

Using Plant Extracts and Chemical Rest Breakages for Breaking Bud Dormancy and Improving Productivity of Superior Grapevines Growing Under Hot Climates

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Abstract: During 2012 & 2013 seasons, Superior grapevines growing under hot climates were exposed to ten plant extracts namely turmeric at 5%; cinnamon at 10%, ginger at 10%, colocynth at 5%; nigella at 5%, olive at 5%, clove at 5% , garlic at 5% , red chillies at 5%; and coffee at 10% as well as four chemical agents namely H₂O₂ at 10%, salicylic acid at 5 to 10%; thiourea at 2 to 8% and Dormex at 1 to 65. The vines received one spray when they received 200 and 210 chilling hours during 2012 and 2013 season , respectively (14th Jan.). The merit was testing the effect of these rest breakages on breaking dormancy and improving yield and quality of such grapevine cv. Using all natural and chemical rest breakages was very effective in breaking bud dormancy, hastening maturity and improving the yield and quality of the berries over the check treatments. The promotion was associated with using Dormex, thiourea, salicylic acid, H₂O₂ and plant extracts, in descending order. The best four plant extracts were coffee, red chillies, garlic and clove, in descending order. The best results with regard to breaking dormancy and promoting yield and quality of Superior grapevines growing under hot climates were obtained with using Dormex at 4% when the vines received 200 or 210 chilling hours (14th of Jan.). This study gives evidence to the possibility of using plant extracts as coffee, red chillies, garlic and clove as naturals and safety substances in breaking bud dormancy .

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1. Introduction

Since, the winter in Egypt is short and does not meet the requirements of the buds from chilling units, the delay in bud breaking of Superior grapevines growing under hot climates up till later winter exposes buds to damage under the influence of high temperature and/ or delays them in entering in dormancy in the following year leads to some physiological defects that may result in weakness and threatens the grapevine productivity. Nowadays, chemical rest breakages as dormex and thiourea are recommended for bud break induction and yield promotion in grapevines (El- Halaby, 2006; Abdalla, 2007; Mekawy, 2008; El- Sawy, 2009 and Hussien, 2009).

Due to the great toxicity and expensive for these compounds, these is a necessity for searching of new natural agents for dormancy break that are easily available, effective, low toxic and used in low concentrations such as turmeric, cinnamon, ginger, colocynth, nigella, olive, clove, red chillies, coffee and garlic for their higher own content of volatile compounds, plant pigments , tannins, phenol compounds, plant pigments, antioxidants, vitamins and different nutrients (Mekawy, 2008; Botelho *et al.*,

2009; Corrales- Maldonado *et al.*, 2010; Botelho *et al.*, 2010 and Biazzi *et al.*, 2010).

Salicylic acid has an announced role in reducing the activity of catalase and increasing the release of H₂O₂. It is a new plant hormone and has been shown to interfere with the biosynthesis and / or action of ethylene, ABA, and cytokinins. Also, it is responsible for inhibiting abiotic stress (Raskin *et al.*, 1990 and Joseph *et al.*, 2010). Application of salicylic acid has many important regulatory effects on enhancing growth, yield and quality of berries in different grapevine cvs (Abd El- Kareem, 2009; El- Kady-Hanaa, 2011, El- Hanafy, 2011 and Mohamed-Ebtesam, 2102).

The target of this study was examining the effect of some plant extracts and chemical rest breakages on breaking bud dormancy and improving productivity of Superior grapevines growing under hot climates.

2. Material and Methods

This study was carried out during 2012 and 2013 seasons on sixty- three uniform in vigour 15- years old Superior grapevines in a private vineyard located at Armant El- Hayet district, Luxor governorate. The texture of the soil is sandy. The chosen vines are spaced at 2 x 3 meters apart. Cane pruning method was

followed (1st week of Jan.) leaving 84 eyes (on the basic of six fruiting canes x twelve eyes plus six renewal spurs x two eyes) with the assistance of Gable supporting system. Irrigation was carried out using drip irrigation system. All the selected vines received regular and horticultural practices that already applied in the vineyard except those dealing with using rest breakages.

This study included the following twenty one treatments from different natural and chemical rest breakages.

- 1- Control (sprayed with water vines).
- 2- Spraying turmeric extract at 5%.
- 3- Spraying cinnamon extract at 10%.
- 4- Spraying ginger extract at 10%.
- 5- Spraying colocynth extract at 5 %.
- 6- Spraying nigella oil at 5 %.
- 7- Spraying olive oil at 5 %.
- 8- Spraying clove oil at 5 %.
- 9- Spraying garlic oil at 5 %.
- 10- Spraying red chillies at 5 %.
- 11- Spraying coffee extract at 10 %.
- 12- Spraying hydrogen peroxide at 10 %.
- 13- Spraying salicylic acid at 5 %.
- 14- Spraying salicylic acid at 10 %.
- 15- Spraying thiourea at 2 %.
- 16- Spraying thiourea at 4 %.
- 17- Spraying thiourea at 8 %.
- 18- Spraying Dormex at 1 %.
- 19- Spraying Dormex at 2 %.
- 20- Spraying Dormex at 4 %.
- 21- Spraying Dormex at 6 %.

Each treatment was replicated three times, one vine per each. Salicylic acid was solubilized in few drops of ethyle alcohol. All natural and chemical rest breakages were applied once (14th Jan.) when the vines received 200 and 210 chilling hours at equal or below 7.2 °C during both seasons, respectively. Accumulated chilling hours (200 or 210) at equal or below 7.2 °C at the time application were recorded by using hours per day by a thermohumidigraph apparatus. Triton B as wetting agent at 0.05% was added to all rest breakages. The untreated vines sprayed with water containing Triton B at 0.05%.

