# Establishing a Sunflower Rust Research Program at the University of Wisconsin-River Falls

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# Background and Sunflower Significance

- Plant Pathology Laboratory and Field Research Assistant (2013-2016)
- Ph.D. in Plant Pathology (2016-2021)
    - Shared recipient of the Curtis Stern Memorial scholarship in (2018)
- Assistant Professor of Crop Science at the University of Wisconsin-River Falls (2021-Present)

# Sunflower Rust (*Puccinia helianthi*)

- Most economically important foliar disease of sunflower
- Yield losses reported up to 80%
- Polycyclic and autoecious pathogen
- Economic threshold 1% disease severity on the upper four fully expanded leaves at or before R5 (Friskop 2015)
- Management genetic resistance and foliar fungicides

# Research Program at UWRF

- In 2025, we screened thousands of accessions in the greenhouse and field to *Puccinia helianthi*
- Help breeders identify novel sources of resistance, growth characteristics in the field, determine if accessions are fixed, etc.
- Is there potential for drone-based technologies to support and strengthen this type of research? Inoculating and evaluating

# Evaluating the effectiveness of aerial drone inoculations to facilitate a localized rust epidemic

- To facilitate a disease epidemic, a locally collected isolate WI2023-01 was used to inoculate field trials
- An uninoculated block of approximately 500 $m^2$ (5,400 $ft^2$) of sunflower was planted adjacent to a block of 8000 $m^2$ (86111 $ft^2$)
- Prior to an aerial inoculation, fields were evaluated, and the absence of disease was recorded in both blocks

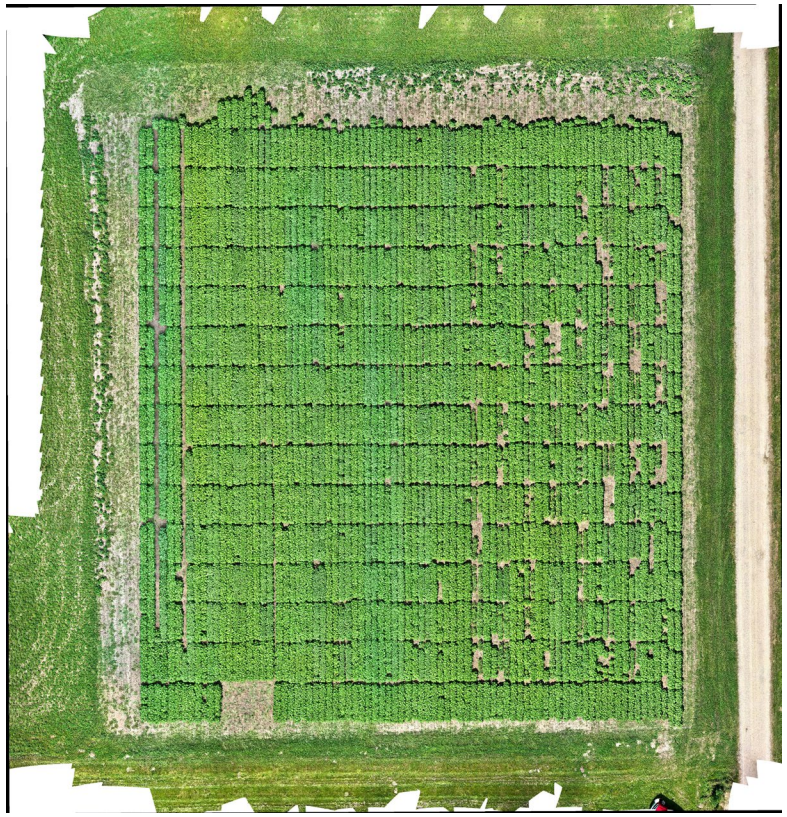
# Evaluating the effectiveness of aerial drone inoculations to facilitate a localized rust epidemic

