

Time of day matters to thirsty trees, researcher discovers

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The time of day matters to forest trees dealing with drought, according to a new paper produced by a research team led by Professor Malcolm Campbell, University of Toronto Scarborough's vice-principal for research and colleagues in the department of cell and systems biology at the St. George campus.

Capitalizing on their previous work to decode the genome of the poplar tree, the research team examined how poplar trees use their 45,000 genes to respond to drought. Campbell and PhD student Olivia Wilkins, the lead researchers, along with researchers Levi Waldron, Hardeep Nahal and Nicholas Provart, had their findings published in the November 13 issue of the *Plant Journal*. The article is titled "[Genotype](#) and time of day shape the *Populus* drought response."

"Each gene is like a line of code in a computer program" says Campbell, a plant biologist. "Depending on which lines of code are used, the tree can create a different program to respond to environmental stimuli, like drought." The use of different combinations of genes creates different programs. The combination of genes that trees use in response to a stress, like drought, determines whether the tree can survive this stress or not.

In the past, researchers examined drought-responsive gene programs at a single time point - normally in the middle of the day when most researchers work in the lab or the field. Wilkins did her experiments so that she examined the gene programs at multiple times throughout the

day and night.

Surprisingly, working together with University of Toronto bioinformaticians, the team found that trees used different drought response gene programs at different times of day. That is, the drought response gene program that the trees used in the middle of the day was different from the program used in the middle of the night.

"Previously, researchers referred to the drought response as though it was a single, simple program that ran all the time," Campbell notes. The new research shows that the story is not that simple. "Rather than one program, trees use multiple programs, each of which runs at a different time of day," says Wilkins.

The discovery that trees use different programs at different times of the day is described as a critical finding. Previous research may have overemphasised the importance of some genes in helping trees to contend with drought, and totally missed others that are important.

The new work provides insights and tools to enable future researchers to identify, conserve and breed trees that are better able to contend with drought. Drought is an increasingly-important malady for [forest trees](#), as it can dramatically reduce forest growth, and, in severe cases, increase forest susceptibility to insect pests and bring about catastrophic forest death. Given the importance of forest trees in vast ecosystems the world over, and as a renewable resource of great economic value, a better understanding of how trees contend with drought can have far-reaching implications for the environment and the economy. The new findings could play a role in safeguarding one of Canada's most important natural resources, our forest trees.

More information: [www3.interscience.wiley.com/jo ...
/122541844/abstract](http://www3.interscience.wiley.com/jo.../122541844/abstract)

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