Selective breeding could save trees from drought

Trees with high wood density tend to survive better under drought conditions. In a new study on Douglas-fir tree populations, research suggests that the trees could be selectively bred for high density wood to increase resistance to drought. With predictions that the frequency of droughts could increase over the coming century, such strategies to protect tree populations could aid climate change adaptation efforts.

Trees are very sensitive to dry conditions. If water in the soil is scarce, a tree’s water-carrying vessels can start to fill with air, thus reducing its ability to conduct, or transport, water from root to leaf. During heat waves, this can lead to tree damage and even death. However, heat waves may also increase the resilience of a species as a whole by preserving only those trees which are genetically best adapted to dry conditions.

In 2003, a heat wave in Europe caused droughts that damaged and killed many Douglas-fir trees, an important commercial species. The study, partly conducted under the European Commission-funded GEMA project, demonstrates that resistance to drought in this species is dependent on the density of wood in each individual tree. Trees with higher density wood tend to be more resistant to air filling.

The researchers took samples of Douglas-fir trees from two different regions of France; both regions had been affected by the 2003 heat wave. The density of the samples was measured and they were then tested for their ability to conduct water at different pressures.

The results suggest that conductivity was dependent on the individual tree. In other words, the genetic make-up of each tree was responsible for the degree of drought resistance. The conductivity of one particular sample at the badly affected site was more than 100 times that of other trees at the site, demonstrating the high levels of variability from tree to tree.

In light of their findings, the researchers suggest that some Douglas-fir trees hold the genetic potential to withstand the pressures exerted by climate change, although longer term studies are needed in order to fully understand their responses under changing environmental conditions.

Selective breeding programmes could therefore be implemented to increase the number of high density wood trees and preserve Douglas-fir populations in times of drought.


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