Randomized, complete block design (RCBD) was followed.

During both seasons, the following measurements were recorded:

1- Behaviour of buds traits namely percentages of bud burst and fruiting buds, start and end of bud burst as well as durations of buds burst and blooming (in days).

2- Vegetative growth characters namely leaf area (**Ahmed and Morsy, 1999**), main shoot length (cm.), number of leaves per shoot, wood ripening coefficient, (**Bouard, 1996**), pruning weight (kg.) per vine and cane thickness (cm).

3- Plant pigments namely chlorophylls a & b and total chlorophylls (mg/ 100 g F.W.). (**Von- Wettstein, 1957**) in the fresh leaves.

4- Percentages of N, P and K in the leaves (**Wilde et al., 1985**).

5- Percentage of berry setting as well as yield expressed in weight (kg.) and number of clusters / vine.

6- Cluster weight (g.) and dimensions (cm, length & width).

7- Harvesting date.

8- Percentage of shot berries.

9- Some physical and chemical characteristics of the berries namely berry weight (g.) and dimensions (in cm longitudinal and equatorial), T.S.S. %, total acidity % (as tartaric acid /100 ml juice, T.S.S./ acid and reducing sugars (**A.O.A.C., 2000**).

Statistical analysis was done (**Mead et al., 1993**) and treatments means were compared using new L.S.D. at 5%.

3. Results and Discussion

1- Behaviour of buds:

It is clear from the data in Tables (1 & 2) that exposing the vines with most natural and chemical rest breakage significantly improved percentages of bud burst and fruiting buds over the check treatment. Using the six plant extracts namely olive oil, nigella oil, colocynth extract, ginger extract, cinnamon extract and turmeric extract significantly increased durations of bud burst and blooming and delayed date of start and end of bud burst over all treatments including the control. Using the four chemical rest breakages namely H₂O₂, salicylic acid, thiourea or dormex was significantly superior than using the ten plant extracts in breaking dormancy and enhancing percentages of bud break and fruiting buds. The best chemical agent was dormex followed by thiourea. The best four plant extracts in this connection were clove oil, garlic oil, red chillies extract and coffee extract, in ascending order. The advancement in bud burst and blooming was associated with increasing concentrations of the selected substances. The best results were recorded on the vines that received Dormex at 4% (since no significant effect was detected among using 4 or 6% Dormex). The control vines effectively delayed bud burst and blooming and reduced percentages of bud burst and fruiting buds. These results were true during both seasons.

2-Vegetative growth characters:

It is evident from the data in Tables (3 &4) that subjecting Superior grapevines with all plant extracts and chemical rest breakages significantly stimulated the leaf area, main shoot length, number of leaves/shoot, wood ripening coefficient, prunings weight and cane thickness over the check treatment. Application of the four chemical rest breakages significantly surpassed the application of the ten plant extracts in enhancing growth characters. The best chemical agent was dormex followed by thiourea. The best four plant extracts were clove oil, garlic oil, red chillies extract and coffee extract, in ascending order. Group containing olive oil, nigella oil, colocynth extract, ginger extract, cinnamon extract and turmeric extract occupied the second position in this respect. They have the same trend . Using turmeric extract ranked the last position, among all plant extracts. Using H₂O₂ occupied the last position among all chemical agents in this respect. The maximum values were recorded on the vines that received Dormex at 6 %. The untreated vines produced the lowest values. These results were true during both seasons.

3- Leaf chemical composition:

Data in Tables (5 &6) obviously reveal that supplying the vines after winters pruning with the ten plant extracts and the four chemical rest breakages significantly was accompanied with enhancing chlorophylls a & b, total chlorophylls and percentages of N, P and K in the leaves rather than the control treatment. Using chemical rest breakages was significantly superior than using plant extracts in enhancing these components. Using the four plant extracts namely coffee extract, red chillies extract, garlic oil and clove oil was significant very effective in enhancing plant pigments and nutrients in the leaves rather than the rest natural breakages. The best results were obtained due to using dormex at 1 to 6%, thiourea at 2 to 8% , salicylic acid at 5 to 10%, H₂O₂ at 10% and plant extracts namely coffee extract at 10% , red chillies at 5% and garlic oil at 5%, in descending order. Using turmeric extract at 5% occupied the last position in this respect. The maximum values were recorded on the vines that treated with Dormex at 6%. The lowest values were recorded on untreated vines. These results were true during 2012 & 2013 seasons.

4- Berry setting %, yield as well as cluster weight and dimensions:

It is evident from the data in Tables (7 &8) that spraying natural and chemical rest breakages at various concentrations significantly improved the percentage of berry setting, yield, number of clusters per vine as well as cluster weight and dimensions (length and width) rather than the control treatment. Using chemical rest

breakages was significantly preferable than using natural extracts in this connection. The perferability of chemical agents in this respect could be arranged as follows in descending order dormex at 1 to 6%, thiourea at 2 to 8%, salicylic acid at 5 to 10% and H₂O₂ at 10% . Using coffee extract at 10%, red chillies at 5% , garlic oil at 5% and clove oil at 5% significantly were preferable in improving berry setting, yield and cluster characters rather than using the other plant extracts namely olive oil, nigella oil, colocynth, ginger, cinnamon and turmeric. The promotion was associated with increasing concentrations of dormex, thiourea and salicylic acid. No significant promotion was detected among the higher two concentrations of dormex, thiourea and salicylic acid. From economical point of view using, dormex at 4% gave the maximum values of yield (7 and 11.7 kg) during both seasons respectively. The untreated vines produced 9 and 5.3 kg yields during both seasons, respectively. The percentages of increase on the yield due to application of Dormex at 4% (the best treatment) reached 42.9 and 120.7% during both seasons, respectively. Similar results are announced during both seasons.

