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Effect of Pre-Bloom Gibberellic Acid Application on Seedlessness and Some Fruit Traits of Three Iranian Seeded Grape Cultivars

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Introduction: The basic characteristic of modern table grape production is its adaptation to the requirements of the market aiming to improve grape quality, such as equal cluster size, equal size and shape of the berry, and equal coloration of all the berries in the cluster. Furthermore, an important attribute of the grape berry quality is seedlessness. Seedless cultivars are characterized with small berries, which can be increased by using some management techniques. Plant hormones may play an important role in the growth and development of grape berries. Gibberellic acid (GA3) is known to stimulate development of parthenocarpic fruit in grapes and other fruits. The exogenous pre-bloom application of GA3 to grapevine is commonly used to induce seedlessness, accelerate early ripening, and enhance berry size in seedless cultivars. Although there are a large number of studies on seedless grape varieties, no previous research has been performed on the effect of GA3 on the seeded grape cultivars. Differences in the types of berry set affect the growth of berries and their size. It is well known that there is an important relationship between seed development and berry growth, which has been attributed to hormones such as auxins, gibberellins and cytokinins.

Materials and Methods: To study the effects of 100 mg/L pre-bloom (7 and 14 days before blooming) GA3 application on the induction of seedlessness and some berry and cluster characteristics of three seeded Iranian cultivars, Qzl ouzum, Rish babab Qermez and Khalili Qermez, this research was conducted as a factorial experiment based on Randomized Complete Block Design (RCBD) with five replications. The vines of each cultivar were selected in the vineyard of Horticultural Research Center in West Azarbaijan Agriculture and Natural Resources Research Center, Urmia, Iran. The vines were 13 years old and bi-lateral cordon system had been used as their training system. Pollen germination test was performed at the time of flowering, and several qualitative and quantitative traits including fruit set percentage, cluster length, rachis fresh weight, number of shot berries, number of seedless berries in clusters, the average weight of seedless berries, length of pedicle, berry weight, total soluble solids (TSS) and pH were measured.

Results and Discussion: The results of the study showed that GA3 at 100 mg/L showed significant difference from control regarding pollen germination rate, fruit set percentage, length of cluster and rachis, number of shot berries, weight and number of seedless berries, length of pedicle, weight of berry and TSS. Pollen germination was reduced in those cultivars treated with GA3 but the responses of cultivars were different. Gibberellin caused an increase in cluster length, but the rate of increase in Rish baba and Qzl ouzum was greater than Khalili. In terms of inducing seedlessness in berries, GA3 caused greater effect in Qzl ouzum than Rish baba and Khalili Qermez. The greatest seedless berries weight obtained with the treatment of GA3 spray 7 days before blooming in Qzl ouzum, although the number of seedless berries in this cultivar was fewer than other cultivars. The difference in berry number per cluster between clusters receiving GA3 pre- vs. post-anthesis appeared to consist largely of seedless berries. Perhaps, GA3 stimulated non-fertilized or otherwise nonviable fruits to be retained. The longest pedicle observed in Qzl ouzum treated with 100 mg/lit GA3 14 days before blooming, while Khalili Qermez had the shortest pedicle. In all the cultivars, treatment with GA3 caused an increase in the average length of pedicle. The content of total soluble solids (TSS) in fruits treated with GA3 was higher than control. Gibberellic acid promotes cell division, stimulates earlier flowering, increases the size and yield of fruits, and induces seedlessness in seedless cultivars. The effect of GA3 depends on variety, concentration and time of application.

Conclusion: In conclusion, application of GA3 at 100 mg/lit increased fruit set and seedless berries. The increased number of seedless berries was also noticed when GA_3 applied at 100 mg/L. In general, GA3

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application before flowering in Qzl ouzum, Rish babab Qermez and Khalili Qermez cultivars produced shot berries and seeded berries, and repeated GA3 application after fruit set can resulted in seedless berries with an acceptable size. More research is needed to establish guidelines for the proper use of GA3 for production of seedless berries from the studied seeded cultivars.

Keywords: Berry, Gibberellin, Pollen grain, Seedlessness