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The Study of Dormancy Breaking in Grapevine Buds by Using Chemical in Ahvaz Area

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Abstract

The effects of dormancy breaking chemical have long been specified and the utilization of these materials is common in many subtropical areas where do not provide adequate chilling requirement for buds to bloom. Although, grape as a fruit that is grown in subtropical areas does not have a high chilling requirement, its fulfillment is crucial to release bud dormancy and for its optimal growth. So, it is necessary to consider the effect of dormancy-breaking chemical on this product. In present research, the effects of dormex in three concentrations of 3%, 5% and 7% and volk oil in three concentrations of 3%, 5% and 7% as two bud dormancy breaking chemical have been evaluated in a split-plot experiment on some qualitative and quantitative properties of Sultani grape cultivar such as yield, bunch weight, number of berry per bunch, bunch length and width, length and volume of berry, 100 berries' weight, number of seeds per berry and pH, TSS, TA, TSS / TA, and vitamin C. Results which were analyzed by SAS software indicated that in bushes treated with 7% dormex and 7% volk oil, the yield and bunch weight, bunch length and width, berry weight and volume dramatically increased, and this increase is proportional to the concentration of applied substance. Generally, it is concluded that the application of dormancy-breaking chemicals has great impact on yield improvement and other quantitative and qualitative characteristics of grapevine bushes and can meet the side effects resulting from the lack of adequate chilling requirement of grapevine. The application of 7% dormex significantly increased the quantitative and qualitative characteristics of grapevine in Ahvaz.

Keywords: Chilling requirement, Bud-dormancy, Dormex, grape, vitis vinifera

Introduction

Grapevine (vitis vinifera) from the vitaceae family is considered as one of the most important horticultural crops of the world (Ahmad, 2012). According to Eshghi et al (2010), the production of grapevine and products drawn from it is important in Iran. The cultivation of this crop has ancient history and during the past two decades, the under cultivation level of this crop is rapidly increasing. Also, the growing enhancement of grapevine in the form of fresh grapes or ancillary products has led to conduct comprehensive studies in relation to the improvement of breeding systems, eugenic, feeding and its quantitative and qualitative enhancement (Smit , 1985; EL-shazly, 1999; Kavoussi et al, 2010) .

Although the *Vitis vinifera* is assumed to have originated in moderate climates, the archaeological findings indicate the use of grapevine products in Southern and Central Europe in the Bronze Age (Rahemi and Asghari, 2004).

The compatibility of grapevine with such conditions was different and includes physiological and morphological parameters. As Siller-Cepeda et al (1992) states, the ability of grapevine in development of deep and extensive root system leads to be adapted to the soil conditions easily.

Materials and Methods

Site and Materials

In this experiment, the native cultivar planted in the area with local name of yellow Sultani is used. Grapevines were selected from the gardens of Ghazaviyeh area which is located 15 km south of Ahwaz, near the Karun River. This experiment was conducted in a randomized complete block design with three replicates and each replicate includes 7 treatments and two samples of the grapevine bushes were considered in each treatments. During the experiment, 84 numbers of 25 years old trees were selected from garden. The maintenance method and harvest procedures and feeding were like other grapevine bushes of that vineyard and any special care and feeding were not done on the under treatment vine bushes. The pruning method of grapevine bushes was also done as the conventional method of site where includes the maintenance of about 75 buds on grapevine bushes. The split plot design was used because this experiment aimed to investigate the effect of two time and treatment factors. In this scheme, each main plot was divided into several plots or sub-plots and levels relevant to the second factor were randomly distributed between sub-plots inside the main plot. So, every main plot has block role for subplot levels. In this scheme, the accuracy of mean of factor levels which is placed in the main plot is low and the accuracy of mean comparison of factors levels effects is enhanced in subplots and if there is an interaction between two factors, the comparison of experimental treatments effects in the subplots are also checked carefully. In the conducted pilot project, time as the first factor in the main plots and treatments were placed in sub-plots. The first time of test was one month before the normal flower opening which was equal to 26^{th} of January and the second time, two weeks before flowering and bud opening namely 11^{th} of February. It should be noted that the tested grape bushes were pruned in the first week of January and bud opening time refers to the fuzz and buds swell stage. The tested treatments included treatment with dormex in three levels of 3% and 5% and 7% and volk oil in three levels of 3% and 5% and 7% and control. At the time of spraying all the bushes were properly sprayed with prepared solution of treatments and control bushes were sprayed with distilled water

Measurements

In this experiment, a number of qualitative characteristics such as bushes' yield, bunch weight, bunch length and width, number of bunch, length and volume of berry, 100 berries' weight, and number of seeds per berry and quantitative characteristics like fruit, TSS, TA, TSS/TA, and vitamin C were tested.

Results and Discussion

Quantity of product

The variance analysis results have shown the quantitative indicators of treated vines' fruit. Different replicates have no effect on yield, bush weight and length and the number of berry in bunch. The investigation of bunch width showed difference at the 5% level. Date of experiment had no significant effect on characteristics of fruit. The effect of all treatments on quantitative characteristics has been significant at the 1% level. Also, different treatments and treatment conducting time had no interactive effect on each other.

In each column, results with common letters have significant difference with each other. According to the variance analysis the quantitative characteristics of grapevines' berry and treated bushes are specified and various replicates had no effect on quantitative characteristics of

grapevines' berry. Meanwhile, date of treatment conducting had no significant effect on these characteristics, while the type of treatments had a significant impact on the quantitative characteristics of grapevine. Experiment conducting date and treatments had no interactive effect on each other.

