Update on UC Davis Strawberry Breeding Program

Mitchell J Feldmann

University of California, Davis
College of Ag and Environmental Sciences
Department of Plant Sciences
UCD Strawberry Breeding Program

UC ANR Annual Production Meeting
Ventura, CA, USA
09/12/2025

Thanks to our supporters, collaborators, and funding agencies!

All photos credited to **Fred Greaves Photography** for UC Davis.

Thanks to the Organizers!

Watsonville, CA 2023

UCD Strawberry Team+

Pictured: Steven Knapp, Omar Gonzalez-Benitez, Hillel Brukental, Glenn Cole, **Mitchell Feldmann**, Marco Castellacci, Jade Dilla-Ermita, Dominique Pincot, Mishi Vachev, Marta Bjornson, Alicia Sillers, Nico Jimenez, Peter Henry, Isaac Rainwater, Cindy Ramirez Lopez, Randi Famula

Not Pictured: Nayeli Valencia, Paul Skillin, Caitlyn Morgan, Annie Willett, Adrianna Ng, Fangyi Wang, Shai Torgeman, Ella Halberstadt, Ryan Chiang, **Allison Krill-Brown**

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UC Strawberry Breeding Program

A growing lab

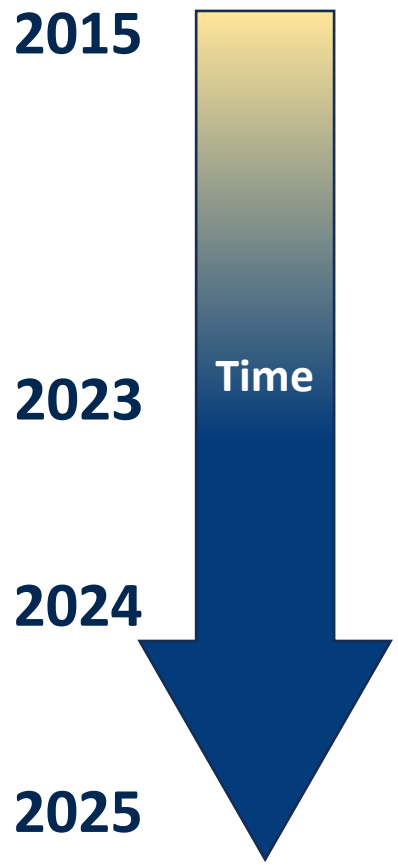
- **Scientists**
  - Glenn Cole (Breeder, Field Manager)
  - Allison Krill-Brown (Field Manager, Breeder)
  - Cindy Lopez (Trial Manager)
  - Randi Famula (Lab Manager)
  - Dr. Dominique Pincot (Pathology Lead)
  - Dr. Marta Bjornson (Molecular Biology Lead)
- **Staff**
  - Nayeli Valencia (Greenhouse Manager)
  - Ella Halberstadt (Fruit Quality Lab Lead)
- **Postdoctoral Researchers**
  - Dr. Shai Torgeman
  - Dr. Christine Dilla-Ermita
- **Graduate Students**
  - Alicia Sillers (PhD, post QE)
  - Paul Skillin (PhD)
  - Caitlyn Morgan (MSc, graduated)
  - Annie Willett (MSc)
  - Adrianna Ng (MSc)
  - Carly Godwin (PhD)
  - Fangyi Wang (PhD, post QE)
- **Undergraduate and Highschool Students**
  - Ryan Chiang, Audrey Hardjabrata, Keira Weireter, Damian Maya-Rodriguez
  - Liam Sy, Cyrus Brown

If there are questions about the research being conducted, **please contact us!**

strawberry.ucdavis.edu
mjfeldmann@ucdavis.edu

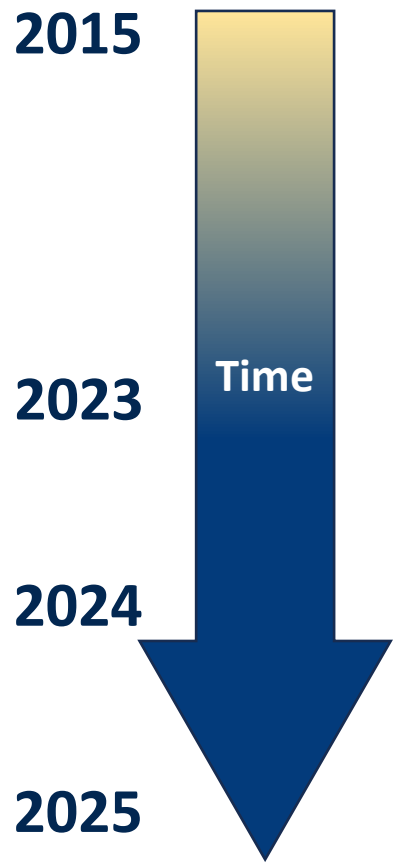
Update on Disease Research

9 Diseases being studies



1. *Fusarium oxysporum* Race 1 (Fusarium Wilt)
2. *Macrophomina phaseolina* (Charcoal Rot)
3. *Verticillium Dahliae* (Verticillium Wilt)
4. *Phytophthora cactorum* (Crown Rot)
5. *Neopestalotiopsis sp.* (Leaf, Fruit, Crown Rot)
6. *F. oxysporum* Race 2 (Fusarium wilt*)
7. *Colletotrichum acutatum* (Fruit Rot)
8. *Botrytis cinerea* (Fruit Rot)
9. *Xanthomonas fragariae* (Angular Leaf Spot)
10. *Podosphaera aphanis* (Powdery Mildew)

