A Study On Using Jasmine Oil As A Breaking Bud Dormancy For Flame Seedless Grapevines

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ABSTRACT: This study was carried out for two successive seasons (2009&2010) in a private vineyards located at Cairo – Alexandria desert rode, 58 km from Cairo-Egypt; to study the use of Jasmine oil as a breaking bud dormancy agent for Flame Seedless grapevines. The chosen vines were 5 years old, grown in a sandy loam soil, spaced at 2x3m a part, irrigated by the drip irrigation system, canes were pruned and trellised by the Spanish Parron system. Eight treatments were applied as follows: Three concentrations of Jasmine oil at 0.1, 0.2 or 0.3% were sprayed alone or combined with 3% Dormex in addition to spraying 5% Dormex and control (untreated vines). The results showed that spraying with all Jasmine oil concentrations either solely or in combination with 3%Dormex in comparison with control improved percentage of bud burst and good yield with high bunch quality. The combination treatment of 0.2% Jasmine oil + Dormex 3% gave the best results equally to those obtained by dormex 5%, which was applied early, uniform and high percentage of bud burst and resulted in the greatest yield and its components as well as the best physical properties of bunches and berries and ensured the best vegetative growth parameters.
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Key words: *Jasmine oil, Spanish Parron system, Dormex.*

1-INTRODUCTION:

"Flame Seedless" cultivar is an early-ripening cultivar, which ripens through the period from first to mid June. Earliness of Flame Seedless grapes is often accompanied by irregular and low percentage of bud break. These defects are thought to due to the insufficient chilling units required to induce full and uniform bud break.

Dormancy is a phase of development that occurs annually in deciduous fruit trees, (Saure, 1985). Release of dormancy requires a chilling period during winter followed by a temperature rise in spring (Fuchigami et al., 1982).

Dormex (a commercial hydrogen cyanamice compound of the SKU company, a.i = 0.49) treatment significantly increased endogenous bud IAA and gibberellic acid contents, and significantly reduced bud ABA contents compared to the control. Spraying with dormex (5%) gave the highest bud burst, yield and berry quality of grape cv. Flame Seedless (El-Sabrout, 1998).

Taking into account the reduction or elimination of the use of synthetic substances that advocate sustainable systems of fruit production, the search for new alternatives for breaking dormancy of temperate fruit it is becoming very important. Hydrogen cyanamide, in particular, is a highly toxic and

is classified by the Environmental Protection Agency of the United States in the highest category of toxicity (Category I). Moreover, the record of this product is under review by the European Union (Settimi et al., 2005). Nevertheless, these bud breaking inducing agents are not authorized for use in organic cultivation. Therefore, looking for new opportunities to break dormancy, among the permitted products in organic agriculture are natural oils (Omri, 2006). It is worth mentioning that no research work was available in the literature concerning the effect of jasmine oil on bud dormancy.

Jasmine oil may have a role as protective substances against stress (Kittikorn and Kanlayanarat 2004), there are well over 100 constituents found in jasmine oil, but the main chemical components are 25-30%benzyl acetate, 17-20%benzyl benzoate, 7-10%cis-jasmone, 7-13%Phytol, 5-7% methyl anthranilate, 3-5%linalool, 3-5%geraniol, <1%indole, and trace amounts of p. cresol, farnesol,

cis-3-hexenyl benzoate, eugenol, nerol, ceosol, benzoic acid, benzaldehyde, y-terpineol, nerolidol, isohytol, phytol etc.

The objectives of this investigation is to determine the efficacy for new alternative of natural extracts i.e. Jasmine oil compared to Dormex in breaking bud dormancy of Flame Seedless grapevines.

2.MATERIALS AND METHODS:

This investigation was conducted in a private vineyard located at Cairo-Alexandria desert rode, 58 km from Cairo-Egypt on Flame Seedless grape vines. The study extended for two successive seasons (2009 sand 2010).

2.1.Materails:

2.1.1.The vines :

They were 5-year-old, grown in a sandy loam soil, spaced at 2x3 meters a part irrigated by the drip irrigation system, canes were pruned and supported by the Spanish parron system.

2.2.Methods:

2.2.1. Experimental design:

The vines were pruned during the second week of January for the two seasons of the study to obtain bud load of 72 buds/vine (6 canes x 12 buds/cane) and sprayed during the second week of January. One hundred ninety two uniform vines were chosen on the basis of their growth depending on weight of prunings and trunk diameter of the vine as indirect estimates for vine vigour. Each six vines acted as a replicate and each four replicates were treated by one of the following treatments.

