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(Original Article)

Effect of Sitofex (CPPU) and Some Plant Extracts Spraying on Red Roomy Grapevines

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Abstract

This experiment was conducted in the experimental orchard of the faculty of Agriculture, Assiut University during 2020 and 2021 seasons to investigate the response of Red Roomy grapevines to spray with Sitofex (CPPU) at 2.5 ppm, moringa leaf, pomegranate peel and turmeric rhizome extracts each at 2 and 4%. The experimental was arranged in a randomized complete block design (RCBD) involved eight treatments of three replicates, one vine each. Pruning wood weight, leaf area and total leaf chlorophyll were significantly increased by spraying with all extracts. There was no significant effect of CPPU on these vegetative traits, TSS and reducing sugar compared with control. All foliar applications were very effective on improving yield components and physical quality characters. Extracts significantly improved the TSS, reducing sugar and skin anthocyanin of berries compared to control and CPPU. These extracts significantly decreased total acidity compared to control and CPPU. It could be concluded that spraying all extracts three times annually was necessary to get high yield with good cluster and berry quality. Hence, from an economic point of view, it is preferable to use 2% from all these extracts treatments. Moreover, it is very safe for human, animals and the environment in terms of less pollution and reduces total production cost.

Keywords: *Red Roomy, CPPU, Moringa leaf extract, Pomegranate peel extract, Turmeric rhizome extract.*

Introduction

Grapevine (*Vitis vinifera* L.) is considered one of the most important fruit plants in the world. It occupies wide areas in the world than any other fruit crops and account for almost half of the world's total production of all fruits. In Egypt, grapes rank third among fruit crops while citrus and mangoes being the first and second ranks. The cultivated area has grown rapidly, especially in the reclaimed lands. It reached about 190486 feddans; the fruitful ones are about 174715 feddans with a total annual production of 1594782 tons. Moreover, grape is considered one of the most important export horticultural crops. Its export value is about 10% while the quantity is about 3% of total horticultural export. The amount of

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Egyptian grapes that are exported annually reached about 131 thousand tons, and the quantity is expected to increase during the coming periods (M.A.L.R., 2019).

Several efforts have been accomplished to improve grapevines production through facing production problems and improving horticultural practices. Red Roomy cultivar grown under Assiut area faces some troubles, such as the reduction of yield and lack of berries coloration causing negative effects on marketing either to local or foreign markets. CPPU (Sitofex) is a synthetic cytokinin-like plant regulator that at low concentrations promotes grape berry set and development, increases berry size and improves storage quality (Dokoozlian *et al*., 2000; Ezzahouani, 2000, Carvaial-Millan *et al.,* 2001. Humphery, 2005, Abou-Zaid, 2009 and Senthilkumar *et al* 2018), in addition, it delays fruit maturity and reduces fruit color. The CPPU works in combination with natural auxins and its primary effects in fruit set control, berry growth and development (Wang *et al.,* 2013). The artificial CPPU is toxic, unhealthy and damage to living organisms (Gong *et al*., 2019). So, it could be using some organic extracts that have almost the same effect on plants but are safer on human health than artificial compounds.

There are 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 and El-Salhy *et al*., 2017). The use of natural plant extracts was the new alternative compounds to improve the yield and quality of fruits in orchards, as safety factors for humans and environment. The use of natural products in horticultural practice instead of other synthetic chemical has become a major goal for many fruit crop producers. In recent years the global market has been growing rapidly for organic fruit production. The higher own of phenolic and other chemical constituents seem to have synergistic effects on growth and production of fruit crop (Srivastava & Lal, 1997 and Dimitri & Oberholtzer, 2006). They could be a good alternative to chemically synthesized preservatives, apart from being inexpensive.

Moringa oleifera leaves are rich source of zeatin, ascorbate, carotenoids, phenolic compounds, calcium and potassium, so being explored as a natural plant growth enhancer, and also as a natural source of cytokinin (Fuglie, 1999 and Foidl *et al.,* 2001). Antioxidants such as ascorbic acid and glutathione, which are found at high concentrations in moringa chloroplasts and other cellular parts, are essential for plant defense against oxidative stress (Noctor & Foyer, 1998).

Pomegranate (*Punica granatum* L.) is considered a very nutritious fruit from the Punicaceae family. Pomegranate peel is an agricultural waste and its non-edible part accounts for about 50% of the total fruit weight. It is a rich source of bioactive compounds like phenolic and flavonoids, which deliver antimicrobial, antimutagenic and antioxidant properties (Ismail,*et al*.,2012, Kazemi, *et al.,* 2016; Xi *et al*., 2017).

Turmeric is the dried rhizome of the *Curcuma longa* L plant. It is used in various industrial purposes, medicine, religious functions and as bio pesticide (Govindarajan, 1980). Turmeric contains 0.5% volatile oil. This oil contains about

60% turmeric, 25% zingiberene and small quantities d-a-phellandrene, d-sabiene, cineole and forneol. Curcumin gives turmeric a yellow color along with nutritional ingredients such as potassium. Plant extracts are characterized by their higher content of organosulfur compounds, volatile components, fats, proteins, nutrients, tannins, vitamins and antioxidants (Peter, 1999).

Hence this research aimed to investigate the benefits of spraying some plant extracts and Sitofex (CPPU) on vegetative growth, yield and berries quality of Red Roomy grapevines under Assiut Condition, Egypt.

Materials and Methods

Experiments were carried out in two consecutive seasons of 2020 and 2021 on "Red Roomy" cultivar grown in the experimental orchard, Faculty of Agriculture, Assiut University. Grapevines were 12 years old and were planted at a distance of 2 x 2.5 m. Twenty-four standardized grapevines were selected and set up in a complete randomized design. The grapevines were pruned as a head training system including 15 fruiting spurs (3) buds as well as 7 replacements spurs (2) buds/vine, thus, the total remaining buds on each vine was 59 buds.

