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Original Article

Efficiency of Extracts of Three Medicinal Plants to Improve Growth, Yield and Quality of Red Roomy Grapevine

Asmaa A. Mohamed[1]; Fatma El-Zahraa M. Gouda[*2]; F.E.M Saleh[3] and Yasser A.M. Omran[1]

[1]Viticulture Department, Horticulture Research Institute, Agricultural Research Center, Giza, Egypt.
[2]Pomology Department, Faculty of Agriculture, Assiut University.
[3]Medicinal and Aromatic Plants Research Department, Horticulture Research Institute, Agricultural Research Center, Giza, Egypt.

[*]Corresponding author email: fatma.gouda@agr.au.edu.eg
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Abstract:

The main objective of this investigation was to study the effects of some plant extracts e.g. licorice root, roselle calyxes or moringa leaves extracts on the growth and fruiting of Red Romy grapevines. The experiment was carried out during 2019 and 2020 seasons. These extracts were using with their different concentrations (control: spraying with water, moringa leaf extract 4, 6 and 8%, licorice root extract 2, 4 and 6% and roselle calyxes extract 2, 4 and 6% concentrations) were applied as a foliar spray three times as follows: at growth start, just after berry setting and at three weeks later. The foliar spray of moringa, roselle or licorice extracts were very effective in improvement the yield/vine and cluster traits. Also, these treatments significantly improved the quality berry of increasing the berry weight, total soluble solids and skin anthocyanin of berries compared to untreated ones. The best results were obtained on the vines that sprayed with 6% moringa extract. It could be concluded that spraying moringa at 6%, licorice at 4% or roselle extract at 4% three times annually was necessary to get high yield with good cluster and berry quality of Red Romy grapevines

Keywords: *Moringa, licorice, Roselle, anthocyanin, extracts and grapevines.*

Introduction

Grapes are one of the most important popular and favorite fruits over the world, which had a good flavor and high nutritional value. It considered an important source of antioxidants such as vitamins, phenols, flavonoid, anthocyanin and contributing to the health benefits (Anastasiadi *et al*. 2010). Most of grape cultivars planted in Egypt belong to the table grape and all of them are European grape cultivars (*Vitis vinifera* L.). In Egypt, grape occupy the third rank after citrus and mangoes. The total area for grapevines was 190486 feddans, whereas the fruiting area of it was 174715 feddans, which produced about 1594782 tons according to the statistics (MALR, 2019). Red Roomy cultivar grown under Assiut area be faced with some troubles especially, decreasing the yield and lack of berries coloration cause an negative affects the marketing either

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to local or foreign markets. There is high voices to used natural compounds to conserve the environment, avoid the side effects and focused on plant extracts as alternative to industrial chemical materials (Sadiq *et al*., 2002). Plant extracts as a natural products were used to improve growth and fruiting of fruit trees, as well as a pesticides for public health and environmental safety. The higher own of phenolic and other chemical constituents seem to have synergistic effects on growth and production of fruit crop (Paik and Chung, 1997 and Srivastava and Lal, 1997). In the recent days, the studies concentrated to the possibility of using the extracts of plant such as licorice root and moringa leaves extracts for improving the growth and yield of plants (Nasira *et al*., 2016). Licorice, (*Glycyrrhiza glabra)* family Leguminoseae, is a plant that grows in Egypt and many other countries of the world. The root of licorice have some nutritive value and medicinal properties (Fenwick *et al*., 1990), it contains many of chemical compounds such as gleserezin, glycyrrhejel and licorice acid. Moreover, it contained a wide range of elements and nutrients (Moses *et al*., 2002 and Al-Ajeeli, 2005). Licorice extract increases the activity of cellulose enzyme which important in the expansion of cells results in accelerating the plant growth. In addition, it can decrease the rate of transpiration, reducing water loss and maintaining cell fullness (Abou-Hussein *et al*., 2000). Licorice root extract contains sugars and gum substances that increase the total soluble solids in plant cells and water retaining due to presence of iron and magnesium (Recta and Bhatnager, 2011). Moreover, many studied confirm the positive effects of *Moringa oleifera* on growth and yield of crops and thus can be promoted as a supplement or instead of chemical fertilizers (Phiri, 2010). Moringa contains seven times more vitamin C than orange, seventeen times Ca than milk, fifteenth times K than bananas, ten times vitamin A than carrot, twenty five times Fe than spinach and nine times proteins than yogurt. Also, it contains amino acids, fatty acids and phenolics, moreover, its leaves contain high zeatin and other cytokinin (Fuglie, 2000 and Farooq *et al.,* 2007). The peels, leaves, seeds and flowers of the moringa plant are good resources of proteins, essential amino acids, beta carotenes, vitamins and phenolic compounds (Iqbal *et al*., 2021).

