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The Effects of Stratification Periods and GA_3 (Gibberellic acid) Applicatıons on Germination of Seeds of Some Grape Cultivars

[a]Mustafa ÇELİK*
[a]Department of Horticulture, Faculty of Agriculture, University of Adnan Menderes, Aydın, Turkey
*Corresponding author: mcelik61@hotmail.com.tr

Abstract

It is neccessery to know the effects of applications increasing the percentage of seed germination for assisting the breeding researches. The aim of this research is to determine the effects of different doses of GA_3 (Gibberellic acid) and different cold stratification times on germination abilities of the seeds of Gelin, Razakı and Alphonse Lavallee cv. (*Vitis vinifera* L.). 75 and 90 days stratification periods at +5ºC together with 0, 250 and 750 ppm GA_3 doses have been applied in completely randomized design as three replicatons. Seeds were either dipped in GA_3 solutions or pure water as control for 24 hours. In Razakı cv., after 75 days stratification periods GA_3 doses applications did not affect on the percentages of seed germination while afer 90 days stratification periods, 750 ppm GA_3 dose increased the percentage of seed germination. In Gelin cv. after both cold stratification periods, 750 ppm GA_3 dose increased the percentage of seed germination. However, in Alphonse Lavallee cv. after both cold stratification period, GA_3 doses did not affect the percentage of seed germination.

Keywords: Seed germination, table grapes, Gibberellic acid, vitis, cold stratification

Introduction

Vines have been growing in Turkey since ancient times and in today, more than thousand cultivars have been grown through to country. Cultivar richness and history show that Turkey is one of the first grape cultivation centers (Çelik et al. 1998). Total fresh grape production and vine planted area of Turkey are 4 296 350 ton and 472 545 ha respectively (Anonymous, 2011). In terms of the vine planted area and grape production, Turkey places 5 th and 6 th rank among the world countries.

The appearance of radicule from the seed is defined as germination. The seeds of grapes are two type of dormancy. They are called ecodormancy (quiescence) and endodormancy (rest) (Weaver, 1976; Eriş, 1990; Westwood, 1993). While ecodormancy is controlled by external factors, endodormancy is controlled by internal factors. During the rest period, favorable external conditions for growing buds are not enough. Unless the internal factors such as balance of poromotive and inhibitor hormones became heavy for direction of promotive hormones, buds did not sprout. The inhibitor items can be found flesh of fruit, skin of the fruit, even endosperm of seed (Eriş, 1990). To remove endodormancy (rest) requirement, seeds are put in the cold medium. This event is called as stratification. During the stratification period, skins of seeds become softer and easier to taking oxygen and water. During the stratification period, it is necessary to keep temperature between 0 and 10 ºC. For grape seeds, the best stratification temperature is 5 ºC (Ağaoğlu, 2002). Generally, it is advised to keep grape seeds in 60 and 80 days in stratification period (Currie ve ark. 1983).

It has been carried out to breeding studies for earliness, big berry size and loose clusters, seedlesness, dark color berry and disease resistance characters for table grapes in Turkey. To know seed germination characters of new cultivars or their parents is required to produce more seedlings and increase the chance of taking good characters. Olmo (1942) noticed that, seed germination ability was determined by mother parent at F2 generation during breeding.

In addition that, Ağaoğlu (2002) claimed that mother parent are more effective on germination ability of seeds at F1 generation similar to at f2 generation.

Ergül (1994) and Ergül, Ağaoğlu (1995), have been carried out to breeding studies among the cvs. of *vitis vinifera* L. They found that the germination ratios have been changed between

14,7 % and 71,2 %. Altıntoprak, Ağaoğlu (1999) founded that in *Vinifera X Amerikan* crossbreeding studies, seed germination ratios changed between 7,4 % and 46,5 %.