5- Harvesting date:

Table (9) shows that using plant extracts namely coffee, red chillies, garlic and clove and all chemical rest breakages significantly was followed by advancing harvesting date over the check treatment. Using extracts of turmeric, cinnamon, ginger, colocynth, nigella and olive significantly was followed by delaying harvesting date rather than the check treatment. Generally, using chemical rest breakages was significantly favourable than using plant extracts in enhancing harvesting date. The best chemical agent in hastening harvesting date was Dormex at 1 to 6% while coffee, red chillies, garlic oil and clove oil ranked the first position in this respect comparing with the other plant extract. The best advancement on harvesting date was presented on the vines that received dormex at 4%. The vines that sprayed with turmeric extract harvested lately. These results were true during both seasons.

6- Percentage of shot berries:

Data in Table (9) clearly show that spraying the vines with all plant extracts and chemical rest breakages significantly was followed by reducing the percentage of shot berries over the check treatment. A significant reduction was observed on such phenomenon with using chemical rest breakages rather than using natural extracts. Using dormex at 1 to 6% was significantly favourable than using any other chemical rest breakages. The best plant extracts in reducing shot berries were coffee extract; red chillies extracts, garlic oil and clove oil , in descending order.

Using turmeric extract at 5% ranked the last position in this respect. Using dormex at 4% gave the lowest values (since no significant reduction on shot berries was observed among using 4 and 6% dormex). Under such promised treatment, shot berries reached 2.1 and 2.2 % while under untreated vines reached 8.1 and 8.3% during both seasons, respectively. These results were true during both seasons.

7- Physical and chemical characteristics of the berries

Data in Tables (9 & 10 & 11) clearly show that spraying all plant extracts and chemical rest breakages significantly improved weight, longitudinal and equatorial of berry over the check treatment. However, with regarding to chemical characteristics of the berries using plant extracts except turmeric, cinnamon, ginger, colocynth, nigella and olive and all chemical rest breakages significantly was followed by enhancing

T.S.S. %, T.S.S./ acid and reducing sugars % and decreasing total acidity % over the check treatment. Using the six plant extracts as rest breakages (turmeric, cinnamon, ginger, colocynth, nigella an olive) significantly was followed by reducing all chemical characteristics except total acidity % compared to using all rest breakages and control treatment. Using chemical breakages was significantly favourable than using plant extracts in this respect. The best chemical agent in promoting fruit quality was dormex at 1 to 6% followed by thiourea at 2 to 8%. Using coffee followed by red chillies was significantly very preferable than using any other plant extracts in enhancing quality of the berries. Unfavourable effects on chemical quality of the berries were received on the vines that received turmeric extract at 5%. The lowest values of weight, longitudinal and equatorial of berry were recorded on untreated vines. These results were true during both seasons.

Table (1): Effect of some chemical and natural rest breakages on the percentages of bud burst and fruiting buds as well as date of bud burst of Superior grapevines during 2012 & 2013 seasons.

Rest breakage treatments	Bud burst %		Fruiting buds %		Date of bud burst	
	2012	2013	2012	2013	2012	2013
1- Control	41.1	42.8	40.1	40.2	25Feb	27Feb
2- Turmeric ext. at 5%	44.1	45.8	41.2	41.2	15Mar	13Mar
3- Cinnamon ext. at 10%	44.2	45.9	41.3	41.3	14Mar	13Mar
4-Ginger ext. at 10%	44.5	46.0	41.5	41.5	13Mar	13Mar
Mar 5- Colocynth ext. at 5%	45.0	46.5	41.6	41.6	12 Mar	13Mar
6-Nigella oil at 5%	45.3	47.0	41.7	41.7	12 Mar	12Mar
7- Olive oil at 5%	45.6	47.2	41.7	42.0	11 Mar	12Mar
8-Clove oil at 5%	48.0	50.0	41.7	44.0	24Feb	25Feb
9-Garlic oil at 5%	48.9	50.3	41.8	44.3	24 Feb	25Feb
10-Red chillies at 5%	49.3	50.5	41.8	44.5	24 Feb	25Feb
11- Coffee ext. at 10%	49.9	50.7	41.9	44.6	24 Feb	25Feb
12-Hydrogenperoxide at 10%	51.9	54.5	41.9	46.0	21 Feb	21Feb
13- Salicylic acid at 5%	55.5	57.3	42.0	47.4	18 Feb	17Feb
14- Salicylic acid at 10%	56.0	58.0	42.0	47.5	18 Feb	17Feb
15- Thiourea at 2.0%	59.9	62.0	42.0	48.9	16 Feb	16Feb
16- Thiorea at 4.0%	63.0	64.3	42.0	50.3	15 Feb	15Feb
17- Thiourea at 8.0%	63.3	64.5	42.0	50.5	15 Feb	15Feb
18- Dormex at 1.0%	65.5	68.1	42.0	52.0	15 Feb	14Feb
19- Dormex at 2.0%	67.0	70.0	42.0	53.5	13 Feb	12Feb
20- Dormex at 4.0 %	69.9	73.0	42.0	54.7	11 Feb	10Feb
21- Dormex at 6.0%	70.0	73.3	42.0	55.0	11 Feb	10Feb
New L.S.D. at 5%	1.5	1.2	NS	0.9	—	—

Ext. Extract.