1- Spraying with 0.1 %Jasmine Oil.
2- Spraying with 0.2 %Jasmine Oil.
3- Spraying with 0.3 %Jasmine Oil.
4- Spraying with 5 %Dormex.
5- Spraying with 0.1 %Jasmine Oil + 3 % Dormex.
6- Spraying with 0.2 %Jasmine Oil + 3 %Dormex.
7- Spraying with 0.3 %Jasmine Oil + 3 %Dormex.
8- Spraying with tap water (control).

2.2.2. To evaluate the tested treatments:

The following parameters were measured:

2.2.2.1. **Bud behaviour:**

Number of bursted out buds/vine was recorded, then the percentage was calculated by dividing number of bud burst per vine by the total number of buds per vine which left at pruning at weekly intervals along the bursting period. Moreover, coefficient of fertility was calculated by dividing average number of bunches per vine by the total number of bud/vine according to Huglin (1958) and Bessis (1960).

2.2.2.2.**Yield and physical characteristics of bunches:**

Yield/vine (kg) was determined as number of bunches/vine x average bunch weight (g). Representative random samples of 6 bunches/vine were harvested at maturity when TSS reached about 16 – 17 % according to Tourky et al., (1995).

Average bunch weight (g), bunch width and length (cm) and number of berries per bunch were determined.

2.2.2.3- Physical characteristics of berries:

Average berry weight (g), berry size (cm3) and berry dimensions (length and diameter) (cm) were also determined.

2.2.2.4- Chemical characteristics of berries:

Total soluble solids in berry juice (TSS) % was determined by a hand refractometer and total titratable acidity as tartaric acid (%) (A.O.A.C 1985). Total anthocyanin of the berry skin (mg/100g fresh weight) according to Husia et al., (1965) were calculated.

2.2.2.5.**Vegetative growth and wood ripening:**

At growth cessation, the following morphological and chemical determinations were carried out on 4 shoots/ vine:

a- Average shoots length (cm).
b- Average number of leaves/shoot.
c- Average leaf area (cm^2) of the apical 5^{th} and 6^{th} leaves using a planimeter.
d- Coefficient of wood ripening was calculated by dividing length of the ripened part by the total length of the shoot according to Bouard (1966).

2.2.2.6**. Leaf content of pigments:**

Leaf content of pigments (chlorophyll A, B and carotene) mg/g fresh weight) of the 5^{th} and 6^{th} leaf of the shoot was determined (Westein, 1957).

Statistical analysis:

The complete randomized block design was adopted for the experiment. The statistical analysis of the present data was carried out according to Snedecor and Cochran (1972). Average was compared using the new L.S.D. values at 5 % level.

3.RESULTS AND DISCUSSION

3.1.Bud behaviour:

Data in Table (1) illustrated the effect of Jasmine oil concentrations alone or in combination with 3%

dormex and 5% dormex on bud burst, fruitful buds and coefficient of bud fertility.

Percentage of bud burst:

It was obviously that spraying with 0.2% Jasmine oil + 3% Dormex and spraying with 5% dormex gave the highest bud burst percentage of Flame Seedless cv. in both seasons, followed in a descending order by jasmine oil at 0.1 & 0.2% with dormex 3% followed by concentrations of jasmine oil alone, while the untreated vine (control) gave the lowest budburst percentage.

Earliness of budburst with dormex (hydrogen cynamide;(H2CN2) applications may be due to its role in increasing rate of respiration, measured as Co2 evaluation and by reducing catalase activity as mentioned by Schulman et al., (1983). Similar effects were reported by Hurter et al., (1991); Nir and Lave (1993); Sourial et al., (1993a) and Elmogy et al., (2002) they found that spraying grapevines with dormex markedly accelerated bud break and eliminated its irregularities to a large extent. The jasmine oil with different concentrations play the same role of dormex.

Percentage of fruitful buds:

The percentage of fruitful buds on the whole vine was calculated in relation to the number of opened buds per vine. The values ranged from (70.3% to 85.0%) + (65.3% to 85.0%) in the two seasons respectively. The highest values (85.0%) were obtained from spraying with jasmine oil 0.2% + dormex 3% while the lowest values were (70.3% & 65.3%) obtained by control.

Coefficient of fertility:

The effect of treatments in this respect was go parallel with budburst (%) which was appreciably increased as a result of the increase of budburst (%).

These results agree with those found by Miele (1991); Sabry (1994); Tourky et al., (1995); Nashaat (1996); Abd El-All (1996); El Sabrout (1998); El-Shazly, (1999); El-Mogy (2002) and Abd El-Wahab et al ., (2006). They found that dormex spray increased budburst and bud fertility in many grape cultivars.

