Effect of Spraying Salicylic Acid, Some Crop Seed Sprouts and Turmeric Extract on Shot Berries, Yield and Berries Qyality of Superior Grapevines

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Abstract: During 2016 and 2017 seasons Superior grapevines were treated with rocket and fenugreek seed sprouts and turmeric extract each at 0.05 to 0.2% and salicylic acid (SA) at 100 to 400 ppm to examine the effect of this treatments on yield and berries quality. Single and combined applications of fenugreek and rocket seed sprouts and turmeric extract at 0.05 to 0.2% and salicylic acid at 100 to 400 ppm caused an obvious promotion on berry setting, yield expressed in weight and number of clusters/ vine as well as weight, length and shoulder of cluster, beery weight and dimensions (longitudinal and equatorial), T.S.S. %, reducing sugars %, T.S.S/acid and reduction shot berries and total acidity% relative to the control treatment. The best materials were rocket seed sprout, salicylic acid, turmeric extract and fenugreek seed sprout, in ascending order. Combined applications (SA at 200 ppm+ fenugreek seed sprout at 0.1%, SA at 200 ppm+ turmeric extract at 0.1% and SA at 200 ppm+ rocket seed sprout at 0.1%) were favourable than using each material alone in this respect. Subjecting Superior grapevines grown under Minia region conditions three times (growth start, just after berry setting and three weeks later) with a mixture of salicylic acid at 200 ppm and fenugreek seed sprout at 0.1% at was responsible for improving yield and quality of the berries.
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1. Introduction:

Recently, salicylic acid and plant extracts such as oils and seed sprouts are greatly useful for improving the production of the different grapevines as alternative to chemical fertilizers that cause huge pollution in our environment and had a inferior effect on nutritional status, yield and quality of different fruit crops.

The previous results showed that using crop seed sprouts was favourable in enhancing growth and tree nutritional status **Ahmed and Gad El- Kareem (2014)**, **El-Khawaga and Mansonr (2014), Mohamed, (2014), Refaai (2014 a and b), Abd El-Rahman (2015), Ahmed, (2015), Ahmed and Habasy- Randa (2017), Allam (2017)** and **Masoud (2017).**

Turmeric extract as mentioned by **Ahmed *et al.*, (2014), Osman (2014), Uwakiem (2014), Shoug (2015), Ahmed (2016), Abdelaziz *et al*., (2017a), Abd El-Hafiz (2017), Ebrahim-Rehab (2017)**, **Zagzog and Saied (2017)** and **Ahmed-Fatma (2018)** was found to enhance growth and tree nutritional status in different fruit crops.

The results of **El- Hanafy (2011)**, **El- Kady-Hanaa, (2011), Bondok- Sawsan *et al,* (2011), Mohamed- Ebtesam (2012), Gad El- Kareem and Abd El- Rahman (2013), Osman (2014), Abd El-Rady (2015)** and **Mohamed – Attiat, (2016)** emphasized the essential effect of salicylic acid on growth and tree nutritional status in different fruit crops.

The aim of this present study was evaluate the effect of rocket and fenugreek seed sprouts, turmeric extract and salicylic acid on vegetative growth characteristics, vine nutritional status, yield and berries quality of Superior grapevines.

2. Material and Methods:

This study was carried out during 2016 and 2017 seasons on 96 uniform in vigour 10 -years old Superior grapevines grown at El- Hawarta village, Minia district, Minia Governorate. The texture of soil is clay. Cane pruning system with using Gable supporting method was adopted. Vine load was 72 eyes (6 fruiting canes x 10 eyes + 6 renewal spurs x two eyes). The vines are planted at 2 x 3 meters (700 vines / fed.) Surface irrigation system using Nile water was followed.

1. Soil analysis:

Soil is classified as clay in texture with water table depth not less than two meters deep. Mechanical, physical and chemical analysis of the tested soil at 0.0 - 90 cm depth were carried out at the start of the

experiments according to the procedures that outlined by **Wilde *et al.*, (1985)** are given in **Table (1)**.