Table (2): Effect of some chemical and natural rest breakages on the date of bud burst end as well as duration of bud burst and blooming of Superior grapevines during 2012 & 2013 seasons.

Rest breakage treatments	Date of bud burst end		Duration of bud burst (dups)		Duration of blooming (daps)	
	2012	2013	2012	2013	2012	2013
1- Control	26Mar.	29Mar.	30.0	31.0	18.0	17.0
2- Turmeric ext. at 5%	16Apr.	15 Apr.	32.0	33.0	2.0	18.0
3- Cinnamon ext. at 10%	15Apr.	15 Apr.	32.0	33.0	2.0	18.0
4-Ginger ext. at 10%	14Apr.	15 Apr.	32.0	33.0	2.0	18.0
5- Colocynth ext. at 5%	13Apr.	15 Apr.	32.0	33.0	2.0	18.0
6-Nigella oil at 5%	13Apr.	14 Apr.	32.0	33.0	2.0	18.0
7- Olive oil at 5%	12Apr.	14 Apr.	32.0	33.0	20.0	18.0
8-Clove oil at 5%	20Mar.	22 Mar.	25.0	25.0	16.0	16.0
9-Garlic oil at 5%	20Mar.	22 Mar.	25.0	25.0	16.0	16.0
10-Red chillies at 5%	20Mar.	22 Mar.	25.0	25.0	16.0	16.0
11- Coffee ext. at 10%	20Mar.	22 Mar.	25.0	25.0	16.0	16.0
12- Hydrogen peroxide at 10%	14Mar.	13Mar.	22.0	20.0	14.0	15.0
13- Salicylic acid at 5%	9 Mar.	7 Mar.	20.0	18.0	12.0	13.0
14- Salicylic acid at 10%	9 Mar.	7 Mar.	20.0	18.0	12.0	13.0
15- Thiourea at 2.0%	4 Mar.	4 Mar.	17.0	16.0	12.0	12.0
16- Thiourea at 4.0%	1 Mar.	2 Mar.	15.0	15.0	11.0	12.0
17- Thiourea at 8.0%	1 Mar.	2 Mar.	15.0	15.0	11.0	12.0
18- Dormex at 1.0%	29Feb.	28Feb.	14.0	14.0	11.0	12.0
19- Dormex at 2.0%	25Feb.	24 Feb.	12.0	12.0	11.0	12.0
20- Dormex at 4.0 %	22Feb.	21 Feb.	11.0	11.0	11.0	12.0
21- Dormex at 6.0%	22Feb.	21 Feb.	11.0	11.0	11.0	12.0
New L.S.D. at 5%			1.0	1.2		

Ext. Extract.

Table (3): Effect of some chemical and natural rest breakages on the leaf area (cm²), main shoot length (cm.) and number of leaves per shoot of Superior grapevines during 2012 & 2013 seasons.

Rest breakage treatments	Leaf area (cm ²)		Main shoot length(cm.)		Number of leaves/shoot	
	2012	2013	2012	2013	2012	2013
1- Control	106.3	107.0	96.0	98.0	15.0	14.0
2- Turmeric ext. at 5%	108.0	108.7	97.5	99.5	16.1	16.5
3- Cinnamon ext. at 10%	108.3	109.0	97.7	99.8	16.1	16.5
4-Ginger ext. at 10%	108.5	109.2	98.0	100.0	16.1	16.5
5- Colocynth ext. at 5%	109.0	109.6	98.0	100.5	16.1	16.5
6-Nigella oil at 5%	109.0	109.7	98.0	100.6	16.1	16.5
7- Olive oil at 5%	109.0	110.0	98.0	101.0	16.1	16.5
8-Clove oil at 5%	111.0	112.0	99.9	103.0	17.5	17.9
9-Garlic oil at 5%	111.3	112.0	100.0	103.0	17.5	18.0
10-Red chillies at 5%	111.6	112.3	100.0	103.8	17.5	18.0
11- Coffee ext. at 10%	111.6	112.4	100.0	103.9	17.6	18.0
12- Hydrogen peroxide at 10%	114.3	116.0	102.7	105.0	19.0	19.6
13- Salicylic acid at 5%	116.0	116.0	104.0	106.9	20.0	20.6
14- Salicylic acid at 10%	116.3	116.6	104.3	107.0	20.0	20.7
15- Thiourea at 2.0%	118.6	118.9	107.0	108.9	21.6	22.0
16- Thiourea at 4.0%	120.1	121.8	109.0	110.2	22.7	23.0
17- Thiourea at 8.0%	120.3	122.0	109.3	110.3	23.0	23.3
18- Dormex at 1.0%	122.3	124.3	112.0	113.0	24.0	25.0
19- Dormex at 2.0%	124.5	126.2	114.9	114.4	25.0	26.0
20- Dormex at 4.0 %	126.6	128.9	118.0	116.0	26.0	27.0
21- Dormex at 6.0%	126.7	129.0	118.3	116.5	26.0	27.0
New L.S.D. at 5%	1.2	1.3	1.1	1.2	1.0	1.0

Ext. Extract.