Table (1): Effect of different breaking dormancy treatments on bud behaviour of Flame Seedless grapevines

Treatments	First season 2009			Second season 2010		
	Bud burst%	Fruitful buds %	Coefficient of bud fertility	Bud burst%	Fruitful Buds %	Coefficient of bud fertility
Jasmine oil (0.1%)	71.67	76.30	0.33	70.67	73.00	0.31
Jasmine oil (0.2%)	79.33	79.30	0.36	83.33	77.00	0.33
Jasmine oil (0.3%)	77.00	78.30	0.33	80.67	78.00	0.31
Dormex (5%)	95.67	83.30	0.41	78.33	80.70	0.39
Jasmine oil (0.1%) + Dormex (3%)	88.00	81.00	0.36	82.67	76.70	0.34
Jasmine oil (0.2%) + Dormex (3%)	95.33	85.00	0.48	90.67	85.00	0.43
Jasmine oil (0.3%) + Dormex (3%)	86.33	84.00	0.39	66.33	77.30	0.36
Control	63.67	70.30	0.31	61.33	65.30	0.18
New L.S.D. at 5%	1.53	2.18	0.02	1.77	2.04	0.06

3.2.Yield and physical characteristics of bunches:

Data in both seasons (Table 2) showed a significant increase in average number of bunches, yield per vine and average bunch weight with spraying with jasmine oil alone or in combination with 3% dormex and 5% dormex as compared to control. It was found that spraying with 0.2% Jasmine oil + 3% Dormex and spraying with 5% dormex gave the highest yield and its components, while the lowest values for these estimations were obtained by control treatment in both seasons. The effect of treatments on bunch dimensions i.e. length and width was statistically significant in both seasons. Spraying with 0.2% Jasmine oil + 3% Dormex and spraying

with 5% dormex gave the highest bunch length and width, while the lowest values for these estimations were obtained by control treatment in both seasons.

From the previously mentioned results it can be concluded that the effect of jasmine oil and dormex on increasing the yield per vine was gained as a result of its effect on increasing both number of bunches / vine and average bunch weight through increasing both budburst (%) and bud fertility coefficient. The results in this connection were in agreement with those obtained by Miele (1991); Ayaad (1992); El-Shahat (1992); Sourial et al., (1993b); El-Sayed (1994); Sabry (1994); Abd El-All (1996); Nashaat (1996); Tourky et al., (1996); El-Sabrout (1998); El-Shazly, (1999); El-Mogy et al., (2002) and Abd El-Wahab et al., (2006). They stated that dormex application caused an obvious increase in the yield and improvement of bunch physical characteristics of some grape cultivars.

Table (2): Effect of different breaking dormancy treatments on yield and physical characteristics of bunches of Flame Seedless grapevines.

Treatments	First season 2009					Second season 2010				
	Yield/vine (Kg)	No. of bunches / vine	Bunch weight (gm)	Bunch width (cm)	Bunch length (cm)	Yield/ vine (Kg)	No. of bunches/vine	Bunch weight (gm)	Bunch width (cm)	Bunch length (cm)
Jasmine oil (0.1%)	12.02	19.70	610.00	21.70	24.67	10.55	18.30	576.70	19.30	25.00
Jasmine oil (0.2%)	14.61	21.70	673.30	23.00	27.33	12.48	19.70	633.30	21.00	27.33
Jasmine oil (0.3%)	12.47	20.00	623.30	21.70	25.67	10.60	18.70	566.70	19.70	25.67
Dormex (5%)	16.88	24.70	683.30	24.70	35.00	15.41	23.70	650.00	24.30	29.67
Jasmine oil (0.1%) + Dormex (3%)	13.86	22.00	630.00	23.00	29.33	12.28	20.70	593.30	22.70	26.00
Jasmine oil (0.2%) + Dormex (3%)	21.05	28.70	733.30	26.00	32.00	15.25	25.70	593.30	24.70	30.00
Jasmine oil (0.3%) + Dormex (3%)	13.82	23.70	583.30	22.70	27.00	12.01	21.70	553.30	24.00	25.67
Control	9.88	18.30	540.00	18.70	22.00	7.50	16.30	460.00	15.70	20.67
New L.S.D. at 5%	2.3	0.98	27.32	0.83	1.22	1.9	0.83	38.25	0.89	1.34

3.3.Berry physical characteristics:

Data in Table (3) demonstrated the effect of treatments on berry weight (gm), berry size (cm), berry length (cm) and berry width (cm) of Flame Seedless grape in 2009 & 2010. It was clear that, spraying with 0.2% Jasmine oil + 3% Dormex and spraying with 5% dormex gave the highest values of these estimations, while the lowest values were obtained by control treatment in both seasons.