The following treatments have been carried out on each vine:

1- Control (water spray)
2- Spraying with CPPU at 2.5 ppm.
3- Spraying with Moringa leaf extracts at 2%.
4- Spraying with Moringa leaf extracts at 4%.
5- Spraying with Pomegranate peel extracts at 2%.
6- Spraying with Pomegranate peel extracts at 4%.
7- Spraying with Turmeric rhizome extract at 2%.
8- Spraying with Turmeric rhizome extract at 4%.

The vines were sprayed with a 2 liters hand sprayer. It was enough to spray 3 vines at maximum vine growth. Rexy film at 0.5 ml/L was added as a surfactant to the spray solutions and sprayed till runoff. Control trees were sprayed with tap water containing Rexy film. The CPPU was sprayed on cluster only. The sprays were added three times: at 10 cm. shoot length, full bloom and one month later. All treatments consist of three vines (replicates) and all horticultural practices such as irrigation, soil management and fertilization were implemented as recommended.

Vegetative growth Parameters

Leaf area (cm^2) was calculated by measuring the length and width of 20 mature leaves from those opposite to the basal clusters on the main shoots. It was calculated using the following equation according to Ahmed and Morsy (1999).

Leaf area (cm^2) = 0.36 (L*W) + 15.38, L: leaf length, W: leaf width, then the average leaf area was registered.

Total chlorophyll leaves were measured by using a portable chlorophyll meter Spad 502 according to Wood *et al*., (1992).

Pruning wood was recorded immediately after winter pruning (g/vine)

All vegetative growth traits i.e., leaf area and total chlorophyll were measured in the middle of July.

Yield components

Berry set and yield

Berry set percentage was estimated by caging three flower clusters on previous labelled shoots per vine in perforated white paper bags before blooming, thereafter, berry set was calculated as follows:

$$\text{Berry set } \% = \frac{\text{No. of berries/cluster}}{\text{Total no. of flowers/cluster}} \text{x} 100$$

At harvest time (first week of September), the clusters were harvested and then

1- Yield (kg/vine) was recorded

2- Cluster weight (g.) was recorded

Cluster and berry attributes

Three clusters were taken at random from each vine and the following characteristics were determined

Physical characteristics

1- Cluster length.

2- Berries number / cluster.

3- Cluster compactness coefficient according to Winkler *et al*. (1974).

$$\text{Cluster compactness coefficien t} = \frac{\text{No. of berries/cluster}}{\text{Cluster length}} \text{x} 100$$

4- Weight of 25 berries (g.).

Chemical properties

1- TSS% (total soluble solids): By using a hand refractometer.

2- Total acidity (expressed as tartaric acid %) was determined by titration of NaOH at 0.1N using phenolphthalein as an indicator. The NaOH was adjusted by using a known volume of oxalic acid 0.1M according to A.O.A.C. (1985).

3- Reducing sugars (%): According to Lane and Eynon procedure described in A.O.A.C. (1985).

Total anthocyanin. The pigment was extracted by ethanolic HCl, a mixture of 95% ethanol and 1.5 N HCl (85:15 v/v) according to Rabino and Mancinelli, (1986).

Table 1. The quantitative composition of the aqueous leaf extracts of Moringa by Nweze and Nwafor (2014)

Minerals Composition		Nutrient Composition		Phytochemical	Aqueous
Nitrogen	3.0	**Carbohydrate**	57.0	**Anthraquinone**	11.7
Calcium	2.1	**Protein**	18.9	**Tannins**	9.4
Potassium	1.6	**Fiber**	9.3	**Terpenoids**	4.8
Sulphur	0.85	**Ash**	7.9	**Flavonoid**	3.6
Magnesium	0.48	**Moisture**	4.1	**Steroids**	3.2
Phosphorous	0.44	**Fats**	2.7	**Alkaloids**	3.1
Iron	0.03			**Saponins**	1.5
Copper	0.01			**Carotenoids**	1.2
Zinc	0.01			**Cardiac glycoside**	0.36
				Anthocyanin	0.06

Table 2. Proximate Composition of Pomegranate Peel Powder (Ullah *et al*., 2012)

Proximate Analysis	Results	Proximate	Results
Moisture	04 ± 0.22(%)	**Crude Fiber**	21 ± 0.6(%)
Ash	05 ± 0.14(%)	**Total sugar**	31.38 ± 0.3(%)
Fat	9.4 ± 0.1(%)	**Reducing Sugar**	30.40 ± 0.11(%)
pH	3.75 ± 0.2	**Non-Reducing**	0.98 ± 0.12(%)
TSS	0.7 ± 0.04(%)	**Nitrogen**	1.395 ± 0.30(%)
Acidity	4.86 ± 0.5(%)	**Protein**	8.719± 0.10(%)

Table 3. Chemical composition of Turmeric according to (Li *et al*., 2011)

Compounds	Values	Compounds	Values
β- Bisabolene %	1.3	**Ascorbic acid (mg)**	50.0
1.8-Cineol %	2.4	**ASH (g)**	6.8
p-Cymene %	3.0	**Calcium (g)**	0.2
p-Cymen-8-ol %	0.3	**Carbohydrate (g)**	69.9
Tr-Curcumin%	6.3	**Fat (g)**	8.9
Curlone %	10.6	**Food energy (k Cal)**	390.0
Dehydrocurcumin %	2.2	**Iron (g)**	47.5
Myrcene	0.1	**Niacin (mg)**	4.8
α-Phellandrene %	0.1	**Potassium (mg)**	200.0
β- Phellandrene %	Tr	**Phosphorus (mg)**	260.0
α- Pinene %	0.1	**Protein (g)**	8.5
β -Pinene%	Tr	**Riboflavin (mg)**	0.19
Terpinolene %	0.3	**Sodium (mg)**	30.0
Tr-Turmerone %	31.1	**Thiamine (mg)**	0.09
Turmerone %	10.0	**Water (g)**	6.0