Table (4): Effect of some chemical and natural rest breakages on wood ripening coefficient, pruning weight (kg.) and cane thickness (cm.) of Superior grapevines during 2012 & 2013 seasons.

Rest breakage treatments	Wood ripening coefficient		Prunings weight (kg.)		Cane thickness (cm.)	
	2012	2013	2012	2013	2012	2013
1- Control	0.511	0.521	1.69	1.71	1.00	1.01
2- Turmeric ext. at 5%	0.550	0.560	1.75	1.82	1.06	1.05
3- Cinnamon ext. at 10%	0.555	0.561	1.75	1.82	1.07	1.06
4-Ginger ext. at 10%	0.560	0.561	1.76	1.83	1.08	1.07
5- Colocynth ext. at 5%	0.561	0.562	1.77	1.85	1.10	1.11
6-Nigella oil at 5%	0.563	0.564	1.78	1.86	1.11	1.11
7- Olive oil at 5%	0.564	0.565	1.79	1.89	1.12	1.12
8-Clove oil at 5%	0.600	0.621	1.91	2.01	1.22	1.22
9-Garlic oil at 5%	0.601	0.622	1.92	2.02	1.23	1.23
10-Red chillies at 5%	0.602	0.623	1.93	2.04	1.24	1.25
11- Coffee ext. at 10%	0.603	0.624	1.94	2.06	1.25	1.25
12- Hydrogen peroxide at 10%	0.650	0.671	2.00	2.13	1.31	1.30
13- Salicylic acid at 5%	0.680	0.691	2.11	2.20	1.37	1.35
14- Salicylic acid at 10%	0.681	0.692	2.12	2.22	1.38	1.36
15- Thiourea at 2.0%	0.705	0.722	2.33	2.41	1.44	1.41
16- Thiorea at 4.0%	0.740	0.750	2.41	2.51	1.48	1.45
17- Thiourea at 8.0%	0.741	0.751	2.42	2.52	1.48	1.46
18- Dormex at 1.0%	0.771	0.781	2.59	2.69	1.52	1.51
19- Dormex at 2.0%	0.791	0.809	2.69	2.79	1.56	1.56
20- Dormex at 4.0 %	0.815	0.833	2.81	2.90	1.59	1.61
21- Dormex at 6.0%	0.816	0.835	2.82	2.92	1.60	1.62
New L.S.D. at 5%	0.020	0.022	0.05	0.06	0.04	0.05

Ext. Extract.

Table (5): Effect of some chemical and natural rest breakages on some plant pigments (mg/ 100 g F.W.) in the fresh leaves of Superior grapevines during 2012 & 2013 seasons.

Rest breakage treatments	Chlorophyll a (mg/ 100 g. F.W.)		Chlorophyll b (mg/ 100 g. F.W.)		Total Chlorophylls (mg/ 100 g. F.W.)	
	2012	2013	2012	2013	2012	2013
1- Control	12.3	13.0	7.9	8.2	20.2	21.2
2- Turmeric ext. at 5%	13.4	14.1	8.9	9.2	22.3	23.3
3- Cinnamon ext. at 10%	13.5	14.1	9.0	9.2	22.5	28.4
4-Ginger ext. at 10%	13.6	14.3	9.1	9.3	22.7	23.6
5- Colocynth ext. at 5%	13.7	14.4	9.2	9.4	22.9	23.8
6-Nigella oil at 5%	13.7	14.4	9.3	9.5	23.0	23.9
7- Olive oil at 5%	13.8	14.5	9.3	9.5	23.1	24.0
8-Clove oil at 5%	15.0	15.7	10.2	10.6	25.5	26.3
9-Garlic oil at 5%	15.1	15.8	10.3	10.7	25.4	26.5
10-Red chillies at 5%	15.2	16.0	10.4	10.8	25.6	26.8
11- Coffee ext. at 10%	15.3	16.0	10.5	10.9	25.8	26.9
12- Hydrogen peroxide at 10%	16.5	17.2	11.3	11.8	27.8	29.0
13- Salicylic acid at 5%	17.6	18.3	12.1	12.6	29.7	30.9
14- Salicylic acid at 10%	17.7	18.5	12.2	12.7	29.9	31.2
15- Thiourea at 2.0%	18.9	20.0	13.0	13.7	31.9	33.7
16- Thiorea at 4.0%	19.9	21.0	13.9	14.6	33.8	35.6
17- Thiourea at 8.0%	20.0	21.2	14.0	14.7	34.0	35.9
18- Dormex at 1.0%	21.0	22.3	14.9	15.8	35.9	38.1
19- Dormex at 2.0%	21.9	23.4	15.9	16.7	37.8	40.1
20- Dormex at 4.0 %	22.0	23.5	16.0	16.8	38.0	40.3
21- Dormex at 6.0%	22.1	23.6	16.1	16.9	38.2	40.5
New L.S.D. at 5%	0.9	1.0	0.7	0.8	1.1	1.0

Ext. Extract.

Table (6): Effect of some chemical and natural rest breakages on the percentages N, P and K in the leaves of Superior grapevines during 2012 & 2013 seasons.