Çelik, (2001) searched the effects of bottom heating, germination media effects and 500, 1000 and 1500 ppm Gibberellic acid (GA_3) applications on *Vitis labrusca* L. cv. Isabella. 500 and 1000 ppm GA_3 gave the higher germination rate. Germination rates ranged between 47,78 % and 51,72 %.
Çalkan (1998), at the 75 days stratification, 0, 250 and 750 ppm GA_3 applied on 7 grape cvs. (Alfonse Lavallèe, Yalova İncisi, Yalova Ata Sarısı, Razakı, Osmanca, Italya, Pembe Gemre) *vitis vinifera* L. Except cv. Italya, Applications of GA_3 increased the germination rates.

In the light of these informations, the aim of this research is to determine the effects of different stratification periods and different gibberellic acid dosages on germination abilities of the seeds of cvs. of Gelin Üzümü, Alfonse Lavallèe and Razakı and to aid to breeding studies.

Materials and Methods

Vitis vinifera L. cv. of Gelin üzümü is late mature (October, November) and mostly consumed as table grape. It has been grown generally on high plateau in Aydın province. *Vitis vinifera* L. cv. of Alfonse Lavallèe has black, sphere, large berry, big cluster. Recently, it is observed that production and consumption of it has been increased. *Vitis vinifera* L. cv. of Razakı has mixture of green, pink and yellow colors and long elliptical berry shape and clusters have large wings, conical shapes. cv. Razakı berries become mature at Midseason.

This research has been conducted in three replications in Completely Randomized Design. For each cv., two stratification period (75 and 90 days) and three gibberellic acid dosages (0, 250 and 750 ppm) have been used.

After seeds were separated from the flesh of berry, they washed and percolated. Floating tests were applied. The seeds of bottom side of beaker with 500 ml was collected and used. After that, seeds were put in the 1% hypochlorite solution for 5 minutes and rinsed couple times with pure water. According to cultivars, seeds were put into different small plastic containers perforated cover and filled perlite medium (Hartmann et al., 1997). The seeds were placed into refrigerator at 5±1 ºC.

Blotting papers were cut as round shape for 12 cm petri dishes and covered by aluminum foil and two erlenmeyer was filled with two of third pure water. Finally, both paper and pure water were sterilized for 20 minutes at 121 ºC. In addition that, % 70 alcohol was prepared for laboratory works such as seeding and counting germinated seeds

In control, the seeds were put into bottles covered aluminum foil and filled pure water. After that they were held there for 24 hours. During GA_3 solution preparations, Firstly, 62,5 and 188,0 mg GA_3 was dissolved in with 1-2 ml volume of 99 % alcohol in separate erlenmeyers. Secondly, solutions were completed with pure water to 250 ml into erlenmeyer. Depending on applications and replications, solutions were poured into bottles put the seeds and covered by aluminum foil. After that, they were held for 24 hours (Fig.1) (Çelik, 2001).

Figure 1. The seeds covered by aluminum foil were held into GA_3 solutions for 24 hours.

Double blotting paper was put in to bottom side of the petri dishes with 12 cm. Sterilized water was sprayed to blotting paper, but it was not allowed to excessive water accumulation on paper because fungal developments happened. 20 seeds are put on paper without touching each other by pens (Anonymous, 2008). One blotting paper also used as cover on the seeds. Experiment number

signed on petri dishes and bounded by stretch nylon and put in the climate room at 25±1ºC temperature (Fig. 2.)(Ellis et al., 1983).
Once for 2 or 3 days, seeds examined and seeds had 5 mm or longer radicule were counted and recorded. If paper become dry, water was sprayed until enough moisturize obtained

