

# Genetic differences in barley govern the responsiveness to priming agents

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During the cultivation of crop plants, priming for enhanced resistance using biocontrol agents is an efficient disease management strategy. Priming results in robust resistance and higher yield. The beneficial effects of the bacterial quorum sensing molecules e.g. *N*-acyl homoserine lactones (AHL) on resistance and plant growth have been shown in different plant species. Presence of AHL influences the transcription of various defense and growth-related genes and modifies the physiology of primed plants. Our study demonstrates the effects of the AHL: *N*-3-oxotetradecanoyl-L-homoserine lactone (oxo-C14-HSL) and AHL-producing bacteria on the priming capacity of different barley genotypes.

Barley is one of the most important crops worldwide and an enhanced resistance against pathogens, such as the powdery mildew-causing fungus *Blumeria graminis f. sp. hordei*, is of high importance. We demonstrated that barley, primed with the beneficial bacterium *Ensifer meliloti*, expresses enhanced resistance against *B. graminis*. We also showed for the first time that the capacity to induce priming varies among different barley genotypes.

This suggests that appropriate genetic background is required for AHL-induced priming. At the same time, it bears the potential to use these genetic features for new breeding approaches. Further, we assessed physiological phenomena, which are responsible for enhanced resistance in primed barley and presented that it involves stronger activation of the barley ortholog of the AtMPK6 kinase, regulation of defense-related (e.g. *PR1* and *PR17b*) genes and chemical remodeling of the cell wall. The stronger accumulation of lignin upon priming after challenge with chitin was particularly apparent. The global metabolomic changes in barley during priming were though rather specific.

Our results allow the discrimination between *primable* and *non-primable* barley genotypes, a newly introduced classification based on our results, and undeniably open new opportunities for breeding approaches. Furthermore, the use of biological products or beneficial bacteria represents a promising strategy for sustainable plant protection.