let stand for two hours before spraying. Active dry yeast solutions and controls contained 0.05% Triton as wetting agent. Also, the control treatment i.e. 0.0%

active yeast received 0.3% Egyptian, treacle. The vines were sprayed till runoff (1.5 L/vine).

At the end of growth in each season (September 1st) ten current season shoots/vine were measured for average length (cm), diameter (cm), internode length (cm), number of leaves/shoot and leaf area (cm^2). For determination pigments content, i.e. chlorophyll A and B and carotinoides as mg/g fresh. Samples of mature leaves were taken from the medium location on unfruitful shoots of each replicate at harvest time (12 June in 2001 and 16 June in 2002).

$$\text{The leaf area was determined} = \frac{3.14 \times (\text{diameter})^2}{4}$$

Also, 5g from each leaf sample was sectioned into small pieces, freshly macerated and extracted with 80% cold methanol alcohol for 72 hrs at 2-3°C. the filtrate was used for quantitative determination of total soluble sugars (Smith *et al.*, 1956). Total indoles (Larson *et al.*, (1962) and Selim *et al.*, (1978) and total Phenols (A.O.A.C., 1975).

For determination mineral content, five mature leaves from each vine from leaves opposite to the first cluster on the shoots were picked at the second week of May. The samples were dried in an electric oven at 70°C. the dried samples were grounded using an electric mill and was digested by using sulphoric acid and hydrogen peroxid. The Fe, Zn and Mn content (ppm) were determined in the digestion according to the standard methods which are outlined by Wilde *et al.*, (1985) and the results were calculated on dry weight basis.

At harvest time, the yield was determined as number of clusters per vine during (12 June in 2001 and 16 June 2002) the yield per vine was recorded in terms of weight (Kg), then the average cluster weight (g) was delivered.

For fruit quality determination, samples of 5 mature cluster were taken at random for each vine in 2001 and 2002. each of average weights of each cluster, number of berries on the cluster. In addition, samples of 100 berries were taken for each replicate and the following physical properties were determined: berry weight (g), berry length (cm), berry diameter (cm), berry volume (ml). Moreover, the following chemical constituents were determined, total soluble solids percentage using a hand refractometer, total titratable acidity by titration against 0.1 N sodium hyroxide in presence of phenolphethaline dye (A.O.A.C., 1975) and T.S.S. / acid ratio was calculated.

The obtained data were statistically analysis and the New L.S.D. at 0.05 was used for comparison between means representing the tested treatments (Snedecor and Cochran, 1972).

RESULTS AND DISCUSSION

1- Vegetative growth:

Data concerning the effect of yeast and Fe, Zn and Mn on vegetative growth of Flame seedless grapevines in 2001 and 2002 seasons are shown in Table (4).

Table (4): Effect of some micronutrient and/or active dry yeast spray application on vegetative growth of "Flame seedless" grapevines.

Treatments	Season 2001				Season 2002			
	Shoot length (cm)	Internode length (cm)	No. of leaves /shoot	Leaf area (cm^2)	Shoot length (cm)	Internode length (cm)	No. of leaves/ shoot	Leaf area (cm^2)
1- Control	110.31	4.16	25.89	128.01	136.12	5.11	22.72	125.36
2 Fe	135.33	5.03	26.90	133.14	150.11	5.78	25.97	135.23
3- Zn	155.23	5.16	30.08	145.12	160.00	5.50	25.09	141.10
4- Mn	135.06	5.11	26.43	123.33	139.16	5.23	26.61	125.23
5- Fe + Zn	166.13	6.14	27.05	120.21	165.11	5.99	27.56	125.11
6- Fe + Mn	155.30	5.31	28.81	138.11	158.33	5.71	27.72	141.25
7- Zn + Mn	165.01	6.00	27.50	141.50	164.12	6.90	24.51	148.14
8- Fe + Zn + Mn	173.11	5.66	30.58	168.31	168.03	6.73	25.71	170.23
9- Dry yeast	179.33	6.11	29.35	155.11	170.33	6.15	28.51	168.13
10- Dry yeast + (Fe, Zn, Mn)	183.16	5.95	30.78	178.30	175.11	5.94	29.90	178.38
L.S.D. at 5%	9.34	1.88	2.45	6.11	4.28	1.56	2.44	5.31

The obtained results indicated that yeast either alone or combined of the three micronutrients was significantly very effective in enhancing shoot length, internode length, number of leaves per shoot and leaf area compared to unspraying. The stimulation effect of yeast on growth might be attributed to its own higher content of amino acids and cytokinen and minerals as well as its positive action on enhancing the biosynthesis of carbohydrates (N.R.P., 1977).