9 Diseases being studies



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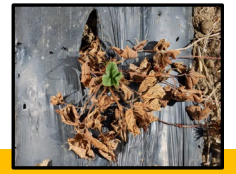
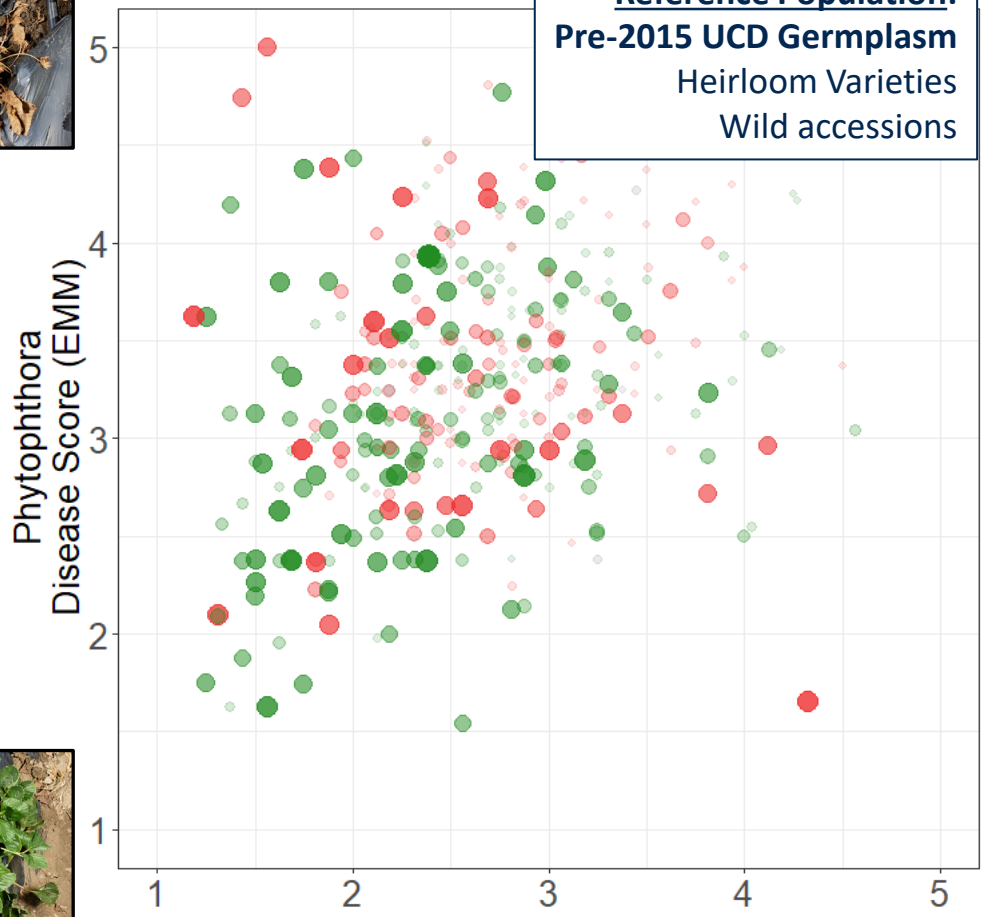
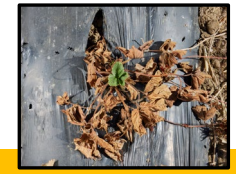
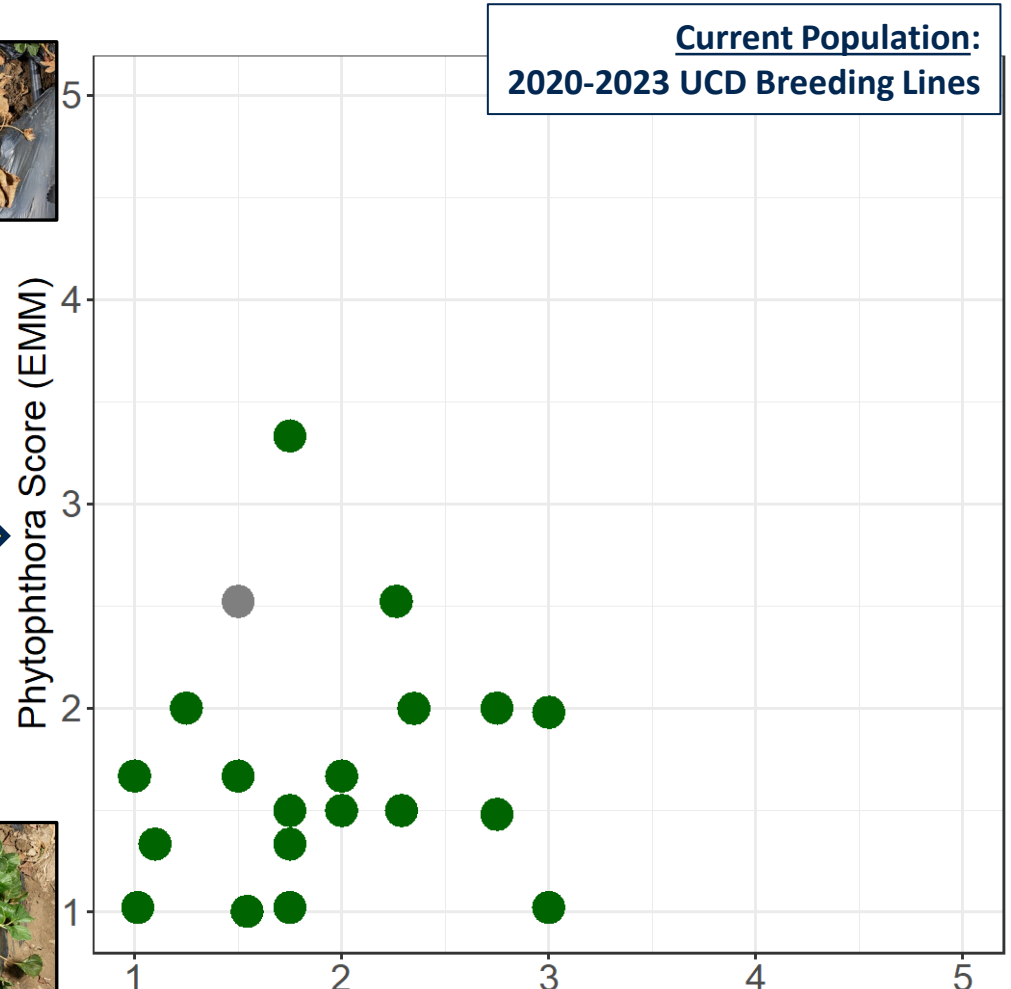
Fusarium oxysporum Race 1