Rest breakage treatments	Leaf N %		Leaf P %		Leaf K %	
	2012	2013	2012	2013	2012	2013
1- Control	1.71	1.80	0.19	0.18	1.11	1.13
2- Turmeric ext. at 5%	1.8	1.89	0.23	0.22	1.17	1.20
3- Cinnamon ext. at 10%	1.81	1.90	0.23	0.22	1.18	1.21
4-Ginger ext. at 10%	1.83	1.91	0.24	0.23	1.18	1.21
5- Colocynth ext. at 5%	1.84	1.92	0.25	0.24	1.19	1.22
6-Nigella oil at 5%	1.84	1.92	0.25	0.24	1.20	1.22
7- Olive oil at 5%	1.85	1.93	0.25	0.24	1.20	1.23
8-Clove oil at 5%	1.93	2.00	0.28	0.27	1.26	1.30
9-Garlic oil at 5%	1.94	2.01	0.28	0.28	1.27	1.31
10-Red chillies at 5%	1.95	2.02	0.28	0.28	1.28	1.31
11- Coffee ext. at 10%	1.96	2.03	0.28	0.28	1.28	1.32
12- Hydrogen peroxide at 10%	2.02	2.11	0.31	0.31	1.33	1.41
13- Salicylic acid at 5%	2.10	2.20	0.35	0.33	1.40	1.47
14- Salicylic acid at 10%	2.11	2.21	0.36	0.34	1.41	1.48
15- Thiourea at 2.0%	2.20	2.29	0.38	0.37	1.47	1.55
16- Thiorea at 4.0%	2.27	2.35	0.40	0.39	1.51	1.61
17- Thiourea at 8.0%	2.28	2.36	0.41	0.40	1.52	1.62
18- Dormex at 1.0%	2.39	2.44	0.43	0.42	1.60	1.71
19- Dormex at 2.0%	2.44	2.50	0.45	0.44	1.65	1.77
20- Dormex at 4.0 %	2.45	2.51	0.45	0.44	1.66	1.78
21- Dormex at 6.0%	2.46	2.52	0.46	0.45	1.67	1.79
New L.S.D. at 5%	0.06	0.05	0.02	0.02	0.04	0.05

Ext. Extract.

Table (7): Effect of some chemical and natural rest breakages on the percentages of berry setting, number of clusters/ vine and yield / vine (kg.) of Superior grapevines during 2012 & 2013 seasons.

Rest breakage treatments	Berry setting %		Number of clysters / vine		Yield/ vine (kg.)	
	2012	2013	2012	2013	2012	2013
1- Control	6.1	6.3	13.0	14.0	4.9	5.3
2- Turmeric ext. at 5%	6.6	7.0	14.0	16.0	5.5	6.3
3- Cinnamon ext. at 10%	6.6	7.1	14.0	16.0	5.5	6.3
4-Ginger ext. at 10%	6.7	7.1	14.0	16.0	5.5	6.3
5- Colocynth ext. at 5%	6.8	7.2	14.0	16.0	5.5	6.3
6-Nigella oil at 5%	6.8	7.3	14.0	16.0	5.5	6.3
7- Olive oil at 5%	6.9	7.4	14.0	16.0	5.6	6.3
8-Clove oil at 5%	7.5	8.0	14.0	19.0	5.7	7.7
9-Garlic oil at 5%	7.5	8.7	14.0	19.0	5.7	7.7
10-Red chillies at 5%	7.6	8.1	14.0	19.0	5.7	7.7
11- Coffee ext. at 10%	7.7	8.1	14.0	19.0	5.7	7.7
12- Hydrogen peroxide at 10%	8.2	8.6	15.0	21.0	6.3	8.7
13- Salicylic acid at 5%	8.9	9.2	15.0	23.0	6.5	9.6
14- Salicylic acid at 10%	9.0	9.3	15.0	23.0	6.5	9.6
15- Thiourea at 2.0%	9.5	9.9	15.0	24.0	6.6	10.0
16- Thiorea at 4.0%	9.9	10.5	15.0	25.0	6.8	10.5
17- Thiourea at 8.0%	10.0	10.6	15.0	25.0	6.8	10.6
18- Dormex at 1.0%	10.6	11.2	15.0	25.0	6.9	10.8
19- Dormex at 2.0%	11.2	11.7	15.0	26.0	6.9	11.2
20- Dormex at 4.0 %	12.2	12.2	15.0	27.0	7.0	11.7
21- Dormex at 6.0%	12.3	12.3	15.0	27.0	7.0	11.8
New L.S.D. at 5%	0.4	0.4	NS	1.0	0.3	0.3

Ext. Extract.

Table (8): Effect of some chemical and natural rest breakages on the weight (g.) and cluster dimensions (length & width in cm) of Superior grapevines during 2012 & 2013 seasons.

Rest breakage treatments	Cluster weight		Cluster length (cm.)		Cluster width	
	2012	2013	2012	2013	2012	2013
1- Control	380.0	381.0	19.0	19.1	8.8	8.9
2- Turmeric ext. at 5%	391.0	391.0	20.0	20.2	9.1	9.2
3- Cinnamon ext. at 10%	392.0	391.0	20.1	20.2	9.2	9.2
4-Ginger ext. at 10%	392.0	392.0	20.2	20.3	9.2	9.3
5- Colocynth ext. at 5%	392.0	392.0	20.3	20.4	9.3	9.3
6-Nigella oil at 5%	393.0	393.0	20.4	20.5	9.3	9.4
7- Olive oil at 5%	399.0	394.0	20.4	20.5	9.4	9.5
8-Clove oil at 5%	4.9.9	404.0	21.6	21.9	9.9	10.1
9-Garlic oil at 5%	410.0	405.0	21.7	22.0	10.0	10.1
10-Red chillies at 5%	410.0	405.0	21.8	22.1	10.1	10.1
11- Coffee ext. at 10%	410.0	405.0	21.8	22.2	10.1	11.3
12- Hydrogen peroxide at 10%	420.0	415.0	23.0	23.2	11.0	11.8
13- Salicylic acid at 5%	430.0	416.0	24.0	24.2	11.5	11.9
14- Salicylic acid at 10%	431.0	416.0	24.1	24.3	11.6	12.4
15- Thiourea at 2.0%	441.0	418.0	25.1	25.4	12.1	12.4
16- Thiourea at 4.0%	451.0	421.0	26.1	26.5	12.6	12.7
17- Thiourea at 8.0%	452.0	422.0	26.2	26.6	12.7	12.8
18- Dormex at 1.0%	462.0	432.0	27.3	27.8	13.3	13.5
19- Dormex at 2.0%	463.0	433.0	28.3	28.9	13.6	13.8
20- Dormex at 4.0 %	466.0	435.0	29.4	29.9	13.8	14.0
21- Dormex at 6.0%	467.0	436.0	29.5	30.0	13.9	14.1
New L.S.D. at 5%	9.7	9.9	0.7	0.8	0.2	0.2

