

Effect of different rootstocks on PAL activity and phenolic compounds in flowers, leaves, hulls and kernels of three pistachio (*Pistacia vera* L.) cultivars

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Abstract Phenylalanine ammonia-lyase (PAL) is a biochemical marker of environmental stress and plays a pivotal role in phenolic synthesis. Lower ROS levels and oxidative damage were observed in grafted plants; moreover, the rootstocks have a profound influence on the biochemical composition, especially of phenolic compounds. Regarding the importance of the effect rootstocks have on scion in pistachio trees, this study was carried out to assess and compare three pistachio cultivars (Ahmadaghahi, Ohadi and Kallehghuchi) on four rootstocks (Mutica, Ahli, Sarakhs and Atlantica). PAL activity, phenolic compounds, and flavonoid and anthocyanin contents in leaves, flowers and fruits were measured for the selection of the most suitable and compatible rootstock/scion resistant to environmental stresses. The results showed that PAL activity was different among the cultivars and organs. A positive correlation was observed between PAL activity and phenolic compounds in the leaves and flowers of Mutica-Ahmadaghahi, suggesting that it was more resistant than the others to environmental stresses. PAL activity and total phenolics in pistachio fruits suffered a decrease when

the maturation processes began. The hulls of the pistachio fruits contained high levels of phenolic compounds, especially in Mutica-Ahmadaghahi, suggesting its function as a protective layer and a defense chemical against ultraviolet radiation and pathogens. Our results indicated the presence of a number of bioactive compounds in kernels with the highest amount belonging to Mutica-Ahmadaghahi. Therefore, we concluded that pistachio rootstocks might affect the antioxidant compounds in kernels.

Keywords PAL activity · Phenolic compound · Pistachio · Rootstock · Cultivar antioxidant

Introduction

Environmental stresses refer to the most limiting conditions for horticultural productivity. Environmental factors such as temperature, nutrition, light, metal ion concentration and pathogens influence the growth, development and yield of plants. One solution to these problems is to develop crops that are more tolerant to such stresses. One method of adapting plants to external stresses is by grafting elite, commercial cultivars onto selected vigorous rootstocks (Lee and Oda 2003). Different studies on vitis (Koundouras et al. 2008) and pistachio (Gijon et al. 2010) showed that rootstocks had an important influence on the tree water relations, vegetative growth and response to water stress. Rootstocks provide a root system to the scion variety grafted onto them and affect numerous physiological and biochemical changes in the scion leaves (Satisha et al. 2005). Pistachio is one of the most important horticultural crops that is considered a potential crop for many arid and semi-arid regions. Selection of suitable genotypes resistant to unfavorable environmental and soil conditions

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