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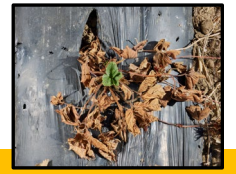
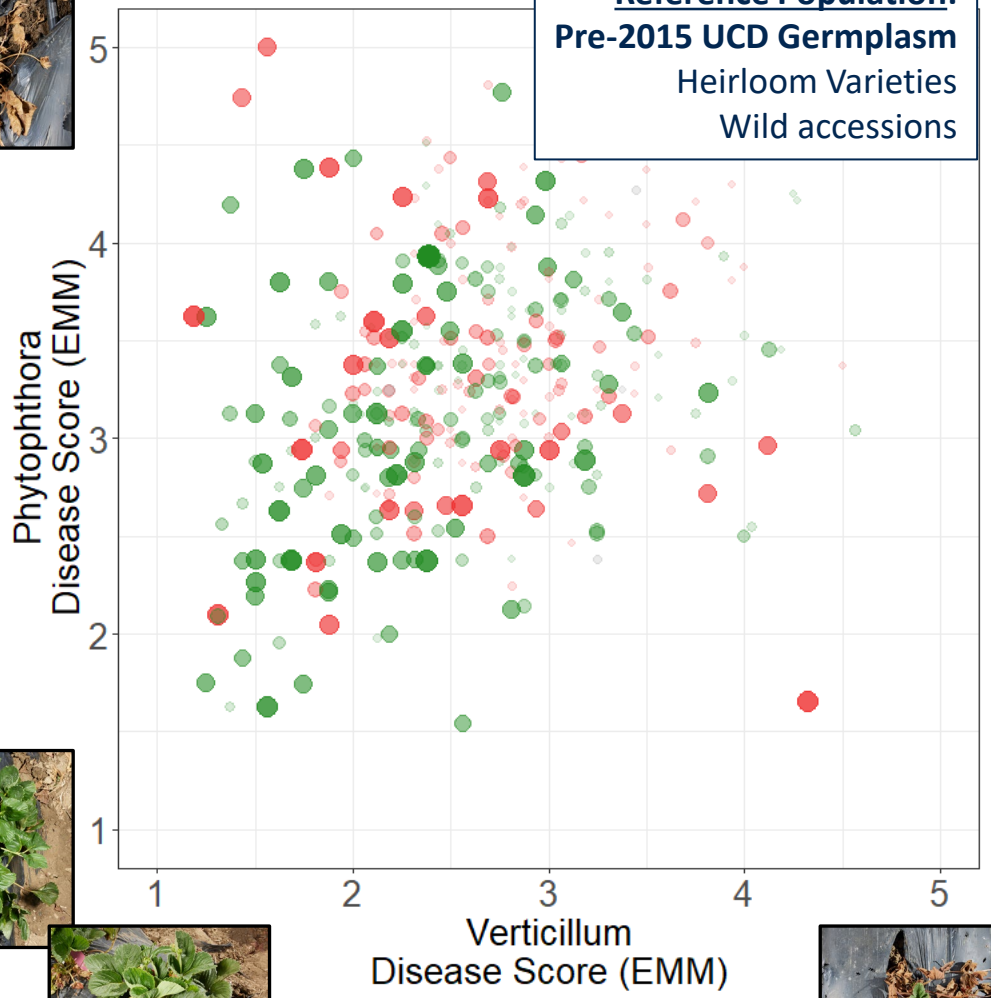
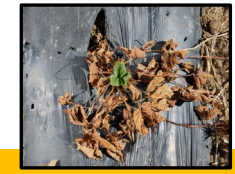
Fusarium (green = R)
Macrophomina (large size = R)

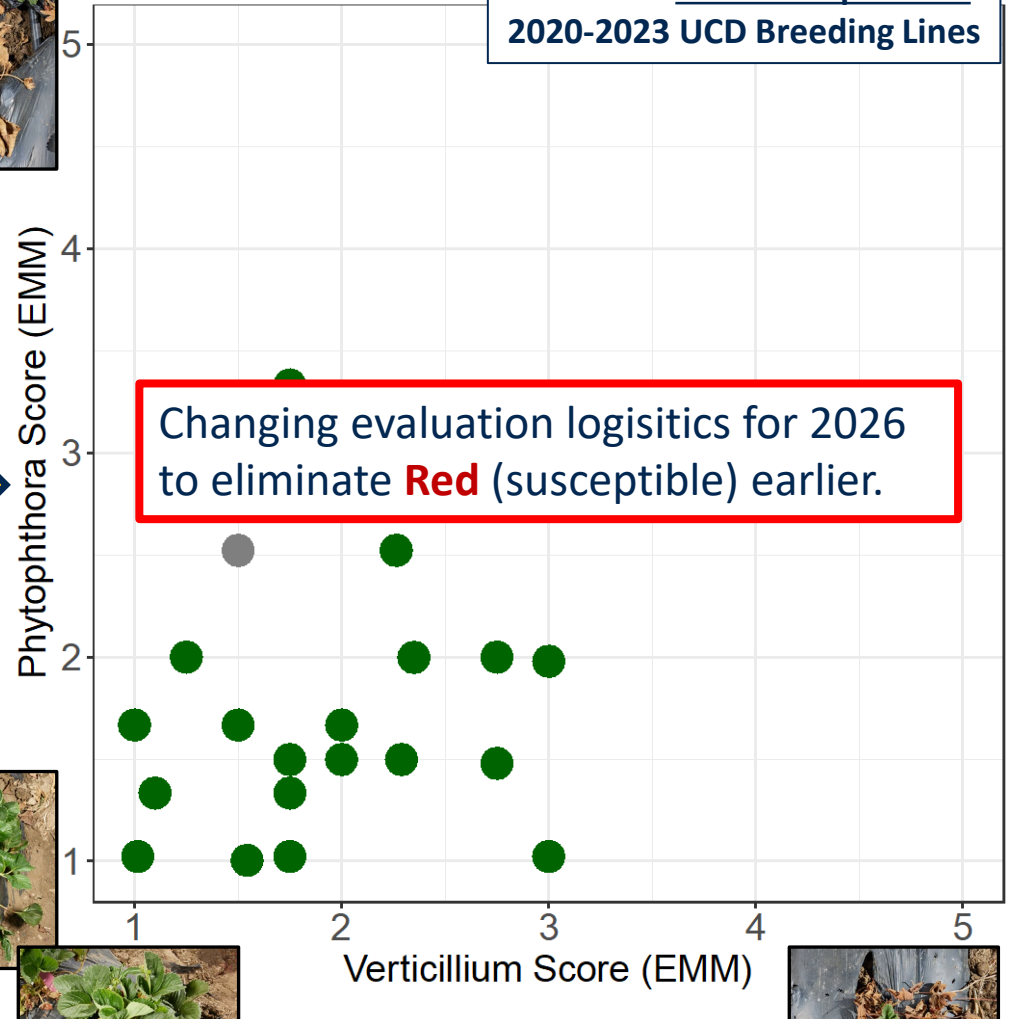
Verticillium (small value = R)
Phytophthora (small value = R)

Fusarium oxysporum Race 1









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Fusarium (green = R)
Macrophomina (large size = R)

Verticillium (small value = R)
Phytophthora (small value = R)

Fusarium oxysporum Race 1

Fall planted farm trial in Watsonville, CA
near San Andreas Rd.

