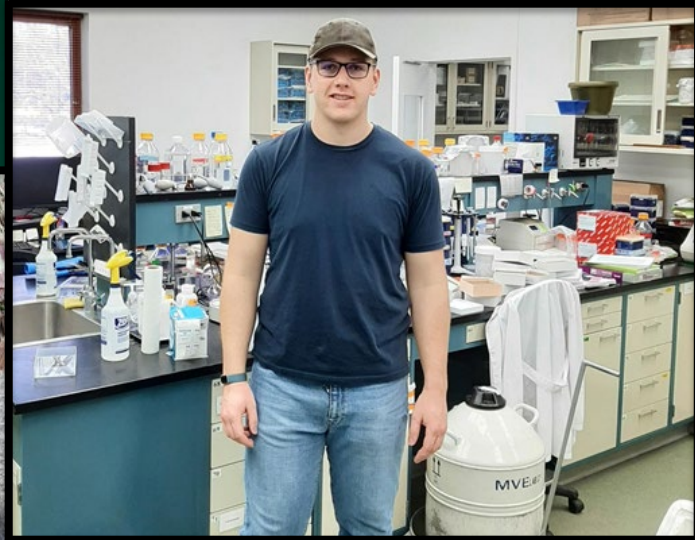


Update On The Determination Of Rust (*Puccinia Helianthi*) Virulence In The Northern Great Plains

Zachary Ittel, Samuel Markell, Brent Hulke, Robert Harveson, Febina Mathew, Jessica Halvorson, Bryan Hanson, and Brandt Berghuis

About Me



The Problem

- About 1.5 million acres of Sunflower are planted in the USA.
- Top 5 most destructive sunflower diseases.
- Management:
 - Genetic Resistance
 - Fungicides
 - Removal of volunteer plants
- Importance:
 - Up to 80% yield loss
 - Virulence phenotype (race) is ever changing



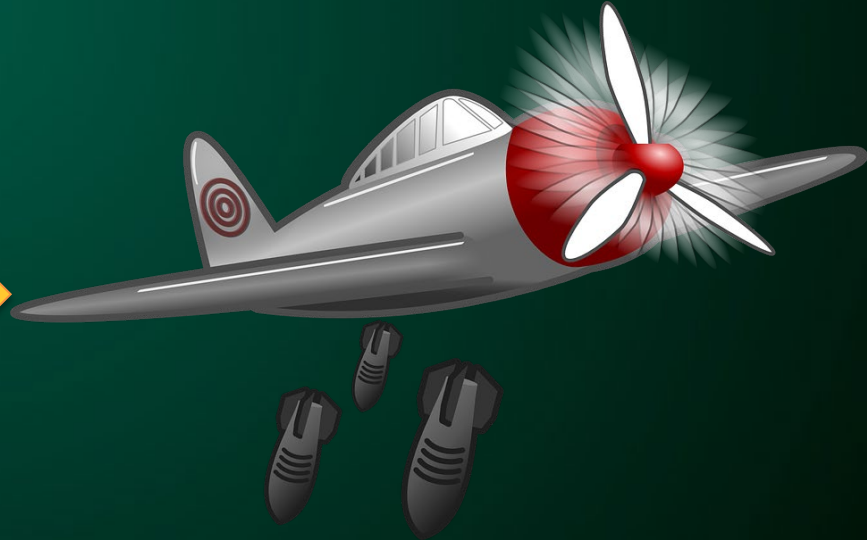
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The Problem

- R genes are incorporated into hybrids.
- The pathogen overcomes the R genes with a new race.
- A race survey can identify emerging races informing breeding.



Objective

Determine the virulence phenotype pattern of *P. helianthi* in the Northern Great Plains.

P. helianthi Diversity in 2011-2012

- In Total: 29 races (238 single pustule isolates)
- States: NE, ND, SD, CA, IA, MN, TX, and MB.
- NE, ND, and MB each had rust that could overcome all known R genes in differentials.



P. helianthi Diversity of CA in 2017-2018

- Production fields:
- 2017 – 6 races (11 SPI)
- 2018 – 8 races (13 SPI)



- Wild sunflower:
- 2017 – 6 races (11 SPI)
- 2018 – 16 races (20 SPI)

- CA had rust that could overcome all known R genes in differentials.

