Water resources management in the development of pistachio fields

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Iran is one of the leading countries in the development of pistachio fields and its related industries [1]. Along with this development in recent years, there has been a sharp decline in water resources, affecting the quality and quantity of water [2]. Climatically speaking, Iran is located on a dry belt and the lack of rainfall and its inappropriate spatial and temporal distribution has resulted in numerous problems for the vegetation in Iran. Meanwhile, poor management of usable water resources has doubled the problems [3]. Accordingly, water is the most important factor restricting the production of agricultural products in arid and semi-arid regions. Plants lose a large amount of water during evaporation this amount of water for plants in arid and semi-arid regions is about 40 to 70% [4]. Frequent droughts and reduced rainfall and overdevelopment of horticultural and agricultural fields, especially in arid and semi-arid regions, have led to groundwater over-exploitation in recent years, resulting in severe water shortages and poor water quality [5]. Numerous studies have been conducted in the field of over-exploitation of groundwater and its adverse effects on the quantity and quality of groundwater [6, 7].

Productivity in pistachio fields and related industries depends on water quality and quantity. Studies on the effects of water quality on the quantity and quality of pistachio products have shown that with increasing salinity and decreasing water quality, the quality of products reduces significantly [8, 9]. A study conducted by Zein al-Dini et al (2020) have indicated that among the quality parameters of water, salinity and SAR have the most significant effects on pistachio yield. Excessive increase of these parameters has a decreasing effect on yield; about 65% of the yield of pistachio fields is affected by these parameters [10]. Increased water salinity has a negative effect on the growth of root and aerial organs and also results in the reducing growth of shoot and leaf [11]. Development of pistachio cultivation without considering scientific principles, lack of compliance with soil characteristics and quality of irrigation water, and lack of water resources management have caused a severe reduction in yield in some pistachio fields; so crop production in some other geographical areas is not cost-effective. [10].

According to the results of different studies, developing pistachio fields with traditional irrigation, using groundwater resources, and exploiting a large amount of groundwater resources have resulted in extensive changes in water quality; so the productivity of pistachio fields has been adversely affected.

Moreover, the role of this product cannot be ignored for its significant economic effect. Thus, it has necessary to properly manage water resources and use modern methods to achieve maximum productivity with minimum water requirements. Numerous studies have been conducted in this field, including that of Yarahmadi et al on the evaluation of different surface water harvesting effects for providing of pistachio trees irrigation water demand that indicated using water harvesting systems with geomembrane insulation surface as the most suitable surface water harvesting and water harvesting systems with plastic and surface isogum insulation in the next priorities can have the highest efficiency for extracting and collecting rainfall.

According to the conducted study, the catchment region with an area of 800 square meters in areas with an average rainfall of 300 mm per year, has the potential to extract 200 cubic meters per year; with this volume of water and drip irrigation method along with gravel filter, 200 fertile pistachio trees can be irrigated during a growing season [3]. Using plastic mulch in drip irrigation is another management method for maximum efficiency of water resources that has been evaluated in a study conducted by Sedaghati et al. The results of this study showed that using plastic mulch has a significant effect on most of the vegetative, quantitative and qualitative traits of the product as well as water use efficiency. Using plastic mulch increased the dry weight of the crop to 271 g per tree, reduced the percentage of fruit blankness to 10.6% and increased water use efficiency by up to 100% compared to the control group. Moreover, using plastic mulch maintained soil moisture in the interval between the two irrigations [12]. Azari et al have also used tarpaulin mulch in a study to reduce irrigation water consumption in pistachio fields. The results of this study showed that using tarpaulin mulch significantly reduces the surface evaporation of water from the soil and increases the relative content of leaf water by 3 to 6%. By using tarpaulin mulch, it is also possible to increase the irrigation cycle by 2 to 3 weeks [13]. Wastewater treatment from pistachio processing industries using advanced treatment processes with the purpose of recovering and reusing wastewater is another effective method in increasing the efficiency of water resources [14].

Studies have indicated that water resources management is not in conflict with increasing the productivity of pistachio fields and if new methods are applied to irrigate pistachio trees, the quantity and quality of pistachio products can be increased and water consumption will be reduced too.

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