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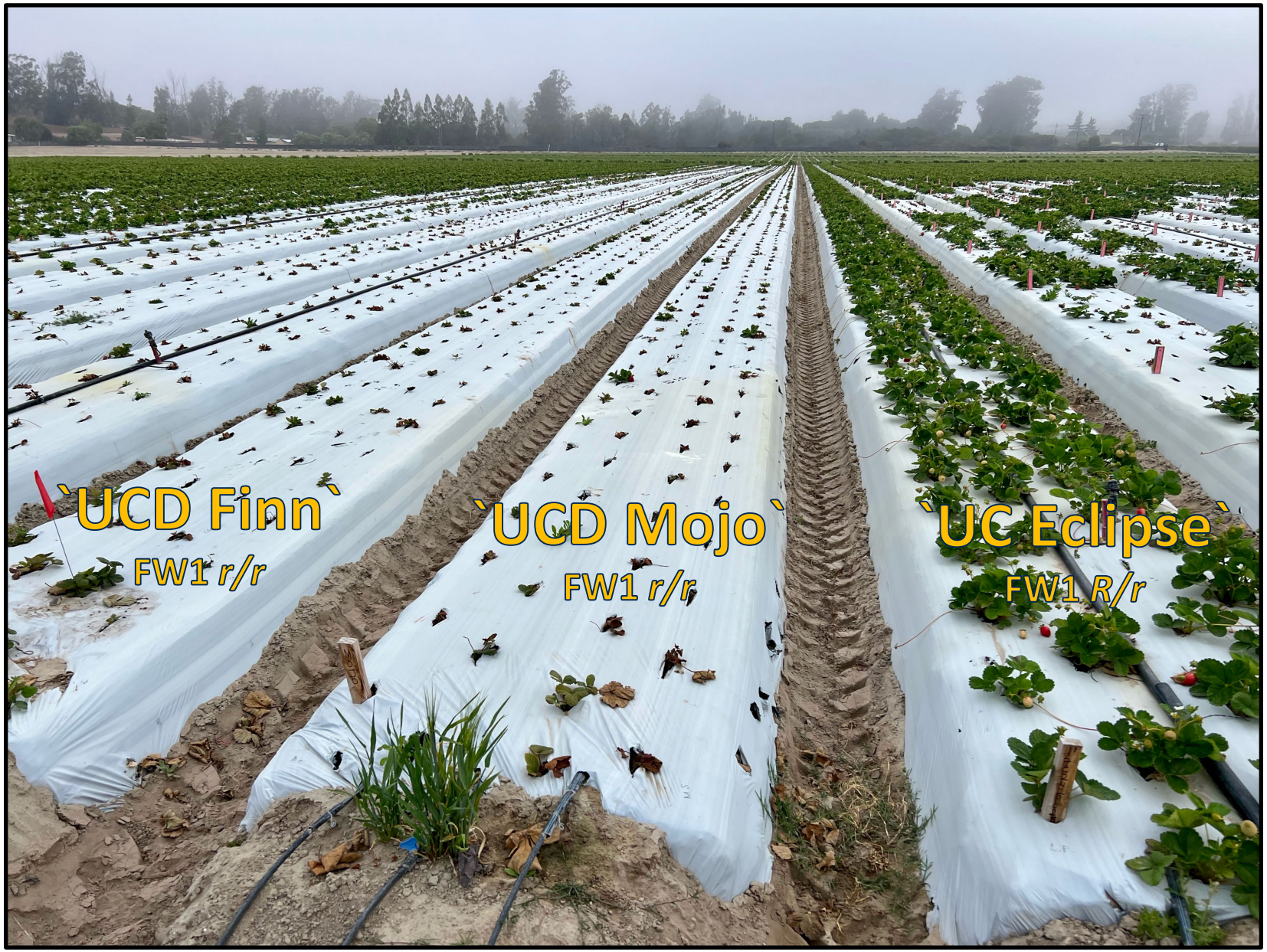

Summer plant product trial in Santa Maria, CA 2021

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Fusarium oxysporum Race 1

Fall planted farm in Orangevale, CA 2024

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Fusarium oxysporum Race 1

Macrophomina phaseolina

1	2	3	4	5
Resistant	Susceptible			
Asymptomatic	Symptomatic			Deceased

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Macrophomina phaseolina





Variety	FW R1	MCR	VW	PhCR	FW R2
UC Surfline	**1**	3	**2**	2	5
UC Monarch	**1**	3	**2**	2	5
UC 198-03	**1**	**2**	**2**	2	5
UC 119-10	**1**	**2**	**2**	2	5
Fronteras	**1**	4	3	2	5
San Andreas	**1**	4	3	2	5
UCD Victor	**1**	4	3	2	5


1	2	3	4	5
Resistant				Susceptible
Asymptomatic		Symptomatic		Deceased
Resistant		Moderately Resistant	Moderately Susceptible	Susceptible

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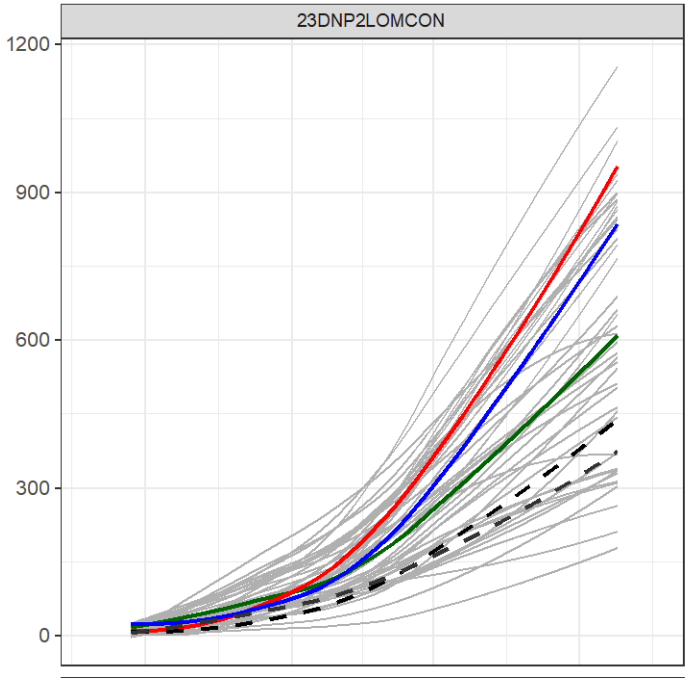
Macrophomina phaseolina

