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# Influence of Using Some Antioxidant Oils and Natural Plant Extracts on Yield and Quality of Crimson Seedless Grapevines

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## ABSTRACT

This research is a helpful step in viticulture aimed to highlight a category of some natural agents effects particularly; grape seed oil (GSO), roselle seed oil (RSO), roselle extract (RE), red chili pepper extract (CPE) and ascorbic acid (As). Thrice sprays during 2019- 2020 seasons of each had applied on Crimson Seedless grapevines grown at Aga, Dakahlia Governorate, Egypt. Findings showed that, As + GSO followed by As + RSO and As + CPE sprays promoted shoot length, leaf area and wood ripening coefficient, total yield, cluster and berry weight, berry size, berries firmness and SSC %. Furthermore, As + CPE spray maintained the lowest acidity, but As + RSO spray had the highest SSC/ acid ratio. In addition, As + GSO spray raised total sugars, phenols, anthocyanin and chlorophyll contents. Also, all treatments raised N %, P % and K% values significantly more than the control. Finally, it could be summarized that 0.2 % sprays of plant- derived agents like GSO, CPE or RSO combined with 200 ppm of As; have a synergistic effect on grapes vegetative growth, yield, cluster physical and chemical quality parameters compared to the control.

***Keywords:*** Grape, grape seed oil, roselle seed oil, roselle extract, chili pepper extract, ascorbic acid.

## 1. Introduction

Crimson Seedless grape (*Vitis vinifera*); (Thompson Seedless x Emperor) the favorable late red table grape is one of the most commercial cultivars in Egypt. It is crispy, firm skin and juicy pulp with an excellent sugary flavor (Río-Segade *et al.,* 2013). However, under Egypt climate conditions, Crimson has common problems such as; non adequate color and small berry size that weaken marketing capability (Dokoolian and Peacock, 2001). Thus there is a real need to improve its quality, especially *via* plants agents; the safe alternatives for sustainable agriculture enhance yield and quality parallel with human and environment safety. Moreover, the major goal of many producers is providing organic fruits to meet the global interest for food safety.

In addition, Miriam Laxa *et al.* (2019) evidenced strong correlative signs of the redox regulatory and antioxidant system in abiotic stresses tolerance, linked to ascorbate- dependent antioxidant activity regulation. Furthermore, resurrection plants have a strong antioxidant system usually. Dumanovic´ *et al.* (2021) mentioned the importance of antioxidants in cooperating and participating for stressed plants survival, particularly providing better regeneration and protection of the active reduced forms.

In those respect, Dimitri and Oberholtzer (2006) set an approach depend on natural plant oils and extracts usage instead of synthetic chemicals or auxins, since they are pollutants, for improving vegetative growth and yield quality. Also, a great attention paid to the natural antioxidants benefits due to their phenolic content (Baydar *et al.,* 2007; Brewer 2011). In this context, Katarzyna Godlewska *et al.,* (2021) pointed out that the raw materials derived from different plant parts like; seeds, flowers or fruits are basic in producing valuable products.

For example, grape seed oil (GSO) (*Vitis* sp.) is represented as promising plant oil due to its composition which promotes biosynthesis (Lachman *et al.,* 2015; Garavaglia *et al.,* 2016). In addition,

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Shinagawa *et al.,* (2015) noticed that GSO constituents influence lipid modulating anti and pro oxidative properties. Furthermore, because of its quality characteristics; this oil has been extracted to produce high quality oil with lower cost (Baydar and Akkurt, 2001). GSO has high phenolic compounds content which is related to high capacity antioxidant activity (Burg *et al.,* 2017; Shinagawa *et al.,* 2018).

Another, beneficial tested oil is roselle seed oil (RSO) (*Hibiscus sabdariffa* L.) which has a good antioxidant capacity (Wu *et al.,* 2018). In those respect, Mohamed *et al.,* (2007) analyzed roselle different plant organs and revealed that, the seeds are a good source of lipid soluble antioxidants such as γ-tocopherol. Moreover, Bamgboye and Adejumo (2010); Elshafie (2015) showed that RSO physicochemical properties have useful industrial purposes, since it contains a great oil amount with good physical and chemical characteristics (high protein content and a low peroxide value due to antioxidants presence). In addition, Karma *et al.,* (2017); Sahar Al- Okbi *et al.* (2017) mentioned that RSO has a high safe oxidative stability and antioxidant activity.

As for plant extracts, roselle extract (RE) obtained from flower calyces and petals is widely used in industry, where it's high anthocyanin content have antioxidants, bioactive properties which can be used as a natural colorant. Working on pear, Abd-El-Latif *et al.* (2017) included that RE sprays combined with soil bio-fertilizers on fruit set had affected fruit yield, physical and chemical quality. Gad El- Kareem and Abd El- Rahman (2013) found that treating Ruby Seedless grape three times with 0.2 % RE+ 100 ppm salicylic acid+ 0.2 % seaweed extract mixture was very effective in stimulating leaf area and minerals, yield, cluster and berry weights, T.S.S and total sugars and reducing acidity and shoot berries %. El-Sharony *et al.* (2015) reported that foliar spray at three times at full bloom, fruit set and two months after fruit set with RE 10 %, particularly when combined with garlic extract had promoted mango yield, fruit quality, vegetative growth and nutritional status (NPK). Abd-El-Latif *et al.* (2017) investigated the phytochemical composition of RE and mentioned that it compose of sugar and many mineral nutrients. Working on Flame Seedless grapevines, El-Salhy *et al.* (2017) recorded that spraying 0.1 % RE 3 times annually maintained high yield, increased berry weight, TSS, anthocyanin, leaf area and chlorophyll. Moreover, Shruthi *et al.* (2017) noted that roselle has considerable protein and fat amounts, ascorbic acid, phenol, flavonoid, anthocyanin and antioxidant properties.