Preparation of Plant materials extracts

Moringa Leaves, Pomegranate peel and Turmeric rhizomes were washed and dried in shade. They were finely grinded to powder. A 50 g of each plant material in powder form was homogenized by blender in 200 ml of methanol and distilled water (20:80 v/v) for 10 min, and then left in dark glass bottles for 72 h for complete extraction. The extracts were filtered through thin cheesecloth. The final extracts were collected in other dark bottles and exposed to 60°C in water bath for

30 min for methanol evaporation. The extracts were stored in a refrigerator at 5°C until needed. According to Ezz- Thanaa *et al* (2015).

The analysis of Moringa leaf, Pomegranate peel and Turmeric extract was in Tables (1, 2 and 3).

Statistical analysis

Experiment was set up as a randomized complete block design (RCBD)with eight treatments and three replicates one vine per each. All the obtained data were tabulated and analyzed according to Gomez and Gomez, (1984) and Snedecor and Cochran, (1990) using New L.S.D. test at 5% level of the probability for distinguishing the significance differences between various treatment means according to Steel and Torrie (1980).

Results

Effect of different treatments on vegetative growth

Data in table 4 showed that moringa leaf extract, pomegranate peel extract and turmeric extract foliar application significantly increased the vegetative growth parameters in terms of leaf area, chlorophyll content and pruning wood weight of Red Roomy vines compared to control and CPPU at 2.5 ppm. The results showed similar trend during the two seasons studied. On the other hand, there are no significant differences between control and sitofix of CPPU at 2.5 ppm on vegetative growth traits.

Table 4. Effect of CPPU and some natural components spraying on vegetative growth of Red Roomy grapevines during 2020 and 2021 seasons

Treatments	Pruning wood			Leaf area cm^2			Total chlorophyll		
	2020	2021	Mean	2020	2021	Mean	2020	2021	Mean
Control	966.67	1006.3	986.49	104.30	98.18	101.24	42.32	41.85	42.09
CPPU 2.5 ppm	981.35	1038.5	1009.9	108.50	101.63	105.07	42.61	43.57	43.09
Moringa leaf	1066.2	1125.2	1095.7	118.40	110.96	114.68	45.96	45.67	45.82
Moringa leaf	1071.1	1128.3	1099.7	119.18	111.58	115.38	45.88	45.6	45.74
Pomegranate peel	1018.1	1065.2	1041.6	111.75	104.60	108.18	44.85	44.23	44.54
Pomegranate peel	1016.9	1069.9	1043.4	111.68	105.11	108.4	45.11	43.85	44.48
Turmirc rhizome	1048.3	1108.4	1078.3	115.30	110.11	112.71	46.18	45.25	45.72
Turmuric	1043.1	1112.3	1077.7	116.20	109.85	113.03	45.78	45.11	45.45
New LSD 5%	**49.32**	**55.11**		**7.14**	**5.98**		**2.18**	**2.31**	

The maximum values were recorded on vines that sprayed with moringa leaf extract at 4% (115.38 cm^2, 45.74 and 1099.7 g as an average of the two studied seasons) followed by spraying with moringa leaf extract at 2% (114.68 cm^2 45.82 and 1095.7 g as an average of the two studied seasons) for leaf area, chlorophyll content and pruning wood weight, respectively. Furthermore, the minimum values of these traits were recorded on spraying with water, as control (101.24 cm^2, 42.09& 986.49 g as an average of the two studied seasons), respectively. Hence the increment percentage of leaf area (13.97% & 13.28%), chlorophyll content (8.67% and 8.86%) and pruning wood weight (11.48% & 11.07%) as an average of the two studied seasons due to foliar applications with moringa leaf extract at

4% and moringa leaf extract 2%, respectively compared to the control. No significant differences were found due to spraying of these extracts. Moreover, there were no significant differences for spraying two concentrations of moringa extract (2 and 4%), pomegranate peel extract (2 and 4%) or turmeric extract (2 and 4%). Hence, from an economic point of view, it is preferable to use 2% from all these treatments.

Effect of different treatments on yield components

Concerning the results in Table 5 berry set, cluster weight and yield/vine were significantly increased by all treatments in both studied seasons compared to control. It was clear from this data that the results took the same trend during the two studied seasons. Spraying with CPPU at 2.5% gave the highest values for cluster weight 441.9 g and berry set 12.27% as an average of two studied seasons. The maximum value of yield/vine (12.46&12.13 kg/vine as an average of two studied seasons) due to spray vines with moringa extract at 2% or CPPU at 2.5 ppm, respectively. Hence the increment percentage of yield/vine attained (24.6% &23.9% as an average of two studied seasons) due to spraying with moringa leaf extract at 2% and CPPU at 2.5ppm, compared to control respectively. No significant differences were found due to spraying any of these studied treatments.