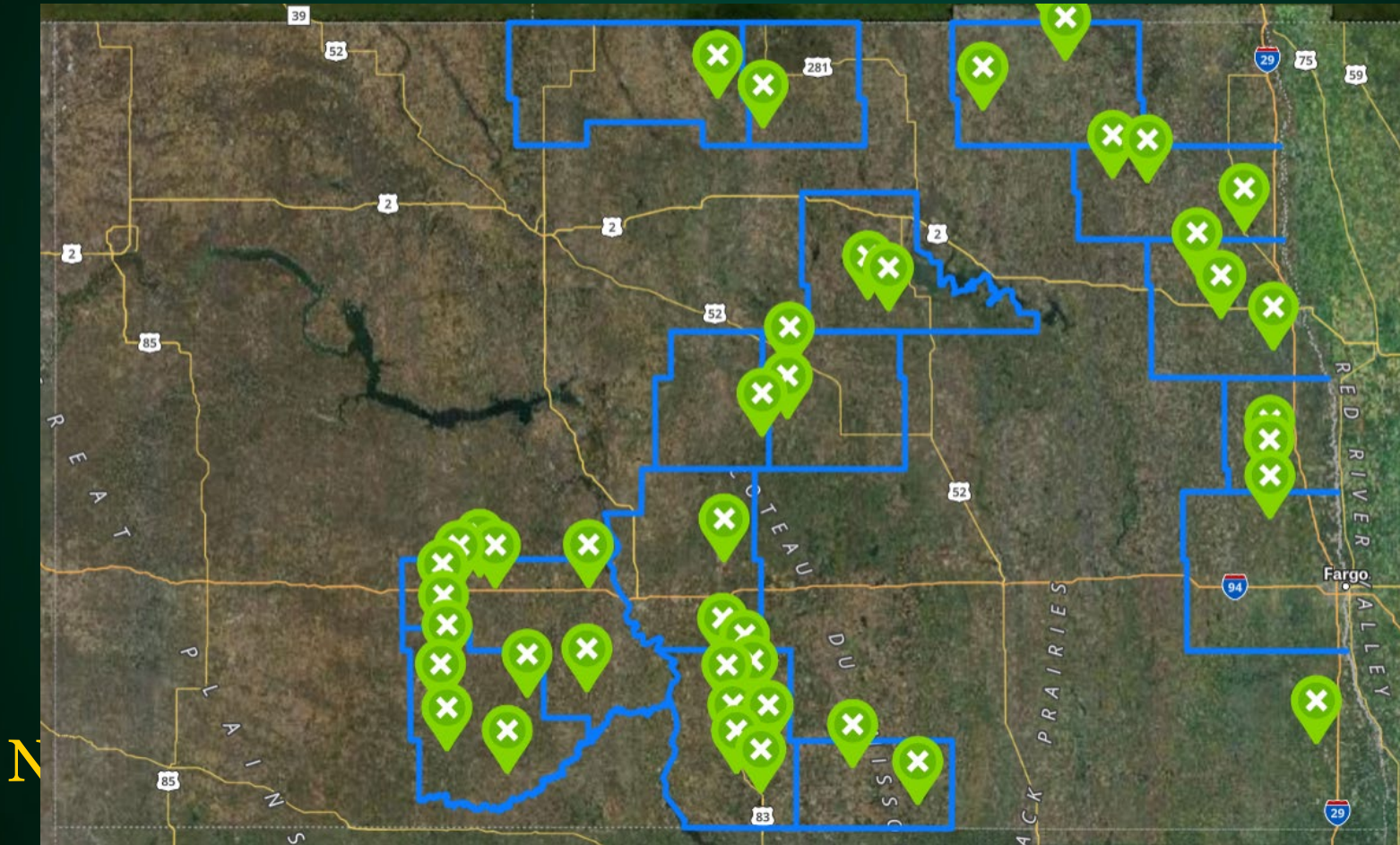


P. helianthi Diversity in 2023

- Survey set in the Northern Great Plains.
- What have I completed?
- What do I plan for the future?
 - Recovery
 - SPI creation
 - Differential testing
 - Another survey in 2024



