Complementary water uptake depth of Quercus petraea and Pinus sylvestris in mixed stands during an extreme drought

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AimsThe growing demand from forest managers is to identify silvicultural practices to overcome projected water scarcity during the next decades. One solution is to mix tree species in the same stand, thereby increasing resource partitioning and minimizing competition for limited soil water. This study investigates the mixture approach for Quercus petraea (Matt.) Liebl. and Pinus sylvestris L. during an extreme summer drought event.MethodsDuring the summer drought event in 2016, we analyzed the isotopic signatures of large- and small-tree xylem and soil water throughout the soil profile to assess the depth of water uptake for both tree species. We also measured predawn leaf water potentials (PLWP) to assess water availability for individual tree species.ResultsWhen grown in pure stands, both species primarily utilized soil water near the surface. In contrast, partial niche complementarity for limited water resources between the two species in mixed stands resulted in less water constraint (i.e., less negative PLWP) for oak trees compared to pure stands, especially for small trees.ConclusionsResults from this study show that contrasting water use strategies can change water availability for trees and could help some species, though not all, to cope with the water scarcity predicted in a changing climate.
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