2- Common Horticultural practices:

Except those dealing with the present treatments (plant extracts and salicylic acid treatments), all the selected vines (96 vines) received the usual horticultural practices which are common used in the vineyard including the application of $20m^3$ F.Y.M. (0.25% N, 0.4 % P_2O_5 and 1.4 % K_2O), 150 kg ammonium nitrate (33.5 N), 200 kg triple calcium superphosphate (37.5 % P_2O_5) and 200 kg potassium sulphate (48% K_2O) per one feddan. Farmyard manure (F.Y.M.) was added once at the middle of Jan. Ammonium nitrate was splitted into three unequal batches and applied as 40% at growth start (1^{st} week of Mar.) 30 % just after berry setting and 30% three weeks later. Phosphate fertilizer was divided into two equal batches, the first with F.Y.M. (Mid. Jan.) and the second one just after berry setting (1^{st} week of May). Potassium fertilizer was divided into two equal batches and added at the first bloom (last week of March) and again immediately after berry setting (1^{st} week of May). Other horticultural practices such as irrigation, hoeing and pest management were carried out as usual.

Table (1): Analysis of the tested soil:

Constituents	Values
Particle size distribution	
Sand %	4.2
Silt %	24.3
Clay %	71.5
Texture	Clay
pH (1: 2.5 extract)	7.3
EC (1: 2.5 extract) mmhos/ 1 cm 25^{o}cm	0.74
Total CaCO3 %	1.80
O.M. %	1.92
Total N %	0.09
P ppm (Oslen)	5.0
K ppm (ammonium acetate)	612.0
Mg (ppm)	6.2
Available micronutrients (EDTA, ppm):	
Fe	4.0
Zn	3.2
Mn	5.5

3- Experimental work:

The present experiment included the following sixteen treatments from rocket and fenugreek seed sprouts, turmeric extract and salicylic acid:

1- Control (untreated trees).
2- Spraying rocket seed sprout at 0.05%.
3- Spraying rocket seed sprout at 0.1%.
4- Spraying Rocket sprout at 0.2%.
5- Spraying salicylic acid at 100 ppm .
6- Spraying salicylic acid at 200 ppm.
7- Spraying salicylic acid at 400 ppm.
8- Spraying turmeric extract at 0.05%.
9- Spraying turmeric extract at 0.1%.
10- Spraying turmeric extract at 0. 2%.
11- Spraying fenugreek seed sprout at 0.05%.
12- Spraying fenugreek seed sprout at 0.1%.
13- Spraying fenugreek seed sprout at 0.2%.
14- Spraying salicylic at 200 ppm.+ rocket seed sprout at 0.1%.
15- Spraying salicylic at 200 ppm.+ turmeric extract at 0.1%.
16- Spraying salicylic at 200 ppm.+ fenugreek seed sprout at 0.1%.

Each treatment was replicated three times, two vines / each. The selected vines were sprayed three times with the investigated three plant extracts and salicylic acid at the growth start (1^{st} week of March.), just after berry setting (middle of April), and 21 days after berry setting (first week of May). Extracts of the two seed sprouts namely rocket and fenugreek were prepared by germinating of the seeds and when the plant height reached ten cm, they were harvested and put in the refrigerator at C0 till use. As the time of application they were blended in electric blinder. Salicylic acid at the assigned amounts was dissolved in ethyl alcohol and the pH of solution was adjusted to 6.5 with NaOH. Triton B as a wetting agent was added to all plant extract solutions at 0.05 % and spraying was done till runoff (5 L water/ vine). The untreated vines received water containing Triton B.

Analysis of fenugreek and rocket seed sprouts and turmeric extract are given in Tables (2 & 3 & 4)**.**

Table 2: Chemical composition of fenugreek seed sprout

Constituent Values	(mg/ 100 g F.W.)
Aspartic acid	**2.2**
Arginine	**2.1**
Alanine	**2.9**
Isoleucine	**2.1**
Cysteine	**1.9**
Cystine	**1.8**
Glutamic acid	**2.0**
Methionine	**6.0**
Lysine	**5.1**
Vitamin A	**1.0**
Vitamin B1	**0.32**
Vitamin B2	**0.30**
Vitamin B6	**1.0**
Vitamin C	**2.0**
Ca	**220**
P	**341**
K	**469**
Mg	**371**
Fe	**242**
Phytic acid	**0.9**
Niacin	**1.4**