In the same context, some researchers investigated red chili pepper extract CPE (*Capsicum* spp.) effects. Their results stated that CPE contain two of main groups as nonvolatile alkaloids compounds such as; capsaicin and dihydrocapsaicin. Many ingredients were identified by Wesolowska *et al.,* (2011); Zagzog and Saied (2017); Batiha *et al.,* (2020) such as provitamin A, vitamins C and E, carotenoids etc. All of these compounds are associated with their antioxidant effect as well as other biological activities. Furthermore, Akl *et al.,* (2017) mentioned that spraying 5 % of CPE had enhanced Flame Seedless transplants all vegetative growth aspects.

An important natural organic acid studied is; ascorbic acid (As) a water soluble vitamin has been considered as one of the main activated oxygen species detoxification systems in plant cells. Moreover, it has a role in enhancing growth and productivity of fruits by interacting in many biological processes in the plant as a growth regulating factor (Marzouk and Kassem, 2011 Yildirim, 2007; Shayan Mustafa, 2016; Kassem *et al.,* 2011). However, Abd- El-Rahman *et al.,* (2017) noticed that 2000 ppm of (As) foliar sprays had improved Zn or B effect on pomegranate fruits yield and quality.

But still a clear need to find out efficient and safe alternatives for common chemical- products definitely; plant- derived extracts as a new generation of natural- products suits various biotic and abiotic stresses. So, the scope of the present study is to investigate the influence of some natural plant antioxidants even oils or extracts on the vegetative growth, nutritional status, yield and quality of Crimson Seedless grapevines.

## 2. Materials and Methods

This experiment was conducted during 2019 and 2020 seasons on Crimson Seedless grapevines grown in a private vineyard at Aga, Dakahlia Governorate, Egypt. Vines aged 8 years old planted in a clay soil and trellised as Gable system, with line spacing 1.5 × 2.5 m, cane pruned with 60 buds/ vine and drip irrigated. Uniform in vigor vines were chosen and received common horticultural practices recommended by the Egyptian Ministry of Agriculture.

**2.1. The applied foliar treatments:**

The selected vines received each substance sprays in three dates: At full bloom, at 5-6 mm berry size and the last date was after one week from the second spray. Sprays were as follows:

1- Control (water spray)
2- Grape seed oil (GSO) at 0.2 %
3- Roselle seed oil (RSO) at 0.2 %
4- Roselle extract (RE) at 0.2 %
5- Red chili pepper extract (CPE) at 0.2 %
6- Ascorbic acid (As) at 200 ppm
7- Ascorbic acid (As) at 200 ppm + Grape seed oil (GSO) at 0.2 %
8- Ascorbic acid (As) at 200 ppm + Roselle seed oil (RSO) at 0.2 %
9- Ascorbic acid (As) at 200 ppm + Roselle extract (RE) at 0.2 %
10- Ascorbic acid (As) at 200 ppm + Red chili pepper extract (CPE) at 0.2 %.

**2.2. Extractions preparation**

**Grape seed and roselle seed oils:** Both pure essential oils in a ready- to use state were used.

**Roselle extract**: It was prepared as described by El-Salhy *et al.,* (2017).

**Red chili pepper extract**: The method of Thanaa Ezz *et al.,* (2015) was applied.

Triton B at 0.1 % as a wetting agent was added to all treatments even the control. All treatments were sprayed till run off using a hand held sprayer (approximately 3 L/ vine).

**Table 1:** Analyses of various oils and extracts sprayed on Crimson Seedless grapevines during 2019 and 2020 growing seasons.

| **Grape seed oil** | | **Roselle seed oil** | |
|---|---|---|---|
| **Compounds** | **Values** | **Compounds** | **Values** |
| Myristic acid C14:0 | 0.07 | Lauric acid % | 0.01 |
| Palmatic acid C16:0 | 6.01 | Palmatic acid % | 21.45 |
| Palmitoleic acid C16:1 | 0.12 | Myristic acid % | 0.20 |
| Ptadecanoic acid C17:1 | 0.08 | Stearic acid % | 4.06 |
| Stearic acid C18:0 | 3.92 | Total saturated fatty acids % | 25.72 |
| Oleic acid C18:1 | 19.36 | Oleic acid % | 31.22 |
| Linoleic acid C18:2 | 68.84 | Linoleic acid % | 41.18 |
| Linoleinc acid C18:3 | 0.42 | Linolenic acid % | 3.46 |
| Eicsanoic acid C20:1 | 0.23 | Total unsaturated fatty acids % | 75.86 |
| Erucic acid C22:0 | 0.14 | Carbohydrates (g) | 21.7 |
| Saturated fatty acid | 10.42 | Total Phenolic content % | 23.65 |
| Unsaturated fatty acid | 89.05 | Ash % | 5.73 |
| Total anon | 0.53 | Protein % | 23.25 |
| Total Tocopherol (mg/100g oil) | 168.15 | Fiber % | 16.25 |
| Total phenolic content (mg) | 133.69 | Polyphenols % | 18.37 |
| Carotenoids (g) | 51.67 | Total tocopherols (mg/100mg oil) | 246 |
| **Roselle extract** | | **Red chili extract** | |
| **Compounds** | **Values** | **Compounds** | **Values** |
| Fat % | 90 | Fat (g) | 73.5 |
| Protein (g) | 2.95 | Protein (g) | 24.65 |
| Carbohydrates (g) | 6.21 | Carbohydrates (g) | 48.91 |
| Fiber % | 2.59 | Fiber % | 3.10 |
| Ash (g) | 1.09 | Ash (g) | 5.09 |
| Total phenolic content % | 32.62 | Stearic acid % | 0.03 |
| Total Flavonoids % | 38.34 | Palmatic acid % | 0.24 |
| Ca (g) | 0.55 | Capsaicin (mg) | 60.53 |
| Fe (g) | 0.22 | Vitamin E (mg) | 6.14 |
| K (mg/g) | 0.46 | Oliec acid % | 0.11 |
| Na (mg/g) | 0.33 | Linoleic acid % | 27.46 |
| Mg (g) | 0.21 | Ascorbic acid (mg) | 27.43 |
| pH | 2.35 | α-tocopherol % | 0.24 |
| Ascorbic acid (g) | 11 | Na (mg) | 3.20 |
| Carotenoids (g) | 22.97 | Ca (g) | 5.51 |
| | | P (mg) | 11.30 |
| | | Mg (g) | 4.93 |