Ext. Extract.

Table (9): Effect of some chemical and natural rest breakages on harvesting date, percentage of shot berries and berry weight (g.) of Superior grapevines during 2012 & 2013 seasons.

Rest breakage treatments	Harvesting date		Shot berries %		Berry weight (g.)	
	2012	2013	2012	2013	2012	2013
1- Control	21 June	23 June	8.1	8.3	3.11	3.13
2- Turmeric ext. at 5%	29 June	28 June	7.4	7.0	3.27	3.30
3- Cinnamon ext. at 10%	28 June	28 June	7.3	6.9	3.30	3.31
4-Ginger ext. at 10%	28 June	28 June	7.2	6.8	3.31	3.32
5- Colocynth ext. at 5%	28 June	27 June	7.2	6.7	3.32	3.33
6-Nigella oil at 5%	27 June	27 June	7.1	6.6	3.33	3.34
7- Olive oil at 5%	27 June	27 June	7.0	6.5	3.34	3.35
8-Clove oil at 5%	17 June	16 June	6.6	6.0	3.55	3.59
9-Garlic oil at 5%	16 June	15 June	6.5	6.0	3.56	3.60
10-Red chillies at 5%	16 June	15 June	6.4	5.9	3.54	3.61
11- Coffee ext. at 10%	16 June	15 June	6.3	5.8	3.58	3.62
12- Hydrogen peroxide at 10%	14 June	13 June	5.9	5.2	3.71	3.74
13- Salicylic acid at 5%	12 June	11 June	5.8	4.7	3.82	3.86
14- Salicylic acid at 10%	12 June	11 June	5.4	4.6	3.83	3.87
15- Thiourea at 2.0%	10 June	9 June	5.0	4.0	3.44	4.00
16- Thiourea at 4.0%	8 June	7 June	4.4	3.5	4.02	4.12
17- Thiourea at 8.0%	8 June	6 June	4.3	3.4	4.03	4.13
18- Dormex at 1.0%	6 June	5 June	3.7	3.0	4.18	4.28
19- Dormex at 2.0%	4 June	3 June	3.0	2.6	4.31	4.39
20- Dormex at 4.0 %	2 June	2 June	2.1	2.2	4.42	4.50
21- Dormex at 6.0%	2 June	2 June	2.0	2.1	4.43	4.51
New L.S.D. at 5%	-	-	0.3	0.3	0.10	0.11

Ext. Extract.

Table (10): Effect of some chemical and natural rest breakages on the longitudinal and equatorial of berry (cm.) and T.S.S. % in the berries of Superior grapevines during 2012 & 2013 seasons.

Rest breakage treatments	Berry longitudinal (cm.)		Berry equatorial (cm.)		T.S.S. %	
	2012	2013	2012	2013	2012	2013
1- Control	2.01	2.03	1.85	1.88	18.0	18.2
2- Turmeric ext. at 5%	2.09	2.11	1.94	1.98	17.3	17.5
3- Cinnamon ext. at 10%	2.10	2.12	1.95	1.99	17.4	17.6
4-Ginger ext. at 10%	2.11	2.13	1.96	1.99	17.5	17.6
5- Colocynth ext. at 5%	2.12	2.14	1.97	2.00	17.5	17.6
6-Nigella oil at 5%	2.13	2.15	1.97	2.01	17.5	17.6
7- Olive oil at 5%	2.14	2.16	1.98	2.01	17.6	17.7
8-Clove oil at 5%	2.19	2.22	2.05	2.11	18.6	18.8
9-Garlic oil at 5%	2.20	2.22	2.06	2.12	18.7	18.8
10-Red chillies at 5%	2.21	2.23	2.07	2.12	18.8	18.9
11- Coffee ext. at 10%	2.22	2.24	2.08	2.13	18.9	19.0
12- Hydrogen peroxide at 10%	2.31	2.30	2.15	2.19	19.6	19.5
13- Salicylic acid at 5%	3.37	2.36	2.21	2.24	20.2	20.0
14- Salicylic acid at 10%	2.38	2.37	2.22	2.25	20.3	20.0
15- Thiourea at 2.0%	2.45	2.44	2.30	2.31	21.0	20.6
16- Thiorea at 4.0%	2.51	2.50	2.36	2.37	21.6	21.0
17- Thiourea at 8.0%	2.52	2.51	2.37	2.38	21.6	21.0
18- Dormex at 1.0%	2.57	2.58	2.43	2.46	22.0	21.7
19- Dormex at 2.0%	2.62	2.65	2.49	2.51	22.3	22.0
20- Dormex at 4.0 %	2.67	2.71	2.54	2.56	22.6	22.6
21- Dormex at 6.0%	2.68	2.72	2.55	2.57	22.7	22.7
New L.S.D. at 5%	0.05	0.06	0.05	0.05	0.6	0.6

Ext. Extract.