Table 5. Effect of CPPU and some natural components spraying on yield components of Red Roomy grapevines during 2020 and 2021 seasons

Treatments	Berry set%			Cluster weight (g)			Yield/vine (kg)		
	2020	2021	Mean	2020	2021	Mean	2020	2021	Mean
Control	8.70	9.85	9.28	345.40	368.50	356.95	9.67	10.33	10.00
CPPU 2.5%	11.48	13.05	12.27	435.30	448.50	441.90	12.06	12.71	12.39
Moringa leaf extract 2%	10.79	12.58	11.69	418.90	427.60	423.25	12.11	12.80	12.46
Moringa leaf extract 4%	10.97	12.67	11.82	420.80	422.50	421.65	11.87	12.74	12.31
Pomegranate peel extract 2%	9.98	11.64	10.81	399.30	418.40	408.85	11.65	12.49	12.07
Pomegranate peel extract 4%	10.31	11.46	10.89	401.90	420.00	410.95	11.53	12.60	12.07
Turmeric rhizome extract 2%	10.9	12.45	11.68	415.70	426.40	421.05	12.20	12.66	12.43
Turmeric rhizome extract 4%	11.05	12.53	11.79	413.60	423.80	418.70	11.67	12.75	12.21
New LSD 5%	**0.73**	**0.69**		**32.48**	**34.69**		**0.75**	**0.86**	

Effect of different treatments on berry quality

It was clear from the data obtained in Table 6 that cluster length, number of berries/cluster, cluster compactness and weight of 25 berries significantly affected by different spraying compared to the control treatment. Moreover, the results showed that there were no significant differences between all foliar applications treatments. It was apparent from the existing data that results followed the same trend during the two seasons studied. The highest values of berries number were (75.30) and cluster compactness was (2.82) as an average of two studied seasons were recorded due to spray of vines with CPPU at 2.5 ppm. While the highest values of cluster length (27.96 cm) and weight of 25 berries (143.21 g) as an average of the two studied seasons were recorded due to spray with moringa leaf extract at 2% and turmeric extract at 2%, respectively. On the other hand, the least values of cluster length (26.29 cm), number of berries (62.08), cluster compactness

(2.35) and weight of 25 berries (131.51 g) as an average of two studied seasons were recorded due to untreated one (control). Hence, the corresponding increment percentage of number of berries (21.28 and 17.89%) and cluster compactness (20 and 12.8%) as an average of the two studied seasons due to foliar applications with CPPU at 2.5 ppm and moringa leaf extract at 2%, compared with control, respectively. No significant differences between all the studied treatments. The best plant extracts were moringa extract, turmeric extract and pomegranate peel extract, respectively.

Table 6.Effect of CPPU and some natural components spraying on cluster traits of Red Roomy grapevines during 2020 and 2021 seasons

Treatments	Cluster length			Berries number / cluster			Cluster compactness			Weight 25 berries (g)		
	2020	2021	Mean	2020	2021	Mean	2020	2021	Mean	2020	2021	Mean
Control	26.97	25.61	26.29	60.35	63.80	62.08	2.23	2.46	2.35	128.19	134.83	131.51
CPPU 2.5%	28.62	26.95	27.79	73.18	77.41	75.30	2.74	2.89	2.82	144.10	141.65	142.88
Moringa leaf extract 2%	28.78	27.13	27.96	71.12	75.25	73.19	2.51	2.78	2.65	140.82	143.52	142.17
Moringa leaf extract 4%	28.90	26.93	27.92	71.85	74.55	73.20	2.49	2.73	2.61	138.89	140.18	139.54
Pomegranate peel extract 2%	28.15	26.75	27.45	69.61	73.13	71.37	2.50	2.76	2.63	137.80	140.89	139.35
Pomegranate peel extract 4%	28.18	26.78	27.48	67.81	71.83	69.82	2.43	2.68	2.56	141.54	142.36	141.95
Turmeric rhizome 2%	28.21	27.14	27.68	70.11	73.86	71.99	2.52	2.73	2.63	142.57	143.85	143.21
Turmeric rhizome 4%	28.39	27.35	27.87	71.65	72.62	72.14	2.55	2.67	2.61	140.12	143.32	141.72
New LSD 5%	**1.18**	**1.11**		**4.98**	**5.35**		**0.1**	**0.14**		**4.68**	**4.24**	

It was clear from the data obtained in Table 7 that all natural extracts treatments significantly increased total soluble solids, reducing sugar and total anthocyanin and significantly decreased total acidity in berry juice compared to control and CPPU at 2.5 ppm. Total soluble solids, reducing sugar and total anthocyanin were unaffected by spraying with CPPU at 2.5 ppm relative to the control treatment. The highest total soluble solids (19.18 and 18.95% as an average of two studied seasons) were observed on berries of the vines that receiving turmeric extract at 4% and moringa extract at 2%, respectively. The maximum value of total anthocyanin (2.38 and 2.30% as an average of two studied seasons) due to spray pomegranate peel extract at 2% & 4%, respectively. No significant differences between different natural extracts treatments and different concentrations in these terms. Contrarily, the least values of total soluble solids (16.59%), reducing sugar (11.59%) and total anthocyanin (1.81%) as an average of two studied seasons were recorded on berries of the vines that sprayed with CPPU at 2.5 ppm. Moreover, the highest total acidity value (0.39% as an average two studied seasons) was recorded on the berries of vines that sprayed with CPPU at 2.5 ppm. Hence, the increment percentage of TSS was attained (12.29 &19.23% and 10.95 & 14.23% as an average of two studied seasons due to spraying turmeric extract at 4%, moringa extract at 2% over the control or CPPU at 2.5 ppm,

respectively. Moreover, spraying turmeric extract at 4% or moringa leaf extract at 2% induce reduction in titratable acidity percentage (36.8 &38.46% and 34.7 & 35.89% as an average of two studied seasons), respectively, than control and CPPU groups.