**2.3. Experimental design and statistical analysis:**

Randomized complete block design was adopted. New L.S.D. method at 5 % level was used to compare treatment means according to Snedecor and Cochran (1989). Ten treatments were applied, each consists of three vines and triple replicated.

**2.4. The following parameters were assessed during the study:**

At harvest time, ripened clusters which reached their full color and about 18- 20 SSC %; were collected for the following determinations according to Tourky *et al.,* (1995):

A. Vegetative growth parameters: Shoot length (cm), leaf area ($cm^2$) was measured using leaf area meter, Model CI 203, U.S.A. and wood ripening coefficient (%) was calculated according to Bouard (1966).
B. Physical parameters of yield and clusters: Yield / vine (kg), cluster weight (g), berry weight (g), berry size ($cm^3$) and berry firmness (g/ $cm^2$) was measured using Push/ Pull powers Dynamometer Model DT 101.
C. Chemical parameters of berries and leaves: Juice soluble solids content (SSC %) was determined using hand refractometer, total titratable acidity % (1 g of tartaric acid/ 100 ml of juice) as described by A.O.A.C. (1990) and then SSC/ acid ratio was calculated. Berry skin total anthocyanin (mg/ g fresh weight) was measured as Geza *et al.,* (1983) method using spectrocolorimeter, berries total sugars (%) were determined according to Sadasivam and Manickam (1996) and total phenols (mg/ 100g D.W) were measured according to Malick and Singh (1980). Leaves total chlorophyll (SPAD) were measured using nondestructive chlorophyll-meter (Minolta SPADA502). Macro nutrients content: Nitrogen % was estimated by micro-keldahl according to Pregel (1945), phosphorus % was determined by a colorimetric method as described by Temminghoff and Houba (2004) and potassium % was measured according to Brown and Lilleland (1946).

## 3. Results

**3.1. Vegetative growth parameters:**

All vegetative parameters measured appear in Table (2), were varied significantly when compared to the control.

As for shoot length, As + GSO and As + CPE sprays resulted in the tallest shoots (181.3 and 177.2 cm), successively in the first season; while with As + GSO and As + RE sprays (190.0 and 187.3 cm), consecutively in the second season. However, the shortest shoots (164.2 and 160.0 cm) were measured with the control in both seasons, respectively.

**Table 2:** Shoot length, leaf area and wood ripening coefficient as affected by natural plant oils and extracts treatments during 2019 and 2020 growing seasons.

| Treatment | Shoot length (cm) | | Leaf area ($cm^2$) | | Wood ripening coefficient (%) | |
|---|---|---|---|---|---|---|
| | 1st season | 2nd season | 1st season | 2nd season | 1st season | 2nd season |
| **Cont.** | 164.2 | 160.0 | 151.8 | 156.8 | 75.50 | 72.90 |
| **GSO** | 168.9 | 183.2 | 190.8 | 169.7 | 95.81 | 91.77 |
| **RSO** | 165.5 | 178.6 | 186.3 | 167.9 | 97.66 | 88.90 |
| **RE** | 170.6 | 183.9 | 191.5 | 163.0 | 84.00 | 79.81 |
| **CPE** | 166.5 | 176.2 | 195.0 | 167.8 | 84.60 | 81.91 |
| **As** | 167.9 | 170.2 | 181.2 | 165.1 | 85.62 | 79.90 |
| **As + GSO** | 181.3 | 190.0 | 201.7 | 182.4 | 99.30 | 98.10 |
| **As + RSO** | 167.4 | 182.3 | 195.1 | 179.4 | 98.96 | 93.64 |
| **As + RE** | 175.4 | 187.3 | 187.6 | 176.7 | 83.88 | 81.88 |
| **As + CPE** | 177.2 | 186.5 | 198.4 | 180.8 | 84.45 | 83.20 |
| **L.S.D at 0.05** | **6.21** | **5.19** | **5.02** | **4.31** | **3.89** | **3.63** |

Regarding leaf area, the largest leaves (201.7 and 198.4 $cm^2$) were recorded with As + GSO and As + CPE sprays, without significant difference between them in the first season, and 182.4 and 180.8 $cm^2$ in the second season, respectively. Whereas, the smallest leaves (151.8 and 156.8 $cm^2$), successively were measured with the control treatment in both seasons.