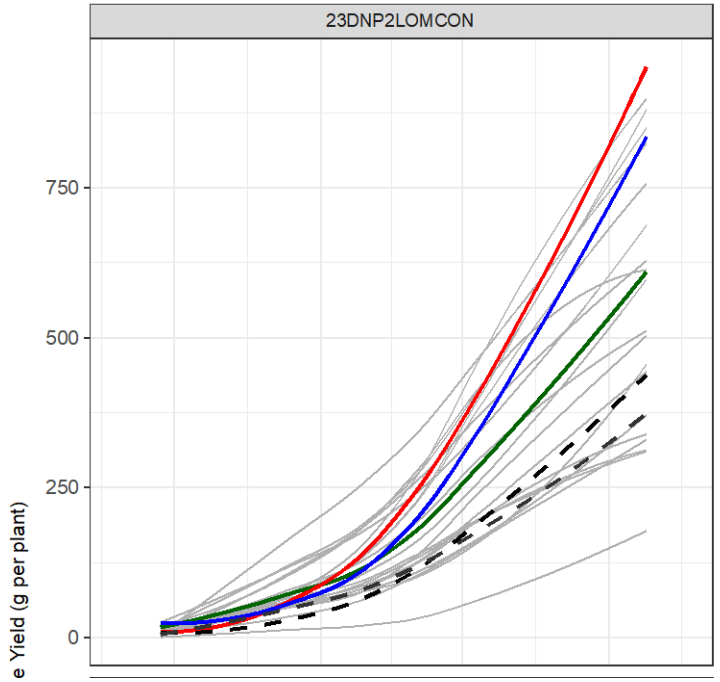




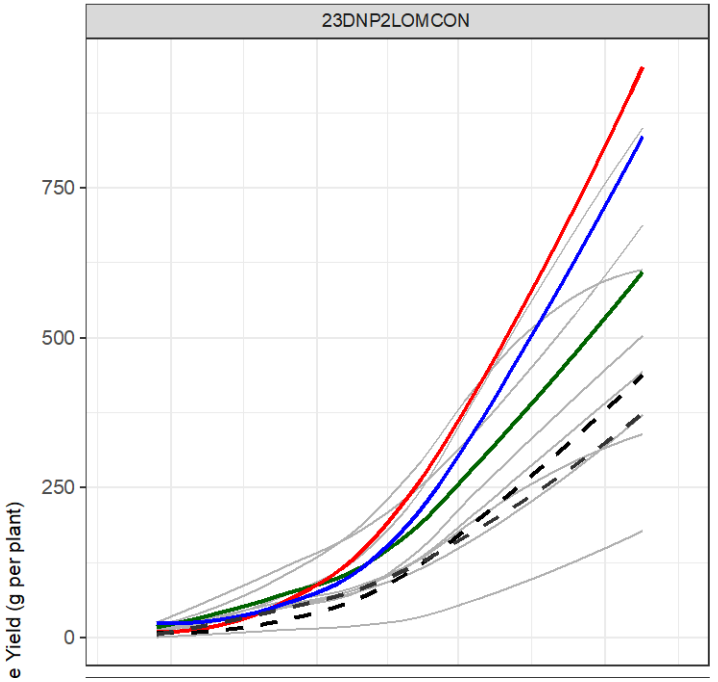
Fusarium Wilt R1 Resistant Breeding Lines (>70%)



Macrophomina Resistant Breeding Lines (>30%)



4−Way Resistant Breeding Lines (>10%)



- UC Eclipse
- UCD Royal Royce
- UCD Valiant
- Monterey
- Albion

1	2	3	4	5
Resistant	Susceptible			
Asymptomatic	Symptomatic			Deceased

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Macrophomina phaseolina

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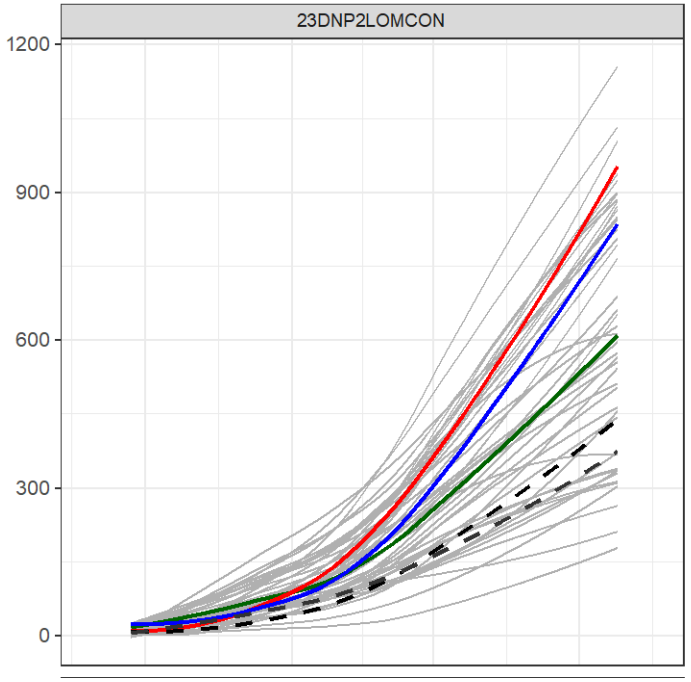
Macrophomina phaseolina





Fusarium Wilt R1 Resistant Breeding Lines (>70%)



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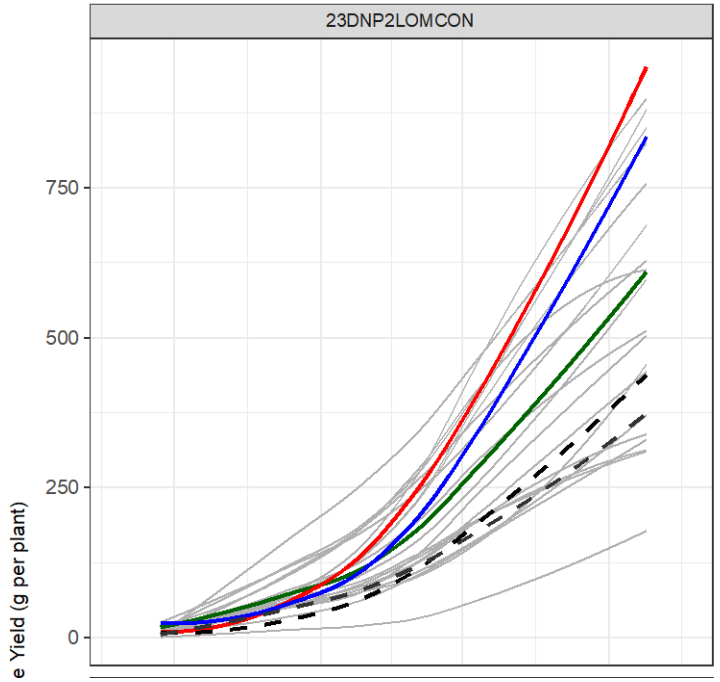
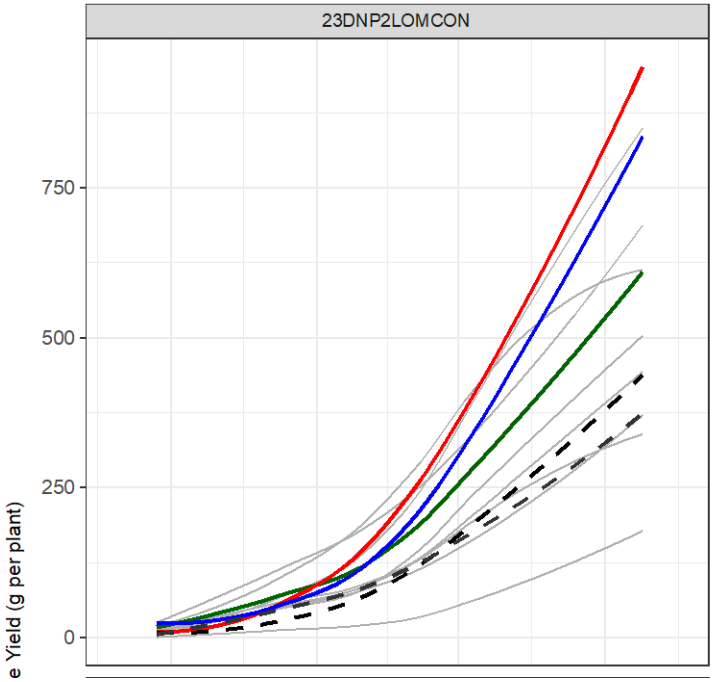


