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Photoperiod sensitivity of bud burst in 14 temperate forest tree species

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The timing of spring phenology of trees reflects a trade-off between a longer growing season and a lower risk for damage by late freezing events. Temperature is driving rates of development directly, but given the high inter-annual variability in weather, it is a poor environmental cue for the progression of the season and thus, the period with low freezing risk. In contrast, photoperiod is a reliable and weather independent signal of the progression of the season. Using growth chamber experiments we assessed the photoperiod sensitivity of bud burst under artificial spring conditions in cuttings of 14 common European tree species that belong to different life-strategy types (pioneers or exotic species vs. native late-successional species; 3 conifers/11 broadleaved). Fully chilled twigs were sampled from populations along two elevational gradients in the Swiss Alps. Applying realistic contrasts in photoperiod, short photoperiods delayed bud burst in five late successional species to variable degree, whereas no distinct photoperiod sensitivity was observed in early successional species. In Picea abies, the photoperiod response was additionally influenced by elevation of origin, whereas in Quercus petraea and Abies alba regional differences in the photoperiod response were observed. For late successional species, photoperiod is thus an important environmental signal that will constrain responses to climatic warming because rising temperatures will drive phenology toward the species specific photoperiod threshold. (c) 2012 Elsevier B.V. All rights reserved.
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