Table 1. Effects of dormex and volk oil on the quantitative characteristics of grapevines

Treatment	bush weight	Bunch weight	Bunch length	Bunch width	number of berry in bunch
First time					
Control	00/26gh	35/237g	13/17g	30/108a	00/124g
volk oil 3%	33/29efg	67/314def	88/24de	43/121a	83/144defg
volk oil 5%	00/34cdef	50/358bcde	53/26cde	45/127a	33/152cdef
volk oil 7%	83/40abc	83/393abc	43/31bc	40/146a	00/173abc
dormex 3%	67/32defg	50/334cdef	10/27cde	53/118a	33/159bcde
dormex 5%	50/36bcde	50/350bcdef	13/29cd	95/136a	83/162bcd
dormex 7%	33/44a	17/418ab	95/37a	28/147a	00/186a
Second time					
Control	50/22h	83/280fg	30/19fg	73/105a	67/130fg
volk oil 3%	00/28fgh	83/291efg	55/22ef	12/110a	33/136efg
volk oil 5%	67/33cdef	50/319def	48/26bc	47/115a	83/135efg
volk oil 7%	33/39abcd	00/366abcd	78/30bc	87/109a	00/148def
dormex 3%	50/31efg	33/337cdef	55/22ef	43/102a	50/158bcde
dormex 5%	00/36bcde	50/374abcd	37/26ab	92/124a	83/154ab
dormex 7%	50/41ab	83/432a	95/34ab	70/147a	181/50ab

Table 2. Effects of dormex and volk oil on quantitative characteristics of berry of grapevine of treated bushes

Treatment	Berry width	berry length	Weight of 100 berries	Number of seeds per berry
First time				
Control	1.88f	1.65ed	178.56d	1.88e
volk oil 3%	2.20cdef	1.74cde	211.49cd	2.33d
volk oil 5%	2.48bc	1.76cd	224.68bcd	2.42cd
volk oil 7%	2.53bc	1.78bc	240.91bc	2.54cd
dormex 3%	2.37bcd	1.72cde	214.06cd	2.33d
dormex 5%	2.65ab	1.77c	228.87bcd	2.71bc
dormex 7%	2.90a	1.87ab	274.40ab	3.13a
Second time				
Control	1.93ef	1.64e	176.92d	1.89e
volk oil 3%	2.27cde	1.72cde	181.90d	2.50cd
volk oil 5%	2.47bc	1.72cde	220.54bcd	2.46cd
volk oil 7%	2.72ab	1.76c	255.85abc	2.71bc
dormex 3%	2.08def	1.69cde	224.34bcd	2.21d
dormex 5%	2.43bcd	1.76c	233.98bcd	2.54cd
dormex 7%	2.98a	1.87a	296.57a	3.02ab

Yield quality

The variance analysis results of qualitative properties of grapevine showed that different replicates had no impact on qualitative properties of grapevine. Experiment conducting date showed no significant effect on these properties. Various treatments on qualitative properties of grapevine indicated very significant impact about 0.01 percent. Although, experiment conducting date and applied treatments had interactive effect on the degree of maturity (TSS / TA), (TA), and the amount of vitamin C, they had no interactive effect on the amount of soluble material of extract (TSS).

Table 3. Effects of dormex and volk oil on qualitative characteristics of grapevine

Treatment	TSS	TA	TSS/TA	Vit C	pH
First time					
Control	11.88hi	2.22a	5.36g	3.41e	3.31e
volk oil 3%	12.41ghi	1.46d	8.52e	3.37e	3.67bc
volk oil 5%	12.84fgh	1.40de	9.19de	3.68de	3.69bc
volk oil 7%	13.30defg	1.37de	9.75d	4.59ab	3.70b
dormex 3%	11.71fi	1.79bc	6.56f	3.99bcde	3.57d
dormex 5%	14.12bcd	1.66c	8.50e	4.39abc	3.63cd
dormex 7%	14.96ab	1.19fg	12.54b	4.52ab	3.83a
Second time					
Control	12.63ghi	1.93b	6.56f	3.78cde	3.49e
volk oil 3%	12.97efg	1.77bc	7.31f	3.70de	3.62cd
volk oil 5%	13.56cdef	1.44de	9.48de	4.11bcd	3.68bc
volk oil 7%	13.97bcde	1.45d	9.72d	3.95cde	3.68bc
dormex 3%	13.60cdef	1.87b	7.27f	4.13bcd	3.50e
dormex 5%	14.40bc	1.28ef	11.23c	4.00bcde	3.73b
dormex 7%	15.48a	1.11g	13.94a	4.93a	3.88a

In each column, results with common letters have no significant difference with each other.

Conclusion

The chilling requirement of grapevine is not fulfilled completely in subtropical region of Ahvaz and this inadequate chilling leads to the lack of complete dormancy-breaking in grapevine. Consequently, fewer buds are opened and indicators such as the quality and quantity of fruit are some factors that demonstrate this matter. The experiment conducting time had no significant effect on the qualitative and quantitative characteristic of grapevine. (In this study, the application of dormex and volk oil at two different times did not show any significant difference.)

7% dormex showed the most performance towards other treatments and control. Weight, length and width of bunch and number of berry in the bunch at 7% dormex were increased more than other treatments in both the first and second time. The results of experiment, which is congruent with the results obtained by Talaei et al (2009), Zahedi (2010), showed that different treatments were very influential on yield and bunch weight. The application of dormex and volk oil in concentration of 7% had a great impact on yield and bush weight increasing. This study indicated the yield quality of grapevine in treated bushes with bud dormancy-breaking agents was increased significantly compared to the control bushes.

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