4−Way Resistant Breeding Lines (>10%)



- UC Eclipse
- UCD Royal Royce
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Resistant	Susceptible			
Asymptomatic	Symptomatic			Deceased

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Macrophomina phaseolina

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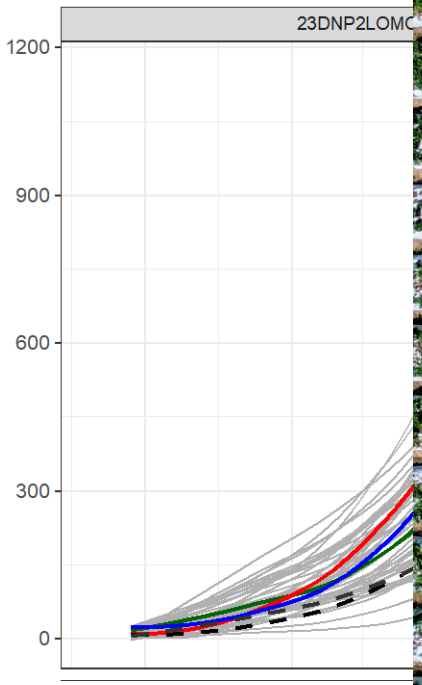
Fusarium Wilt R1 Resistant Br



- Portola
- UC Eclipse
- UC 155-35
- UC Golden Gate
- UC 060-11
- UC 058-25
- UC 058-51

- UC Eclipse
- UCD Royal Royce
- UCD Valiant
- Monterey
- Albion

1

Resistant

Asymptomat

Guadalupe, CA
09/11/2025

5

Deceased

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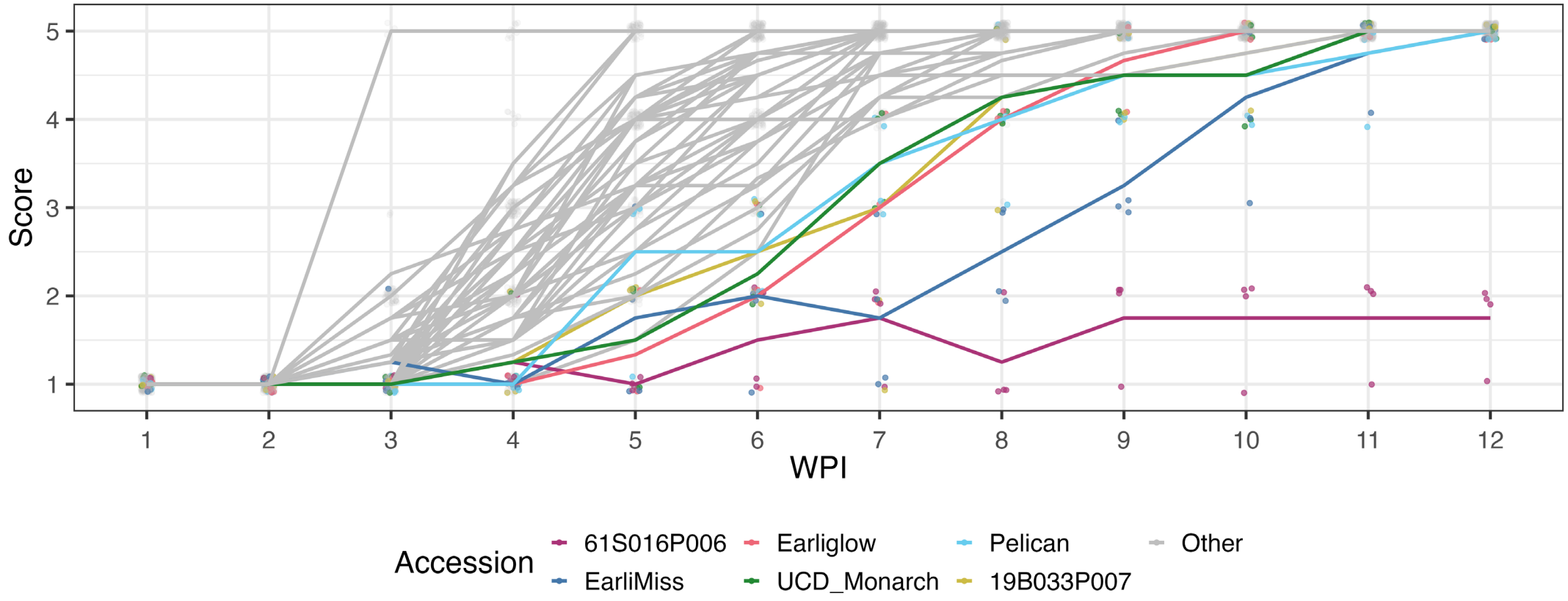
Macrophomina phaseolina

Fusarium oxysporum Race 2

- Screened 50 UC Davis breeding lines in spring 2023



Fusarium oxysporum Race 2

>300 genotypes completely dead

- Trialing 598 strawberry varieties from the UC Davis Strawberry Breeding Program to identify resistance to FW2.
  - Begin: Fall 2023; End" Spring 2025
  - Work being conducted in collaboration with USDA (Peter Henry, Jade Dilla-Ermita), PSI, Driscoll's
  - All experiments are being conducted at Biosafety Level 2 in greenhouses or growth chambers to negate outbreak risk.

Fusarium oxysporum Race 2

Too early to say, but some seedlings after 6 weeks XX% of seedlings have no symptoms.

