

Identification of candidate genes for the pre-haustorial resistance of *Triticum monococcum* against *Puccinia triticina*

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Leaf rust caused by *Puccinia triticina* can cause yield losses up to 60 % and is the most common rust disease of wheat in the world. Vertical leaf rust resistance genes (*Lr*-genes) have been introduced in cultivars. Many of these resistances are broken down by virulent pathotypes. Horizontal resistances which are independent from races of a pathogen are known but show a quantitative characteristic which is carried by a few cultivars.

In Einkorn (*Triticum monococcum*) a horizontal resistance against *P. triticina* was identified. Microscopic analysis revealed that this type of resistance is accompanied by an early hypersensitive response that prevents the fungus to form haustoria 8-24 hours after infection. Furthermore expression studies using the massive analysis of cDNA ends (MACE) pointed out that prehaustorial resistant plants increase the expression of peroxidase and chitinase genes after an inoculation. To elucidate the genetic base of this quantitative resistance, a resistant and susceptible Einkorn accession was crossed, F2 plants were phenotyped and the

most diverging plants were used for differential array technology analyses (DarTs). As a result QTL-regions on Chromosome 2A and 5A which were related to the prehaustorial resistance could be identified.

In the scope of this project 41 *T. monococcum* contigs were anchored to these QTL-regions. 13 genes within three of four QTL-regions could be assigned to MACE-tags. Two genes seem to be involved in defense responses of the plant. Only one of the 13 genes was differentially expressed between the resistant *Einkorn* accession and the susceptible one. This gene encodes a beta carotene hydroxylase and was downregulated in the resistant Einkorn after infection with *P. triticina*. The enzyme beta carotene hydroxylase is involved in the carotenoid synthesis which affects the generation of abscisic acid (ABA). An experimental treatment of leaves with ABA led to partially inhibited defense of the prehaustorial resistant Einkorn. This confirms that the beta carotene hydroxylase encoding gene is one of the candidate genes involved in the prehaustorial resistance.