Table (2) point out that, the most ripened wood (99.30 and 98.96%), by order was recorded with As + GSO and As + RSO sprays without significant difference between them in the first season and with As + GSO spray (98.10 %) in the second season. Whereas, the less ripened wood (75.50 and 72.90 %), consecutively were detected with the control in both seasons.

### 3.2. Physical parameters

All studied physical parameters presented in Table (3), were significantly influenced by various treatments when compared to the control.

Regarding vines yield in both seasons, As + GSO and As + RSO sprays yielded the heaviest weights (15.90 and 15.80 kg) and (14.20 and 13.59 kg), respectively. Meanwhile, water spray (control) yielded the lightest weight (12.70 and 11.09 kg) in both seasons, successively.

Results clear that the heaviest clusters (489.3 and 447.4 g) were obtained from As + GSO spray, while the lightest clusters (310.5 and 282.8 g) were weighed with the control treatment in the two seasons, by order.

Concerning berry weight, the heaviest berries were weighed from As + GSO and As + RSO sprays without significant difference between them (4.89 and 4.81 g) in the first season, successively, and (4.95 and 4.94 g) in the second season, respectively. However, the lightest berries (3.85 and 3.79 g), consecutively were weighed with the control treatment in the two seasons.

Looking to berry size, results showed that values were graded from the largest berries (4.21 and 4.32 $cm^3$) with As + GSO sprays reaching the smallest berries in size (3.51 and 3.20 $cm^3$) with the control, respectively in both seasons.

Considering berry firmness, the highest values (580.0 and 574.5 $g/cm^2$), by order in the first season and (584.0 and 572.5 $g/cm^2$) in the second season, respectively were measured with As + GSO and As + RSO sprays. Meanwhile, the lowest values (485.0 and 472.5 $g/cm^2$) were measured with the control in both seasons, consecutively.

**Table 3:** Yield/ vine, cluster weight, berry weight, berry size and berry firmness as affected by natural plant oils and extracts treatments during 2019 and 2020 growing seasons.

| Treatment | Yield / vine (kg) | | Cluster weight (g) | | Berry weight (g) | | Berry size ($cm^3$) | | Berry firmness ($g/cm^2$) | |
|---|---|---|---|---|---|---|---|---|---|---|
| | 1st season | 2nd season | 1st season | 2nd season | 1st season | 2nd season | 1st season | 2nd season | 1st season | 2nd season |
| **Cont.** | 12.70 | 11.09 | 310.5 | 282.8 | 3.85 | 3.79 | 3.51 | 3.20 | 485.0 | 472.5 |
| **GSO** | 15.50 | 13.26 | 424.2 | 371.0 | 4.50 | 4.59 | 3.82 | 4.10 | 532.0 | 520.5 |
| **RSO** | 15.30 | 12.94 | 419.0 | 356.9 | 4.45 | 4.51 | 3.81 | 4.01 | 543.5 | 540.5 |
| **RE** | 14.05 | 12.30 | 383.1 | 337.7 | 4.27 | 4.31 | 3.63 | 4.11 | 530.0 | 527.5 |
| **CPE** | 14.12 | 12.40 | 410.3 | 365.8 | 4.42 | 4.48 | 3.81 | 3.90 | 539.0 | 530.5 |
| **As** | 13.94 | 11.57 | 360.8 | 302.4 | 4.19 | 4.22 | 3.72 | 3.91 | 530.5 | 541.5 |
| **As + GSO** | 15.90 | 14.20 | 489.3 | 447.4 | 4.89 | 4.95 | 4.21 | 4.32 | 580.0 | 584.0 |
| **As + RSO** | 15.80 | 13.59 | 478.8 | 417.2 | 4.81 | 4.94 | 4.11 | 4.11 | 574.5 | 572.5 |
| **As + RE** | 14.95 | 13.20 | 466.6 | 413.8 | 4.55 | 4.63 | 3.92 | 4.01 | 550.0 | 555.0 |
| **As + CPE** | 15.20 | 12.87 | 480.1 | 412.1 | 4.80 | 4.92 | 4.10 | 4.21 | 568.0 | 570.0 |
| **L.S.D at 0.05** | **2.18** | **1.86** | **7.84** | **9.37** | **0.443** | **0.408** | **0.32** | **0.31** | **14.47** | **14.20** |

### 3.3. Chemical parameters

Chemical parameters were mentioned in Tables (4 & 5) and will be presented as follows:

SSC results show that, the highest significant value (19.8 %) was obtained with As + RSO spray at the first season and with As + GSO spray (19.3 %) at the second season. However, the lowest significant SSC values (17.2 and 17.7 %) were recorded with the control in the two seasons, respectively.

Regarding total acidity, it was affected significantly by various treatments, since in both seasons As spray solely raised acidity value significantly (0.510 and 0.490 %), successively. While As + CPE spray significantly lowered acidity in both seasons (0.445 and 0.440 %), by order.

As for SSC/ acid ratio, As + RSO spray showed the highest ratio (43.51) in the first season; and with As + CPE spray (43.40) in the second season. However, the lowest significant ratios (35.29 and 37.14) were recorded with As sprays solely in the two studied seasons.