The improving effect of yeast on growth was confirmed by the results of Mohamed (1996) and Ahmed *et. al.*,(1997) on Romi Red grapevines.

Data concerning the effect of Fe, Zn and Mn on growth characters clearly show that combined application of three micronutrients was preferable than using double application. These results were true in both seasons.

The stimulating effect of Zn in enhancing the biosynthesis of IAA and the effect of Zn, Fe and Mn in activating cell division and building organic foods (Nijjar, 1985) could explain in the present results.

On the other hand, foliar manganese sprays had no effect on leaf area in both seasons. These findings are in harmony with those obtained by Ahmed *et. al.*, (1997) and Kilani (1992) found that foliar Mn sprays had no effect on leaf surface area of Thompson seedless grapevine.

Furthermore, between the effect of yeast 0.1% of and the three micronutrient treatment on leaf area of Flame seedless grapevines in both seasons, revealed positive results as found in each treatment separately. Similarly as observed by Abada (2002), who indicated that, fertilizing Romi

Red vines with yeast at 0.1% plus the Fe, Zn and Mn gave the maximum values in leaf area.

2- Yield / Vine:

It is clear as shown in Table (5) that all treatments exhibited significantly increase in yield / vine in both seasons.

Table (5): Effect of some micronutrients and/or active dry yeast spray application on yield and some physical properties of cluster of "Flame seedless" grapevines.

Treatments	Yield / vine (kg)		Cluster length (cm)		Cluster weight (g)		Rachis weight (g)		No. berries / cluster	
	2001	2002	2001	2002	2001	2002	2001	2002	2001	2002
Control	5.03	4.50	21.09	22.16	230.30	255.50	8.14	8.86	136.31	137.20
Fe	7.63	8.00	23.11	22.99	293.30	280.31	8.87	9.11	145.15	130.38
Zn	8.95	9.51	24.88	24.50	301.60	315.31	11.30	10.90	134.83	136.51
Mn	9.23	10.33	22.16	25.50	299.41	288.32	11.36	10.81	136.51	125.57
Fe + Zn	12.23	11.20	23.10	24.00	375.03	390.11	12.10	12.33	143.80	146.51
Fe + Mn	9.94	9.88	23.00	23.10	315.31	335.12	9.83	10.13	151.19	114.37
Zn + Mn	10.87	8.50	24.12	23.82	350.33	366.03	9.96	10.16	130.63	147.48
Fe + Zn + Mn	11.33	10.98	25.03	24.16	401.30	419.23	14.03	11.01	129.95	148.79
Dry yeast	10.60	12.87	26.81	25.10	290.12	300.14	13.11	11.36	92.02	92.65
10- Dry yeast + (Fe, Zn, Mn)	13.50	14.33	27.33	28.16	450.31	433.23	14.33	14.01	142.50	126.94
New L.S.D. at 5%	2.03	2.56	2.01	1.91	73.53	76.45	1.58	1.84	3.98	3.06

According to data obtained regarding the effect of three micronutrients applications on yield of "Flame seedless", it is obvious that, combined application of nutrients was favourable in improving the yield than using each alone, combined application resulted the highest yield in both seasons. The positive action of micronutrients on berry set and number of cluster could explain the improving effect of micronutrients on the yield. These results are in harmony with findings of Ahmed, (1992) and Mansour *et al.*, (2000). On white Banaty grapevines; Gobara (1999)on Flame seedless grapevines and Abada (2002) on Romi Red grapevines.

In regared to the effect of active dry yeast on yield it is noticed that spraying with 0.1% yeast at three time application produced significant increased in yield of "Flame seedless" grapevines than control in both seasons. The improving effect of yeast on yield might be attributed to its effect on increasing berry set % and number of cluster/ vine.

Moreover, maximum yield (Kg) could be noticed in vines sprayed with Fe, Zn and Mn together in addition 0.1% a active dry yeast in both seasons. Under such promising treatments, the yield reached 13.50kg and 14.33 kg in both seasons, respectively. The control vines had the lowest values, it produced 5.03 kg and 4.50 kg in both seasons, respectively.