Roselle (*Hibiscus subdariffa L.*) which belongs to the family *Malvaceae* is a tropical plant. The main ingredients of roselle are antioxidants, anthocyanins, vitamins C, A, D, B_1, B_2 and Fe, Mg elements and omega-3 beta-carotene (Bruneton, 2011). The two predominant organic acids in roselle were quantified as succinic acid and oxalic acid. Roselle was contained higher amount of ascorbic acid compared to orange and mango (Wong *et al*., 2002). The beneficial effects of roselle extracts on building plant pigments and organic foods surely reflected on advancing maturity and improving fruit quality (El-Salhy *et al*., 2017 and Radwan *et al*., 2019). Previous studied confirms the importance of spraying some plant extracts on growth, yield and berry quality of grapevines (Abdelaal and Aly, 2013, Gadel-Kareem and Abdel-Rahman, 2013, Calvo *et al*., 2014, Uwakien, 2014,Gouda-Fatma El-Zahraa, 2016, El-Salhy *et al.*, 2017, El-Salhy *et al*., 2019 and Radwan *et al*., 2019). Therefore the present investigation was done

to evaluate the effects of using licorice, roselle and moringa extracts on growth and fruiting of grapevine grown under Assiut conditions.

Materials and Methods

Experimental layout and treatments

The experiment was conducted during 2019 and 2020 seasons on Red Roomy grapevines grown at the Experimental Orchard at Assiut University, Faculty of Agriculture. The vines age had about 12 years old and they were planted at 2 x 2.5 m apart. Sixty uniform grapevines were used in our study. All vines were pruned as the traditional training system with 20 fruit spurs and 4 buds were left on each spur consequently, the total buds left on each vine in this study were 80 buds. Ten treatments were established as follows:

1- Spraying with water (control, C).
2- Spraying with moringa leaf extract (MLE) at 4%.
3- Spraying with moringa leaf extract (MLE) at 6%.
4- Spraying with moringa leaf extract (MLE) at 8%.
5- Spraying with licorice root extract (LRE) at 2%.
6- Spraying with licorice root extract (LRE) at 4%.
7- Spraying with licorice root extract (LRE) at 6%.
8- Spraying with roselle calyxes extract (RCE) at 2%.
9- Spraying with roselle calyxes extract (RCE) at 4%.
10- Spraying with roselle calyxes extract (RCE) at 6%.

Preparation of plant extracts

Preparation of moringa leaf extract

The fresh small leaves of *Moringa oleifera* were harvested from the farm Arab El Awamer research station, Agriculture research center then washed and dried for seven days under shade condition at room temperature, then ground to powder and weighed, then stored in an air-tight bottle for further use. Moringa extract (2, 4 and 6%) were prepared by blending 20, 40 and 60 g/L of moringa powdered sample in tap water until obtained homogenized suspended, the solution was leaved for 24 hours then it filtered by wringing using a mutton cloth. The obtained extract re-filtered through No. 2 Whatman filter paper and diluted by tap water to reach one liter (Abou-Zeid and El-Darier, 2014). The quantitative composition and composition of the aqueous leaf extracts of moringa analysis in Table (1) by Nweze and Nwafor (2014).

Preparation of licorice root extract

Licorice roots aqueous extract of 2, 4, and 6 g/L were prepared by soaking 20, 40, 60 g of licorice roots in a half-liter of tap water for 24 hours then the solution filtered by wringing using a mutton cloth. The obtained extract re-filtered through No. 2 Whatman filter paper and completed by distilled water to one liter and completed by tap water to one liter. The phytochemical and minerals proximate composition of the aqueous licorice extract analysis is shown in table (1) by Morsi *et al.* (2008).

Preparation of roselle calyxes extract

Roselle (*Hibischus sabdariffa* L.) extract at 2, 4 and 6 g/L were prepared by soaking 20, 40 and 60 g dried and grinded hibiscus calices, in a liter of tap water in an electric mixer and mixing the mixture for 15 m, then let the mixture for 24 hours and filtering several times, then filtrate was taken to give the concentrations that required (El-Sharony *et al*., 2015), the nutritional composition of roselle calyxes extract described in table (2) by Jabeur *et al*. (2017).

Triton B at 0.1% used as wetting agents with all treatments expect with *Glycyrrhiza glabra* extract that contain saponin and triterpenes. The experiments set up as a randomized complete block design with three replicates and two vine per each. All studied vines gave three sprays from each substance at growth start (1st week of March), just after berry setting (2nd week of April) and at three weeks later.

Recorded data

The following parameters were measured to evaluate the effects of different medicinal plant extracts spraying on growth and fruiting.