Table (11): Effect of some chemical and natural rest breakages on some chemical characteristics of the berries of Superior grapevines during 2012 & 2013 seasons.

Rest breakage treatments	Total acidity %		T.S.S. /acid		Reducing sugars %	
	2012	2013	2012	2013	2012	2013
1- Control	0.720	0.728	25.0	25.0	17.1	17.2
2- Turmeric ext. at 5%	0.750	0.759	23.1	23.1	16.1	16.2
3- Cinnamon ext. at 10%	0.749	0.758	23.2	23.2	16.2	16.3
4-Ginger ext. at 10%	0.748	0.757	23.4	23.2	16.3	16.3
5- Colocynth ext. at 5%	0.747	0.756	23.4	23.3	16.4	16.4
6-Nigella oil at 5%	0.746	0.755	23.5	23.3	16.5	16.4
7- Olive oil at 5%	0.745	0.754	23.6	23.5	16.6	16.5
8-Clove oil at 5%	0.691	0.690	26.9	27.2	17.6	17.7
9-Garlic oil at 5%	0.690	0.689	27.1	27.3	17.7	17.8
10-Red chillies at 5%	0.688	0.688	27.3	27.5	17.8	17.9
11- Coffee ext. at 10%	0.687	6.86	27.5	27.7	17.9	18.0
12- Hydrogen peroxide at 10%	0.660	0.652	29.7	29.9	18.6	18.8
13- Salicylic acid at 5%	0.639	0.631	31.6	31.7	19.0	19.3
14- Salicylic acid at 10%	0.638	0.609	31.8	32.8	19.1	19.4
15- Thiourea at 2.0%	0.601	0.590	34.9	34.9	19.5	19.8
16- Thiorea at 4.0%	0.572	0.562	37.8	37.4	19.8	20.3
17- Thiourea at 8.0%	0.571	0.560	37.8	37.5	19.9	20.4
18- Dormex at 1.0%	0.541	0.540	40.7	40.2	20.5	20.9
19- Dormex at 2.0%	0.522	0.521	42.7	42.2	20.9	21.4
20- Dormex at 4.0 %	0.504	0.501	44.8	45.1	21.4	21.8
21- Dormex at 6.0%	0.503	0.500	45.1	45.4	21.5	21.9
New L.S.D. at 5%	0.018	0.019	0.8	0.7	0.4	0.4

Ext. Extract.

4. Discussion

The positive action of dormex on breaking dormancy and improving growth and fruiting of Superior grapevines mainly attributed to its effect in removing buds scales, reducing ABA, catalase, reduced and oxidized glutathione and enhancing free water, IAA, GA₃, cytokinins, soluble sugars, amino acids, total indoles, oxidative stress, H₂O₂, total free polyamines and respiratory key enzymes activities (Wood, 2000 and Rady and Seif- El Yazal, 2013). A transient increase in H₂O₂ levels precedes the release of endo dormancy of buds of grapevines the H₂O₂ peak could act as a signal triggering the expression of genes related to endo dormancy release. Moreover, the early occurrence of H₂O₂ release peak in the treated buds could be due to the inhibitory catalase and could be the cause of dormancy shortening and of earlier bud break response (Perez and Lira, 2005).

The active substances occurred in turmeric, cinnamon, ginger, colocynth, nigella, olive, clove, garlic, red chillies and coffee that responsible for breaking bud dormancy in grapevines are sulfur-containing compounds (allyl group and mono- di- tri and tetra sulfides), volatiles, tannins, phenols antioxidants, vitamins, amino acids and plant pigments, cysteine acts as a precursor for the synthesis of all other organic compounds containing reduced sulphur as well as for other biosynthesis pathways such as the formation of ethylene. Also, the great biosynthesis of GA₃ and IAA during dormancy period surely reflected on terminating bud dormancy (Miyazak and Yang, 1987). The beneficial effects of salicylic acid on enhancing H₂O₂ and natural hormone and reducing ethylene biosynthesis could explain the present results (Hayat et al., 2010).

These results regarding the effect of dormex on bud breaking and fruiting of Superior grapevines are in agreement with those obtained by El- Halaby (2006); Abdalla (2007), Mekawy (2008) and El- Sawy (2009).

The results of Mekway (2008); Botelho et al., (2009); Corrales- Maldonado et al., (2010); Botelho et al., (2010) and Biazzi et al., (2010) supported the beneficial effects of plant extracts on terminating bud dormancy and enhancing fruiting of Superior grapevines.

The results of Abd El- Kareem (2009); El- Kady- Hanaa (2011) and El- Hanafy (2011) emphasized the present results concerning the positive action of salicylic acid on fruiting of Superior grapevines.

Conclusion

The best results with regard to breaking bud dormancy and improving yield and quality of Superior grapevines growing under hot climates were obtained

with spraying Dormex at 4% once when the vines received 200 or 210 chilling hours. This study gives evidence to the possibility of using plant extracts especially coffee extract, red chillies, garlic oil and clove oil as various natural and safety substances in breaking bud dormancy. It is possible for using these plant extracts as a partial replacement of chemical rest breakages.

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