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Increased wheat resistance to leaf rust by priming

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Abstract

Leaf rust (Puccinia triticina) is the most common rust disease in wheat. Several resistance genes identified in wheat are mostly overcome due to high genetic diversity and adaptability of Puccinia fungi. Priming is proposed to enhance plant's defense against pathogens using beneficial rhizosphere microbes which activates stronger cellular defense responses through induced systemic resistance.

Soil bacteria Ensifer meliloti enhance plant resistance against pathogens by quorum sensing N-acyl homoserine lacton (AHL) causing systemic signaling in plants. This study aims to establish priming in wheat to identify the priming efficiency regarding leaf rust resistance and QTL identification by Genome-wide association study (GWAS).

A diverse set of 200 wheat genotypes was tested for priming efficiency regarding P. triticina in two independent experiments comprising three replications each. Wheat seedlings were treated three times with soil injections of two bacteria suspension (expR+ch overexpressing AHL and transformed E. meliloti carrying lactonase gene attM) at 2, 8, 14 days after planting (dap). Plants were infected with P. triticina at 16 dap. Scores of infected leaf area and infection type were recorded at 12 days after infection.

Results revealed lower relative infection under expR+ch representing a increased resistance by priming. Means for infected leaf area under attM and expR+ch were 12.66% and 11.55%. The ANOVA indicated significant genotype and treatment effects.

GWAS was conducted in GAPIT using mixed linear model to study the association between markers and priming efficiency. Preliminary results reveal one significant ($p<0.001$) associated marker for priming efficiency on chromosome 1B.