Table 7. Effect of CPPU and some natural components spraying on juice chemical properties of Red Roomy grapevines during 2020 and 2021 seasons

Treatments	TSS%			Reducing sugar %			Anthocyanin (mg/g)			Acidity%		
	2020	2021	Mean	2020	2021	Mean	2020	2021	Mean	2020	2021	Mean
Control	16.83	17.33	17.08	11.96	11.84	11.90	1.86	1.96	1.91	0.36	0.39	0.38
CPPU 2.5 ppm	16.33	16.85	16.59	11.56	11.62	11.59	1.75	1.87	1.81	0.37	0.41	0.39
Moringa leaf extract 2%	18.80	19.10	18.95	13.14	13.1	13.12	2.26	2.32	2.29	0.24	0.25	0.25
Moringa leaf extract 4%	18.55	18.67	18.61	13.18	12.85	13.02	2.28	2.25	2.27	0.27	0.25	0.26
Pomegranate peel extract 2%	18.67	19.10	18.89	13.25	13.10	13.18	2.39	2.36	2.38	0.28	0.26	0.27
Pomegranate peel extract 4%	18.22	19.53	18.88	12.88	13.35	13.12	2.28	2.31	2.30	0.27	0.24	0.26
Turmirc rhizome extract 2%	18.80	18.85	18.83	13.10	12.86	12.98	2.31	2.18	2.25	0.27	0.23	0.25
Turmuric rhizome extract 4%	19.10	19.25	19.18	13.32	13.16	13.24	2.29	2.22	2.255	0.26	0.22	0.24
New LSD 5%	**0.89**	**0.81**		**0.53**	**0.44**		**0.11**	**0.12**		**0.01**	**0.02**	

Discussion

Now many of growth regulators are used to achieve different objectives. The effectiveness of these products remains controversial, it depends on the concentration and time of application. The CPPU has been suggested to be a plant growth regulator with a strong cytokinin activity for enhancing fruit quality. In the present study, CPPU was significantly increased yield/vine, fruit set, cluster weight and physical properties of cluster. Several studies cleared the positive effect of CPPU on weight and volume berries and cluster in grape (Abou-Zaid, 2009 and Marzouk and Kassem, 2011) decreasd TSS and increased titratable acidity in grape (Zhang *et al*., 2013, EL-Abbasy *et al.,* 2016 and Kok and Bal, 2016). In addition, CPPU decreased anthocyanin concentration (Peppi & Fidelibus, 2008) and reduction in total soluble solids (Du Plessis 2008). The reduction in the TSS may reflect the influence of CPPU on the maturation process by sowing the accumulation of sugars and the delay in fruit maturity (Ben Mohamed *et al.,* 2013). The increase in both fruit weight and dimensions due to the use of CPPU can be attributed to its positive action on enhancing both cell division and cell elongation, as well as its major role in activating the biosynthesis of proteins, RNA and DNA (Nickell, 1985). Our results showed that CPPU treatment led to improved yield and berry quality of Red Roomy grapevines. These results are in agreement with those obtained by Abou-Zaid (2009), Guirguis *et al*. (2010), Zang *et al*. (2013), Senthilkumar *et al.* (2018) and Aly *et al.* (2020). The artificial CPPU is toxic, unhealthy and damage to living organisms (Gong *et al.,* 2019). So, it could be using some organic extracts that have almost the same effect on plants but are safer on

human health than artificial compounds. Recently, public health and environmental safety encourage the use of natural extracts and bio fertilizer as an alternative to different chemicals for enhancing production of fruit crops. Natural plant extracts were used in many ways. These natural products were used for improving growth, nutritional status, production and as pesticides for public health and environmental safety.

Moringa oleifera leaves are potential sources of vitamin A , C, iron, calcium, riboflavin, b-carotene, phenolics and active natural antioxidants (Nambiar *et al.,* 2005). Moringa as well as, high in zeatin (cytokinin), antioxidants, macronutrients and micronutrients (Abdalla and El- Khoshiban, 2012, Ashfaq *et al*. 2012 and Abdalla, 2013). Moringa leaves extract (MLE) showed nearly effects as like CPPU, where it has cytokinin, antioxidants, macronutrients and micronutrients (Abdalla and El-Khoshiban, 2012). In this study, all foliar application of moringa leaf extract significantly improved growth, yield components and berries quality, Moreover, moringa at 2% gave the highest yield/vine and increased the TSS and sugar contents in grape berry juice and reduced the acidity percentage. Our results were agreed with those by Thanaa *et al*, (2017) Aly *et al,* (2020) and Mohamed *et al*., (2022). The effect of moringa leaf extract is supported by the fact that fruit size increases with cell division and cell enlargement and can attributed to these cytokinins (Santner *et al.* 2009).

Pomegranate peel extract is a rich source of phenols and flavonoids, which provided anti-microbial, antimutagenic and antioxidant properties (Kazemi, *et al*., 2016 and Xi *et al*., 2017). It has been extensively studied for its effects as a free radical scavenging and its strong antioxidant capacity caused by the high concentration of biologically active components, such as punicalagin, ellagic, gallic and chlorogenic acids (Elsherbiny *et al.,* 2016; Kazemi *et al.,* 2016; Kharchoufi *et al*., 2018). All parts of pomegranate (*Punica sp*.) extract show antimicrobial and antioxidant activities for many kinds of bacteria and fungi, (Foos *et al*., 2014 and Nozohour *et al.,* 2018). Demonstrated that some pomegranate methanol extracts contain high ratio of total phenolic and presence by a combination of poly phenols and organic acids (Fawole *et al*., 2012 and Orak *et al*., 2011). In this study, pomegranate peel extract improved growth, yield, berries quality and gave the highest value of total anthocyanin.

Turmeric contains a higher amount of different antioxidants as well as different nutrients these contents surely reflected on enhancing cell division, building organic foods and the tolerance of plants to biotic and abiotic stresses. In this study, turmeric improved growth, yield and berries quality this study was in agreement with many studies (Mustafa *et al.,* 2016, El-Salhy *et al.,* 2017 and Gouda-Fatma El-Zahraa 2021).

