**Tropentag, September 14-16, 2010, Zurich**

"World Food System —
A Contribution from Europe"

# Genetic Exploration of Quantitative Fungal Resistance in Wheat: Broad Spectrum *vs.* Specific Approaches

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**Abstract**

Fungal diseases are by far the most important threat for wheat yield and quality. In principle plants use two strategies for defense against fungal infections. One strategy involves specific resistance genes according to Flor (1946) leading to hypersensitive reaction and another one quantitative resistance genes, which provide only partial resistance. Research in the Wheat Consortium of the National Research Program 59 (NFP59) in Zurich has the unique advantage, to have genetically modified wheat lines available that contain different transgenes from the above-mentioned categories for defense against fungal diseases. Race-specific transgenes of alleles of *Pm3b* from wheat (B. Keller, UniZh) provide resistance against certain powdery mildew strains. On the other hand, chitinase and glucanase double gene expression cassette in Frisal A13 line and glucanase only in Frisal A9 line (J. Fütterer, ETHZ) might provide resistance against a broad spectrum of pathogens containing chitin in their cell walls. As an alternative or supplementary approach, an interstrain inhibition system of so-called "killer proteins" (KP) from *Ustilago maydis* viruses has been explored as a mechanism to increase specific quantitative resistance against smut fungi in wheat. Moreover, KP-genes do not have any endogenous homologous genes, therefore, their expression and activity should be independent of any homeostasis or endogenous signaling. The project analyzes the expression profile of endogenous pathogen-related genes in wheat and compares the profiles between the different types of resistance. We expect from the results new insights into the plant pathogen defense mechanisms, and how it can be enhanced by ectopic transgenes. Particularly, we expect information about putative pleiotropic effects on the expression of endogenous resistance genes.

**Keywords:** Expression profile, pathogen defense, wheat

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