Table 3: Chemical composition of rocket seed sprout

Constituent Values	(mg/ 100 g F.W.)
Riboflavin	**0.15**
Cysteine	**3.9**
Cystine	**4.1**
Glutamic acid	**3.5**
Methionine	**3.8**
Thamine	**0.16**
Vitamin A	**4.4**
Vitamin E	**0.94**
Vitamin C	**101**
P	**1410**
K	**496**
Mg	**460**
Fe	**267**
Mn	**16**
Zn	**255**

Table 4: Chemical composition of Turmeric

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

4- Experimental design:

A randomized complete block design was followed where this experiment included sixteen treatments each replicated three times, two vines per each.

5- Differential measurements:

During the two seasons, the following measurements were recorded:

5-1 Measurements of berry setting %:

It was calculated by caging five clusters/ vine in perforated white paper bags before blooming stage. At the end of berry setting stage, the bags were removed for counting:

a) The number of attached berries.

b) The number of dropped berries

c) The number of dropped flowers.

d) The number of total flowers (a+ b+ c) / cluster Percentage of berry setting was estimated by dividing number of attached berries by total number of flowers / cluster and multiplying the product by 100.

5-5- Measurements of yield and berries quality:

5-5-1 Yield:

Harvesting took place when T.S.S/ acid ratio in the berries of the check treatment reached at least 25: 1 (at the middle of July in the three seasons) (according to **Weaver, 1976**). The yield of each vine was recorded in terms of weight (in kg.) and number of clusters per vine, and then the average weight of cluster was recorded (g.)

5-5-2 Berries quality:

Five clusters from each vine were taken at random for determination of the following physical and chemical characteristics of the berries:-

1. Shot berries.
2. Cluster dimensions (length and shoulder, cm.).
3. Average berry weight (g).
4. Average berry dimensions (longitudinal and equatorial, in cm).
5. Percentage of total soluble solids in the juice by using handy refractometer.
6. Percentage of reducing sugars in the juice by **Lane and Eynon (1965)** volumetric method as described in **A.O.A.C. (2000).**
7. Percentage of total acidity (as g tartaric acid/ 100 ml juice) by titration against 0.1 NaOH using phenolphthalein as an indicator **A.O.A.C. (2000).**
8. The ratio between total soluble solids and acid.

6- Statistical analysis:

All the obtained data were tabulated and statistically analyzed using New L.S.D at 5% for made all comparisons among the investigated treatment means (according to **Snedecor and Cochran, 1972 and Mead *et al.*, 1993**).

3. Results and Discussion:

1-Berry setting:

It is clear from the obtained data in Table (5) that treating Superior grapevines three times with fenugreek and rocket seed sprouts and turmeric extract at 0.05 to 0.2% and/or salicylic acid at 100 to 400 ppm significantly enhanced the percentage of berry setting relative to the control. The stimulation on berry setting % was significantly related to the application of rocket seed sprout, salicylic acid (SA), turmeric extract and fenugreek seed sprout, in ascending order. There was a gradual and significant stimulation on this trait namely berry setting % with increasing concentrations of rocket and fenugreek seed sprouts and turmeric extract from 0.05 to 0.2% and salicylic acid from 100 to 400 ppm. However, meaningless promotion was occurred on this parameter among the higher two concentrations of rocket and fenugreek seed sprouts and turmeric extract from 0.1 to 0.2% and salicylic from 200 to 400 ppm. Combined applications of SA plus rocket, fenugreek seed sprouts and turmeric extract was significantly favourable than using each material alone in enhancing berry setting %. Using SA at 200 ppm + rocket seed sprout at 0.1%, SA at 200 ppm+ fenugreek seed sprout at 0.1%, in ascending order gave the highest values of percentage of berry setting. The highest values of berry setting % **(17.3 & 17.2%)** were recorded on the vines that received SA at 200 ppm+ fenugreek seed sprout at 0.1%. The untreated vines produced the minimum values **(9.1 & 8.9%)** during both seasons, respectively. These results were true during both seasons.

