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EFFECT OF ADDING SOME ORGANIC WASTES ON YIELD AND BERRY QUALITLES OF KING RUBY GRAPEVINES

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ABSTRACT

The two field trails of present investigation was carried out during 2006 and 2007 seasons on 4-years-old King ruby grapevines grown on clay soil. The trial was to study effect of Orange and Apple wastes compost, in food factories, mixed with farmyard manure to enrich the compost as nitrogen sources complementary for mineral nitrogen on buds behavior, yield and berry quality. The results from this study indicated that applying both kinds of compost either Apple or Orange each alone (40 unit of nitrogen) gave the highest values in bud fertility and fruiting coefficient compared with control that used 40 unit of mineral nitrogen alone, also 40 unit N of OC, 30 unit mineral N +10 units of organic of OC, 40 units organic N of AC and 30 mineral N +10 units organic N of AC recorded in average a pronounce increase on the yield. Application of 40 units organic N of OC gave the highest increase on the berry adherence and firmness during the two seasons of study. All application from organic or mineral fertilizers under study did not show a clear variation in SSC% and acidity in berries juice during the two seasons, application of 10 units organic N from both AC and OC + 30 unit mineral N gave the significant increased in total sugars, reducing sugars and non-reducing sugar in berries juice as compared with control during the two seasons of study. Most interaction between organic and mineral materials gave good values in the anthocyanin content in berry skin in average as compared with control during the two seasons of study. application of 20 unit organic N of both AW and OC +20 unit mineral N gave the lowest values of nitrite and nitrate followed by 40 unit organic N of OC in berries juice compared with control that used 40 unit mineral N alone.

INTRODUCTION

A king ruby grapevine is one of the most important table Grapevines cultivars and very popular fruits for many people in Egypt and the world. The total planted area with grape cultivars reached about 160000 fed and the fruitful ones are abut 144624 fed total annual production of 1391749 ton according to the *Ministry of Agriculture statistics* (2007). The grapevine growers wish to obtain healthy, good characteristics and economic yield not only for local marketing but also for exportation, especially fertilization program to provide the vines with nutrient requirements of macro and micronutrients. Compost application of organic fruit wastes that obtained from food industrial such as Juice and Jam mixed with farmyard manure to improve nutrient status and physical properties of soil such as water holding capacity, total porosity, permeability and bulk density (*FAO*, 1977).

Many studies were workers concerning the effect of compost as an alternative source either perfect or partial form of mineral fertilizer especially nitrogenous fertilizers on vegetative growth and nutrient status (NPK), yield

and quality of cluster and berries of Grapevines. Abd EL-Galil *et al.* (2003) added 50% recommended doses of mineral N (76 units /fed) from organic N source (filter mud) on 10-years-old King ruby grapevines. They found that replacing one fourth or half of nitrogen units requirements for vine by organic N enhanced the yield, significant increase on SSC%, reduced total acidity and significantly increased N content in leaves compared with using N totally as a mineral source. Omar (2005) investigated the effect of adding 60 units N/ fed by replacement 1/2 of recommended requirement of mineral N with organic manure (compost) according to their N content on 7-years-old Thompson seedless grapevines grown in a sandy soil, found that the combination of 1/2 mineral +1/2 compost gave the lowest values of nitrate and nitrate in berries as compared with control that used 60 units N/fed from mineral N only. Abd El-Hameed and Rabeea(2005) on 8-years-old Superior grapevines, found that all combination at various proportion of mineral N and organic gave positive effect on yield and cluster weight and significant increase on SSC% and decrease total acidity as compared with control that used 80 units N/fed from mineral N solely. Mostafa *et al.* (2008) on fifteen years old Thompson seedless grapevine showed that Farmyard manure, Rice straw, Mansura town refuse, Damietta town refuses as organic N complementariness sources with mineral nitrogen gave significant increase nitrogen% in the leaf petioles by DTR application as compared with the there organic nitrogen sources tested during the study. In addition to, data revealed that there was a gradual increment in N content in the leaf petioles by increasing the doses of organic nitrogen application and reducing the doses of mineral nitrogen, as well as, significant increase in cluster weight, yield/vine, insignificant differences on berry adherence and firmness, SSC% in berries juice, whereas significant increase on total sugar and significant decrease of nitrate and nitrite content in berries when applied 60 units of organic nitrogen +20 units of mineral nitrogen as compared with mineral nitrogen only during the two seasons of study.