Conclusion

From the results of this study, it could be concluded that foliar application with moringa leaf, pomegranate peel and turmeric rhizome extracts at 2% each at 10 cm. shoot length, full bloom and one month after full bloom to improve growth and fruiting of Red Roomy grapevines. In addition, as a natural bio stimulants treatment due to their high potentiality as well as nutritive value and environmental friendliness. Moreover, plant extracts can be used as a substitute for CPPU to overcome some of the problems of its use in terms of reducing the sugars percentage and TSS in grape juice, bad coloring of the berries and reducing pollution and production costs.

References

A.O.A.C. (1995). Association of Official Agricultural Chemists. Official Methods of Analysis. 16th ed. pp. 495-510. Benjamin Franklin Station, Washington. D.C., U.S.A.

Abdalla, M.M. and El-Khoshiban, N. (2012). The palliative effect of bio-organic fertilizer on lead pollution in *Lycopersicum esculentum* plants. J.Basic App. Sci, 8: 1-12.

Abdalla, M.M. (2013). The potential of Moringa oleifera extract as a biostimulant in enhancing the growth, biochemical and hormonal contents in rocket (*Eruca vesicaria* subsp. sativa) plants. International Journal of Plant Physiology and Biochemistry, 5(3): 42-49.

Abou-Zaid, A.A. (2009). Effect of some cultural practices on vegetative growth, yield and berry quality of Ruby Seedless and Roomy Red grapevines. M.Sc. Theses, Fac. Of Agric., Assiut Univ., Egypt, 195 p.

Ahmed, F.F. and Morsy, M.H. (1999). A new methd for measuring leaf area in different fruit crops. Minia J. of Agric.Res. &Develop. 19:97- 105.

Aly, M.A.; Harhash, M.M.; Bassiony, S.S. and Felifal, M.M.S. (2020). Effect of Foliar Spray of Sitofex, Moringa Leaves Extract and some Nutrients on Productivity and Fruit Quality of "Thompson seedless" Grapevine. J.Adv.Agric.Res.(Fac.Agric. Saba Basha) 25 (1): 112- 129.

Ashfaq, M.S. and Basraand, M.A. (2012). Moringa: A miracle plant of agro-forestry. J Agric Soc Sci 8:115–122.

Ben Mohamed, H.; Zrig, A. and Khemira, H.(2012). Effect of Date of Spraying CPPU (Sitofex) on Fruit Quality of 'Meski' Table Grapes.Global Scince Books, 41-43.

Carvajal-Millan, E.T.; Carvallo, J.A.; Orozco, M.A.; Martinez, I.; Tapia, V.M.; Guerrero, A.; Rascon-Chu, J. Llamas, and Cardea, A.A. (2001). Polyphenol oxidase activity, color changes, and dehydration in table grape rachis during development and storage as affected by N-(2chloro-4-pyridyl)-N-phenylurea. J. Agr. Food Chem. 49:946–951.

Dimitri, C. and Oberholtzer, L. (2006). EU and U.S. organic markets face strong demand under different policies. Amber Waves, 4(1):12-19.

Dokoozlian, N.; Ebisuda, N.C.; Hamamoto, S. and Macias, A. (2000). Influence of CPPU on the growth and composition of several table grape cultivars. Viticulture Research Report, Vol. 29. California Table Grape Commission.

Du Plessis B.W. (2008). Cellular factors that affect table grape berry firmness. MS Thesis, Stellenbosch Uni-versity, South Africa, 85 p.

El-Abbasy, U.K.; Mohammed, S.M.; Ibrahim, F.E. and Abd EL-Aziez, M.H. (2016). Impact of gibberellic acid, Sitofex and calcium chloride as preharvest applications on yield and fruit quality of 'Thompson Seedless' grapevine. proceedings book.

El-Salhy, A. M.; Abdel-Galil, H.A.; Badawy, E.F.M. and Abou-Zaid, E.A.A. (2017). Effect of different potassium fertilizer sources on growth and fruiting of Balady Mandarin trees. Assiut J. Agric. Sci., 48(1): 202-213.

El sherbiny E.A.; Amin, B.H. and Baka, A. (2016). Efficiency of pomegranate (*Punica granatum* L.) peels extract as a high potential natural tool towards Fusarium dry rot on potato tubers. Postharvest Biology and Technology. 111:256–263,

Ezzahouani, A. (2000). Effects of forchlorfenuron (CPPU) and girdling on table grape cultivars 'Perlette' and 'Italia'. J. Intl. Sci. Vigne Vin. 34(2): 57–60.

Ezz-Thanaa, M.D.; Aly, M.A.; Ahmed, Z.A.; Ekbal, M. and Abd El-Gawad, M.G. (2015). Improving Washington Navel orange fruits by some natural pre- harvest foliar applications. J. Adv. Agric. Res. (Fac. Agric. Saba Basha), 20(1): 66-85.

Fawole, O.A.; Makunga, N.P. and Opara, U.L. (2012). Antibacterial, antioxidant and tyrosinase-inhibition activities of pomegranate fruit peel methanolic extract. BMC Complementary and Alternative Medicine, 12(1): 200,11p.

Foidl, N., Makkar, H.P.S and Becker,K. (2001). The potential of *Moringa oleifera* for Agricultural and Industrial uses. A report presented at Dares-salam on what development potential for moringa products. October 20th-November 2nd

Foss, S.R.; Nakamura, C.V.; Ueda-Nakamura, T.; Cortez, D.A.; Endo, E.H. and Dias Filho, B.P. (2014). Antifungal activity of pomegranate peel extract and isolated compound punicalagin against dermatophytes. Ann Clin Microbiol Antimicrob 5:13–32

Fuglie, L.J. (1999). The miracle tree: *Moringa oleifera*, natural nutrition for the tropics. New York: Church World Service.

