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Investigating the Effect of Irrigation Volume and Intervals on the Performance of *Haloxylon Ammodenderon* Forestry

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Extended Abstract

Introduction: Wind erosion contributes to climate change on both global and local scales, causing changes in biological, geological, and chemical cycles. Exerting adverse effects on the environment and human health, the phenomenon also brings about the loss of vegetation and the reduction in water resources. In this regard, carrying out biological recovery projects to be used as windbreaks is regarded as a highly effective method for combating wind erosion. However, due to the scarcity of water in desert areas, plant planting poses some serious threats to the implementation of the above-mentioned projects, requiring the observance of water management techniques. On the other hand, improper irrigation leads to the loss of large amounts of water through evaporation, causing stress in the irrigated plants. According to the predictions, the world will face a 40% water shortage by 2030. Thus, should the shortage continue to grow, many regions worldwide will experience severe water shortages or droughts in the near future. Located in the desert belt of the world and enclosed in relatively high mountain fences, Iran is threatened by the phenomenon of dryness in such a way that two-thirds of its area is now at risk of being caught by the phenomenon. The current research selected the Qom province (one of the 22 desert provinces in Iran) as its study area where high temperature and poor water quality have challenged the implementation of biological projects. Currently, the Iranian Organization of Forests, Pastures, and Watershed Management Common methods uses 30 liters of water every two weeks as its main irrigation method for the plants that grow in the province. Considering a treatment in which half of such amount of water (15 liters) is used for irrigation water, this study sought to assess the efficiency of the treatment on the *Haloxylon ammodenderon* plant.

Materials and Methods: Characterized by high-temperature rates in summer, low annual precipitation, hot winds during the dry season, dry cold in winter, and temperature fluctuations in different seasons, Qom province does not have a favorable climate due to its proximity to desert areas. In the traditional method of planting a seedling, a hole with a depth of 50 cm is dug, the plant is placed in the center of the pit, and the irrigation is done by surface method. This study investigated both 15-liter and 30-liter treatments made within two-week, threeweek, and four-week irrigation intervals to compare the morphological indicators of the plant during the intended growth season

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(May to November). Moreover, variance analysis was conducted via SPSS statistical software to compare the variance between treatments and Duncan's test, seeking to identify potential differences

between treatments (at a confidence level of 5%). On the other hand, the study used the *Haloxylon ammodenderon* as a halophyte plant with a wide vegetative range, considering the fact that the plant is indigenous to Qom province, characterized by its high resistance and adaptability in harsh conditions. It should be noted that while the average annual precipitation rate of the province is reported to range from 40 to 200 mm, the plant grows well and remains fresh.

Results and Discussion: Thirteen physical and chemical characteristics of the study area's soil were tested in five points. Accordingly, it was found that the region's soil had a sandy clay loam texture with a salinity of 1.92 Decisiemens per meter and a pH of 7.19 with an average of 0.57% organic matter, 24.2% lime, 16.8% sulfate, and 0.2% gypsum. Moreover, solutes such as calcium, magnesium, carbonate, bicarbonate, and chlorine were found to be 13.6, 24, 0, 8.2, and 33.2 mill equivalents per liter, respectively. On the other, as Qom province suffers from low urban water quality, the study used the wastewater located near the study area. The results suggested that morphological characteristics such as height, trunk diameter, growth index, and canopy diameter significantly differed at the 5% level, while no significant difference was found in terms of root depth, aerial and root weight, and survival rate. As 90% of soil particles move within 30 cm of the ground surface, the shape of the canopy can effectively prevent their movement. As for the measurement of the canopy cover of the 30- and
15-liter treatments in two, three, and four weeks' periods after irrigation, the results showed that the 30-liter treatment had better canopy dimensions, which exerted a significant influence on reducing wind speed, receiving more rainwater, and reducing runoff. The necessary water for the implementation of biological recovery projects in dry areas is provided through irrigation due to low and scattered rainfall. In Iran, water management is faced with challenges such as the shortage of water resources, environmental dryness, waste of water resources in the agricultural sector due to traditional irrigation, etc. The results of this study indicated that the 30-liter treatment performed better in terms of the plants' height in all three irrigation intervals. Moreover, the treatment presented better results in terms of rooting when tested in the tree-weak interval, while no significant difference was found between the two treatments under a two-week irrigation interval. However, the 15-liter treatment had a greater rooting depth than the 30-liter one in four weeks of irrigation. As for the canopy diameter, aerial and root weight, and growth index, the 30-liter treatment revealed better performance. On the other hand, the percentage of survival in the 30-liter treatment was better in two-week and four-week irrigation periods than those of the 15liter treatment, but the difference is very small. According to the comparison of the results of canopy dimensions and morphological characteristics, it can be concluded that the 30-liter treatment was definitely better. However, the results obtained for the 15-liter treatment can be acceptable in terms of reduction in irrigation costs

Keywords: Biological Recovery, Desert, Morphological Indicators, Wind Erosion, Water Shortage.