MATERIALS AND METHODS

This study was carried out during 2006 and 2007 seasons to study the effect of using different levels of Apple compost and Orange compost that mixed with farmyard manure to enrich them as complementary to mineral nitrogen fertilizer (ammonium sulphate 20.5%) on bud behavior, N in leaf petioles, yield, characteristics of physical and chemical berries juice. Treatments were applied as the following:

1- 40 unit mineral N fertilizer (control).
2- 40 unit organic N apple waste compost.
3- 30 unit organic N apple waste compost +10unit of mineral N
4- 20 unit organic N apple waste compost +20unit of mineral N
5- 10 unit organic N apple waste compost +30 unit of mineral N
6- 40 unit organic N orange waste compost.
7- 30 unit organic N orange waste compost +10unit of mineral N
8- 20 unit organic N orange waste compost +20unit of mineral N
9- 10 unit organic N orange waste compost +30unit of mineral N

Both apple and orange waste compost as a source of organic nitrogen was added after winter pruning directly at 24 December and 12 November in 2007 and 2008 seasons, respectively. Ammonium sulfate (source of mineral N) was added in equal two doses, where the first half dose was after bud burst and the second one after fruit set a cording to Table 4. The experiment was conducted in a private vineyard (Chycheny vineyard) at Menut Samanod village near Mansoura city in Dakahlia governorate. The vines were 4-year-old and grown in a clay soil as shown in table 1, cultivated at 2.5x3 meters apart under drip irrigated system and trained by bilateral cardoon system. 81 vines nearly uniform, healthy and number of buds per vine (40 buds) were selected in 3 replications 3 vines each to represent each treatment under study and arranged in complete blocks randomized design.

Table (1): Soil physical and chemical characteristics.

Particle size distribution						Soil depth. Cm	pH	Available nutrient(ppm)				
Soil depth (cm)	coarse sand %	clay %	silt %	Find Sand%	Texture			N	p	K	Mn	zn
0-30	0-2	44	24.2	22.40	clay	O-30	7.8	65.60	42.98	429	9.2	1.7
30-60	0-2	45	25.1	23.60	clay	30-60	7.9	57.2	41.97	4oo	8.9	1.6
						60-90	8	47.2	40.96	380	7.0	1.5

Table (2): The chemical analysis of Apple and Orange compost season that used in 2007.

Fertilizers	C%	N%	C:N	P%	K%	Cu ppm	Zn ppm	Mn ppm	Fe ppm	PH1:5	EC1:5 $ds.m^{-1}$
Apple compost	16.1	1.58	10.2	0.29	1.41	103	139	600	80	8.20	3.9
ange compost	18.96	1.60	11.8	0.50	1.03	82	140	720	60	8.00	3.6

Table (3): The chemical analysis of Apple and Orange compost season that used in 2008.

Fertilizers	C%	N%	C:N	P%	K%	Cu ppm	Zn ppm	Mn ppm	Fe ppm	pH 1:5	EC1:5 $ds.m^{-1}$
Apple compost	17.4	1.13	24.9	0.19	1.34	1.9	10.1	16.3	78.6	8.33	4.95
Orange compost	22.6	1.47	15.4	0.23	1.38	2.8	9.3	18.2	91.7	8.12	4.76

Table 4: The amounts of nitrogen that used as organic and mineral fertilized sources in the studied treatments.

