



## NEW HYPOTHESES ON THE ORIGIN OF THE INTERSPECIFIC HYBRID OOMYCETE *PHYTOPHTHORA ALNI*

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An emergent disease of alder is caused by a complex of three taxa belonging to the genus *Phytophthora* (Oomycetes): *P. alni* subsp. *alni* (*Paa*), *P. alni* subsp. *multiformis* (*Pam*) and *P. alni* subsp. *uniformis* (*Pau*). *Paa* was previously hypothesized to be an allopolyploid hybrid between two genetically close species, *P. cambivora* and a taxon close to *P. fragariae*, whereas *Pau* and *Pam* were believed to be genetic breakdowns of *Paa* (1).

In order to examine these hypotheses, we studied the occurrence and the allelic distribution of four nuclear and two mitochondrial genes on a wide collection of *P. alni* and closely related species. *Paa* possesses three different alleles for each of the nuclear genes we studied, two of which are present in *Pam* as well, whereas the third matches the single allele present in *Pau*. Moreover, *Paa* displays common mtDNA patterns with both *Pam* and *Pau*. A combination of the data suggests that *Paa* may have been generated on several occasions by sexual hybridization between *Pam* and *Pau*, and that *Pam* may result itself of an ancient reticulation (2).

In addition, we studied the expression of elicitor genes, a multigenic family specific to the genus *Phytophthora*. The cumulative patterns of *Pau* and *Pam* in regard with *Paa* confirmed our first results and demonstrated that for this allopolyploid taxa, distinct genomes may be co-expressed. Last, in order to study the genetic variability of the different taxa, microsatellite markers were isolated in *Paa* and characterized (3). These markers revealed a low genetic diversity in all three taxa. The cumulative microsatellite patterns observed in *Paa* confirmed the hybridization scheme and confirmed that *Paa* was generated by several hybridization events. Genotypes resolved for *Pam* suggest that this taxon may also be allopolyploid.

Altogether, our results clearly demonstrate that (i) *P. cambivora* and *P. fragariae* are not the progenitors of *P. alni*, and (ii) *Paa* was generated at several occasions by hybridization between *Pam* and *Pau*. This study raises new issues about the geographic origin, host range, ecology and aetiology of *Pam* and *Pau*.

(1) Brasier *et al.* (1999) Proc. Natl. Acad. Sci. USA 96, 5878-5883.

(2) Ioos *et al.* (2006) Fungal Genet. Biol. 43, 511-529.

(3) Ioos *et al.* (2007) Mol. Ecol. Notes 7, 133-137.