

GENOMICS AND PLANT-MICROBE INTERACTIONS

Durable broad-spectrum powdery mildew resistance in crops and cereals: What can we learn from Arabidopsis?

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Recessively inherited loss-of-function alleles (*mlo*) of the barley *Mlo* gene confer resistance that is effective against all known isolates of the barley powdery mildew fungus, *Blumeria graminis* f. sp. *hordei*. In susceptible *Mlo* wild type plants, the fungus potentially manipulates the protein encoded by this gene for plant cell invasion. Although *Mlo* homologs are found in all flowering plants examined to date it was unclear until recently whether *mlo* resistance represents a species-specific phenomenon restricted to barley. Our results demonstrate that *mlo*-based powdery mildew resistance can be induced in the model plant *Arabidopsis thaliana* by inactivation of a particular of the 15 *Mlo* homologs. These data demonstrate that *mlo* resistance is effective in both major clades of flowering plants, suggesting that the role of MLO proteins for colonization by powdery mildews is ancient and evolutionarily conserved. Besides conferring powdery mildew resistance, lack of *Mlo* results in an early senescence-like pleiotropic phenotype in both barley and *Arabidopsis*. The genetic and molecular tool-box available for the dicotyledonous reference species may enable to unravel the molecular basis of *mlo* resistance. In addition, it will help in designing strategies to uncouple the undesired pleiotropic phenotypes from the desired resistance trait.