	Organic fertilizers					The amount of N (g/vine)		The amount of mineral Fertilizers as Ammonium Sulfate (g/vine)	Total units N/fed
	type	Amount/vine(kg)		N (%)		organic	mineral		
		2007	2008	2007	2008				
1	**AC**	2.5	3.5	1.58	1.13	40	----	----	40
2	**AC**	1.9	2.6	1.58	1.13	30	10	50	40
3	**AC**	1.3	1.7	1.58	1.13	20	20	100	40
4	**AC**	0.7	0.9	1.58	1.13	10	30	150	40
5	**Control**	----	----	----	----	----	40	200	40
6	**OC**	SEFAN**		SEFAN**		SEFAN**		SEFAN**	
7	**OC**	SEFAN**		SEFAN**		SEFAN**		SEFAN**	
8	**OC**	SEFAN**		SEFAN**		SEFAN**		SEFAN**	
9	**OC**	SEFAN**		SEFAN**		SEFAN**		SEFAN**	

Apple compost (AC) - **Orange compost (OC)** - **Control = 40 unit mineral nitrogen**

Measurements:

1- Bud fertility and Fruiting coefficient : bud fertility percent and fruiting coefficient were calculated according to Omran (2000) as the following equations:

$$\text{Bud fertility \%} = \frac{\text{Number of clusters/vine}}{\text{Total number of buds left/vine}} \times 100$$

$$\text{Fruiting coefficient} = \frac{\text{Number of clusters}}{\text{Bud burst number/vine}} \times 100$$

2- Measurements of yield and its elements.

2-1- Yield (kg) and cluster weight(g).

2-2- Firmness and adherence of berries (gm/cm^2): by using push /pull powers (Dynamometer Model DT 101).

2-3- Soluble solids content (SSC %): by using a hand refractometer.

2-4- Total acidity(%).

2-5- Total sugars percent: Reducing sugars, Non-reducing sugars were calculated as the differences between total soluble sugars and reducing sugars according to modified method of Shaffer and Hartman (1921).

2-6- Anthocyanin content in skin of berries (mg/100g): According to (Hsia *et al.*, 1965) and the anthocyanin was calculated using the following equations:

$$\text{Total absorbance} = \frac{\text{color measurement at535nm x total volume}}{\text{Ml of extration x weigh of sample}}$$

$$\text{Total anthocyanin} = \frac{\text{Total absorbance.}}{98.2\ (E)}\ \text{Mg /100 gm.}$$

3- Determination of nitrate and nitrite in berries juice (ppm): they were determined according to Singh (1998) in juice of berries.

4- N in leaf petioles:

Total nitrogen%: according to the method described by pregle (1945)

5- Weight of pruning wood: It determined at winter pruning time during the season of study and the data were recorded as kg/vine according to Rizk and Rizk (1994).

Statistical analysis:

All data of this study were statistically analyzed for complete blocks randomized a cordoning to Gomez and Gomez (1984), using" MSTAT-C" Computer software package. The treatment means were compared using the Newly Least Significant Differences (N.L.S.D) according to the producer outlined by Waller and Duncan (1969).

RESULTS AND DISCUSSION

1-Bud fertility and Fruiting coefficient:

Table 5 presented that all treatments gave non significant variation on bud fertility and fruiting coefficient, while both kinds of compost either Apple or Orange alone (40 unit) gave the highest values in bud fertility and fruiting coefficient compared with control that used 40 unit of mineral nitrogen alone during the two seasons of study, as well as, both 30 unit from OC and AC complementary with 10 units mineral N gave high values in this respect.

2- Effect of Apple, Orange compost and mineral nitrogen fertilizers on N content at fruit set:

Data illustrated in Table 5 showed that all treatments either that received Apple compost, Orange compost or any supplementary of them with mineral nitrogen gave not significant differences in nitrogen content in the leaf petioles during the two seasons of study. 10 units organic nitrogen from Apple compost +30 units mineral N and 30 units organic N from Orange compost +10units mineral N gave best values of N% content in the leaf petioles compared with control (40 units) mineral N as mean of two seasons of study.

Table 5: Effect of Apple, Orange compost and mineral nitrogen fertilizers on bud fertility, fruiting coefficient and N content in leaf petiole at fruit set.