The increment in bunch and berry weight with Jasmine oil concentrations might be due to the parallel increment observed in the leaf area which improve photosynthesis activity of the leaves.

Table (3): Effect of different breaking dormancy treatments on berry physical characteristics of Flame Seedless grapevines

Treatments	First season 2009				Second season 2010			
	Berry weight (g)	Berry size (cm)	Berry length (cm)	Berry width (cm)	Berry weight (g)	Berry size (cm)	Berry length (cm)	Berry width (cm)
Jasmine oil (0.1%)	2.73	2.80	1.83	1.93	2.60	2.47	1.73	1.83
Jasmine oil (0.2%)	3.13	3.07	1.87	1.97	2.80	2.73	1.83	1.90
Jasmine oil (0.3%)	3.27	2.87	1.73	1.90	2.80	2.80	1.73	1.83
Dormex (5%)	3.47	3.17	1.93	2.03	3.13	3.07	1.83	2.00
Jasmine oil (0.1%) + Dormex (3%)	3.47	3.30	1.90	2.00	3.33	3.20	1.80	2.00

Jasmine oil (0.2%) + Dormex (3%)	3.87	3.67	2.13	2.13	3.53	3.67	1.97	2.10
Jasmine oil (0.3%) + Dormex (3%)	3.53	3.40	1.93	2.03	3.53	3.53	1.67	1.97
Control	2.53	2.60	1.70	1.90	2.47	2.40	1.60	1.73
New L.S.D. at 5%	0.13	0.13	0.09	0.06	0.15	0.12	0.08	0.06

3.4. Berry chemical constituents:
The data in Table (4) revealed that spraying with Jasmine oil concentrations specially 0.2%oil + 3% dormex gave the values nearly similar to dormex 5% increased juice TSS, TSS / acid ratio and total anthocyanin of berry skin and reduced acidity as compared to control.

3.5.Vegetative growth and wood ripening:
Data in Table (5) indicated a significant increase in shoot length (cm), No. of leaves per shoot, leaf area (cm^2) and coefficient of wood ripening with spraying with jasmine oil alone or in combination with 3% dormex and 5% dormex as compared to
control. It was found that spraying with 0.2% Jasmine oil + 3% Dormex and spraying with 5% dormex gave the highest vine vigor parameters, while the lowest values for these estimations were obtained by control treatment in both seasons.

Table (4): Effect of different breaking dormancy treatments on berry chemical characteristics of Flame Seedless grapevines

Treatments	**First season 2009**				**Second season 2010**			
	TSS %	**Acidity %**	**TSS/acid ratio**	**Antho-cyanin (mg/100g F.W.)**	**TSS %**	**Acidity %**	**TSS/acid ratio**	**Antho-cyanin (mg/100g F.W.)**
Jasmine oil (0.1%)	19.30	0.35	54.70	28.2	17.80	0.46	38.80	26.7
Jasmine oil (0.2%)	20.20	0.31	60.80	29.4	19.20	0.44	43.60	28.0
Jasmine oil (0.3%)	18.50	0.31	59.10	27.3	18.30	0.45	40.90	27.2
Dormex (5%)	20.70	0.29	72.30	29.5	19.70	0.41	48.00	28.6
Jasmine oil (0.1%) + Dormex (3%)	19.50	0.29	66.50	28.6	19.30	0.41	47.20	28.1
Jasmine oil (0.2%) + Dormex (3%)	21.80	0.28	77.20	30.7	20.30	0.39	52.60	29.2
Jasmine oil (0.3%) + Dormex (3%)	19.60	0.30	65.30	28.7	19.00	0.36	53.60	27.9
Control	17.30	0.40	40.00	26.1	17.30	0.50	34.70	26.2
New L.S.D. at 5%	0.59	0.01	5.27	1.7	0.42	0.03	4.37	1.4

Table (5): Effect of different breaking dormancy treatments on some vegetative growth characteristics and coefficient of wood ripening of Flame Seedless grapevines.