Growth: shoot length (cm), leaf area (cm^2), twenty leaves from those opposite to basal clusters were measured according to the following equation that was reported by Ahmed and Morsy (1999),
Leaf area = 0.56 (0.79 x w^2) + 20.01, where, w = the maximum leaf width.

Yield and cluster traits: Yield/vine, cluster weight and dimensions (length & width) were recorded.

Physical characters of the berries: Berry weight and dimensions (longitudinal and equatorial in cm), berries coloration percentage, berry firmness was recorded by using a texture analyzer instrument (Fruit Hardness Tester, No. 510-1) as a small cylinder by 3 mm penetrates into a distance of 3 mm inside the berry with a speed of 0.2 mm second, then the resistance of berry to this penetration force was recorded and taken as an expression of berry firmness (g/cm^2).

Chemical analysis of the berries: T.S.S %, total acidity % and T.S.S/acid. The soluble solid contents (TSS) % was measured using hand refractometer apparatus and the titratable acidity (%) was determined as of tartaric acid equivalent to NaOH (0.1N) in 100 ml berries juice of berries. TSS: Acid ratio was calculated using data of TSS % and that of titratable acidity (A.O.A.C., 1985). Total anthocyanin content (mg/g fresh grapes skin) estimated spectrophotometrically as recorded by Ranganna (1979), half gram of fresh skin berries was ground with 10 ml acidified alcohol centrifuged for 3 minutes and the supernatant was measured at 535 nm, NPK in leaves, Nitrogen % was determined in dried mature leaves (5-7th leaves from shoot top) using the modified micro-Kjeldahl method according to Bremmer and Mulvaney (1982), Phosphorus % was determined by colorimetrically according to Snell and Snell (1967) and also, Potassium % was estimated photometrically according to Jackson (1967).

Statistical analysis

The experiment was laid out in complete randomized design (CRD) counting ten treatments and three replicates with two vines for each. The obtained data was subjected to the analysis of variances (ANOVA) according to Steel and Torrie (1980) and Mead *et al*. (1993). Means separation was made according to the Least Significant Differences (RLSD) at 5% level of the probability.

Table 1. The quantitative proximate composition of moringa leaves and root licorice extracts.

Moringa leaves extract						Licorice root extract			
Minerals Composition (g/100g)		**Nutrient Composition (g/100g)**		**Phytochemical Aqueous extract (g/100g)**		**Minerals Composition (mg/ 100g dw)**		**Phytochemical Aqueous extract (mg/100g dw)**	
Nitrogen	3.0	Carbohydrate	57.0	Anthraquinone	11.7	Potassium	341.5	Total phenol	405.0
Calcium	2.1	Protein	18.9	Tannins	9.4	Magnesium	174.7	Total flavonoids	114.9
Potassium	1.6	Fibre	9.3	Terpenoids	4.8	Sodium	122.8	Tannins	47.5
Sulphur	0.85	Ash	7.9	Flavonoid	3.6	Calcium	104.6	Saponins	27.9
Magnesium	0.48	Moisture	4.1	Steroids	3.2	Zinc	0.40	Carotenoids	11.8
Phosphorous	0.44	Fats	2.7	Alkaloids	3.1	Manganese	0.40	Vitamin C	1.2
Iron	0.03			Saponins	1.5	Iron	1.2		
Copper	0.01			Carotenoids	1.2	Copper	0.18		
Zinc	0.01			Cardiac glycoside	0.36				
				Anthocyanin	0.06				

Table 2. Nutritional composition of rosella extract.

Nutritional value (g/100 g dw)				Fatty acids (%)			
Ash	7.4	**Organic acids Content**		Caproic acid	0.40	Stearic acid	4.46
Proteins	5.5	Oxalic acid	1.81	Caprylic acid	0.14	Linoleic acid	32.65
Fat	0.47	Malic acid	9.10	Capric acid	0.220	α-Linolenic acid	15.76
Carbohydrates	24.5	Shikinic acid	0.356	Lauric acid	0.47	Arachidic acid	1.02
Energy (kcal/100 g dw)	373	Fumaric acid	0.043	Myristic acid	1.24	Eicosenoic acid	0.21
Sugars Content		**Tocopherols (mg/100 g dw)**		Oleic acid	9.1	Behenic acid	1.40
Fructose	4.6	α-Tocopherol	39.19	Pentadecanoic acid	0.84	Tricosanoic acid	0.67
Glucose	6.5	β-Tocopherol	0.76	Palmitic acid	27.73	Lignoceric acid	1.08
				Palmitoleic acid	1.32		