Characters / Treatments	Bud fertility (%)		Fruiting Coefficient (%)		N (%)	
	2006	2007	2006	2007	2006	2007
*AC	47.22	54.99	69.27	84.00	1.644	3.42
3/4Min***+ 1/4AC	47.11	44.71	55.90	79.70	2.092	3.38
1/2Min +1/2AC	43.10	44.72	57.14	75.16	2.022	3.30
1/4Min+3/4AC	38.88	48.77	61.07	80.58	1.852	3.07
Control	45.33	(54.44)	57.57	68.16	1.361	3.11
**OC	50.22	57.49	67.68	85.43	1.582	3.22
3/4Min+1/4OC	48.44	44.16	51.32	70.36	1.878	3.19
1/2Min+1/2OC	45.55	48.83	59.14	72.89	1.915	3.22
1/4Min+3/4OC	47.55	57.49	67.18	83.76	2.003	3.41
N.L.S.D. 5%	NS	Ns	NS	NS	NS	NS

AC *=Apple compost, OC ** =Orange compost, Min ** * =Ammonium Sulphate 20.5 %

3- Effect of Apple, Orange compost and mineral nitrogen fertilizers on yield and components of King ruby grapevines.

Data in Table 6 showed that cluster weight and yield/vine were not affected by used application either organic or mineral N fertilizers, but yield was differ from each other, where 40 unit organic N of OC, 30 unit mineral N+10 units of organic of OC, 40 units organic N from AC, 30 mineral N+10 units organic N from AC, 20 unit organic of AC+20 unit mineral N recorded a pronounce increase of the yield as mean of two seasons compared with 10 unit mineral N+ either 30 unit organic N of OC or 30 unit of AW compost and control.

4- Berry adherence and firmness:

Data in Table 6 showed that application of 40 unit organic N of OC compost significantly increased the berry adherence compared with AC alone and high values than another treatments either control or all organic sources complementary with mineral N during the two seasons, while all complementariness of OC with mineral N and10 unit mineral N+30 unit AC gave the highest values in average on berry firmness comparing with other treatments under study during two seasons.

5- Effect of Apple and Orange compost and mineral nitrogen on SSC, acidity and SSC/acid ratio:

Table 6 revealed that each application under study did not show clear variation between them during the two seasons in SSC and acidity, but the data showed that both AC and OC at 40 units gave the highest average values during the two seasons on SSC% as compared with other treatments in the study.

6- Effect of Apple, Orange compost and mineral nitrogen on total sugar, reducing sugars and non reducing sugars:

Data in Table 7showed that application of 10 units organic N from both AW and OW compost +30 unit mineral N gave the significant increased in total sugars, reducing sugars and non-reducing sugar in juice berries as compared with control that used 40 unit mineral N during the two seasons of study.

7- Effect of Apple and Orange compost and mineral nitrogen fertilizer on nitrite and nitrate content in berry juice:

Data in Table 7 revealed that application of 20 unit organic N from both AW and OW +20 unit mineral N gave the lowest values of nitrite followed by 40 unit organic N of OW compost, but 20 unit organic N from both AW and OW recorded lowest values of nitrate in berries juice during both seasons of study as compared with control that used 40 unit mineral N alone.

8- Effect of Apple and Orange compost and mineral nitrogen fertilizer on anthocyanin content in berry skin:

Data in Table 7 showed that application 30unit mineral N+10 unit organic N of AW compost, 20 unit organic N +20 unit mineral N, 10 units organic N from OW compost+30 unit mineral N, and 20unit organic N from both OW compost and 20 unit mineral N compost+20unit mineral N gave the highest values on anthocyanin content in berry skin as compared with control that used mineral N only during the two seasons of study.

9- Effect of Orange, Apple compost and mineral nitrogen on pruning wood weight and total carbohydrates in canes:

Table 8 showed that there were not significant differences between all applications on pruning wood weight at winter pruning in the study, where the results had not clear variation in 2006 and 2007 seasons, whereas, data in Table (16) indicated that application that 10 unit organic N from both OW and AW compost+30 unit mineral N comparing with control that used 40 units mineral N only and other treatments on total carbohydrates in canes at winter pruning compared with other applications (17.77- 18.62, 17.43- 18.29 and 17.05- 17.88) in the two seasons of study, respectively.

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Table 8: Effect of Apple, Orange compost and mineral nitrogen fertilizers on pruning wood weight and total carbohydrates in canes.

