Reduced humidity seriously restricts leaf growth of beech trees

Beech trees are extremely sensitive to drought and are known to be one of the European tree species most at risk from climate change. New research found a dramatic reduction in the leaf growth of young beech trees growing in Central European forests when air conditions were dry, even where there was sufficient moisture in the soil.

While previous experiments have shown the damaging effect of drier soils on beech, this new research from Germany shows for the first time that reduced air humidity also causes drought stress in young beech trees. In the research, young trees were grown at different air humidity levels both in climate chambers and in open-forest settings. In both cases, the trees were harvested and the amount of plant material or biomass, both above and below ground, weighed and measured.

In the climate chambers, reducing air humidity by 40% resulted in a 68% reduction in plant size or biomass. This finding was similar to the results of the open-top chamber experiment conducted on the forest floor: biomass declined by 30% when relative air humidity was reduced by 15%. Drier conditions led to a reduction in leaf growth and production of fewer leaves. Under the driest conditions, growth in young trees was so diminished that almost all new leaf buds died. Over a longer period, it is likely that this would have caused the trees to die. It appears that when stressed by drought conditions, leaves are less able to take up moisture.

Dense Central European forests have a humid microclimate on the forest floor which may support beech seedling survival under dry conditions. The researchers warn that creating gaps in beech forests considerably alters this microclimate. Ironically, current forest management techniques which create gaps in the beech canopy to encourage germination and survival, may threaten the vitality of young beech trees by exposing them to drier air as well as heat stress.

These results add to the ongoing debate about how the distribution of the European beech might be affected by a future drier climate. The researchers conclude that air humidity levels are a widely ignored factor which influences the growth and vitality, and possibly also the distribution of European beech trees. Future forest management schemes under an altered climate should take this factor into account.


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