Concerning berries total sugars, it was significantly influenced by various treatments as the highest percentages (16.35 and 16.43 %) were detected with As + GSO sprays in both seasons, sequently. Whereas, the lowest sugars percentage (13.91 and 14.20 %) was measured with the control in the two seasons, respectively.

Considering total phenols, it was realized that the highest phenols amounts (0.429 and 0.432 mg/ 100g) were measured with As + GSO spray in both seasons, successively. But the lowest amounts (0.343 and 0.344 mg/ 100g) were found with the control in the two seasons, by order.

**Table 4:** SSC, titratable acidity, SSC/ acid ratio, berries total sugars and total phenols as affected by natural plant oils and extracts treatments during 2019 and 2020 growing seasons.

| Treatment | SSC % | | Titratable acidity (%) | | SSC/ acid ratio | | Berries total sugars (%) | | Total phenols (mg/100g D.W) | |
|---|---|---|---|---|---|---|---|---|---|---|
| | 1st season | 2nd season | 1st season | 2nd season | 1st season | 2nd season | 1st season | 2nd season | 1st season | 2nd season |
| **Cont.** | 17.2 | 17.7 | 0.460 | 0.455 | 37.39 | 38.90 | 13.91 | 14.20 | 0.343 | 0.344 |
| **GSO** | 18.0 | 18.4 | 0.466 | 0.458 | 38.62 | 40.17 | 15.60 | 15.68 | 0.365 | 0.385 |
| **RSO** | 18.0 | 18.8 | 0.461 | 0.456 | 39.04 | 41.22 | 14.81 | 14.88 | 0.393 | 0.399 |
| **RE** | 17.5 | 18.7 | 0.464 | 0.459 | 37.71 | 40.74 | 14.29 | 14.35 | 0.366 | 0.369 |
| **CPE** | 18.6 | 18.9 | 0.453 | 0.449 | 41.05 | 42.09 | 14.80 | 14.94 | 0.364 | 0.351 |
| **As** | 18.0 | 18.2 | 0.510 | 0.490 | 35.29 | 37.14 | 14.85 | 14.96 | 0.349 | 0.352 |
| **As + GSO** | 19.4 | 19.3 | 0.457 | 0.451 | 42.45 | 42.79 | 16.35 | 16.43 | 0.429 | 0.432 |
| **As + RSO** | 19.8 | 18.9 | 0.455 | 0.452 | 43.51 | 41.81 | 16.20 | 16.26 | 0.420 | 0.425 |
| **As + RE** | 18.2 | 18.1 | 0.454 | 0.450 | 40.08 | 40.22 | 16.00 | 16.07 | 0.417 | 0.421 |
| **As + CPE** | 18.7 | 19.1 | 0.445 | 0.440 | 42.02 | 43.40 | 16.30 | 16.37 | 0.420 | 0.415 |
| **L.S.D at 0.05** | **0.17** | **0.17** | **0.027** | **0.027** | **3.22** | **2.82** | **0.16** | **0.13** | **0.182** | **0.170** |

Results in Table (5) point out that, As + GSO spray scored the highest significant total anthocyanin content (43.1 and 44.6 mg/ g F.W) in the two seasons, consecutively. Whereas, the control treatment recorded the lowest significant content (29.5 and 30.4 mg/ g F.W) in both studied seasons, successively.

Looking at leaves total chlorophyll, As + GSO spray maintained the highest content (47.51 and 48.31 SPAD) in both seasons, respectively. While, the control gave the lowest chlorophyll content (40.30 and 41.91 SPAD) in the two seasons, consecutively.

**Table 5:** Total anthocyanin, total chlorophyll, N, P and K as affected by natural plant oils and extracts treatments during 2019 and 2020 growing seasons.

| Treatment | Total anthocyanin (mg/g F.W) | | Total chlorophyll (SPAD) | | N (%) | | P (%) | | K (%) | |
|---|---|---|---|---|---|---|---|---|---|---|
| | 1st season | 2nd season | 1st season | 2nd season | 1st season | 2nd season | 1st season | 2nd season | 1st season | 2nd season |
| **Cont.** | 29.5 | 30.4 | 40.30 | 41.91 | 1.40 | 1.42 | 0.35 | 0.35 | 1.45 | 1.47 |
| **GSO** | 36.8 | 37.9 | 45.82 | 46.42 | 1.81 | 1.84 | 0.44 | 0.45 | 1.77 | 1.79 |
| **RSO** | 36.0 | 36.7 | 44.42 | 45.32 | 1.52 | 1.55 | 0.44 | 0.44 | 1.71 | 1.73 |
| **RE** | 34.0 | 35.0 | 43.03 | 43.74 | 1.59 | 1.60 | 0.43 | 0.43 | 1.63 | 1.65 |
| **CPE** | 35.1 | 35.8 | 45.73 | 46.36 | 1.66 | 1.68 | 0.44 | 0.44 | 1.71 | 1.72 |
| **As** | 31.1 | 32.9 | 44.88 | 46.23 | 1.77 | 1.79 | 0.42 | 0.42 | 1.55 | 1.56 |
| **As + GSO** | 43.1 | 44.6 | 47.51 | 48.31 | 1.97 | 1.99 | 0.46 | 0.46 | 1.95 | 1.96 |
| **As + RSO** | 41.2 | 42.9 | 46.82 | 47.65 | 1.94 | 1.95 | 0.46 | 0.46 | 1.91 | 1.93 |
| **As + RE** | 38.7 | 39.8 | 46.23 | 46.93 | 1.86 | 1.88 | 0.45 | 0.45 | 1.81 | 1.82 |
| **As + CPE** | 42.8 | 43.6 | 46.66 | 47.32 | 1.92 | 1.96 | 0.46 | 0.46 | 1.90 | 1.92 |
| **L.S.D at 0.05** | **0.18** | **0.16** | **2.68** | **2.93** | **0.26** | **0.24** | **0.05** | **0.04** | **0.18** | **0.16** |

Considering minerals namely N, P and K, they weren't influenced by various treatments.

