Understorey senescence caused by autumnal canopy opening in boreal forests.

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Abstract

Leaf fall in the autumn opens the forest canopy, allowing more solar radiation to be transmitted to the forest floor. Those understorey species that remain physiologically active may benefit from the sunlight received by assimilating additional carbon while conditions remain favourable. We monitored water and leaf pigment content, as well as photosynthetic capacity in six understorey species growing in three adjacent stands differing in their canopy tree species. Leaf fall, transmitted light and microclimate were followed in each stand. We found that leaf fall started earlier in the *Betula pendula*, than in the *Quercus robur* stand, and light transmission changed accordingly. Concurrently, understorey leaf senescence was generally earlier in the birch than in the oak stand, itself earlier than in the evergreen *Picea abies* stand. Neither atmospheric CO_2, humidity, nor temperature differed between stands. A change in light quality and/or increase in quantity following leaf fall drove the difference in the timing of senescence in the understorey. Species with later senescence were more able to use the increased light after leaf fall. Together these findings help provides a mechanistic foundation to predict how ecosystem functioning and carbon balance will be impacted by phenological shifts in response to global changes.

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