Treatments	**First season 2009**	**Second season 2010**

	Shoot length (cm)	No. of leaves per shoot	Leaf area $(cm)^2$	Coe. Of wood ripening	Shoot length (cm)	No. of leaves per shoot	Leaf area $(cm)^2$	Coe. Of wood ripening
Jasmine oil (0.1%)	199.07	27.63	186.50	0.83	185.10	25.37	179.23	0.79
Jasmine oil (0.2%)	204.90	29.43	189.43	0.84	190.73	27.00	186.80	0.82
Jasmine oil (0.3%)	203.40	29.23	186.67	0.82	191.57	26.07	181.67	0.79
Dormex (5%)	207.33	31.37	205.30	0.85	201.53	29.73	197.73	0.81
Jasmine oil (0.1%) + Dormex (3%)	204.80	31.60	197.17	0.84	194.90	28.60	187.20	0.80
Jasmine oil (0.2%) + Dormex (3%)	213.83	33.70	209.97	0.87	204.00	32.60	200.40	0.82
Jasmine oil (0.3%) + Dormex (3%)	206.40	32.40	190.27	0.85	197.10	24.43	190.07	0.80
Control	146.43	25.43	150.53	0.80	141.60	23.60	147.67	0.76
New L.S.D. at 5%	3.09	1.19	1.21	0.01	2.68	0.97	2.16	0.02

3.6. Leaf pigments content:

Data in Table (6) illustrated the effect of different breaking dormancy treatments on leaf pigments content of Flame Seedless vines in both seasons.

The positive effects attributed to spraying with jasmine oil alone or in combination with 3% dormex and 5% dormex as compared to control were evident on chlorophyll A & B and carotinoides. It is evident that spraying with 0.2% Jasmine oil + 3% Dormex and spraying with 5% dormex gave the highest leaf pigments content, while the lowest values for these estimations were obtained by control treatment in both seasons.

The results were in agreement with Abd El-All (1996) and Abd El-Wahab (2006) who pointed out that spraying grapevines with dormex increased the leaf content of pigments.

3.7.Economical feasibility/Feddan of the recommended treatment (0.2% Jasmine oil + 3% Dormex) compared with spraying 5% Dormex:

It can be shown from the data presented in Table (7) that spraying with 0.2% Jasmine oil + 3% Dormex gave the best net profit compared with spraying 5% Dormex in both seasons. In addition, to achieve the environmental objective to reduce the use of chemical compounds and appeasement with organic agriculture.

Table (6): Effect of different breaking dormancy treatments on leaf content from pigments of Flame Seedless grapevines

Treatments	First season 2009			Second season 2010		
	Chlorophyll A	Chlorophyll B	Carotinoides	Chlorophyll A	Chlorophyll B	Carotinoides
	(mg/g F.W.)			(mg/g F.W.)		
Jasmine oil (0.1%)	0.68	0.21	0.23	0.62	0.20	0.20
Jasmine oil (0.2%)	0.71	0.24	0.25	0.66	0.22	0.22
Jasmine oil (0.3%)	0.73	0.22	0.27	0.67	0.21	0.20
Dormex (5%)	0.80	0.27	0.28	0.71	0.25	0.27
Jasmine oil (0.1%) + Dormex (3%)	0.78	0.26	0.26	0.72	0.24	0.26

Jasmine oil (0.2%) + Dormex (3%)	0.82	0.29	0.31	0.77	0.26	0.28
Jasmine oil (0.3%) + Dormex (3%)	0.79	0.25	0.26	0.75	0.24	0.27
Control	0.47	0.19	0.18	0.41	0.17	0.17
New L.S.D. at 5%	0.03	0.01	0.01	0.01	0.01	0.01

Table (7): Cost and net profit/Feddan for the recommended treatment (0.2% Jasmine oil + 3% Dormex) compared with spraying 5% Dormex

Per Feddan	2009, season		2010, season	
	0.2% Jasmine oil + 3% Dormex	5% Dormex	0.2% Jasmine oil + 3% Dormex	5% Dormex
Jasmine oil (cm)	200	---	200	---
Dormex (L)	3	5	3	5
Price of 0.2% Jasmine oil (L.E.)	80.0	---	80.0	---
Price of Dormex (L.E.)	150.0	250.0	150.0	250.0
Labour cost (L.E.)	100.0	100.0	120.0	120.0
Cost of cultural practices (L.E.)	2000	2000	2100	2100
Total cost (L.E.)	2330	2350	2450	2470
Yield (Kg)	14735.0	11816.0	10675.0	10787.0
Kg (L.E.)	1.25	1.25	1.35	1.35
Yield (L.E.)	18418.8	14770.0	14411.3	14562.5
The net profit (L.E.)	16088.8	12420.0	11961.3	12092.5

In conclusion:

The use of natural oil (Jasmine oil) in the production of grapes or other fruit commodities was not available in previous literature reports and further work might be needed.

Finally, from the previous results, the role of jasmine oil lies in the cause erosion external bud just like dormex. In addition oil is cheaper than dormex as it is environmentally safe, natural substance does not have an incendiary effect on the skin as dormex.

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