
Primary and secondary growth of *Pinus halepensis* are more sensitive to inter-annual drought variability than to 14 years of rainfall exclusion

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Résumé

With ongoing climate change, the impact of droughts of increasing intensity on forest functioning is of critical concern. While the adverse effects of drought on tree aboveground growth have been largely documented both at the tree and stand scales, our understanding of how primary growth traits, which control crown development, respond to drought remains limited - especially over long temporal scales.

Based on 14 years of monitoring of primary growth (shoot elongation, polycyclism rate, branching rate, and needle length) and stem secondary growth at the Font-Blanche experimental site, we investigated (i) the climatic drivers of above-ground growth and (ii) the effect of long-term exacerbated drought conditions (via a 30% rainfall exclusion) on the growth response to drought of *Pinus halepensis*.

Aboveground growth was strongly and negatively impacted by drought duration during the current year (stem secondary growth), the previous year (polycyclism) and both years (branching, shoot length), and by drought during spring (needle length). While excluding 30% of the incoming rainfall did not significantly affect the number of ramifications, polycyclism rate or stem secondary growth, it reduced needle and shoot lengths by 14.3 and 7.7% over the entire study period, respectively. However, this effect is significant only in the first years after the treatment was established. Such acclimation to exacerbated drought conditions is also reported in the drought-growth relationships, which are similar among treatments, except for needles that were slightly shorter under a similar level of drought stress in the exclusion plot. Our study highlights thus the key acclimation capacity in the response of *P. halepensis* primary and secondary growth to drought.

Mots-Clés: tree growth, drought, acclimation, crown development, Mediterranean

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