These results of the present research are in agreement with those found by Abada (2002) on Romi Red grapevines.

3- Physical Properties of Cluster:

Table (5) shows the effect of yeast and some micronutrients on weight, length and width, rachis weight of "Flame seedless" grapevines in 2001 and 2002 seasons.

It can be noticed from the data obtained that varying number of micronutrient significant by differed cluster weight, length and width of cluster. The promotion of such parameters was associated with increasing number of nutrients sprayed. Single or combined applications of Fe, Zn and Mn was significantly more effective in improving weight, length and width of cluster compared to the untreated vines.

Results of this current investigation are in harmony with those reported by Kumar and Bhushan (1978) and Moustafa (1980), on Thompson seedless vines; Myrianthousis (1984) on Malaga vines, Mansour *et al.*, (2000) on Banaty vines and Abada (2002) on Romi Red grapevine.

According to the data obtained from the present study, it is clear that spraying yeast at 0.1% was favourable in increasing cluster weight, length and width of Flame seedless grapevines compared to unspraying. The beneficial effect of yeast on cluster weight might be attributed to its positive action on berry set and berry weight. These results are nearly in the same line with those obtained by Ahmed *et. al.,* (1991); El-Mogy *et al.*, (1998) on Thompson seedless grapevines and Abada (2002) on Romi Red grapevines.

The maximum values were recorded on vines sprayed with 0.1% yeast combined with Fe, Zn and Mn together in both season.

In regard to rachis weight, Table (5) indicated that the effect of the different practices used on rachis weight was almost similar to that concerning in cluster weight.

4- Physical Properties of the berries:

From Table (6), it is obvious that, yeast and the three micronutrients together induced the uppermost increments in berry weight compared with the control and all other treatments in both seasons. The highest berry weight was 3.16 and 3.25g, in the two seasons compared with 1.63 and 1.80g, for the control respectively. In the second rank came active dry yeast and three micronutrients together.

Table (6): Effect of some micronutrients and/or active dry yeast spray application on physical properties of berries of "Flame seedless" grapevines.

Treatments	Season 2001				Season 2002			
	Berry weight (g)	Berry length (cm)	Berry diameter (cm)	Berry volume (ml)	Berry weight (g)	Berry length (cm)	Berry diameter (cm)	Berry volume (ml)
Control	1.63	1.03	1.00	1.52	1.80	1.20	1.12	1.72
Fe	1.96	1.21	1.16	1.87	2.08	1.35	1.24	1.96
Zn	2.15	1.35	1.15	1.99	2.23	1.36	1.33	2.15
Mn	2.11	1.36	1.31	2.01	2.21	1.39	1.35	2.12
Fe + Zn	2.53	1.55	1.54	2.49	2.58	1.48	1.43	2.41
Fe + Mn	2.01	1.36	1.34	1.88	2.15	1.45	1.38	2.11
Zn + Mn	2.33	1.38	1.36	2.23	2.41	1.43	1.41	2.36
Fe + Zn + Mn	2.98	1.65	1.60	2.89	2.90	1.68	1.63	2.73
Dry yeast	3.01	1.61	1.59	2.93	3.11	1.65	1.61	2.98
10- Dry yeast + (Fe, Zn, Mn)	3.16	1.70	1.68	3.01	3.25	1.75	1.71	3.13
New L.S.D. at 5%	0.39	0.05	0.04	0.48	0.46	0.16	0.14	0.36

They consistently induced significant increase in berry weight in the two seasons 3.01 and 2.98g, respectively in the first season and 3.11 and 2.90g, respectively in the second season. The other tested treatments recorded in between values. The improving effect of micronutrients on cell division and the biosynthesis of organic food (Nijjar, 1985) could explain the present results. These results are in harmony with those reported by Dobrolyubskii *et al.*, (1981) on Aligote vines; Alekperov (1986) on tavriz vines; Ahmed *et al.*, (1988) on White Banaty grapes; Ahmed *et al.*, (1997) on Romi Red grapevines; Gobara (1999) on Flame seedless vines and Abada (2002) on Romi Red vines.

On the other hand, it is worthy to mention that tested treatments had the same trend on berry dimensions and berry size in both seasons, the difference was unsignificant.

