

## HAPLOTYPE ANALYSIS OF THE *RDG2A* LOCUS IN DIFFERENT BARLEY VARIETIES

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Leaf stripe disease on barley is caused by the seed-transmitted hemi-biotrophic fungus *Pyrenophora graminea*. Race-specific resistance to leaf stripe is controlled by two known *Rdg* (Resistance to *Drechslera graminea*) genes: the *H. spontaneum*-derived *Rdg1a*, mapped to chromosome 2HL and *Rdg2a*, identified in *H. vulgare*, mapped on chromosome 7HS and cloned in the resistant cultivar (cv.) Thibaut. The *Rdg2a* locus contains a gene cluster of three sequence-related Coiled-Coil, Nucleotide-Binding site, and Leucine-Rich Repeat (CC-NB-LRR) encoding genes. However, only one gene conferred resistance to isolate *Dg2*, against which *Rdg2a* is effective, when the susceptible cv. Golden Promise was transformed with the *Rdg2a*-candidates. The high level of sequence similarity between the three genes most likely contributed to significant rearrangements during evolution, probably derived from un-equal crossing-overs resulting in sequence exchange between paralogs and in the generation of recombinant genes, as well as in expansion/contraction of gene copy number. To examine haplotype variation at the *Rdg2a* locus, the sequencing of the allelic *Mrdg2a* (Morex *rdg2a*) locus of the leaf stripe susceptible barley cv. Morex was carried out and revealed large rearrangements including two deletions that generated an *Rdg2a*-homolog gene. This gene most likely derived from an un-equal crossing-over between the *Rdg2a* ancestor and its paralog *Nbs2-Rdg2a*. PCR analyses performed with informative markers at five loci within the *Rdg2a* locus identified four different haplotypes. The Thibaut haplotype was observed to be largely conserved in *Dg2*-resistant barley cultivars. The re-sequencing of the *Rdg2a* gene in barley genotypes showing the same Thibaut haplotype or the same resistant phenotype revealed high sequence similarity to Thibaut *Rdg2a*, demonstrating the widespread conservation of the gene. Nonetheless, some sequence variation were identified in at least two barley genotypes that were verified for possible differences, with respect to *Rdg2a*, in the range of resistance specificities towards different leaf stripe isolates.