2- Yield and cluster weight and dimensions.

As Shown in Table (5) yield expressed in weight and number of clusters/ vine as well as weight, length and shoulder of cluster were significantly improved due to treating the vines with single and combined application of fenugreek and rocket seed sprouts and turmeric extract each at 0.05 to 0.2% and salicylic acid at 100 to 400 ppm relative to the control treatment. The beneficial effects of these materials on enhancing yield and cluster aspects could be arranged as follows, in ascending order rocket seed sprout, SA, turmeric extract and fenugreek seed sprout. Significant differences on these parameters were observed among all concentrations of rocket and fenugreek seed sprout, turmeric extract and SA except among the higher two concentrations of each material (0.1 and 0.2 % for all plant extracts and 200 and 400 ppm for SA). Therefore, from economical point of view, it is suggested to use rocket and fenugreek seed sprouts and turmeric extract at 0.1 % and SA at 200 ppm. The maximum yield/ vine **(10.3 & 15.0 kg)** were recorded on the vines that received a mixture of SA at 200 ppm+ fenugreek seed sprout at 0.1 % during both seasons, respectively. The second best treatment in this respect was the application of SA at 200 ppm+ turmeric extract at 0.1 %. The untreated vines produced **7.2 & 6.6 kg** during both seasons, respectively. The percentage of increment on the yield due to using best treatment (SA at 200 ppm+ fenugreek seed sprout at 0.1 %) above the control treatment reached **43.1 and 127.0%** during both seasons, respectively. These results were true during both seasons.

3- Shot berries.

As shown in Table (6) subjecting the vines to rocket and fenugreek seed sprouts and turmeric extract at 0.05 to 0.2 % and / or SA at 100 to 400 ppm significantly controlled the percentage of shot berries relative to the control treatment. The redaction on shot berries was significantly related to the application of rocket seed sprout, SA, turmeric extract and fenugreek seed sprout, in ascending order. Increasing concentrations of both materials were accompanied with a gradual reduction on the percentage of shot berries. Combined applications were significantly favourable for reducing shot berries than using each material alone. The lowest values of shot berries **(4.0 & 3.0 %)** were appeared on the clusters of the vines received SA at 200 ppm + fenugreek seed sprout at 0.1%. The highest values **(11.1 & 11.3 %)** of shot berries % were recorded on the veins that unsupplied with these materials (Control) during both seasons, respectively. These results were true during both seasons.

4- Quality of the berries.

One can state from the obtained data in Table (6 & 7) that single and combined applications of rocket and fenugreek seed sprouts and turmeric extract at 0.05 to 0.2 % and SA at 100 to 400 ppm significantly was very effective in enhancing quality of the berries in terms of increasing beery weight and dimensions (longitudinal and equatorial), T.S.S. %, reducing sugars %, T.S.S/acid and decreasing total acidity% relative to the control treatment. The promotion on berries quality was significantly correlated to the increase in the concentrations of each material. Increasing concentrations of rocket and fenugreek seed sprouts from 0.1 to 0.2% and SA from 200 to 400 ppm had negligible promotion on quality of the berries. The best materials for enhancing quality of the berries were fenugreek seed sprout, turmeric extract, SA and rocket seed sprout, in descending order. Combined application of SA with any plant extract significantly was responsible for improving quality of the berries relative to the application of each material alone. The best results were due to treating the vines with SA at 200 ppm + fenugreek seed sprout at 0.1 % followed by SA at 200 ppm+ turmeric extract. The untreated vines produced

unfavorable effects on quality of the berries. These results were true during both seasons.

4. Discussion:

The use of natural products is horticultural practice instead of other synthetic chemical products is becoming a main target for many fruit crop species, where, the world markets has been growing rapidly in recent years for organic fruit production (**Dimitri and Oberholtzer, 2006**).

Recently, plant extracts are used for improving production and storability of grapes instead of using chemicals. The change for using plant extract against chemicals was performed because pathogens resistance to the fungicides has developed as well as for protecting our environment from pollution. The higher own content of these plant extracts from plant pigments, phenolic compounds and essential oils seem to have synergistic effects on the growth and yield of grapevines. (**Kirtikare and Basu, 1984, Maia *et al.*, 2014 and Dhekney, 2016)**.

