

Field Trial Evaluations of Sunflower to Determine Novel Sources of Resistance to *Puccinia helianthi*



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Introduction

- Sunflower (*Helianthus annuus*) is considered an important crop grown primarily for oil (oilseed) and human consumption (confection).
- The most economically important foliar disease in sunflower is rust, caused by the fungal pathogen *Puccinia helianthi*, which has been shown to reduce yield up to 85%.
- One of the most economically friendly and cost-effective options to manage rust in sunflower is to incorporate genetic resistance.



Figure 1. Sunflower leaf showing signs of rust caused by *Puccinia helianthi*.

Objective

- The objective of this study is to evaluate the effectiveness of sunflower resistance genes to manage *Puccinia helianthi* in field trials.



Figure 2. Sunflower field trial located at the University of Wisconsin-River Falls Mann Valley Farm in the summer of 2025.

Materials and Methods

- Location: University of Wisconsin-River Falls Mann Valley Farm
- Planting Date: July 1st, 2025
- Trial Size: 1.3 acres
- Plant Population: 28,000 plants per acre
- Plot Number: 254 plots
- Plot Arrangement: 4 row plots with outer two rows susceptible genotype and center two rows genetic resources
- Pathogen Inoculation: 3 isolates inoculated at growth stage V6
- Rating: August 19th, 2025 at growth Stage R5.1



Figure 3. Aerial drone photo of the sunflower trial design.

Table 1. Resistance Gene Efficacy

Resistance Gene or Alleles	Resistant or Susceptible
Susceptible Check	Susceptible
R ₁	Resistant
R ₂ +R ₁₀	Susceptible
R _{4e}	Resistant
R _{4a}	Susceptible
R ₅	Resistant
R _{4b}	Resistant
R _{4c}	Susceptible
R _{4d}	Susceptible

Results

- Disease was observed seven days post inoculation in all highly susceptible border rows.
- The bulk inoculation included three locally derived isolates which coded to a virulence phenotype of 526 on the international differential set.
- Disease was observed in plots with the following resistance genes R₁, R₂+R₁₀, R_{4a}, R_{4c}, and R_{4d}.
- Disease was not observed in plots with resistance genes R_{4e}, R₅, and R_{4b}.



Figure 4. Field trial rating for disease incidence and severity at R5.1.

Discussion

- To our knowledge, this is the first field trial conducted in Wisconsin evaluating resistance genes from the international differential set.
- As a result of these trials, new potential sources of resistance have been identified.
- Future projects are underway in the Controlled Environments Laboratory at the University of Wisconsin-River Falls to identify new novel sources of resistance for future field trials.

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