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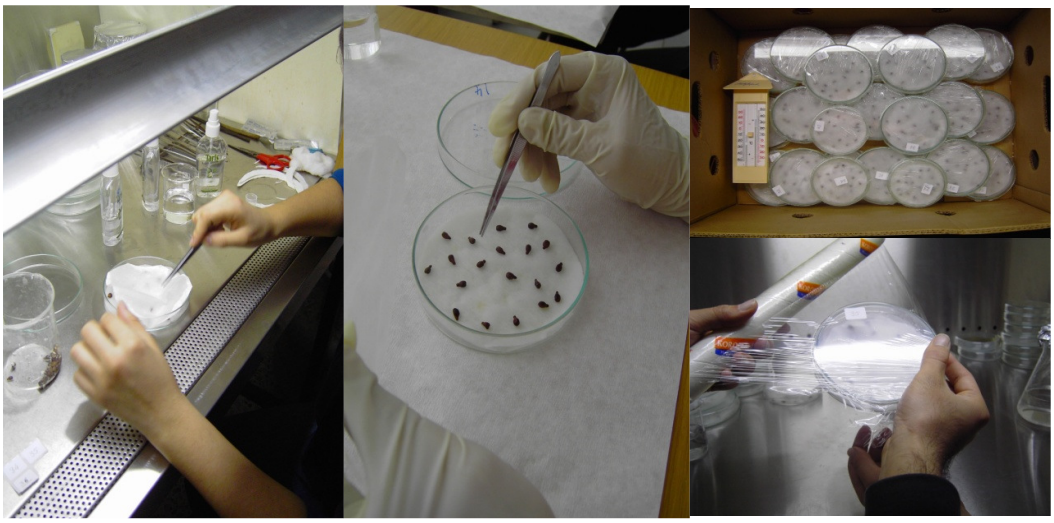

Figure 2.. Seeding on Petri Dishes and placing in the climate room

Results and Discussion

For each cultivar, the data obtained were analyzed by completely randomized design with two factors as statistically. It was found that interactions of stratification periods and GA_3 dose factors were significant. For each cultivar, graphics were prepared by separately (Fig. 3., 4, 5). At the cv. of Razakı, at the 75 days stratification period, the effects of GA_3 applications on germination rates were not significant, yet at the 90 days stratification period, the effects of GA_3 applications on germination rates were significant.
As seen fig. 3, the highest germination rate was obtained by application of 750 ppm GA_3 with 68, 33 %. It was followed by 250 ppm application with 35,00 % germination rate. The lowest rate was taken by control application with 16, 67 %.

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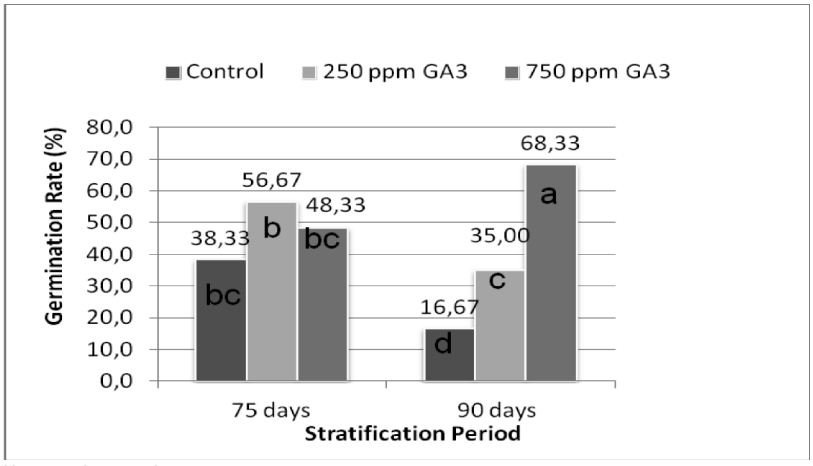

Figure 3. The effects of stratification periods and GA_3 applications on seeds germination rate of cv. Razakı (**Similar letters indicate no differences between the averages as statistically*).

As seen fig.4, at the 75 days stratification period, While the highest germination rate was obtained by application of 750 ppm GA_3 with 78,33 %, the lowest rate was obtained by control with 56, 67 %. 250 ppm application had middle germination rate between them.

At the 90 days, similar to 75 days, the highest germination rate was obtained with 750 ppm GA_3 applications by 73,33%. The lowest rate was obtained by control by 26,67 % Middle rate was taken 250 ppm applications with 41,67 %.