It is Vegetative part of turmeric, oleoresin and oil. The oleoresin is a mixture of compounds, namely curcumin volatile oil and other active ingredients, non- volatile fatty resinous material (**Govindarajan, 1980**). Turmeric contains 0.5 % volatile oil. This oil contains about 60% turmeric, 25% zingiberene and small quantities d- & - phellandrene, d-sabiene, cineole and forneol. Turmeric is valued mainly for its principle coloruing pigments, curcumin which imports the yellow clour to turmeric, besides nutritive constituents like potassium. The main colouring constituents of turmeric and other yellow *Curcuma* species are curcumins, demethoxycurumin, methane and bisdemethoxy curumin together make the colouring pigment in the turmeric rhizomes (**Peter, 1999**).

Germination and sprouting of different crop seed may change the content and composition of foods namely proteins, fats and amino acids and enhances the building and biosynthesis of essential amino acids like glutamic acid, tryptophan, arginine, methionine and lysine, vitamin B & C and all macro and micro nutrients and makes them high available to the trees **(Cazuola *et al.*, 2004; Cairney, 2005; Biommerson, 2007; Abdallah, 2008 and Anwar *et al.*, 2013)**.

Salicylic acid (SA) from latin salix willow trees is widely used in organic synthesis and function as a plant hormone. It is derived from the metabolism of salicin. It had the formula C_6H_4 (OH) COOH ($C_7H_6O_3$). It is a phenolic phytohormone and is found in plants with role in plant growth development, photosynthesis, transpiration as well as uptake and transport of nutrients. SA also induces specific changes in leaf anatomy and chloroplast structure. It is involved in endogenous signaling mediating in plant defense against pathogens. It is biosynthesized from the amino acids phenylalanine (**Taiz and Zeiger, 2002; Lobez- Delgado *et al.*, 2007; Hayat and Ahmed, 2007 and Joseph *et al.*, 2010)**.

Table (5): Effect of single and combined applications of salicylic acid and some plant extracts on the percentage of berry setting, yield and cluster aspects of Superior grapevines during 2016 and 2017 seasons

Treatments	Berry setting %		No. of. Clusters/ vine		Yield/vine (kg)		Cluster weight (g)		Cluster length (cm)		Cluster shoulder (cm)	
	2016	2017	2016	2017	2016	2017	2016	2017	2016	2017	2016	2017
Control.	9.1	8.9	23.0	22.0	7.2	6.6	315.0	301.0	15.1	15.2	8.9	9.0
Spraying rocket sprout at 0.05%	9.8	10.0	23.0	25.0	7.5	7.7	325.0	309.0	15.5	15.6	9.2	9.3
Rocket sprout at 0.1%	10.6	10.8	23.0	27.0	7.5	8.6	326.0	320.0	16.0	16.2	9.5	9.6
Rocket sprout at 0.2%	10.7	11.0	23.0	27.0	7.5	8.8	327.0	325.0	16.1	16.3	9.8	9.9
Salicylic acid at 100 ppm.	11.6	11.9	23.0	29.0	7.8	8.9	340.0	338.0	16.6	16.8	10.1	10.2
Salicylic acid at 200 ppm.	12.4	12.7	23.0	29.0	8.1	10.0	350.0	345.0	17.2	17.5	10.4	10.5
Salicylic acid at 400 ppm.	12.5	12.8	23.0	29.0	8.1	10.0	351.0	346.0	17.3	17.6	10.5	10.6
Turmeric extract at 0.05%	13.3	13.6	23.0	31.0	8.3	11.1	362.0	359.0	18.0	18.1	10.8	10.9
Turmeric extract at 0.1%	14.0	14.2	23.0	31.0	8.6	11.5	372.0	371.0	18.5	18.6	11.0	11.0
Turmeric extract at 0. 2%	14.1	14.3	23.0	31.0	8.6	11.5	373.0	371.0	18.6	18.7	11.1	11.1
Fenugreek sprout at 0.05%	14.8	15.0	23.0	33.0	8.8	12.6	383.0	382.0	19.1	19.3	11.4	11.5
Fenugreek sprout at 0.1%	14.9	15.1	23.0	33.0	9.1	13.0	394.0	393.0	19.5	19.7	11.8	11.7
Fenugreek sprout at 0.2%	15.0	15.2	23.0	33.0	9.1	13.0	395.0	395.0	19.6	19.8	11.9	11.8
Salicylic at 200 ppm.+ rocket at 0.1%	15.7	16.0	24.0	35.0	9.8	14.4	410.0	411.0	20.9	21.0	12.3	12.4
Salicylic at 200 ppm.+ turmeric at 0.1%	16.5	16.6	24.0	35.0	10.1	14.7	419.0	420.0	22.8	22.9	12.5	12.7
Salicylic at 200 ppm.+ fenugreek at 0.1%	17.3	17.2	24.0	35.0	10.3	15.0	428.0	429.0	24.0	23.9	12.7	13.0
New L.S.D. at 5%	**0.7**	**0.6**	**NS**	**2.0**	**0.3**	**0.3**	**8.1**	**6.9**	**0.4**	**0.3**	**0.2**	**0.3**

