



# Pistachio (*Pistachia vera L.*) seedling growth response to irrigation method and volume in Iran

Akbar Mohammadi Mohammadabadi, Seyed Javad Hosseinifard\*, Nasser Sedaghati, Mohammadreza Nikooei Dastjerdi

*Pistachio Research Center, Horticultural Sciences Research Institute, Agriculture Research Education and Extension Organization (AREEO), Rafsanjan, Iran*

## ARTICLE INFO

### Keywords:

Applied water  
Drip irrigation system  
Pistachio seedling  
Soil salinity  
Water management

## ABSTRACT

In Iran, pistachio (*Pistachia vera L.*) orchards are mostly irrigated by surface irrigation. In this research, the border surface irrigation method was compared to five different irrigation systems. The research was carried out for four years at the Pistachio Research Center of Iran (IPRC) in Rafsanjan. A split-plot design was used with six irrigation systems with main plots; surface, drip, subsurface porous pipe, bubbler, T-Tape, and pottery cylinder, and three subplots of 10%, 20% and 30% Class A Evaporation Pan (685, 1370 and 2055 m<sup>3</sup> ha<sup>-1</sup> year<sup>-1</sup>). Generally, seedling performance increased with level of irrigation. The best results for seedling height, trunk diameter, leaf number and leaf area were with the pottery cylinder and drip systems and the 30% irrigation treatment; the poorest results were with the surface and T-Tape systems and the 10% irrigation treatment. The highest salinity was with the subsurface system and the 10% irrigation treatment and the T-Tape system with the 10% and 20% irrigation treatments. The lowest salinity with the lowest irrigation treatment was with the pottery cylinder and drip system with the 20% and 30% irrigation treatments. The pottery cylinder system had the highest common thin roots at 60–90 cm, and the drip system had many thin roots at 30–60 cm. Overall, the pottery cylinder and drip systems were best for pistachio seedlings.

## 1. Introduction

There are more than 45,7000 ha of bearing and nonbearing pistachio orchards in Iran, mainly in Kerman province with 57 % of total pistachio growing areas (Bureau of Statistics and Information Technology, 2017). In recent years, pistachio planting has developed in other arid and semi-arid regions of Iran where the production of fruits and nuts is fully dependent upon irrigation (Naor, 2010). Pistachio orchards are mostly irrigated by surface irrigation method and efficiency has been reported to be 47.7% during one decade (1990–2000) in Kerman Province (Ashrefi et al., 2006). Development of pistachio using surface irrigation has contributed to severe decline of the groundwater table in the pistachio growing areas of Iran. Therefore optimized use of available water resources and modern irrigation in this region is necessary for both new and mature pistachio orchards which have suitable soil and water quality for irrigation.

Others have tested different irrigation systems in fruit orchards. Chopade et al. (2001) in their seven-year research on mature pomegranate trees reported that drip and bubbler irrigation systems

increased the yield by 30–40% with lower water application (23–24%) compared with surface irrigation (control). Al-amoud (2008) and Abdel-Naby (2016) reported the suitability of bubbler irrigation system for irrigating orchards. Similarly, Sokalska et al. (2009) reported highest apple yield with less frequent drip irrigation.

In California, drip irrigation management of mature pistachio trees was studied by Phene et al. (1985) showing no significant difference between the quality and quantity of yield in pistachio trees treated by a 25% decrease in water application from 11,500 m<sup>3</sup> ha<sup>-1</sup> year<sup>-1</sup> (as control). However, a significant decline was reported for quality and quantity of yield with a 50–75% decrease in water application. Studies by Arastirma (2004) on application of drip irrigation on mature pistachio trees in Turkey revealed that use of drip irrigation on mature pistachio trees increased yield from 11.8–15.2 kg per tree. In choosing the irrigation system, the physiological properties of each plant are very effective in the resistance of the plant to shortage of water (Ooi et al., 2005). Although the pistachio nut tree has drought tolerance, proper irrigation especially during summer months increases productivity (Iniesta et al., 2008; Kirnak et al., 2001; Mohammadi Mohammadabadi

\* Corresponding author.

E-mail addresses: [a-mohammadi@pri.ir](mailto:a-mohammadi@pri.ir) (A. Mohammadi Mohammadabadi), [hosseinifard@pri.ir](mailto:hosseinifard@pri.ir) (S.J. Hosseinifard), [n-sedaghati@pri.ir](mailto:n-sedaghati@pri.ir) (N. Sedaghati), [nikooei@pri.ir](mailto:nikooei@pri.ir) (M. Nikooei Dastjerdi).

<https://doi.org/10.1016/j.agwat.2020.106287>

Received 10 September 2019; Received in revised form 18 May 2020; Accepted 20 May 2020

0378-3774/ © 2020 Elsevier B.V. All rights reserved.