

POTENTIAL GENE FLOW BETWEEN CULTIVATED POPLARS AND NATIVE BLACK POPLAR (*POPULUS NIGRA* L.) IN BELGIUM

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We evaluated the potential risks associated with the use of cultivated poplar plantations of *P. x canadensis* (hybrids resulting from a cross between *P. deltoides* and *P. nigra*) and *P. nigra* cv. *italica*, in the surroundings of *P. nigra* in Belgium. First, the flower biology of trees of *P. x canadensis*, *P. nigra* cv. *italica* and *P. nigra* was studied. The results indicated that flowering time did not constitute a barrier to hybridisation between *P. x canadensis* and *P. nigra*.

In order to assess the level of inter-specific hybridisation, the open pollinated offspring of black poplar females was studied by conducting a paternity analysis based on the combined data of different molecular markers (isozymes, SSRs, the diagnostic STS marker win3). This was done on two different study sites: (i) a species mixed poplar plantation where the black poplar females were surrounded by *P. nigra* as well as *P. x canadensis* males, and (ii) an open agricultural landscape where the black poplar female was surrounded by many *P. x canadensis* males but isolated from black poplar males.

In the first study site, introgressive hybridisation was not detected. This was in conformity with several former studies investigating the introgression of genes of *P. deltoides* in the offspring of black poplar females located in natural black poplar populations. In contrast, introgression was clearly detected in the offspring of the isolated black poplar female located in the open agricultural landscape.

This was the first time that evidence for introgressive hybridisation was presented. Based on the contrasting results obtained on both study sites, we have put forward the hypothesis of pollen competition in *P. nigra*. The hypothesis of pollen competition between *P. nigra* and *P. x canadensis* states that, in a mixed pollen cloud, pollen of *P. nigra* may be more successful than that from *P. x canadensis* in pollinating female black poplars. Also, if no pollen of the own species is present, *P. nigra* females are pollinated successfully by pollen of *P. x canadensis*. This hypothesis was tested in an experimental study. We analysed the genotypes of seeds produced in a series of controlled hand-pollinated crosses in which pollen of the two species were mixed. Paternity analysis based on the SSR markers confirmed the hypothesis of pollen competition in *P. nigra*. This explains why no introgression was detected in the species mixed poplar stand and explains also the results of former studies reporting on very low levels of introgressive hybridisation in natural populations of black poplar.

Based on the results, recommendations were made to conserve and restore black poplar populations in Belgium.

Key words: *Populus nigra*, introgressive hybridisation, introgression, gene flow, paternity analysis

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