As for N percentage, the highest value (1.97 and 1.99 %) was measured with As + GSO spray in both seasons, successively. Meanwhile, the control shows the lowest value (1.40 and 1.42 %) in the two seasons, by order.

Regarding P percentage, As + GSO, As + RSO and As + CPE sprays equally scored the highest value (0.46 %) in both seasons. Oppositely, the control recorded an equal lowest value (0.35 %) in both seasons.

Concerning K percentage, spraying vines with As + GSO resulted in the highest contents in the two seasons (1.95 and 1.96 %), respectively. However, spraying vines with water only (control) gave the lowest contents in both seasons (1.45 and 1.47 %), successively.

## 4. Discussion

It is well known that antioxidants are essential for plant's nutriment and stress tolerance (Miriam Laxa *et al.,* 2019; Dumanovic´ *et al.,* 2021).

Grape seed oil is full of oil soluble antioxidants mainly α –tocopherols; the content possesses antioxidant activity. Thus, may also interact with cellular and molecular pathways (Schmidt *et al.,* 2003; Anamaria Hanganu *et al.,* 2012; Lachman *et al.,* 2015; Garavaglia *et al.,* 2016). In addition, it has high phenolic compounds and vitamins (Burg *et al.,* 2017; Shinagawa, *et al.,* 2018).

As for roselle, it has high antioxidants content that helps to increase skin firmness and presents a good source of nutrients and antioxidants (Elshafie, 2015; Shruthi *et al.,* 2017). Furthermore, it's ascorbic acid content seems to have synergistic effects on growth, nutritional status, yield quality and plant pigments formation (Tsai *et al.,* 2002; Ogiehor and Nwafor, 2004; Wesolowska *et al.,* 2011; El-Sharony *et al.,* 2015; Karma *et al.,* 2017).

Regarding red chilies extract, its beneficial influence could be attributed to its composition of fats, α -tocopherols, protein and vitamins (Zagzog and Saied, 2017).

Presence of ascorbic acid (As) strengthen various natural agents used chemical reactions through acidification properties for example; roselle anthocyanins can serve as a good source of functional ingredients and color in an acidic environment. Also, ascorbate has the capability to regenerate tocopherol from tocopheroxyl radicals formed upon lipid peroxidation inhibition. Those findings agree with Ahmed *et al.,* (2018); Wu *et al.,* (2018).

This study results show an improvement in plant vegetative growth, physical characteristics and most of the chemical analyses used compared to the untreated vines. It could be explained if we realize that, the plant derived compounds are rich in nutrients and antioxidants which surely reflects on plant cell division enhancement, natural hormones biosynthesis such as; IAA and ethylene, nutrient and water uptake, photosynthesis, pigments and proteins building, amino acids and metabolism and cells protection from senescence and disorders (Ahmed *et al.,* 2014; Akl *et al.,* 2017). Moreover, vitamins content enhance growth and vine nutritional status subsequently enhancing fruits yield and quality. These results are in harmony with those obtained by Mansour *et al.,* (2018).

## 5. Conclusion

From the previous results, 0.2 % sprays of plant originated oils and extracts enhanced Crimson Seedless grapevines vegetative growth, clusters yield and quality parameters. Grape seed and roselle seed oils have superiority in promoting growth more than red chili pepper and roselle aqueous extracts when compared to non-treated vines. Moreover, adding 200 ppm of ascorbic acid to these natural substances strongly enhance their original antioxidative activities. Generally, spraying these agents as safe, cheap and available plant sources is efficient for grapes promotion.

### Abbreviations

GSO: Grape Seed Oil; RSO: Roselle seed oil; RE: Roselle extract; CPE: Chili pepper extract; As: Ascorbic acid; FRF: fruit retention force.

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## References

Abd-El-Latif F.M., S.F. El-Gioushy, A.F. Ismail and M.S. Mohamed, 2017. The impact of bio-fertilization, plant extracts and potassium silicate on some fruiting aspects and fruit quality of "Le-Conte" pear trees. Middle East J. Appl. Sci., 7 (2): 385- 397.

Abd- El-Rahman I.E., M.F. Attia, Eman El-Hady S. and Laila Haggag F., 2017. Effect of foliar spraying of some antioxidants and micronutrients on yield, fruit quality and leaf mineral content of Manfaloty pomegranate trees (*Punica granatum* L.) grown in a calcareous soil. Middle East J. Appl. Sci., 7 (4): 713- 725.

Ahmed F.F., Aisha Gaser S.A. and M.M.A. Hassan, 2018. Effect of spraying salicylic acid, some crop seed sprouts and turmeric extract on shot berries, yield and berries quality of Superior grapevines. New York Science Journal, 11 (1): 60- 68.

Ahmed F.F., M.Kh. Kamel and H.I.M. Ibrahim, 2014. The synergistic effects of using plant extracts and salicylic acid on yield and fruit quality of Keitte mango trees. Stem Cell, 5 (2): 30- 39.