Results

Concerning the results in Tables (3 & 4), data detected that spraying vines with moringa leaf extract (MLE) 8% gave the longest of shoot length (89.4 and 82.6 cm in the 1st and 2nd seasons), respectively. Also, the best improvement of leaf area was associated with MLE at 8% spraying (146.0 cm^2 as an average. the two studied seasons) followed by spraying with roselle calyxes extract (RCE) in both seasons. While the lowest shoot length and leaf area recorded in control treatment. In addition, nitrogen and potassium leaf contents of grapevines significantly affected by all treatments in both seasons. Wherever, spraying vines with MLE at all tested concentrations gave the best leaf nitrogen content in the two studied seasons followed by RCE. However phosphorus affected by moringa extract at 4%, 6% and 8% and recorded 0.212, 0.225 and 0.221 as an av. the two

studied seasons, followed by roselle extract at 2, 4 and 6% (0.205, 0.206 and 1.99% as an av. the two studied season).While, moringa extract at 4% gave the best leaf content of potassium (1.48% as an av. the two studied seasons) followed by roselle extract at 2% (1.43% as an av. the two studied seasons). On the other side, control was the lowest leaf nitrogen content (1.89), phosphorus (0.178%) and potassium (1.28%) as an average the two studied seasons.

In general, the previous results show that spraying moringa extract is the most effective, followed by spraying roselle extract. On other hand, there are no significantly affected of licorice spraying on vegetative growth traits compared to sprayed water one (control). Moreover, there are no significant differences for spraying two higher concentration of moringa extract (6 & 8%) or roselle extract (4 & 6%). Hence, from an economic point of view, it is preferable to use 6% moringa and 4% roselle extracts.

Table 3. Effect of moringa, licorice or roselle extracts on shoot length (cm) and leaf area (cm^2) of Red Roomy grapevines during 2019 and 2020 seasons.

Treat.	Shoot length (cm)			Leaf area (cm^2)		
	2019	2020	Mean	2019	2020	Mean
MLE 4 %	84.6	81.8	83.2	138.9	139.1	139.0
MLE 6 %	76.9	77.9	77.4	142.5	143.5	143.0
MLE 8 %	89.4	82.6	86.0	146.2	145.8	146.0
LRE 2 %	75.6	72.6	74.1	133.9	136.9	135.4
LRE 4 %	76.9	71.9	74.4	134.8	134.6	134.7
LRE 6 %	74.6	75.6	75.1	133.2	135.8	134.5
RCE 2 %	76.9	82.4	79.6	138.3	132.6	135.4
RCE 4 %	87.5	77.6	82.5	140.0	140.9	140.4
RCE 6 %	74.3	71.9	73.1	136.1	137.3	136.7
Control	76.3	69.6	72.9	132.5	135.2	133.8
RLSD	4.11	3.66	-	4.42	4.86	-

MLE= Moringa Leaf Extract, LRE= Licorice Root Extract, RCE= Roselle Calyxes Extract

Table 4. Effect of moringa, licorice or roselle extracts on leaf N, P and K% of Red Roomy grapevines during 2019 and 2020 seasons.

Treat.	N%			P%			K%		
	2019	2020	Mean	2019	2020	Mean	2019	2020	Mean
MLE 4 %	2.43	2.35	2.39	0.213	0.211	0.212	1.43	1.53	1.480
MLE 6 %	2.13	2.34	2.23	0.220	0.230	0.225	1.40	1.43	1.415
MLE 8 %	2.21	2.22	2.22	0.231	0.211	0.221	1.42	1.39	1.405
LRE 2 %	1.92	1.89	1.92	0.179	0.178	0.179	1.35	1.33	1.340
LRE 4 %	1.94	1.91	1.93	0.198	0.199	0.198	1.37	1.36	1.365
LRE 6 %	1.96	1.88	1.90	0.177	0.181	0.179	1.39	1.40	1.395
RCE 2 %	1.98	2.11	2.04	0.201	0.208	0.205	1.42	1.45	1.435
RCE 4 %	2.02	2.00	2,01	0.214	0.198	0.206	1.41	1.39	1.400
RCE 6 %	1.96	1.89	1.93	0.197	0.200	0.199	1.41	1.42	1.415
Control	1.92	1.87	1.89	0.173	0.184	0.178	1.33	1.23	1.280
RLSD	0 .05	0.07	-	NS	NS	-	0.013	0.021	-

MLE= Moringa Leaf Extract, LRE= Licorice Root Extract, RCE= Roselle Calyxes Extract

It is cleared from the data in Table (5) that yield/vine was significantly affected by all treatments in both seasons. Moreover, spraying vines with

moringa leaf extract (MLE) at 8% gave the best yield (9.55 and 10.43 kg/vine in the 1st and 2nd seasons, respectively), cluster weight (666.0 (g) average the two studied seasons) and 10 berries weight (58.33 and 63.84 (g) in the 1st and 2nd seasons), followed by spraying vines with MLE at 6% and roselle (RCE) at 4%. On other side, results showed that control gave the least values of these characters. The increment percentage of yield/vine attained (8.13 & 7.42% av. the two studied seasons) due to spraying MLE at 8% or 6% compared control (water spray), respectively.