Gemez, K.A. and Gomez, A.A. (1984). Statistical Procedures for Agricultural Research, 2ndEd. Wily.New York.

Gong, G.; Kam, H.; Tse, Y. and Lee, S.M. (2019). Cardiotoxicity of forchlorfenuron (CPPU) in zebrafish (*Danio rerio*) and H9c2 cardiomyocytes. Chemosphere. 235:153-162.

Gouda, F.M. (2021). Response of Thompson Seedless Grapevines to Foliar Sprays with GA_3 and some Natural Compounds. Assiut J. Agric. Sci., 52 (5):142-152

Govindarajan,V.S.(1980). Turmeric chemistry, technology and quality. CRC Nutrition, 12: 199-201.

Guirguis, N.S.; Attala, E.S.; Mikhael, G.B. and Gaber, M.A. (2010). Effect of Sitofex quality of "Costata"of persimmon trees. J. Agric. Res. Kafer ElShiekh Univ., 36(2): 206-219.

Humphery, T. (2005). Evaluation of the new active for chlorfenuron in the product sitofex 10 EC plant growth Regulators. APUAA, Canberra, Australia. pp. 1-31.

Ismail T.; Sestili, P. and Akhtar, S. (2012). Pomegranate peel and fruit extracts: a review of potential anti-inflammatory and anti-infective effects. Journal of Ethnopharmacology, 143 (2): 397-405.

Kazemi, M.; Karim, R.; Mirhosseini, H. and Hamid, A.A. (2016). Optimization of pulsed ultrasound-assisted technique for extraction of phenolics from pomegranate peel of *Malas* variety: Punicalagin and hydroxybenzoic acids. Food Chemistry, 206:156-166.

Kharchoufi, S.; Licciardello, F.; Siracusa, L.; Murator, G.; Hamdi, M. and Restuccia, C. (2018). Antimicrobial and antioxidant features of "Gabsi" pomegranate peel extracts. Industrial Crops and Products, 111, : 345–352.

Kharchoufi S.; Parafati, L.; Licciardello, F.; Muratore, G.; Hamdi, M.; Cirvilleri, and Restuccia, C. (2018). Edible coatings incorporating pomegranate peel extract and biocontrol yeast to reduce *Penicillium digitatum* postharvest decay of oranges, Food Microbiology, 74, : 107–112,

Kok, D. and Bal, E. (2016). Seedless berry growth and bioactive compounds of cv. „Recel Uzümü" (*V. vinifera* L.) as affected by application doses and times of pre-harvest thidiazuron. Erwerbs-Obstbau, 58(4), 253-258.

Li, S.; Yuan, W.; Deng, G.; Wang P.; Yang, P. and Aggarwal B.B. (2011). Chemical composition and product quality control of turmeric (*Curcuma longa* L.). Pharmaceutical Crops 2: 28-54.

M.A.L.R. (2019). Ministry of Agriculture and Land Reclamation Publishes. Economic Affairs Sector.

Marzouk, H.A. and Kassem, H.A. (2011). Improving yield, quality, and shelf life of Thompson seedless grapevine by preharvest foliar applications. Postharvest Biology and Technology, 130 (2), 425-430

Mohamed A.A.; Gouda, F.M.; Saleh, F.E.M and Omran, Y.A.M. (2022). Efficiency of Extracts of Three Medicinal Plants to Improve Growth, Yield and Quality of Red Roomy Grapevine. Assiut Journal of Agriculture Scince 53 (1) pp 45-59.

Mustafa, B; Õzyürek, M; Güclü, K. and Apak, R . (2016). Optimization of Microwave-Assisted Extraction of Curcumin from *Curcuma longa* L. (Turmeric) and Evaluation of Antioxidant Activity in Multi-Test Systems. Rec. Nat. Prod. 10 (5): 542-554

Nambiar, V.S.; Mehta, R. and Daniel, M. (2005). Polyphenols content of three Indian green leafy vegetables. J Food Sci Technol 42:312–315.

Nickell, L.G. (1985). New plant growth regulator increases grape size. Proc. Plant Growth Regulat. Soc. Amer. 12:1–7.

Noctor, G. and Foyer, C.H. (1998). Ascorbate and glutathione: Keeping active oxygen under control. Annu. Rev. Plant Physiol. Plant Mol. Biol., 49: 249–279

Nozohour, Y; Golmohammadi, R.; Mirnejad, R. and Fartashvand, M. (2018). Antibacterial Activity of Pomegranate (*Punica granatum* L.) Seed and Peel Alcoholic Extracts on *Staphylococcus aureus* and *Pseudomonas aeruginosa*

Isolated from Health Centers. Journal of Applied Biotechnology Reports. 5(1):32-36

Nweze, N.O. and Nwafor, F.I. (2014). Phytochemical, proximate and mineral composition of leaf extracts of *Moringa oleifera* Lam. from Nsukka, South-Eastern Nigeria. Journal of Pharmacy and Biological Sciences, 9 (1): 99-103.

Orak, H.H.; Yagar, H. and Isbilir, S.S. (2012). Comparison of antioxidant activities of juice, peel, and seed of pomegranate (*Punica granatum* L.) and inter-relationships with total phenolic, tannin, anthocyanin and flavonoid contents, Food Science and Biotechnology, 21(2): 373–387.

Peppi, M.C. and Fidelibus, M.W. (2008). Effects of forchlorfenuron and abscisic acid on the quality of Flame Seedless grapes.HortSci. 43, 173-176.

