

## Effect of Arbuscular Mycorrhizal Fungi on Seasonal Changes of Some Growth and Physiological Parameters of Apple Clonal Rootstocks in a Calcareous Soil

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An experiment carried out to study the effects of arbuscular mycorrhizal fungi on growth and physiological parameters of three commercial apple clonal rootstocks during growing season in greenhouse. This investigation was conducted with two factors, rootstock (M<sub>9</sub>, M<sub>7</sub> and, MM<sub>106</sub>) and species of arbuscular mycorrhizal fungi (*Glomus versiforme*, *Rhizophagus intraradices*, *Claroideoglomus etunicatum* and, control) in a completely randomized design. Growth (including plant height and diameter and shoot fresh weight) and physiological (including total chlorophyll, photosynthesis, and transpiration) parameters as well as root colonization were measured in 11, 15 and 19 weeks after transplanting. Results showed that mycorrhizal treatments and rootstocks had significant effects on all measured parameters comparing to the control. It was also shown that the fungus *Glomus versiforme* performed better than other fungi having the highest records for almost all of the measured parameters. Among the rootstocks, MM<sub>106</sub> performed the highest shoot fresh weight (as well as plant height in the first and second measurements) but the final height of M<sub>7</sub> was more than MM<sub>106</sub>. The highest and the lowest plant diameter were observed in MM<sub>106</sub> and M<sub>7</sub>, respectively. The highest chlorophyll content, transpiration and photosynthesis rate was measured in M<sub>9</sub> but the highest root colonization was recorded in M<sub>7</sub>. It seems that choosing proper rootstocks and treating them with suitable arbuscular mycorrhizal fungi could reduce adverse conditions of calcareous soils for apple trees.

**Keywords:** Arbuscular mycorrhizal fungus, Apple, Clonal rootstocks, Growth, Photosynthesis.

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