These results are parallel with Fuglie (2000) that moringa leaf extract was sprayed on leaves of onions, bell pepper, soya beans, sorghum, coffee, tea, chili, melon and maize and was shown to increased yields of these crops, generally moringa leaf extract increased yield by 20 and 35%.

Table 5. Effect of moringa, licorice or roselle extracts on yield/vine (kg), cluster weight (g) and berry weight (g) of red Roomy grapevines during 2019 and 2020 seasons

Treat.	Yield/vine(kg)			Cluster weight(g)			Ten berries weight(g)		
	2019	2020	Mean	2019	2020	Mean	2019	2020	Mean
MLE 4 %	8.63	10.68	9.65	587.3	705.3	646.3	56.00	63.02	59.5
MLE 6 %	9.11	10.86	9.98	603.0	606.7	604.8	56.71	60.5	58.61
MLE 8 %	9.55	10.43	9.99	588.7	743.3	666.0	58.33	63.84	61.09
LRE 2 %	8.70	9.86	9.28	614.5	648.6	631.5	54.0	57.71	55.80
LRE 4 %	8.93	9.56	9.24	536.3	689.5	562.4	50.56	56.52	53.54
LRE 6 %	8.84	10.11	9.47	568.6	611.7	590.1	51.83	55.90	53.86
RCE 2 %	8.74	10.27	9.51	667.0	612.8	639.9	53.34	53.87	53.61
RCE 4 %	8.84	10.44	9.64	595.6	623.4	609.5	51.00	57.54	54.27
RCE 6 %	8.74	10.02	9.47	703.8	580.0	641.9	52.00	60.09	56.04
Control	8.54	9.92	9.23	556.6	562.0	559.3	50.42	56.53	53.47
RLSD	0.25	0.29	-	4.52	4.88	-	2.27	2.98	-

MLE= Moringa Leaf Extract, LRE= Licorice Root Extract, RCE= Roselle Calyxes Extract

Table 6: Effect of moringa, licorice and roselle extracts on cluster length (cm) and cluster width (cm) of Red Roomy grapes during 2019 and 2020 seasons

Treat.	Cluster length (cm)			Cluster width(cm)		
	2019	2020	Mean	2019	2020	Mean
MLE 4 %	26.33	30.0	28.2	15.60	13.66	14.63
MLE 6 %	24.00	25.7	26.3	13.33	14.3	13.81
MLE 8 %	27.67	30.5	29.08	15.73	14.9	15.31
LRE 2 %	27.33	26.34	26.83	13.33	12.2	12.76
LRE 4 %	25.33	27.4	26.36	13.8	11.7	12.75
LRE 6 %	27.0	26.5	26.75	15.5	14.5	15.0
RCE 2 %	25.00	26.8	25.9	15.70	16.7	16.2
RCE 4 %	23.00	30.43	26.71	14.61	13.8	14.2
RCE 6 %	26.00	27.17	26.58	13.30	14.32	13.8
Control	25.23	26.5	25.86	12.83	13.8	13.31
RLSD	2.98	2.76	-	1.61	1.97	-

MLE= Moringa Leaf Extract, LRE = Licorice Root Extract, RCE=Roselle Calyxes Extract

Data in Table (6) revealed that cluster length and cluster width of Red Roomy grapes was significantly affected by all treatments in both seasons. It is cleared that spraying vines with moringa extract (MLE) 8% gave the best results of cluster length (27.67 in the 1st and 30.5 cm in the 2nd season), cluster width

(15.73 in the 1st and 14.90 cm in the 2nd season). Contrarily, licorice extract at 2 or 4% recorded lowest cluster width (12.76 & 12.75 cm as an av. of the two studied seasons).

Data in Table (7) cleared that all spraying treatments significantly improved the berry quality in terms of increasing total soluble solid %, TSS/acid ratio % and decreasing titratable acidity % compared to unsprayed to spray with water (control).

Table 7. Effect of moringa, licorice and roselle extracts on TSS %, acidity and TSS/acid ratio of Red Roomy grapes during 2019 and 2020 seasons.