Peter, K.V. (1999). Information on turmeric and ginger. Indian species 6 (2 & 3): 12-14.

Rabino, I. and Mancinelli, A.L. (1986). Light, temperature and anthocyanin production. J. Plant Physiol., 81(3): 922- 924.

Sadeq, Q.S.; Ekbal. M.K.; Mageda, H.F. and Hadeel, B.D. (2002). Effect of fogging with powdered leaves of some plants in the ceramic qualities of potato tubers Desri Category. 2- Damage and weight loss and specifications of the quality of tuber. Journal of Iraqi Agricultural Sciences, 34(5): 69-81.

Santner A.L.; Calderon-Villalobos, I.A. and Estelle, M. (2009). Plant hormones are versatile chemical regulators of plant growth. Nat Chem Biol, 5:301–307.

Senthilkumar S.; Vijayakumar, R.M.; Soorianathasundaram, K. and Durga Devi, D. (2018). Role of CPPU and Application Stages with Other PGR's on Bunch and Berry Characters in New Grape cv. Italia under Tamil Nadu Conditions Int.J.Curr.Microbiol.App.Sci., 7 (4): 353-358.

Snedecor, G.W. and Cochran, W.G. (1990). "Statistical Methods", 7th ed., Iowa State Univ. Press, U.S.A., 593 p.

Srivastava, A.K. and Lal, B.(1997). Studies on biofungicidal properties of leaf extract of some plants. Indian Phytopath. 50 (3): 408-511.

Steel, R.G.D. and Torri, J. H. (1980). Principles and procedures of statistics: Biometrical approach Mc-Grow Hill Book company (2nd Ed) N.Y, pp: 631.

Thanaa, Sh.M.; Kassim, N.E.; Abou-Rayya, M.S. and Abdallah A.M. (2017). Influence of foliar application with moringa (*Moringa oleifera* L.) leaf extract on yield and fruit quality of Hollywood plum cultivar. J. Hortic 4 (1):1–7.

Ullah, N.; Ali, J.; Khan, F.A.; Khurram, M. ; Hussain, A.; Inayat-ur-Rahman, Zia-ur-Rahman and Shafqatullah. (2012). Proximate Composition, Minerals Content, Antibacterial and antifungal Activity Evaluation of Pomegranate (*Punica granatum* L.) Peels Powder. Middle-East Journal of Scientific Research 11 (3): 396-401,

Wang, Z.; Jiao, Z.; Xu, P.; Chen, L.; Ai, J.; Liu, X. and Yang, Y. (2013). Bisexual flower ontogeny after chemical induction and berry characteristics evaluation in male *Vitis amurensis* Rupr. Scientia Horticulturae, 162:11-19.

Winkler, A.J.; Cook, A.J, Kliewerand, W.M. and Linder, L.A. (1974). General viticulture. Published by Univ. of California Press, Berkley.

Wood, C.W.; Tracy, P.W.; Reeves, D.W. and Edmisten, K.L. (1992). Determination of cotton nitrogen status with a hand-held chlorophyll meter. J Plant Nutri 15:1435-1448.

Xi, J.; He, L and Yan, L.G. (2017). Continuous extraction of phenolic compounds from pomegranate peel using high voltage electrical discharge. Food Chemistry, 230: 354-361.

Zhang, J.; Ren, J.; Yang, Q.; Gao,Y.; Wu, Y.; Liu, X. and Tao, J. (2013). Effect of CPPU treatments on fruit growth of summer black grape. South China fruits, 42(2): 22-25.

تأثير الرش بالسيتوفيكس وبعض المستخلصات النباتية على العنب الرومي الأحمر

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الملخص

تم اجراء هذه التجربة خلال موسمي 2021,2020 على كرمات العنب الرومي الاحمر التي تبلغ من العمر 12 سنة المنزرعة بالمزرعة البحثية بكلية الزراعة – جامعة اسيوط- مصر. بهدف دراسة تأثير رش السيتوفكس بتركيز 2.5 ppm وبعض المركبات الطبيعية (مستخلص كل من اوراق المورينجا وقشور الرمان والكركم) على النمو الخضري والاثمار حيث رشت المركبات بصورة فرديه وبتركيزات2% ،4% لكل منهم ثلاث مرات خلال فصل النمو.

وقد أظهرت النتائج

أظهرت جميع معاملات رش المستخلصات النباتية زيادة جوهرية في مساحة الورقة ومحتواها الكلى من صبغة الكلوروفيل ووزن خشب التقليم مقارنة بالشجيرات التي رشت بالسيتوفكس أو الماء (المقارنة).

أوضحت جميع معاملات المستخلصات النباتية تحسنا معنويا في مكونات المحصول والصفات الطبيعية والكيميائية للحبات.

سبب رش السيتوفيكس نقصا جوهريا في محتوى عصير حبات العنب من TSS والسكريات المختزلة وصبغة الانثوسيانين وزيادة معنويه في الحموضة الكلية للعصير.

لم تكن هناك فروق جوهرية بين التركيزات المختلفة من المستخلصات النباتية المستخدمة.

من نتائج الدراسة يمكن التوصية بأهمية الرش بمستخلص كل من اوراق المورينجا وقشور الرمان والكركم بتركيز2% ثلاث مرات عند بداية النمو وأثناء التزهير وبعد العقد بشهر لتحسين النمو الخضري وانتاج محصول عالي ذو خصائص عناقيد وحبات جيده للعنب الرومي. فضلا عن استخدامها كبديل للسيتوفكس في انتاج العنب وللتغلب على بعض مشاكل استخدامه من حيث تقليل نسبة السكريات، TSS في عصير حبات العنب ورداءة تلوين الحبات وتقليل التلوث البيئي وتكلفة الانتاج.