Characters / Treatments	Pruning wood weight (kg)		Total Carbohydrates (%)	
	2006	2007	2006	2007
Apple compost(AW)	1.66	1.69	16.13	16.91
3/4mineral+1/4(AW)	1.78	1.39	17.43	18.29
1/2(Min) +1/2(AW)	1.66	1.27	16.57	17.38
1/4((Min)+3/4(AW	2.00	1.08	15.48	16.21
Control(C)Mineral(Min)	1.97	1.19	17.05	17.88
Orange compost(OW)	1.89	1.27	16.34	16.99
3/4(Min0+1/4(OW)	1.61	1.11	17.77	18.62
1/2(Min)+1/2(OW)	1.70	1.16	16.73	17.68
1/4(Min)+3/4(OW)	1.85	1.41	15.80	16.53
N.L.S.D.5%	NS	NS	0.30	0.46

DISCUSSION

Applying orange and apple wastes mixed with farmyard manure compost as nitrogen sources complementary for mineral nitrogen to vines increased bud fertility and fruiting coefficient, yield and berry quality. This effect may be due to that both compost increases of the nutrients elements in the soil. This increase can encourage the vegetative growth, which increases the photosynthetic rates leading to an increase of assimilation rates. Also applying compost to the soil improves soil fertility, increases cations exchange capacity of soil and adding manure as fertilizer leading to decrease in soil PH thus allowing increased availability and uptake nutrients elements, especially micronutrients. When added organic compounds and decomposed by microorganisms which exist in the soil, the nutrient elements release from them to use by plants. So the bud fertility and fruiting coefficient enhanced leading to increase the yield. Similar results have been found by Abd El-Hady *et al.* (2003) who reported that the organic fertilizers improve berry characteristics in Flame seedless grapevines as a result of accumulation more carbohydrates and enhancing berry ripening. Similar, Abd EL-Galil *et al.* (2003) on King ruby seedless found that the yield per vine increased by increasing the organic manures doses as compared with vines receiving only mineral fertilizer without applying any organic sources and Mostafa *et al.* (2008) show that all organic N significant increase the cluster weight and yield/vine, higher values on berry adherence and firmness, Damitta town refuses gave a clear increase on N content in the leaf petioles and insignificant differences between all used organic materials on SSC% and SSC/acid ratio during the two season of study.

This study conducted that application of organic wastes compost that obtained from food industries can use as good source of nitrogenous fertilizers in King ruby vineyard, which grow in clay soil. These are very useful for Human healthy, environment and encourage the farmers for exporting to increase its income.

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تأثير إضافة بعض المخلفات العضوية على محصول وجودة الحبات فى عنب الكينج روبى

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أجريت هذه الدراسة فى ثلاث مواسم ٢٠٠٧،٢٠٠٦، ٢٠٠٨، وأعتبرالموسم الأول ٢٠٠٦ تجربة تمهيدية للموسمين الأساسيين٢٠٠٧ ، ٢٠٠٨ على شجيرات عنب صنف كينج روبى عمره إربعة سنوات ومزروع فى أرض طينية ومرباه تربية كردونبة (ثنائى الكردون) والرى بالتنقيط بمزرعة الشيشينى،سمبوخت، منية سمنود، المنصورة، الدقهلية.

أجريت هذا الدراسة لمعرفة تأثير إضافة نوعيات جديدة من المواد العضوية المتخلفة عن عمليات التصنيع الغذائى (مصنع بست) مختلطة مع السماد البلدى لعمل الكمبوست كمصادر لعنصر النتروجين. وكان يوجد نوعين هما كمبوست مخلفات التفاح وكمبوست مخلفات البرتقال المختلط بالسماد البلدى، وقد إضفيت بنسبة الربع والنصف والثلث مكملا لكمية وحدات النتروجين الموصى بها لصنف عنب الكينج روبى فى الأراضى الطينية وذلك لتقليل إستعمال الأسمده الأذوتية وتحسين ظروف التربة بما يعود بالفوائد الكثيرة على نمو ، محصول وجودة كروم العنب ، من ثم البيئة والإنسان.