Treat.	TSS %			Acidity %			TSS/acid ratio %		
	2019	2020	Mean	2019	2020	Mean	2019	2020	Mean
MLE 4 %	17.25	17.70	17.47	0.362	0.389	0.375	47.65	45.50	46.57
MLE 6 %	17.63	16.90	17.26	0.357	0.360	0.358	49.38	47.20	48.29
MLE 8 %	17.73	17.30	17.51	0.355	0.373	0.364	49.94	46.38	48.16
LRE 2 %	17.33	17.61	17.47	0.350	0.387	0.368	49.51	45.50	47.50
LRE 4 %	18.67	17.9	18.28	0.380	0.386	0.383	49.13	46.37	47.75
LRE 6 %	17.30	17.42	17.36	0.337	0.354	0.345	51.33	49.21	50.27
RCE 2 %	18.31	18.08	18.20	0.372	0.379	0.376	49.22	47.70	48.46
RCE 4 %	18.00	18.96	18.48	0.380	0.384	0.382	47.37	49.37	48.37
RCE 6 %	18.00	17.98	17.99	0.352	0.364	0.358	51.13	49.39	50.26
Control	17.00	17.50	17.25	0.375	0.412	0.394	45.33	42.47	43.90
RLSD	0.21	0.23	-	0.002	0.003	-	2.11	1.98	-

MLE= Moringa Leaf Extract, LRE= Licorice Root Extract, RCE= Roselle Calyxes Extract

Concerning the results in Table (8) data showed that all treatments had a significant difference in anthocyanin and coloration in both seasons. However, spraying vines with licorice extract at 6% gave the best anthocyanin content (2.23 and 2.28 mg/g in the 1st and 2nd seasons consecutively) and berry coloration %. In the two studied seasons followed by spraying 2% licorice and roselle extract at 4% (2.09 mg/g av. the two studied season).

Table 8. Effect of moringa, licorice and roselle extracts on anthocyanin (mg/g) and berry coloration % of red Roomy grapes during 2019 and 2020 seasons

Treat.	Anthocyanin (mg/g)			Coloration %		
	2017	2018	Mean	2017	2018	Mean
MLE 4 %	1.62	1.65	1.64	68.9	71.6	70.3
MLE 6 %	1.81	1.85	1.83	70.6	72.3	71.4
MLE 8 %	1.69	1.79	1.74	70.5	69.5	70.0
LRE 2 %	2.21	2.09	2.15	72.1	73.2	72.65
LRE 4 %	1.99	2.13	2.06	71.3	71.2	71.3
LRE 6 %	2.23	2.28	2.26	72.2	74.8	73.5
RCE 2 %	2.06	2.12	2.09	69.9	71.7	70.8
RCE 4 %	2.17	2.02	2.09	69.8	71.2	70.5
RCE 6 %	2.00	2.10	2.05	71.4	70.3	70.9
Control	1.79	1.87	1.83	69.3	71.4	70.3
RLSD	0.05	0.06	-	3.16	3.51	-

MLE= Moringa Leaf Extract, LRE= Licorice Root Extract, RCE= Roselle Calyxes Extract

Data in Figures (1 & 2) showed berry width and berry length was significantly affected by all treatments in both seasons. Furthermore, the values of berry width due to spraying vines with roselle extract at 6% were (2.23 & 2.28

in 1st and 2nd season, respectively) and berry length due to spraying moringa extract at 8% were (2.31 & 2.42 cm in 1st and 2nd season, respectively). In addition, the control was the lowest in berry width (1.79 & 1.87 cm) and berry length (1.97 & 2.08 cm) in both seasons.

Figure (3) showed that all treatments were significantly effective on berry firmness of Red Roomy grapes. However, spraying vines with moringa extract at (6%) gave the highest berry firmness compared to control or other treatments. Hence, the values of berry firmness were (9.57 & 8.48 mg/cm^2 in 1st and 2nd season, respectively) followed by spraying vines with Roselle extract at 4% (9.07 & 9.02 mg/cm^2 in 1st and 2nd season, respectively). In addition, the control was less in berry firmness.

