Sap Flow Characteristics of Dwarf Red Jujube Trunks in Southern Xinjiang and Their Response to Environmental Factors (Postprint)

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Abstract

Using FLGS-TDP needle-type thermal diffusion probe technology, long-term monitoring of sap flow in dwarf jujube tree trunks was conducted in the Cele Oasis, with simultaneous recording of meteorological factors around the experimental site, analysis of variation patterns in dwarf jujube trunk sap flow, and establishment of a relationship model between sap flow and environmental factors. The results show that: diurnal variation of sap flow exhibits a unimodal curve, with occasional bimodal curves occurring in summer; weather conditions affect sap flow variation, with the highest sap flow rates under sunny conditions, followed by dusty weather, and the lowest on rainy days; sap flow rates differ significantly among seasons, with sap flow initiating at approximately 6:30 in summer, earlier than in spring and autumn; summer exhibits the longest duration of trunk sap flow, with relatively shorter durations in spring and autumn, and peak sap flow rates are highest in summer and lower in spring and autumn; during the growing season, sap flow rate shows a significant positive correlation with solar radiation intensity and air temperature, and a significant negative correlation with relative humidity; among various environmental factors, solar radiation intensity has the greatest influence on sap flow rate, with a correlation coefficient of 0.927, followed by air temperature with a correlation coefficient of 0.7254, while relative air humidity has the smallest effect, with a correlation coefficient of 0.548. Through monitoring sap flow in dwarf jujube tree trunks and analyzing water consumption characteristics of dwarf jujube, this study provides data support for water resource allocation and management in oasis agriculture.

Full Text

Preamble

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Characteristics of Sap Flow of Dwarf Red Jujube Trees and the Response to Environmental Factors in South Xinjiang

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Abstract:
In this paper, the characteristics of sap flow of the dwarf red jujube trees in the Qira Oasis were analyzed, and the relationship between the sap flow and environmental factors was researched. The results showed that the curve of daily variation of sap flow was unimodal, and it was occasionally bimodal in summer. Weather conditions affected significantly the change of sap flow; the sap flow rate was the highest on sunny days, followed by sandy and dusty weather, and it was the lowest on rainy days. The seasonal difference of sap flow rate was significant; the sap flow started earlier in summer than that in spring and autumn; the duration of sap flow was the longest in summer, and it was relatively short in spring and autumn; the peak value of sap flow was the highest in summer but low in spring and autumn. There was a significantly positive correlation between the sap flow rate and the solar radiation intensity and air temperature, but a significantly negative one between the sap flow rate and the relative humidity. Among the environmental factors, the effect of solar radiation intensity on the sap flow rate was the highest, then that of air temperature, and that of the relative humidity was the lowest.

Keywords: TDP thermal diffusion probe technology; dwarf red jujube tree; sap flow; environmental factor; Qira Oasis; Xinjiang

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[28] *Note: Reference [28] appears to be incomplete in the original text and cannot be fully reconstructed.*

Note: Figure translations are in progress. See original paper for figures.