وقد أظهرت نتائج الدراسة أن إضافة كمبوست المخلفات العضوية للتفاح والبرتقال فقط مختلطاً **بالسماد** البلدى كمصدر نتروجينى أو إدخالهم مشتركين مع الأسمدة النتروجينية المعدنية فى برنامج التسميد، يؤدى الى تحسين كمية المحصول الناتج من الكرمات، وتحسين صفات الجودة لحبات العناقيد من حيث محتوى المواد الصلبة الذائبة والسكر وصبغة الأنثوسيانين وتقليل مستوى النترات والنيتريت فى عصير حبات العنب. وقد أوضحت النتائج أيضاً بأن الفروق بين وزن نواتج التقليم الشتوى ومحتوى القصبات من المواد الكربوهيدراتية فى الكرمات المسمدة عضوياً من نوعى الكمبوست أو معدنياً أو مشتركين معاً ليست معنوية مما يدل على إمكانية إدخالهم فى برامج التسميد فى مزارع العنب.

Table 6: Effect of Apple, Orange compost and mineral nitrogen fertilizers on yield and its components of King ruby grapevines.

Characters / Treatments	Cluster weight g		Yield/vine kg		Berry adherence g/cm²		Berry Firmness g/cm²		SSC%		Acidity%	
	2006	2007	2006	2007	2006	2007	2006	2007	2006	2007	2006	2007
(AC)	574	664	14	19	354	333	547	579	19	20	0.47	0.32
3/4 Min+1/4AC	559	730	13	20	350	403	519	512	19	18	0.50	0.35
1/2Min+1/2 AC	622	822	14	19	361	550	657	634	18	19	0.56	0.28
1/4 Min+3/4AC	594	657	11	17	400	416	597	805	18	19	0.47	0.31
Control	465	646	13	14	405	517	533	666	17	19	0.56	0.39
O C	576	751	14	20	538	500	505	733	18	21	0.58	o.34
3/4 Min+1/4OC	596	568	14	19	450	416	572	766	17	19	0.55	0.31
1/2Min+1/2OC	691	579	15	13	368	300	655	783	18	20	0.55	0.32
1/4Min+3/4OC	473	524	11	13	444	383	535	764	19	19	0.55	0.30
N.L.S.D. 5%	NS	NS	4.99	5.75	188	184	179	187	NS	NS	NS	NS

AC *=Apple compost, OC ** =Orange compost, Min ** * =Ammonium sulphate 20.5 %

Table 7: Effect of Apple, Orange compost and mineral nitrogen fertilizers on total sugars, reducing and non reducing sugars (gm), nitrate and nitrites content in berries juice (ppm).

Characters / Treatments	Total sugars %		Reducing Sugars% gm		Non reducing %		Nitrites Content(ppm)		Nitrates Content(ppm)		Anthocyanin content (mg/100gm)	
	2006	2007	2006	2007	2006	2007	2006	2007	2006	2007	2006	2007
AC*	13.37	14.13	11.46	11.01	1.91	3.12	0.13	0.11	6.33	5.21	1.34	0.67
3/4Min+1/4AC	14.57	15.20	12.35	12.86	2.22	2.34	0.12	0.12	6.03	5.82	1.37	1.02
1/2Min*** +1/2AC	13.83	14.46	11.77	12.30	2.06	2.16	0.11	0.11	5.12	5.28	1.18	1.12
1/4Min+3/4AC	12.89	14.18	10.97	11.37	1.92	2.81	0.14	0.13	6.85	6.45	1.04	0.78
Control	14.23	14.94	12.20	12.60	2.03	2.34	0.14	0.14	7.44	6.85	1.28	0.81
OC**	13.57	14.16	11.51	11.96	2.06	2.2	0.12	0.12	5.79	5.59	1.07	0.71
3/4Min0+1/4OC	14.89	15.58	12.70	13.11	2.19	2.47	0.14	0.13	7.16	6.64	1.37	0.89
1/2Min+1/2OC	14.03	14.63	11.92	12.34	2.11	2.29	0.11	0.11	5.47	5.47	1.08	1.02
1/4Min+3/4OC	13.14	13.81	11.14	11.62	2.00	2.19	0.13	0.11	6.60	6.22	0.99	0.78
N .L.S.D. 5%	0.14	0.67	0.12	0.11	NS	NS	NS	NS	NS	NS	NS	NS

AC *=Apple compost, OC ** =Orange compost, Min ** * =Ammonium Sulphate 20.5 %