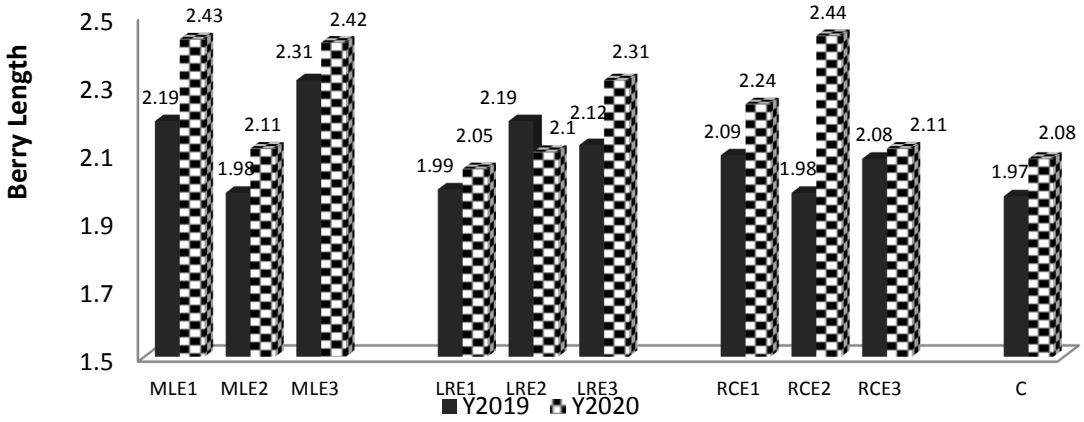

Fig. 1: Effect of moringa , licorice or roselle extracts on berry length (cm) of Red Roomy grapes during 2019 and 2020 seasons. M1: Moringa4%, M2: Moringa 6%, M3: Moringa 8%, R1: Roselle 2%, R2: Roselle 4%, R3: Roselle 6%, L1: Licorice2%, L2: Licorice 4%, L3: Licorice6% and C: Control

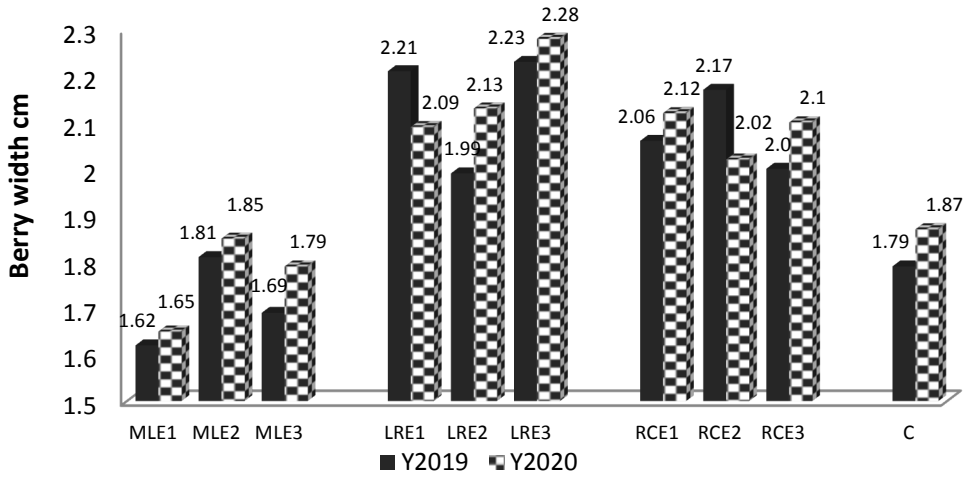

Fig. 2: Effect of moringa, licorice or roselle extracts on berry width (cm) of Red Roomy grapes during 2019 and 2020 seasons

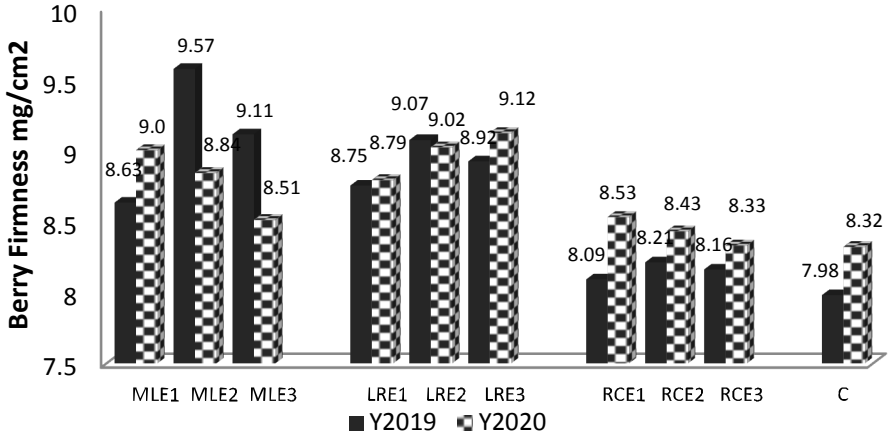

Fig3: Effect of moringa, licorice or roselle extracts on Berry firmness of Red Roomy grapes during 2019 and 2020 seasons

Discussion

These findings could be due to the content of *Moringa oleifera* leaves extract that have a high zeatin, which is a major source for synthesis of naturally cytokinin in the plants. Cytokinin a remarkable plays role in division and elongation of cells that direct to improve the growth and having anti-aging potency and conservative effects in plants. Moreover, it contain vitamins (such as A, B_1, B_2, B_3, ascorbic acid and E). β-carotene, amino acids, phenolic and sugars as well as calcium and potassium which involved in growth and development of plant due to osmo-regulation, enzyme activation, photosynthesis and several other physiological processes (Epstein and Bloom 2005 and Iqbal *et al*., 2021) and being a best source of natural antioxidants and many flavonoid pigments (Anwar *et al*., 2007, Jacob and Shenbagaraman, 2011). Ascorbic acid improved growth and yield of various crops (Fuglie, 2000, Foidl *et al*., 2001 and Nagar *et al*., 2006). Licorice extract had more than 100 different organic compounds, some of which cumulative in high amounts, most important of them are triterpene, saponins (including glycyrrhizin), phenolic compounds, mevalonic acid, amino acid (asparagine), polysaccharide (glucose, fructose, sucrose, maltose), lignins, vitamins such as B_1, B_2, B_3, B_6, C and E, Biotin, folic acid and pantothenic acid which play an important role in improving the growth of the plants (Fukai *et al*., 1998, Rossi, 1999 and Arystanova *et al*., 2001).

