

Phenotypic Mechanisms of Host Resistance to Greenbug in Wheat

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BACKGROUND

The greenbug is the most important cereal aphid pest in the Great Plains of North America. Annual losses to U.S. wheat production due to greenbug damage range from \$60 million to more than \$100 million. This pest is especially notorious due to periodic occurrence of new virulent biotypes. Over the years, there has been a shift of prevailing biotypes from C to E and E to I in the fields of the Southern Plains. New greenbug strains able to damage all known host resistance of wheat have been found. Although six genes conferring resistance to different greenbug biotypes have been identified, *Gb3* in the wheat cultivar TAM 110 is currently the only widely deployed gene with resistance to prevailing biotypes in the field. The *Gb3*-conferred resistance might be potentially overcome by newly emerging virulent greenbug biotypes. For effective and sustainable control of greenbug damage, it is important to study the underlying mechanisms of host resistance against this aphid pest, which are poorly understood at present. This project aims to study the phenotypic mechanisms of *Gb3*-mediated host resistance against greenbug feeding.

OBJECTIVES

- Identify the components of phenotypic resistance in *Gb3*-mediated host resistance in wheat.
- Investigate the effects of induced resistance on aphid performance in a resistant wheat line.

RESULTS

Greenbug-wheat interactions in terms of within-plant aphid distribution, aphid population dynamics and host responses to greenbug feeding were investigated for 47 days using two near-isogenic lines of *Gb3* (one resistant and one susceptible). Antixenosis, antibiosis and tolerance in the resistant genotype were found to contribute to resistance against greenbug feeding. In a second study, interaction between greenbugs and the two lines was examined for 65 days after infestation. It was found that systemic resistance was inducible in the resistant, but not the susceptible line by preconditioning (pre-infestation) with greenbugs for 48 hours (see the figure). The induced resistance reduced the size and buffered the fluctuation of the aphid population and extended the life of host plants.

Fig. Greenbug population dynamics on control and preconditioned resistant (R) and susceptible (S) near isogenic wheat lines. For preconditioning, 10 aphids were placed on the first leaf of each three-leaf-stage seedling, but none on control plants. After 48 hours, all aphids were removed and 10 new aphids were infested on each control and preconditioned plant.

