The risks and benefits of using poplars for biofuels

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A potential solution for global energy demands is the use of Poplar, a fast-growing tree with high yields, for biofuels. To get the most out of Poplar plantations, varieties that are the best fit for the conditions—ones with disease resistance or higher yields, for example—are desired. But do these plantations of new, non-native (exotic) species impact nearby native populations of Poplar? In particular, is the genetic makeup of the native populations being altered by interactions with the exotic species?

In the October issue of the American Journal of Botany, Dr. Nathalie Isabel and colleagues tackled these issues by conducting a scientific risk assessment on the introduction of exotic species of Poplar (complex hybrids primarily made up of *Populus nigra*, *P. trichocarpa*, and *P. maximowiczii*) and the resulting impact on three native populations of Poplar species (*P. deltoides* and *P. balsamifera*) at two different locations over 3 years.

The researchers monitored gene flow—the passing of genetic information (alleles) between two populations—resulting from spontaneous hybridization between exotic and native populations. By looking for specific DNA signatures, called SNPs, they determined who the father species was for individual offspring. These paternity tests revealed that complex patterns of hybridization were occurring. All five species were capable of producing hybrids with the native populations, but when the native population was large, the native species were more successful; native species represented more than 95% of the parental alleles.

After the initial hybridization, the new genetic makeup may persist in the population through the generations (introgression) or be lost over time. The long-term effects of hybridization "depend on the ability of the hybrids to become established in natural forests and to subsequently reproduce," Isabel said. "Thus, there is a need to monitor multiple steps of the introgression process for poplars."

The risk of introgression is likely to be higher for small populations of native Poplars (ex: in disturbed agricultural landscapes) compared to more densely populated areas. This has important implications for further steps (ex: modeling introgression) and the development of regulatory guidelines for the commercial release of plants with novel traits, and for other cases where the rate of gene flow from plantations into natural populations should be kept to a minimum.

More information: Patrick G. Meirmans, Manuel Lamothe, Marie-Claude Gros-Louis, Damase Khasa, Pierre Périnet, Jean Bousquet, and Nathalie Isabel (2010). Complex patterns of hybridization between exotic and native North American poplar species. American Journal of Botany 97(10): 1688-1697. DOI:10.3732/ajb.0900271

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