Akl, A.M.M.A., M.A.M. Abada and Fatma Gadalla F.A., 2017. Effect of some plant extracts on growth and nutritional status of Flame Seedless grapevine transplants. J. Product. & Dev., 22 (2): 323- 337.

Anamaria, H., T. Maria-Cristina, C. Nicoleta-Aurelia, M. Maria, and R. Sorin, 2012. The compositional characterisation of Romanian grape seed oils using spectroscopic methods. Food Chemistry, 134: 2453- 2458.

A.O.A.C., 1990. Official Methods of Analysis. 15th Edition, Association of Official Analytical Chemist, Washington DC.

Bamgboye, A.I. and O.I. Adejumo 2010. Physicochemical properties of roselle seed oil. Nutrition & Food Science, 40 (2): 186- 192.

Batiha, G.E. , A. Alqahtani, O.A. Ojo, H.M. Shaheen, Lamiaa W., M. Elzeiny, M. Ismail, M. Shalaby, T. Murata, A. Zaragoza-Bastida, N. Rivero-Perez, Amany M.B., K.I. Kasozi, P. Jeandet and H.F. Hetta, 2020. Biological properties, bioactive constituents, and pharmacokinetics of some *Capsicum* spp. and capsaicinoids. Int. J. Mol. Sci., 21 (5179): 2- 35.

Baydar, N.G. and M. Akkurt 2001. Oil content and oil quality properties of some grape seeds. Turk J. Agric For, 25: 163- 168.

Baydar, N.G., G. Özkan, and S.Ç. Emine, 2007. Characterization of grape seed and pomace oil extracts. Grasas y aceites, 58 (1), Enero-marzo, 29- 33.

Bouard, J., 1966. Recherches physiologiques sur la vigne et en particulier pour l, aoutment des sarrnents. Thesis Sc. Nat Bordeaux (France), 34.

Brewer M.S., 2011. Natural antioxidants: sources, compounds, mechanisms of action, and potential applications. Comprehensive Reviews in Food Science and Food Safety, 10 (4): 221-247.

Brown J.D. and O. Lilleland, 1946. Rapid determination of potassium and sodium in plant material and soil extracted by flam photometer. Proc. Amer. Soc. Hort. Sci., 48: 341- 346.

Burg P., V. Mašán, K. Rutkowski, B. Jana, L. Lampíř and V. Višacki, 2017. Seed oil content and selected qualitative parameters of oils from grape seeds. Potravinarstvo Slovak Journal of Food Sciences, 11(1): 629- 633.

Dimitri C. and L. Oberholtzer, 2006. EU and U.S. organic markets face strong demand under different policies. Amber Waves, Economic Research Service USDA, 4: 12-19.

Dokoolian N.K. and W.L. Peacock, 2001. Gibberellic acid applied at bloom reduces fruit set and improves size of "Crimson Seedless» table grapes. *HortiScience,* 36 (4): 706- 709.

Dumanovic´ J., Eugenie Nepovimova, M. Natic´, K. Kuc˘a and V. Jac´evic, 2021. The significance of reactive oxygen species and antioxidant defense system in plants: A Concise Overview. Front. Plant Sci., 11: 1- 13.

El-Salhy, A.M., R.A. Ibrahim, M.A. Mgawer and G.N. Abd El-Hafiz, 2017. Effect of some plant extracts spraying on growth and fruiting of Flame Seedless grapevines. Assiut J. Agric. Sci., 48 (3): 188- 197.

Elshafie, B.M., 2015. Chemical and Physicochemical characteristics of roselle seeds oil (*Hibiscus sabdariffa* L.). B.Sc. (Honors) thesis, Sudan University of Science and Technology College of Agricultural Studies Department of Food Science and Technology.

El-Sharony, T.F., S.F. El-Gioushy and O.A. Amin, 2015. Effect of foliar application with algae and plant extracts on growth, yield and fruit quality of fruitful mango trees cv. Fagri Kalan. Journal of Horticulture, 2: 162.

Gad El- Kareem M.R. and M.M.A. Abd El- Rahman, 2013. Response of Ruby Seedless grapevines to foliar application of seaweed extract, salicylic acid and roselle extract. Hortscience Journal of Suez Canal University, 1: 299- 303.

Garavaglia, J., M. Melissa Markoski, O. Aline and M. Aline, 2016. Grape seed oil compounds: biological and chemical actions for health. Nutrition and Metabolic Insights, 9: 59- 64.

Geza, H., G.F. Parsons and L.R. Mattick 1983. Physiological and biochemical events during development and maturation of grape berries. Amer. J. Enol. Vitic. , 35 (4): 220- 227.

Karma B.R., U.D. Chavan, C.A. Nimbalkar and S.P. Kahar 2017. Rheometry of roselle (*Hibiscus sabdariffa* L.) seed oil. *Int. J. Pure App. Biosci.*, 5 (2): 987- 993.

Kassem H.A., R.S. Al-Obeed and S.S. Soliman 2011. Improving yield, quality and profitability of Flame Seedless grapevine grown under arid environmental by growth regulators preharvest applications. Middle-East Journal of Scientific Research, 8 (1): 165- 172.

Katarzyna, G., D. Ronga and M. Izabela, 2021. Plant extracts- importance in sustainable agriculture. Italian Journal of Agronomy, 16: 1851.

Lachman J., H. Alena, J. Taborský, Z. Kotíková, V. Pivec, R. Stralková, V. Alena, B. Tatiana and M. Dédina, 2015. Evaluation of oil content and fatty acid composition in the seed of grapevine varieties. LWT- Food Science and Technology, 63: 620- 625.