Table (6): Effect of single and combined applications of salicylic acid and some plant extracts on the percentage of shot berries as well as berry weight and dimensions of Superior grapevines during 2016 and 2017 seasons

Treatments	Shot berries %		Berry weight (g)		Berry longitudinal (cm)		Berry equatorial (cm)	
	2016	2017	2016	2017	2016	2017	2016	2017
Control.	11.1	11.3	3.14	3.15	2.11	2.11	1.94	1.93
Spraying rocket sprout at 0.05%	10.7	10.0	3.25	3.25	2.16	2.18	1.97	1.96
Rocket sprout at 0.1%	10.4	9.7	3.36	3.36	2.20	2.22	2.00	1.99
Rocket sprout at 0.2%	10.3	9.7	3.37	3.38	2.21	2.23	2.01	2.00
Salicylic acid at 100 ppm.	10.0	9.3	3.47	3.47	2.26	2.28	2.04	2.04
Salicylic acid at 200 ppm.	9.5	8.8	3.58	3.58	2.31	2.33	2.08	2.07
Salicylic acid at 400 ppm.	9.4	8.7	3.60	3.61	2.32	2.33	2.09	2.09
Turmeric extract at 0.05%	8.9	8.2	3.71	3.71	2.37	2.38	2.14	2.15
Turmeric extract at 0.1%	8.5	7.8	3.81	3.80	2.42	2.41	2.17	2.17
Turmeric extract at 0. 2%	8.4	7.7	3.82	3.82	2.43	2.44	2.18	2.19
Fenugreek sprout at 0.05%	7.0	6.3	3.94	3.95	2.48	2.49	2.23	2.25
Fenugreek sprout at 0.1%	6.0	5.3	4.05	4.07	2.52	2.53	2.27	2.26
Fenugreek sprout at 0.2%	5.8	5.1	4.06	4.08	2.53	2.54	2.28	2.29
Salicylic at 200 ppm.+ rocket at 0.1%	5.0	4.3	4.14	4.15	2.58	2.59	2.33	2.34
Salicylic at 200 ppm.+ turmeric at 0.1%	4.5	3.8	4.25	4.27	2.63	2.64	2.39	2.40
Salicylic at 200 ppm.+ fenugreek at 0.1%	4.0	3.0	4.39	4.38	2.69	2.70	2.41	2.41
New L.S.D. at 5%	**0.3**	**0.4**	**0.10**	**0.09**	**0.04**	**0.05**	**0.04**	**0.03**

Table (7): Effect of single and combined applications of salicylic acid and some plant extracts on some chemical parameters of the berries of Superior grapevines during 2016 and 2017 seasons.