Fusarium oxysporum Race 2

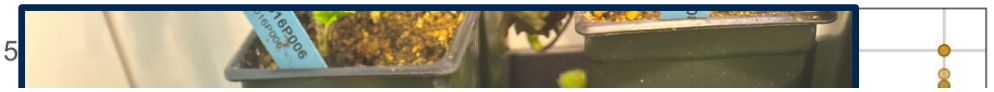
- We tested seedling populations at UC Davis w/ **Senga Sengana, Sitka,** and **17C310** as **Resistant Donors**

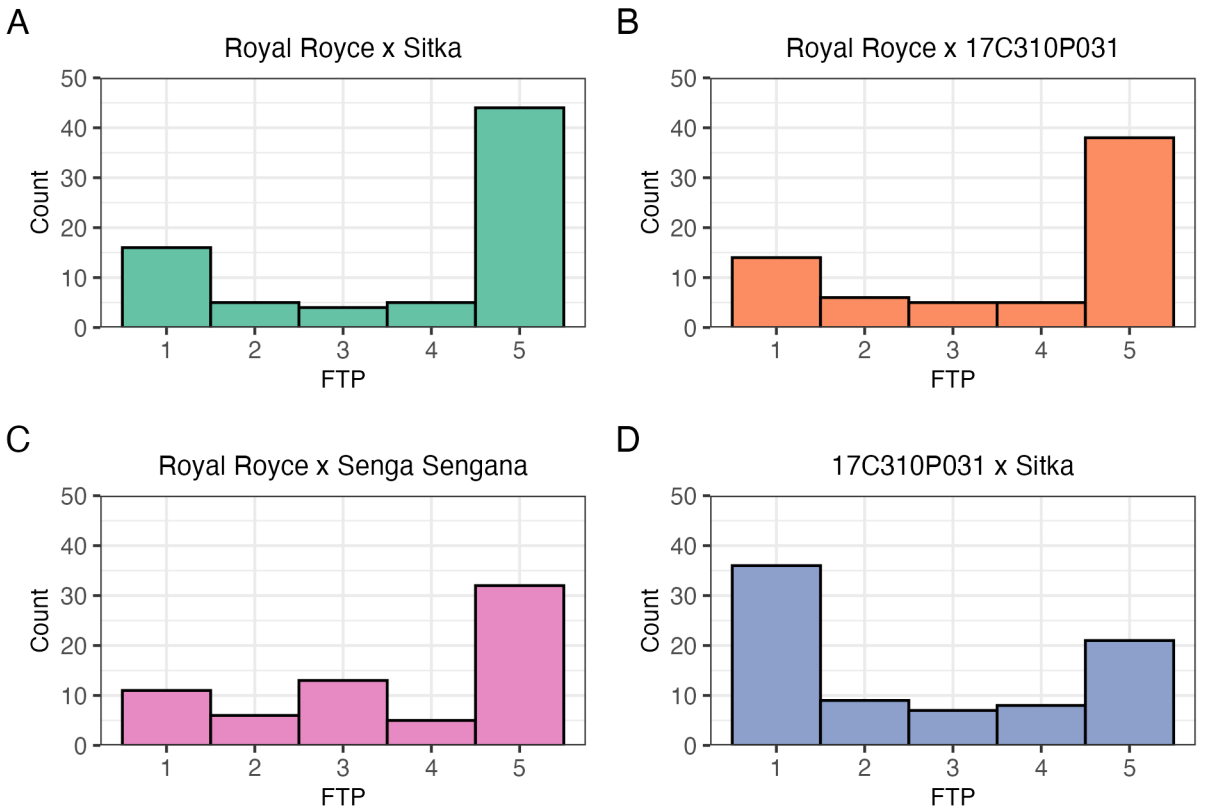
he

Fusarium oxysporum Race 2

- We tested seedling populations at UC Davis w/ **Senga Sengana, Sitka,** and **17C310** as **Resistant Donors**

  Observed **transgressive segregation** (resistant progeny) in all 4 population
  twice as many in the R x R cross





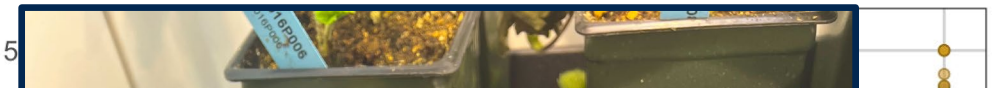
Fusarium oxysporum Race 2

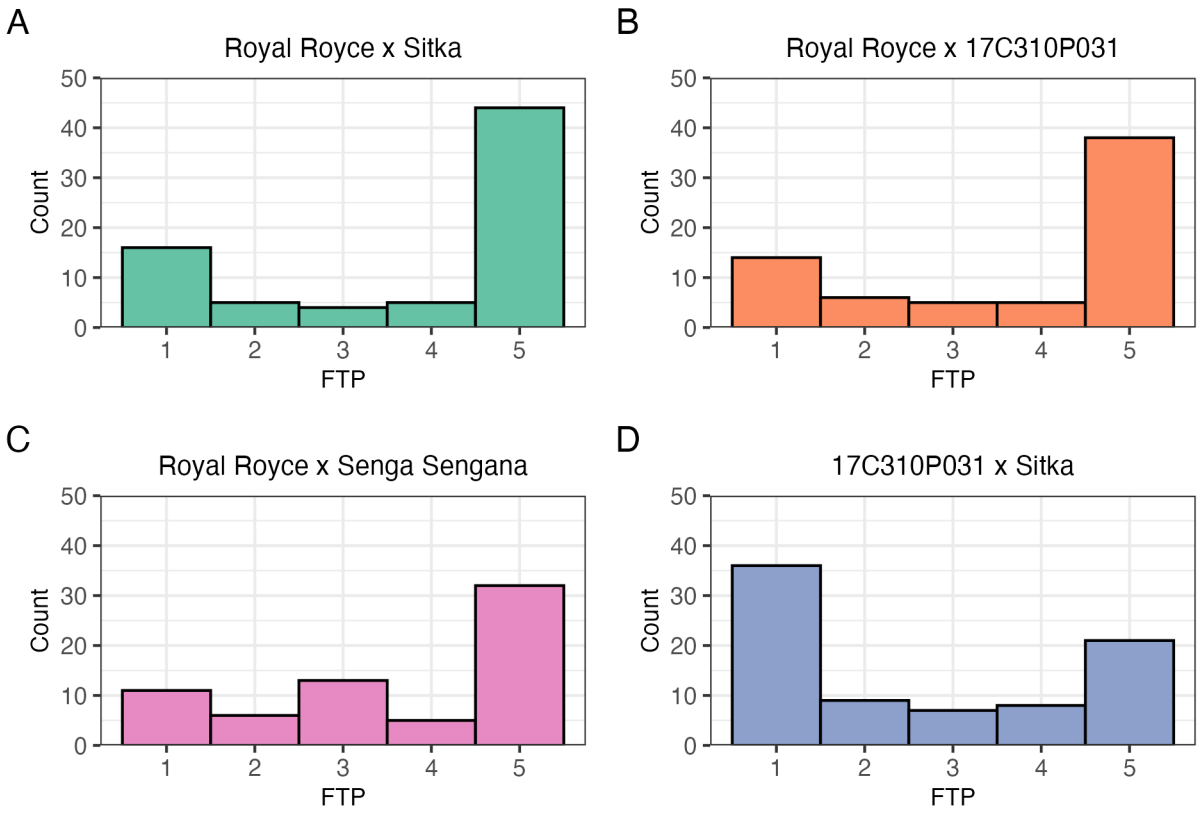
- We tested seedling populations at UC Davis w/ **Senga Sengana, Sitka,** and **17C310** as **Resistant Donors**