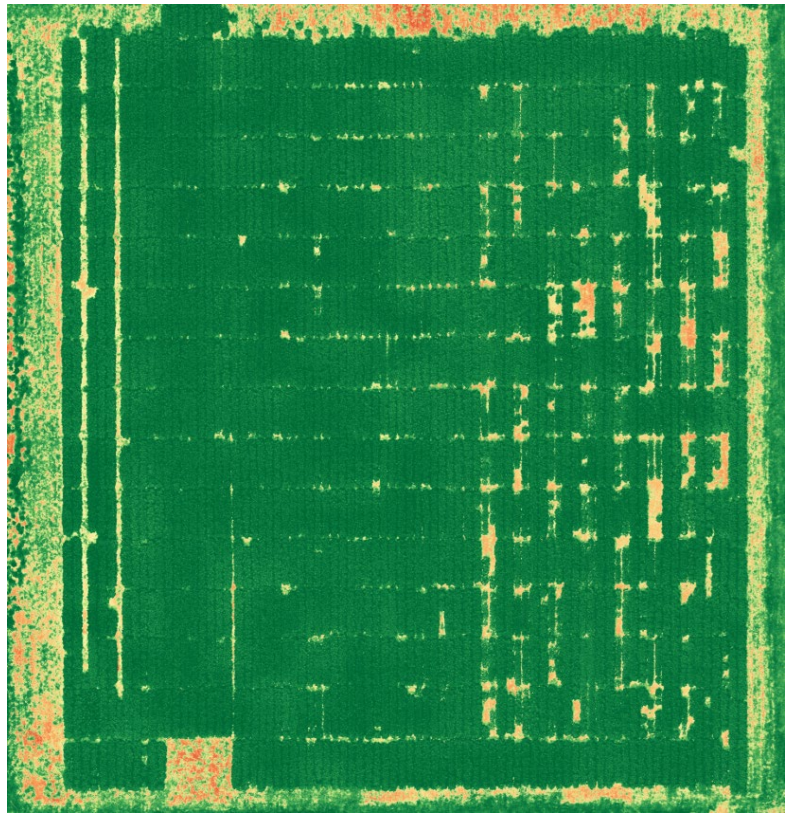
- Two hundred plants in both blocks were visually evaluated for disease severity at 7- and 14-days post inoculation
- Disease incidence was recorded for all 200 plants in the inoculated block 14 days post inoculation
- No disease was recorded for all 200 plants in the non-inoculated block 14 days post inoculation

# Comparing ground inoculation to aerial inoculations

- Both can be used to facilitate disease to evaluate genetics and foliar applications
- **Drone** has the potential to have more uniform gpa coverage and time efficiency. Droplets need to be further evaluated for coverage and size
- **Ground inoculation** creates a dense fog and coverage within the canopy. More labor intensive and time consuming
- Weather imperative and goal is to facilitate an epidemic

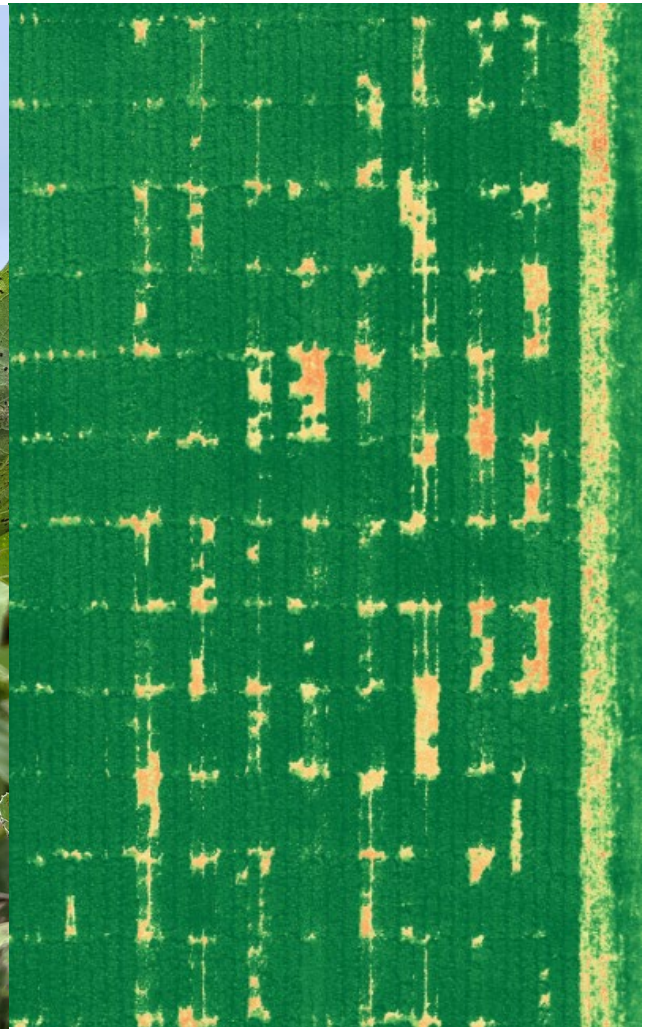
# Is there potential for drone-based technologies to support field evaluations?





# Drone-based technologies to support field evaluations

- Provides a great overview of field trials
- Give international breeders weekly updates (stand counts, etc.)
- Evaluating rust in the field with drones is immensely challenging



# THANK YOU!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