Twilight far-red treatment advances leaf bud burst of silver birch (Betula pendula roth)

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Leaf bud development of boreal trees, once initiated, is driven by ambient air temperature. The mechanism triggering the bud development is so far unclear. Models of bud burst utilizing the release of winter bud dormancy or change in day length in spring give comparable prediction of bud burst under current climatic conditions, but disagree when climatic warming is simulated.

We conducted an experiment to find out if day length is the trigger of bud burst. We grew 3-year old birch seedlings cloned from a mature tree of boreal origin in light conditions simulating the lengthening days of spring. One group was subjected to a morning and evening treatment under lilac filters, emulating the reduced red to far-red (R/FR) spectral ratio of twilight. The other group was grown under white translucent filters, cutting the light intensity to same level as the lilac filters, while not changing the spectral composition.

The bud burst was observed when the stem of the leaf emerged from the bud for 3 leaves out of 5 in the main stem of the plant. Bud burst dates were converted to accumulated heat sums. We then fitted a model to the data with separate, parameterized starting dates of heat sum accumulation to both treatments.

Least-squares fitting suggested that the bud development started under light conditions corresponding to late March, and that the lilac-filtered group had started development 6 days before the other. Bud development of Betula pendula is triggered by lengthening days in spring and the reduced red to far-red light during twilight promotes bud burst. As contemporary climate change simulations show that when bud burst is triggered by a light signal, we conclude that birch will not see increase in spring frost damage risk with climatic warming.