5- Chemical Properties of the berries:

It could be noticed from data listed in Table (7) that spraying yeast or micronutrients significantly improved the chemical quality of the berries in terms of increasing the total soluble solids, the ratio between total soluble solids and reducing total acidity compared with control. These results were true in both seasons.

Table (7): Effect of some micronutrients and/or active dry yeast spray application on fruit quality of "Flame seedless" grapevines.

Treatments	T.S.S (%)		Acidity (%)		T.S.S./Acid ratio	
	2001	2002	2001	2002	2001	2002
Control	15.60	14.55	0.88	0.85	17.73	17.12
Fe	16.34	15.63	0.83	0.81	19.67	19.29
Zn	17.54	17.30	0.82	0.80	21.39	21.09
Mn	16.36	16.20	0.85	0.83	19.25	19.52
Fe + Zn	16.78	17.02	0.85	0.81	19.71	21.01
Fe + Mn	16.90	17.00	0.75	0.73	22.53	22.67
Zn + Mn	16.23	16.83	0.83	0.79	19.55	21.30
Fe + Zn + Mn	18.31	18.56	0.77	0.75	23.78	24.75
Dry yeast	17.03	17.31	0.80	0.78	20.03	20.91
10- Dry yeast + (Fe, Zn, Mn)	18.86	19.03	0.72	0.70	26.149	27.16
New L.S.D. at 5%	0.33	0.31	0.03	0.02	1.23	1.20

As for active dry yeast spray, Ahmed *et al.*, (1997) reported that adding yeast to foliar spray solution of micro and macronutrients improved T.S.S and reduced acidity of Roumi Red grapes compared with the same nutrient without yeast. On the other hand, Ahmed *et al.*, (1997) mentioned that the increase in T.S.S.% might be attributed to a parallel increase in leaf area. Similar results was obtained by Mohamed (1996); El-Mogy *et. al.*, (1998); Abd El-Hady and Ibrahim (2001); El-Shamaa and Abd El-Hady (2001) and Abada (2002).

The data also reveal that, combined application of micronutrients was superior the applications of each alone in this respect. The differences between the various micronutrients treatments was accrued statistically.

Combined applications of yeast 0.1% plus the three micronutrients together was more pronounced in this respect.

These results coincide with those reported by Abada (2002) on Romi Red grapevines.

6- Leaf Pigments Content:

It is evident from the obtained data (Table, 8) that spraying yeast at 0.1% was significantly effective in improving leaf pigment content in both seasons. Similar tendency was obtained by Nomier (2000) on Thompson seedless grapevines.

Table (8): Effect of some micronutrients and/or active dry yeast spray application on leaf pigments content (mg/g fresh weight) of "Flame seedless" grapevines.

Treatments	Season 2001				Season 2002			
	Chl. A	Chl. B	Total A + B	Total carotenoids	Chl. A	Chl. B	Total A + B	Total carotenoids
Control	0.78	0.28	1.06	0.55	0.81	0.29	1.07	0.52
Fe	0.95	0.31	1.26	0.58	0.93	0.32	1.22	0.61
Zn	1.05	0.25	1.30	0.63	1.10	0.33	1.36	0.65
Mn	1.11	0.35	1.46	0.71	1.01	0.37	1.38	0.75
Fe + Zn	1.24	0.36	1.60	0.69	1.30	0.41	1.71	0.70
Fe + Mn	1.32	0.37	1.69	0.65	1.33	0.43	1.76	0.63
Zn + Mn	1.33	0.35	1.68	0.68	1.28	0.31	1.59	0.70
Fe + Zn + Mn	1.43	0.41	1.84	0.75	1.41	0.45	1.86	0.73
Dry yeast	1.38	0.43	1.80	0.63	1.03	0.43	1.41	0.66
10- Dry yeast + (Fe, Zn, Mn)	1.48	0.45	1.93	0.81	1.45	0.47	1.92	0.79
New L.S.D. at 5%	0.33	0.03	0.35	0.04	0.44	0.02	0.55	0.03

In regard to the effect of micronutrients on leaf pigments content, it was clear according to data in the same Table that leaves of vines sprayed with Iron, Zinc and Manganese contain more chlorophyll A and B and total chlorophyll (A + B) than untreated vines. In this respect Kilani (1992) found that leaves of vines sprayed with manganes, magnesium and Zinc were significantly increased chlorophyll A, B and total caroteniodes.