  Observed **transgressive segregation** (resistant progeny) in all 4 population
  twice as many in the R x R cross

  Currently *backcrossing* resistant progeny to several **short-day varieties** and *validating* Resistance scores in replicated trials.

  Goals: Large uniform fruit w/ a firm end of season
  Good peak production in Feb-March/April
  Resistant to FW R1 & R2, MCR
  Great Flavor





Fusarium oxysporum Race 2

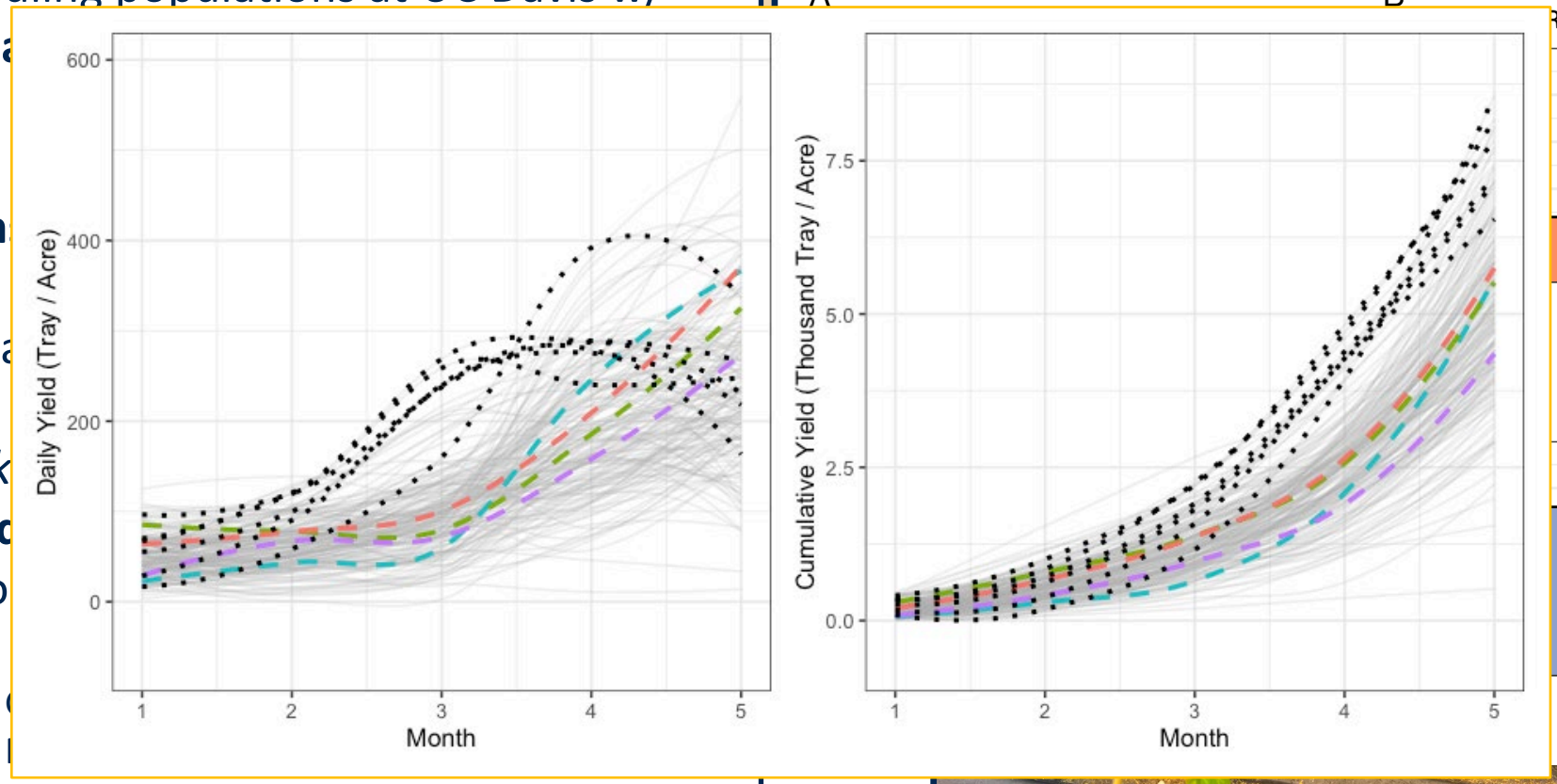
- We tested seedling populations at UC Davis w/ **Senga Sengana**
  Donors

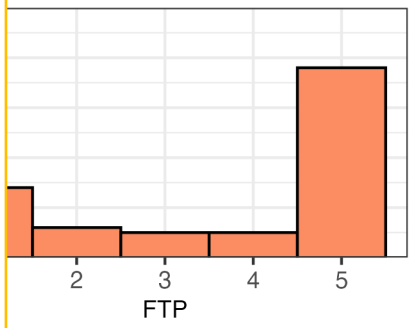
  Observed **tran**
  progeny) in all
  twice as ma

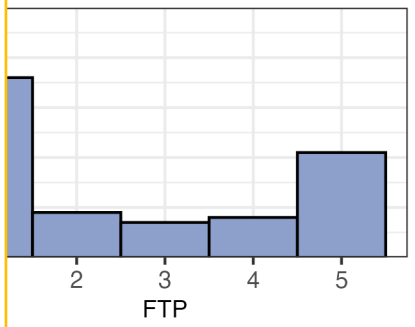
  Currently *back*
  several **short-c**
  Resistance sco

  Goals:

  Great Flavor







Take away

- **The five most recent UC varieties are all resistant to *F. oxysporum* Race 1**
- **Several varieties resistant to *M. phaseolina*** are coming down the pipeline for short day and summer plant segments
- **Potential Donors of resistance to *F. oxysporum* Race 2** are being confirmed in progeny tests, with clear strategy for variety development.