Treatments	T.S.S %		Reducing sugars %		Total acidity %		T.S.S/acid	
	2016	2017	2016	2017	2016	2017	2016	2017
Control.	17.1	16.9	14.1	13.9	0.684	0.675	25.0	25.0
Spraying rocket sprout at 0.05%	17.5	17.4	14.4	14.2	0.671	0.670	26.1	26.0
Rocket sprout at 0.1%	18.0	18.0	14.7	14.5	0.659	0.658	27.3	27.4
Rocket sprout at 0.2%	18.1	18.1	14.8	14.9	0.658	0.656	25.5	27.6
Salicylic acid at 100 ppm.	18.5	18.5	15.3	15.0	0.646	0.644	28.6	28.7
Salicylic acid at 200 ppm.	19.0	19.0	15.7	15.6	0.631	0.630	30.1	30.2
Salicylic acid at 400 ppm.	19.1	19.1	15.8	16.2	0.629	0.628	30.4	30.4
Turmeric extract at 0.05%	19.6	19.8	16.4	16.3	0.609	0.609	32.2	32.5
Turmeric extract at 0.1%	20.1	20.3	16.8	17.0	0.591	0.594	34.0	34.2
Turmeric extract at 0. 2%	20.2	20.4	16.9	17.5	0.588	0.592	34.4	34.5
Fenugreek sprout at 0.05%	20.6	20.9	17.4	17.6	0.570	0.569	36.1	36.7
Fenugreek sprout at 0.1%	21.0	21.4	18.0	17.8	0.560	0.558	37.5	38.4
Fenugreek sprout at 0.2%	21.1	21.5	18.1	17.9	0.559	0.557	37.7	38.6
Salicylic at 200 ppm.+ rocket at 0.1%	21.6	22.0	18.5	18.3	0.540	0.540	40.0	40.7
Salicylic at 200 ppm.+ turmeric at 0.1%	22.1	22.5	18.8	18.6	0.529	0.528	41.8	42.6
Salicylic at 200 ppm.+ fenugreek at 0.1%	22.2	23.0	19.2	19.0	0.509	0.517	43.6	44.5
New L.S.D. at 5%	**0.3**	**0.2**	**0.2**	**0.2**	**0.10**	**0.011**	**0.9**	**1.0**

There is increasing interest in the interactive role between salicylic acid and reactive oxygen species (ROS) and other plant signalling molecules in regulating cell death in plants. Initial evidence suggested that salicylic acid was a potent inhibitor of heme- containing enzymes such as catalase and ascorbate peroxidase thus capable of stimulating ROS accumulation during various biotic and abiotic stress conditions. The mode of action of salicylic acid may in fact be related to its ability to prime the defense response by increasing the levels of various defense compounds. Salicylic acid was also proposed as both a potent inducer of NADPH oxidase and an inhibitor of the alternative oxidase thus capable of indirect regulation of the redox status of plant cells (**Hayat and Ahmed, 2007).**

The current results showed that the beneficial effects of crop seed sprouts on yield and berries quality are in concordance with those obtained by **Ahmed and Gad El- Kareem (2014)**, **El-Khawaga and Mansonr (2014), Mohamed, (2014) Refaai (2014 a and b), Ahmed, (2015**) **Abd El-Rahman (2015), Ahmed and Habasy- Randa (2017), Allam (2017)** and **Masoud (2017),** turmeric extract **Ahmed *et al.*, (2014), Osman (2014), Uwakiem (2014), Shoug (2015), Ahmed (2016), Abdelaziz *et al*., (2017a), Abd El-Hafiz (2017), Ebrahim-Rehab (2017)**, **Zagzog and Saied (2017)** and **Ahmed-Fatma (2018)**, salicylic acid **El- Hanafy (2011)**, **El- Kady-Hanaa, (2011), Bondok - Sawsan *et al,* (2011), Mohamed - Ebtesam (2012), Gad El- Kareem and Abd El- Rahman (2013), Osman (2014), Abd El-Rady (2015)** and **Mohamed – Attiat, (2016**).

5. Conclusion:

For improving yield and berries quality of Superior grapevines grown under Minia district and at the same time for reducing our environmental pollution, it is recommended to spray a mixture of salicylic acid at 200 ppm and fenugreek seed sprout at 0.1% at growth start, just after berry setting and three weeks later was responsible.

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