Malick C.P. and M.B. Singh 1980. In Plant Enzymology and Hist Enzymology. Khlyani Publishers, New Delhi, 286.

Mansour A.H.A., Ghada Mahmoud A. and Asmaa Mohamed A., 2018. Evaluation of natural oils impact on Flame Seedless grape quality at harvest and storage marketing process. Asian J. Biol. Sci., 11 (4): 228- 235.

Marzouk H.A. and H.A. Kassem 2011. Improving yield, quality, and shelf life of Thompson Seedless grapevine by preharvest foliar applications. Scientia Horticulturae, 130: 425- 430.

Miriam Laxa, M. Liebthal , W. Telman, K. Chibani and K.J. Dietz, 2019. The role of the plant antioxidant system in drought tolerance. Antioxidants, 8 (94): 1- 31.

Mohamed, R., J. Fernandez, M. Pineda, and M. Aguilar 2007. Roselle (*Hibiscus sabdariffa*) seed oil is a rich source of γ-tocopherol. Journal of Food Science, 72 (3): 207- 211.

Ogiehor I.S. and O.E. Nwafor, 2004. Associated microbial, biochemical and chemical quality changes in Sobo beverage produced from *Hibiscus sabdariffa L.* Niger. Ann. Natio. Sci., 5 (2): 1-10.

Pregel, F., 1945. Quantitive organic micro analysis. 4 th Ed. J. A. Churchill Ltd., London, 53.

Río-Segade S., S. Giacosa, F. Torchio, L. de Palma, N. Novello, V. Gerbi and L. Rolle 2013. Impact of different advanced ripening stages on berry texture properties of 'Red Globe' and 'Crimson Seedless' table grape cultivars (*Vitis Vinifera* L.). *Scientia Horticulturae*, 160: 313- 319.

Sadasivam, S. and A. Manickam 1996. "Biochemical Methods", 2nd ed., New Age International, India.

Sahar Al-Okbi, Y., A.G. Abdel-Razek, Shaimaa Mohammed E. and M.E. Ottai, 2017. Roselle seed as a potential new source of healthy edible oil. Journal of Biological Sciences, 17 (6): 267- 277.

Schmidt, Š., J. Pokorný, M. Vajdák, S. Sekretár and M.H. Gordon, 2003. Oilseeds as a source of antioxidants. Bulletin of Food Research, 42 (3- 4): 133- 149.

Shayan, M.A., 2016. Effect of foliar application of algamix and ascorbic acid on yield and quality of grape (*Vitis vinifera* L.) cv. BAE-DANK Journal of University of Duhok, Special Issue of the 2nd scientific Agriculturai Conference, 19 (1): 1- 7.

Shinagawa F.B., C. Fernanda Santana, E. Araujo, E. Purgatto and J. Mancini-Filho, 2018. Chemical composition of cold pressed Brazilian grape seed oil. Food Sci. Technol, Campinas, 38 (1): 164-171.

Shinagawa F.B., C. Fernanda Santana, R.D. Lucillia Tdrres and J. Mancini-Filhd, 2015. Grape seed oil: a potential functional food. Food Sci. Technol., Campinas, 35 (3): 399- 406.

Shruthi V.H., C.T. Ramachandra, U. Nidoni, S. Hiregoudar, N. Naik and A.R. Kurubar, 2017. Physico-chemical, nutritional and functional properties of roselle (*Hibiscus sabdariffa* L.). International Journal of Current Microbiology and Applied Sciences, 6 (12): 1- 7.

Snedecor G.W. and W.G. Cochran 1989. Statistical methods, 8th Edn. Ames: Iowa State Univ. Press, Iowa.

Temminghoff, E.E.J.M. and V.J.G. Houba, 2004. Plant analysis procedures. Second Edition, Kluwer Academic Publishers. Dordrecht, Boston, London, 179.

Thanaa Ezz, M.D., M.A. Aly, Ekbal Ahmed Z.A., Rehab Awad M.A. and M.G. Abd El- Gawad, 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.

Tourky M.N., S.S. El-Shahat and M.H. Rizko, 1995. Evaluation of some new grape cultivars in relation to growth, yield, berry quality and storage life. J. Agric. Sci., Mansoura Univ., 20 (12): 5135- 5167.

Tsai P.J., J. Mc Intosh, P. Pearce, B. Camden and B.R. Jordan, 2002. Anthocyanin and antioxidant capacity in roselle (*Hibiscus sabdariffa L.*) extract. *Food Research International*, 35: 351- 356.

Wesolowska, A., J. Dorota, and G. Monika, 2011. Chemical composition of the pepper fruit extracts of hot cultivars *Capsicum annuum* L. Acta Sci. Pol., Hortorum Cultus, 10 (1): 171- 184.

Wu, H.Y., K.M. Yang and P.Y. Chiang, 2018. Roselle anthocyanins: antioxidant properties and stability to heat and pH. Molecules, 23 (1357): 1- 13.

Yildirim, O., 2007. Effects of ascorbic acid treatment to grapevine rootstock1616C and *Vitis vinifera* L. cvs. Razaki. Asian Journal of Biochemistry, 2 (6): 395- 401.

Zagzog, O.A.I. and H.H.M. Saied, 2017. Insight onto the effect of fourteen plant extracts on fruiting of Sakkoti date palms. Current Science International, 06 (03): 552- 559.