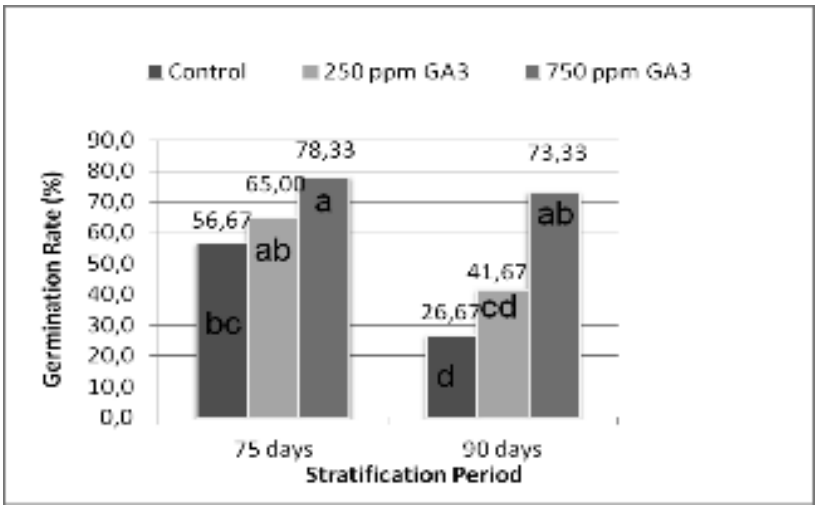

Figure 4. The effects of stratification periods and GA_3 applications on seeds germination rate of cv. Gelin grape (**Similar letters indicate no differences between the averages as statistically*).

As seen fig. 5, there were no differences between 75 and 90 days periods with between control and GA_3 applications. Germination rates changed between 70 % and 85 %

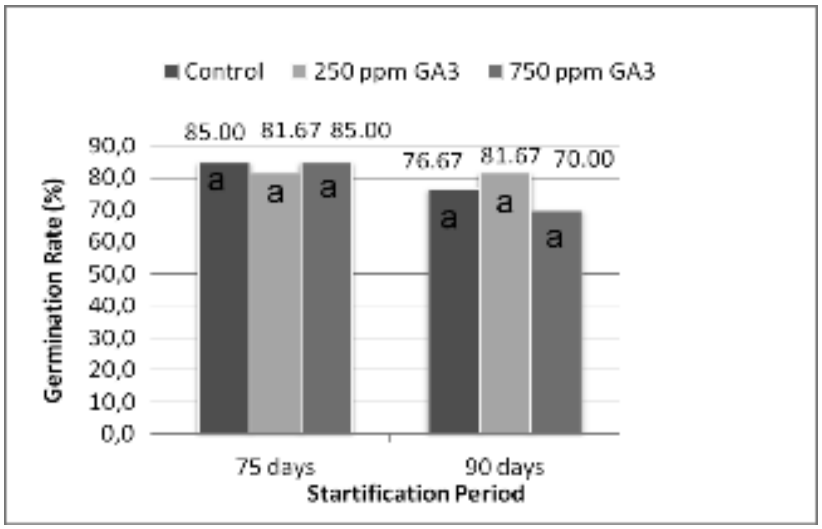

Figure 5. The effects of stratification periods and GA_3 applications on seeds germination rate of cv. Alfonse Lavallèe (**Similar letters indicate no differences between the averages as statistically*).

Conclusion

As a result of this study, for Alfonse Lavallèe cv.,75 days stratification is enough. Ağaoğlu (2002) claimed that mother parents are more effective on germination ability of seeds at F1 generation similar to at F2 generation. So, Alfonse Lavallèe has good characters as mother parent because even control seeds not applied GA_3 had higher germination rates.

If 75 days stratification was applied for Razakı cv., it is not necessary to use GA_3. Yet, 90 days stratification plus 750 ppm GA_3 increased germination rate.

In Gelin cv., in both stratification period, 750 ppm GA_3 increased germination rates.

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