Roselle contains higher amount of anthocyanins, organic acids, ascorbic acid, calcium oxalate and hibicine hydrochloride (Raffaut, 1967). The own higher content of turmeric extract from antioxidants especially phenolic compounds, nutrients and plant pigments which in turn stimulating the growth and fruiting of fruit trees (Srimal, 1997 and Pons, 2003). Furthermore, using extracts of roselle improve the growth and nutritional status as well as yield and fruiting of grapevines. These effects on farming plant pigments and organic foods cause an improving on maturity and fruit quality (Gadel-Kareem & Abdel-Rahman, 2013, El-Salhy *et al*., 2017 and Radwan *et al*., 2019).

These results are analogous with Fuglie (2000), Chowdhury *et al*. (2007) and Zuhair (2010) who found that leaf extracts of moringa increased growth of tomato, peanut, corn and wheat, improved resistance to pests and diseases, increased leaf duration and increased number of roots as well as number of fruits and overall increased yield by 20-35%. Azra (2011) found that spraying wheat, peas and tomato with moringa extract at 3.5% increased all growth parameters and yield traits. In addition, Abdalla (2013) found that treated the rocket (*Eruca vesicaria subsp. sativa*) plants with moringa at rates 2% extracts potentially increased the content of N, P and K in leaves. Moreover, Gadel-Kareem and Abdel-Rahman (203), Uwakiem (2014), El-Salhy *et al*. (2017) and Radwan *et al*. (2019) who mentioned that plant extract spraying significantly improved the growth traits and nutritional status as well as yield and fruit quality of different grapes cultivar.

Conclusion

On the light of the current results, it was noted that spraying extract of moringa or roselle extract improved growth, yield, physical and chemical characteristics. On the other side, licorice extract gave the best coloration % and anthocyanin content. Therefore, it could be concluded that foliar application of moringa, licorice and roselle extracts three times annually was necessary to get high yield, and improve fruit quality of Red Romy grapevines and also, could be recommended due to their high potentiality as well as nutritive value and the environmentally friendly as a natural biostimulants treatment.

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تأثير مستخلص ثلاث نباتات طبية علي تحسين النمو والمحصول وجودة العنب الرومي الأحمر

أسماء أحمد محمد[١]، فاطمة الزهراء محمد عبد الله جوده[٢]، فل الندى محمد صالح[٣]، ياسر أنور محمود[١]

[١]قسم بحوث العنب – معهد البساتين – مركز البحوث الزراعية – الجيزة – مصر

[٢]قسم الفاكهة – كلية الزراعة – جامعة أسيوط

[٣]قسم النباتات الطبية والعطرية – معهد البساتين – مركز البحوث الزراعية – الجيزة – مصر

الملخص

أجريت هذه الدراسة خلال موسمي ٢٠١٩، ٢٠٢٠ علي شجيرات العنب الرومي الأحمر والمنزرعة بمزرعة الفاكهة كلية الزراعة – جامعة أسيوط بهدف دراسة تأثير الرش بمستخلص كل من نبات المورينجا بتركيز ٤، ٦، ٨% ونبات العرق سوس بتركيز ٢، ٤، ٦% ونبات الكركدية بتركيز ٢، ٤، ٦% وذلك ثلاث مرات في بداية النمو وبعد العقد وقبل الجمع بثلاث أسابيع علي تحسين النمو وزيادة المحصول وصفات الجودة.

وأوضحت النتائج الآتي: أن رش مستخلص كل من المورينجا، الكركديه والعرق سوس كان لهم تأثير ايجابى علي النمو الخضري ومحتوي الأوراق من النيتروجين والبوتاسيوم وأيضا في تحسين كل من وزن المحصول، وزن العنقود وأبعاده، كما حسنت بشكل معنوي جودة الحبات بزيادة كل من وزن الحبة، المواد الصلبة الذائبة (TSS)، صبغة الانثوسيانين.

من نتائج هذه التجربة يمكن التوصية بأهمية رش مستخلص كل من المورينجا ٦%، أو الكركديه ٤% أو العرق سوس ٤% للحصول علي محصول ذو خصائص ثمرية جيدة.