Variability among individuals in senescence and bud-burst timing is linked to trees' reserves of carbon and nitrogen

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Résumé

Phenology is the study of annually recurring events in plant life in relation to the environment. The most noticeable phenological events for deciduous trees are bud-burst in spring and leaf coloration and leaf fall in autumn. Temperature is a main regulator of these events, in some species in interaction with photoperiod. Recently it was highlighted that the timing of the onset of leaf senescence significantly affects the timing of next year's spring bud-burst. Both events show variability across individuals within a monospecific stand for common European tree species. The mechanism behind this finding is potentially related to the tree nutrient reserves which are remobilized during leaf senescence and are heavily used next spring for the development of leaves. We investigated the relationship between the reserves of stem carbohydrates and nitrogen compounds, and the timing of tree phenology, in monospecific forest plots of beech, birch and oaks in Belgium. In autumn, trees that started senescence early displayed higher nitrogen reserves in all three species. However for carbon reserve, the relationship was species-specific. Effective nitrogen relocation before cold events is essential for chlorophyll production the following year. In early spring, trees with higher carbohydrate and nitrogen compound reserves could initiate leaf phenology earlier, capitalizing on an extended growing season and securing a more advantageous canopy position. Drawing from these initial results, the potential impact of tree reserves on phenology timing emerges as a critical subject, as it directly influences biomass production and the long-term efficiency of carbon storage in trees.

Mots-Clés: Phenology, Deciduous trees, Nutrient reserve

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