Water intake patterns of Juglans major to manage hydro-stress in a greenhouse study.

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Abstract

Water needs in plants account for landscape distribution and comprise a variety of responses to catch up with climate driven hydrological patterns. The present study aimed to determine the water intake of a common riparian species in the Sonoran Desert: Juglans major (Black walnut), and relate it to a mathematical equation which can elucidate the best way to manage its inclusion in an ecosystem restoration project. As water becomes less available in desert ecosystems, identifying hydro-stress levels is important for predicting changes in dominant species. An indirect method was applied to collect data in order to find the water intake rate as an inverse of soil electrical resistivity.

Five individual two year-old Juglans major trees grown using organic methods from seed were selected and monitored in the greenhouse for 6 months to track their growth rate and water needs as different volumes of water were used to irrigate. The average height of the trees at time zero was 41.4±0.94 cm. The electrical resistivity was read with an EXTECH multimeter, model 070900734, before and after irrigation within six months. Data was treated upon an equation that relates humidity in soil with electrical resistivity (R) as reported by Benitez:

$\omega(R)=e0.0065R+2.528569$ ….(l)

where ω is the rate of water expressed as percentage, that is to say the difference between humid weight of soil minus dry weight divided by dry weight of soil.

The results, after treating data, appear on Figure 1. Figure 1 shows that humidity decreases as electrical resistivity increases. Soil infiltration for this experiment was not significant since the trees were confined to pots. Water vaporization from the surface of soil only matters before irrigation of plants because of the time held back until reading resistivity. The information found is relevant to manage hydro-stress in Juglans major and therefore avoids the plant risk in either ponding or shortage of water.

Biography:

Perfecto Barragan-Peña has completed his PhD in Environmental Sciences from Tecnológico Nacional de México, campus Toluca. He is currently professor at Instituto Tecnologico de Nogales, in Mexico where he teaches Project Management in Urbanism, Sustainable Development, and Statistics, which are part of the Master Degree Program in Urbanism . He has experience in research projects related to water and waste management. He has published original research articles in Journal of Environmental Sciences (China), Environmental Technology (UK) and Materials Research Society (MRS Advances) from Cambridge University Press. He was accepted as Candidate to SNI, which stands for National System of Researchers in Mexico, for the period January 2020 to December 2022

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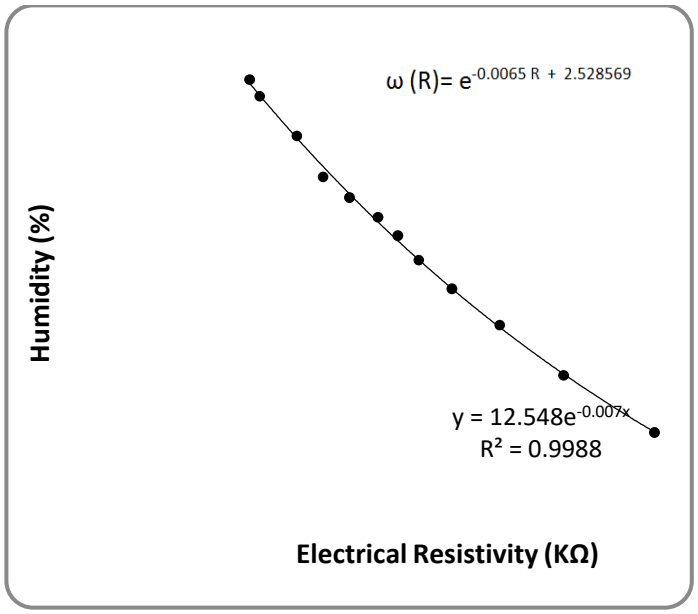

Figure 1. Humidity behavior in soil for Juglans major within six months