

Publication

Water relations of drought-stressed temperate trees benefit from short drought-intermittent rainfall events

Journal Article (Originalarbeit in einer wissenschaftlichen Zeitschrift)

ID 4500293

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Year 2019

Title Water relations of drought-stressed temperate trees benefit from short drought-intermittent rainfall events

Journal Agricultural and forest meteorology

Volume 265

Pages / Article-Number 70-77

Keywords Mature trees; Drought; Recovery; Tree water deficit; Sap flow; Water potential

Mesh terms Science & TechnologyLife Sciences & BiomedicinePhysical SciencesAgronomyForestryMeteorology & Atmospheric SciencesAgricultureForestryMeteorology & Atmospheric Sciences

Decreasing amounts of precipitation and more frequent dry periods will challenge temperate European forests in the future. During such dry periods, short drought-intermittent rainfall events might be the only renewing water source for trees. We investigated the effects of short drought-intermittent rainfall events on the water relations of mature individuals of six different tree species in a near-natural temperate forest during the exceptionally dry summer of 2015. We found the trees to strongly respond to short drought-intermittent rainfall events: maximum daily sap flow recovered already at precipitation amounts of 1.5 mm by up to 20%, and tree water deficit (TWD) and midday shoot water potential ($\Psi(\text{midday})$) improved by up to 60% from rainfall amounts of >4.5 mm. We speculate that a mix of foliar and root water uptake as well as relaxation of canopy VPD and thus stomatal water control lead to the observed recoveries. Hydraulic conductivity was found to partly explain the differences in TWD recovery among species. Duration of the rainfall-facilitated recovery of tree water relations was on average 3 days in the coniferous species and *Q. petraea* but distinctly longer in *C. betulus* and *F. sylvatica* for which it reached 9 days. These results show that drought-intermittent short rainfall events strongly facilitate the relaxation of water stress in temperate tree species during drought events and possibly contribute as such to the ability of temperate trees to withstand longer periods of drought.

Publisher Elsevier

ISSN/ISBN 0168-1923 ; 1873-2240

edoc-URL <https://edoc.unibas.ch/69864/>

Full Text on edoc No;

Digital Object Identifier DOI 10.1016/j.agrformet.2018.11.012

ISI-Number 000456751200006

Document type (ISI) Article