Combined application of 0.1% yeast and Fe, Zn and Mn gave the maximum values in this respect. These results were true in both seasons.

7- Leaf Minerals Content:

It is evident from the data in Table (9) that spraying micronatrients significantly improved the leaf content of N, P, K, Fe, Zn and Mn compared with control. The increase in any element was associated with its existence in the spraying solutions.

Table (9): Effect of some micronutrients and/or dry yeast spray application on leaf minerals content of "Flame seedless" grapevines.

Treatments	PPm dry matter 2001			Percent in dry matter 2002			PPm dry matter 2001			Percent in dry matter 2002		
	Fe	Zn	Mn	N	P	K	Fe	Zn	Mn	N	P	K
Control	70	31	231	1.6	0.25	1.16	71	29	241	1.80	0.30	1.14
Fe	73	35	223	1.4	0.28	1.17	82	32	235	2.01	0.32	1.20
Zn	78	41	179	1.8	0.26	1.19	78	38	183	2.00	0.28	1.21
Mn	86	37	283	1.7	0.29	1.16	81	35	295	1.90	0.31	1.23
Fe + Zn	79	39	201	1.6	0.28	1.23	75	39	199	1.60	0.30	1.17
Fe + Mn	88	41	228	1.6	0.27	1.22	79	38	236	1.80	0.32	1.26
Zn + Mn	83	42	225	1.6	0.33	1.24	78	42	225	1.80	0.35	1.24
Fe + Zn + Mn	89	41	178	1.7	0.41	1.31	86	33	185	1.90	0.43	1.26
Dry yeast	86	44	235	1.7	0.42	1.35	83	41	245	2.00	0.44	1.33
10- Dry yeast + (Fe, Zn, Mn)	100	45	233	1.7	0.45	1.55	99	45	243	2.10	0.46	1.55
New L.S.D. at 5%	16	5	31	N.S.	0.3	1.2	17	6	123	0.20	0.20	1.10

Data also indicated that leaves of "Flame seedless" grapevines generally contained high amount of Fe, Zn and Mn, using foliar spray of Mn either alone in 2001 or in combination with Fe and Zn in both seasons significantly increased Fe concentration in leaf petioles. Similar results obtained by Verma *et al.*, (1971) who reported that spraying grapevines with Mn solution increased Fe absorption by leaves.

Moreover, it was obvious that, the only treatment that high significantly increased Mn content inpetioles was Mn spray treatment comparing with the other treatments and control.

On the other hand, it demonistrated that foliar spray of Zn either alone or combining with Fe or Mn significantly increased Zn concentration in leaf petioles in both seasons. These findings under this current investigation are in disagreement with those pointed out by Moustafa *et al.*, (1986) who found that all foliar spray treatments including Zn treatment had no appreciable effect on Zn level in the petioles of leaves of Romi Red grapevines.

According to the data obtained from present study, it was clear that nitrogen and potassium were increased by three micronutrients treatment.

Combined application of 0.1 yeast and the studied nutrients was of benefial effect on vine nutritional status. Results of this current investigation are in harmony with those reported by Ahmed *et al.*, (1997) and Abada (2002) who pointed out that active dry yeast and Fe, Zn and Mn revealed promising improvements in leaf minerals contents of Romi Red cultivar.

8- Leaf total soluble sugars, total indoles and total phenols contents:

It is clear from Table (10) that all treatment except, Fe application alone increased in the leaf total sugar contents than control. Moreover, yeast alone or combined with Fe, Zn and Mn together gave significantly the highest increment in this respect. In this connection, Abada (2002) mentioned that, supplying the vines of Romi Red with 0.05% yeast plus Zn + Fe + Mn in chelated form at 0.05% gave the best leaf total sugars content. On the other hand, Kilani (1992) found that leaf content of total soluble sugars of Thompson seedless cultivar tended to increased with 2.0% $MgSO_4$ and 0.2% $MnSO_4$ treatments. This trend may be due to the effect of these nutrients in increasing leaf chlorophylls content consequently photosynthesis activity. Similar results were obtained by Gavrilow (1984) concluded that foliar nutrition with 0.5% $MnSO_4$ or 0.2% $ZnSO_4$ increased photosynthesis intensity of grapevines.