ND Survey Map 2023

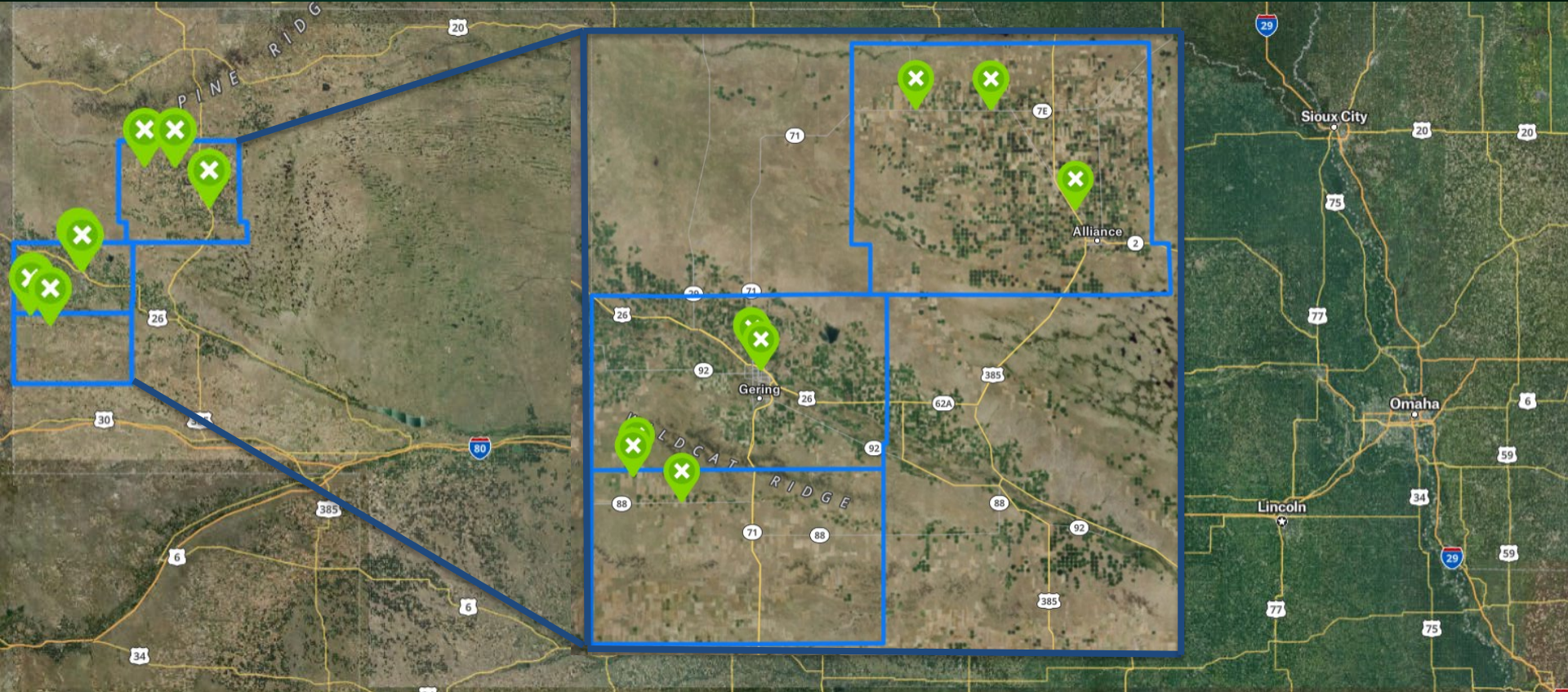


SD Survey Map 2023



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INDO STATE UNIVERSITY



Rust Prevalence in 2023

Fields with rust vs. Fields surveyed:

- ND: 41/43
 - 111 isolates
- WI: 6/6
 - 15 isolates

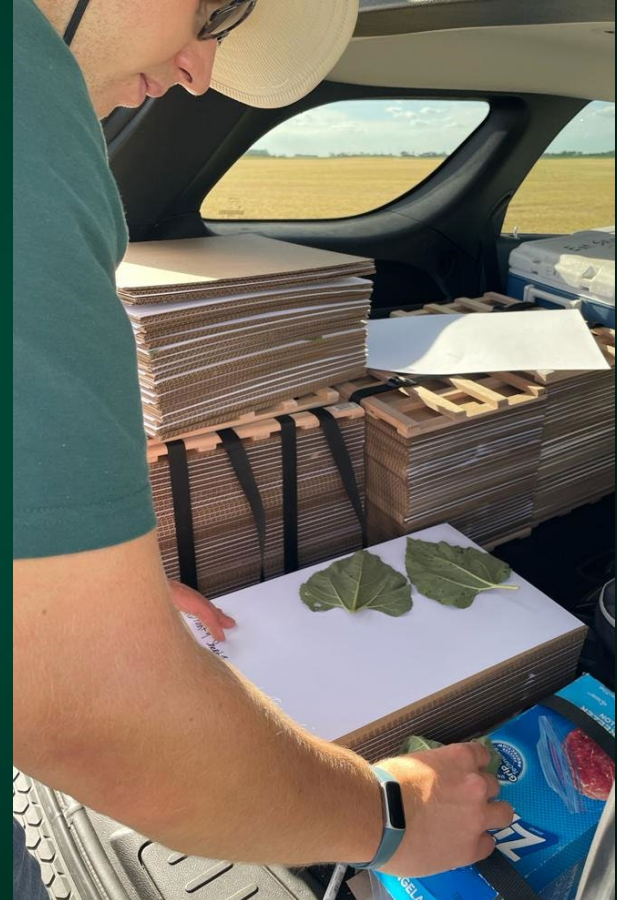


- SD: 8/8
 - 23 isolates
- NE: 10/10
 - 30 isolates

Methods: Pathogen Recovery



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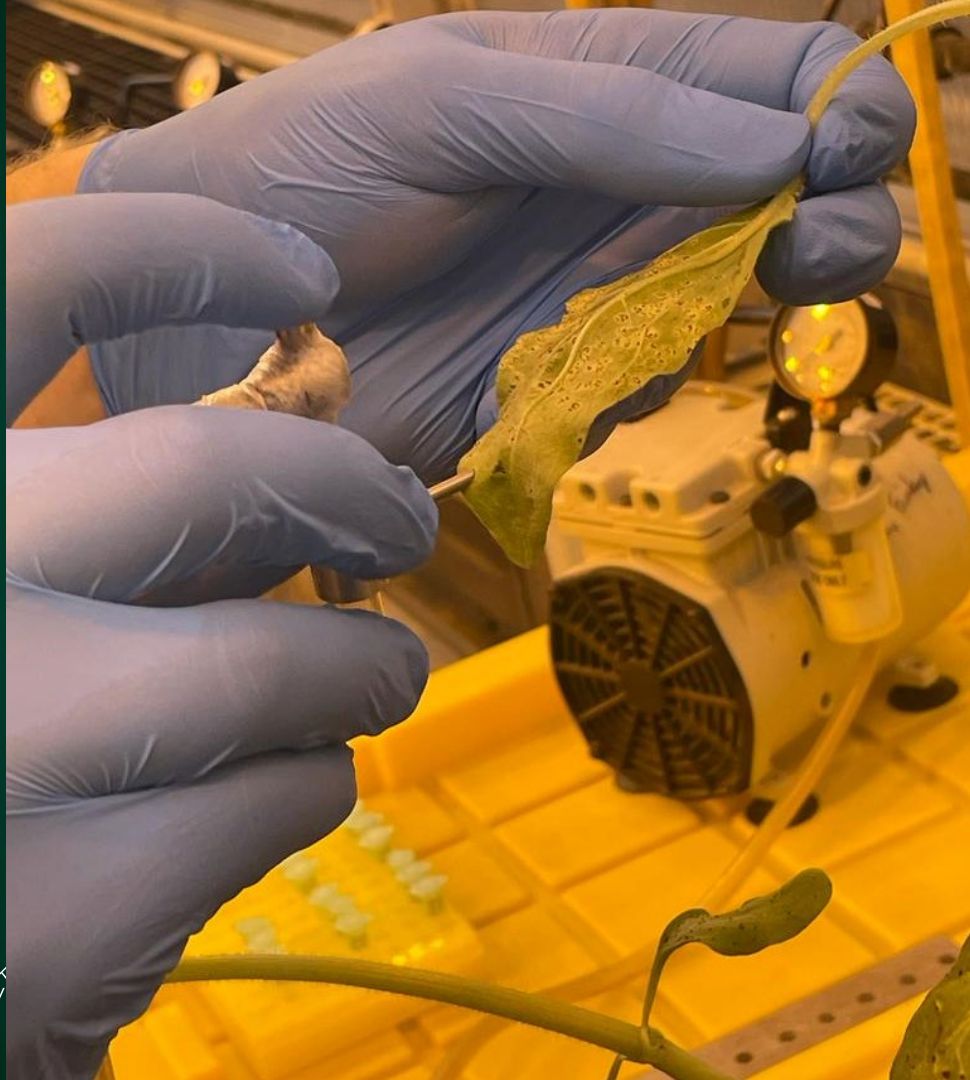




NE
Balk 18











Future Work

Bulk Recovery Save

Recovery

Differential Testing

SPI Creation

Determine Virulence Phenotype (Race)

- In collaboration with Brent Hulke.
- Race results by next year.

Set	Differential	Resistance gene	Scoring Value
One	7350	...	1
	MC90	R_1	2
	MC29	R_2+R_{10}	4
Two	P386	R_{4e}	1
	HA-R1	R_{4a}	2
	HA-R2	R_5	4
Three	HA-R3	R_{4b}	1
	HA-R4	R_{4c}	2
	HA-R5	R_{4d}	4
Four	?	?	1
	?	?	2
	?	?	4

Future Objectives

- 2024 rust survey
- Sequencing
- Genotyping
- Fungicide trial



Acknowledgements



- Advisor: Samuel Markell's Team
- Co-advisor: Upinder Gill
- Febina Mathew's Team
- Brent Hulke

Survey Help:

- ND (Scott Knoke, Katelyn Landeis, Bailey Reiser, Tessa Osterbauer, Hannah Peterson)
- SD (Mr. Weber)
- NE (Bob Harveson and his team)
- WI (Brandt Burghuis)