Similar trand was obtained in both seasons in regard to the effect of all treatments application on total indoles and total phenoles of Flame seedless grapevines studied.

Table (10): Effect of some micronutrients and/or active dry yeast spray application on total soluble sugars, total indoles and total soluble phenols in leaves of "Flame seedless" grapevines.

Treatments	Season 2001			Season 2002		
	Total sugars (g/100g D.W.)	Total indols (mg/100g D.W.)	Total phenols (mg/100g D.W.)	Total sugars (g/100g D.W.)	Total indols (mg/100g D.W.)	Total phenols (mg/100g D.W.)
Control	6.33	398.31	320.63	6.68	415.23	300.16
Fe	6.36	425.32	335.11	6.73	418.03	331.12
Zn	8.10	458.01	343.33	7.90	450.33	423.10
Mn	7.12	436.23	338.14	7.33	443.23	360.11
Fe + Zn	9.30	491.08	345.10	9.00	511.26	355.12
Fe + Mn	8.54	438.00	331.11	8.86	450.11	336.31
Zn + Mn	9.18	501.11	355.31	10.11	483.32	428.11
Fe + Zn + Mn	10.31	503.03	373.16	11.32	466.03	376.33
Dry yeast	10.01	499.31	403.11	10.75	458.23	363.08
10- Dry yeast + (Fe, Zn, Mn)	12.86	536.36	486.33	13.16	486.86	435.16
New L.S.D. at 5%	0.98	21.16	23.01	0.94	19.08	26.03

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تأثير الرش ببعض العناصر الصغرى والخميرة الجافة النشطة على النمو الخضري والمحصول وجودة الثمار والتركيب الكيماوي لأوراق كرمات العنب الفيلام سيدلس النامية في أرض جيرية.

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الملخص العربي

أجـرى هذا البحث على كرمات عنب الفيلام سيدلس نامية في أرض جيرية بمنطقة النوبارية حيث تم معاملتها بالرش ثلاثة مرات كل موسم بالخميرة الجافة النشطة ٠,١% وبالثلاث عناصر الصغرى في صورة مخلبية الحديد ٠,٠٤%، الزنك ٠,٠٥% والمنجنيز ٠,٠٥% بالإضافة إلى الماء (كنترول) وذلك خلال موسمي ٢٠٠١ و٢٠٠٢.

وأظهـرت النـتائج أنه أمكن الحصول على أفضل تحسن في صفات النمو (طول الفرع، السلامية، عدد الأوراق على الفرع ومساحة الورقة) عند استخدام الخميرة بتركيز ٠,١% مع العناصر الثلاثة في الصورة المخلبية.

أما كمية المحصول على الكرمة ووزن العنقود ووزن الحبة وأبعادها ونسبة المواد الصلبة الذائبة فقـد ازدادت معـنوياً حيث كانت أكثر المعاملات تأثراً هي التي تضمنت إمداد محاليل الرش بالخميرة الجافـة النشـطة وذلـك بالمقارنة باستخدام العناصر الغذائية بدونها. كان التحسن الكبير في محتوى الأوراق مـن الكلوروفـيل أ، ب والكاروتيـن مرتـبط بزيادة عدد العناصر المرشوشة. ونتج عن رش الكرمات بالمنجنيز سواء أكان منفرداً أو مع الحديد والزنك زيادة مؤكدة في محتوى الأوراق من الحديد إذا ما قورنت بأوراق الكرمات الغير معاملة. كانت المعاملة الوحيدة التي سببت زيادة مؤكدة في مستوى المنجنـيز فـي أعـناق الأوراق هـي معاملـة الـرش بالمنجنيز منفرداً، كما زاد مستوى النيتروجين والبوتاسيوم باستخدام الحديد + الزنك + المنجنيز. وقد أدت جميع المعاملات إلى زيادة محتوى الأوراق من الأندولات والفينولات الكلية.

بـناء علـى مـا سـبق يمكن القول بصفة عامة أن رش كرمات العنب (فيلام سيدلس) بالعناصر المستخدمة بالإضافة إلى الخميرة تحت ظروف هذه التجربة قد أدى إلى زيادة النمو الخضري والثمري لهذه الكرمات تحت ظروف الأراضي الجيرية.