Reducing late rot in Imperial Valley sugar beet production using variety tolerance and irrigation

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SPRECKELS Research

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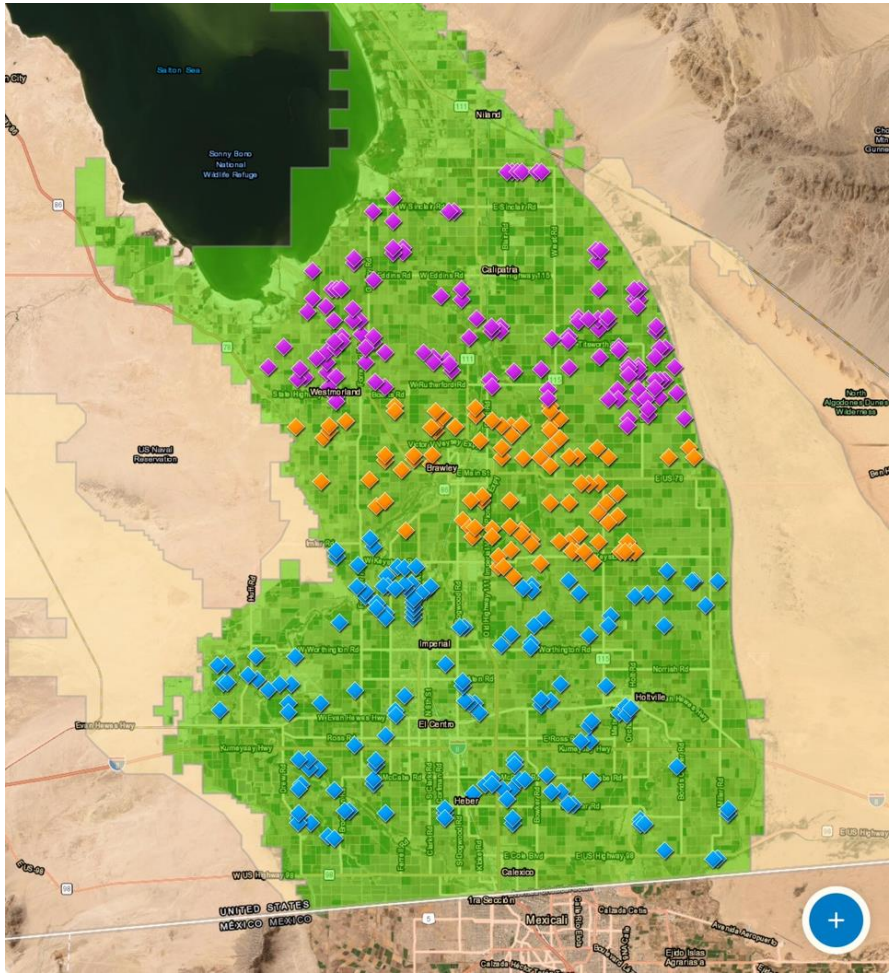
Background – Imperial Valley



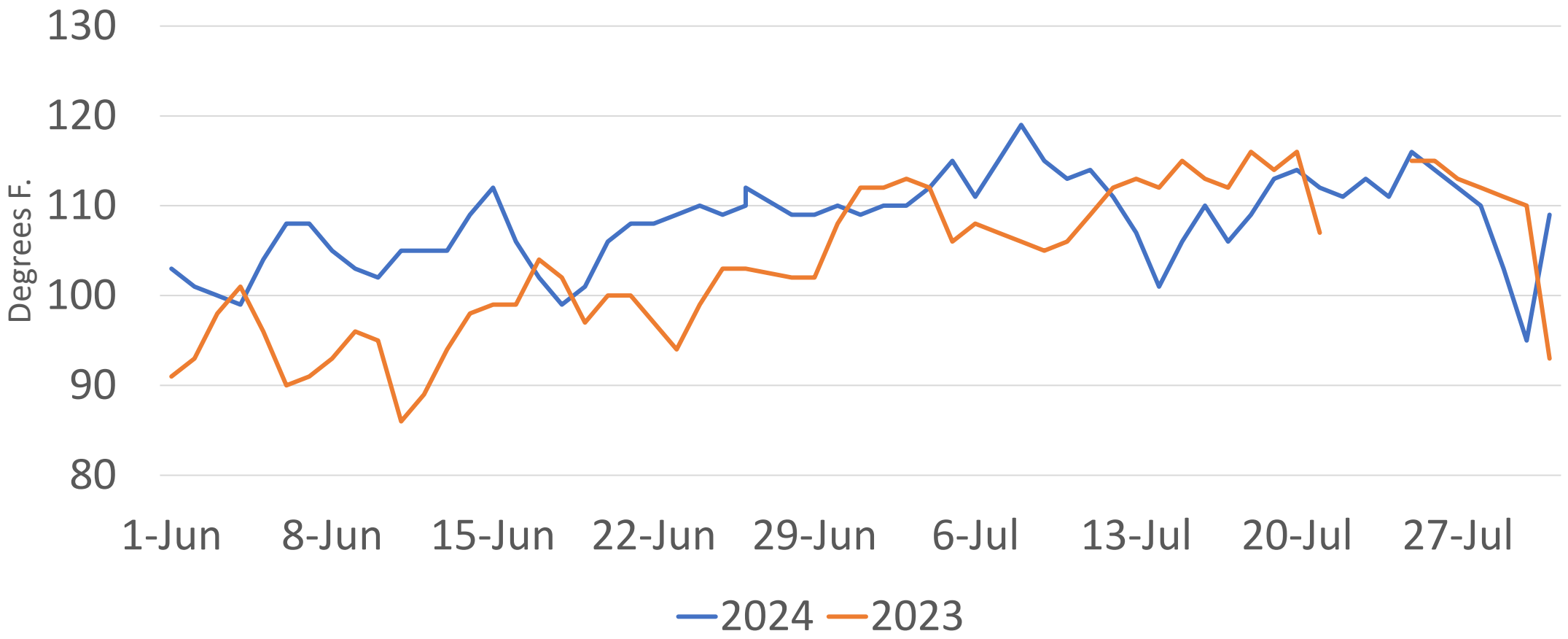
- Spreckels Sugar – Brawley, CA
- 28,000 acres (2024-2025 crop)
- Planting: September - October
- Harvest: mid-March – July
- Furrow irrigation

Background

- Late rot complex.
  - *Pythium aphanidermatum*
  - *Phytopthora drechsleri*
- Favored by warm temperatures and saturated soils.
- Significant impact on fields harvested in July and August.
- Variety tolerance.

University of California Integrated Pest Management. (2009) Sugar Beet Phytophthora and Pythium Root Rots. http://ipm.ucanr.edu/PMG/r735100711.html

2023 and 2024 June - July
Daily High Temperatures for Imperial, CA



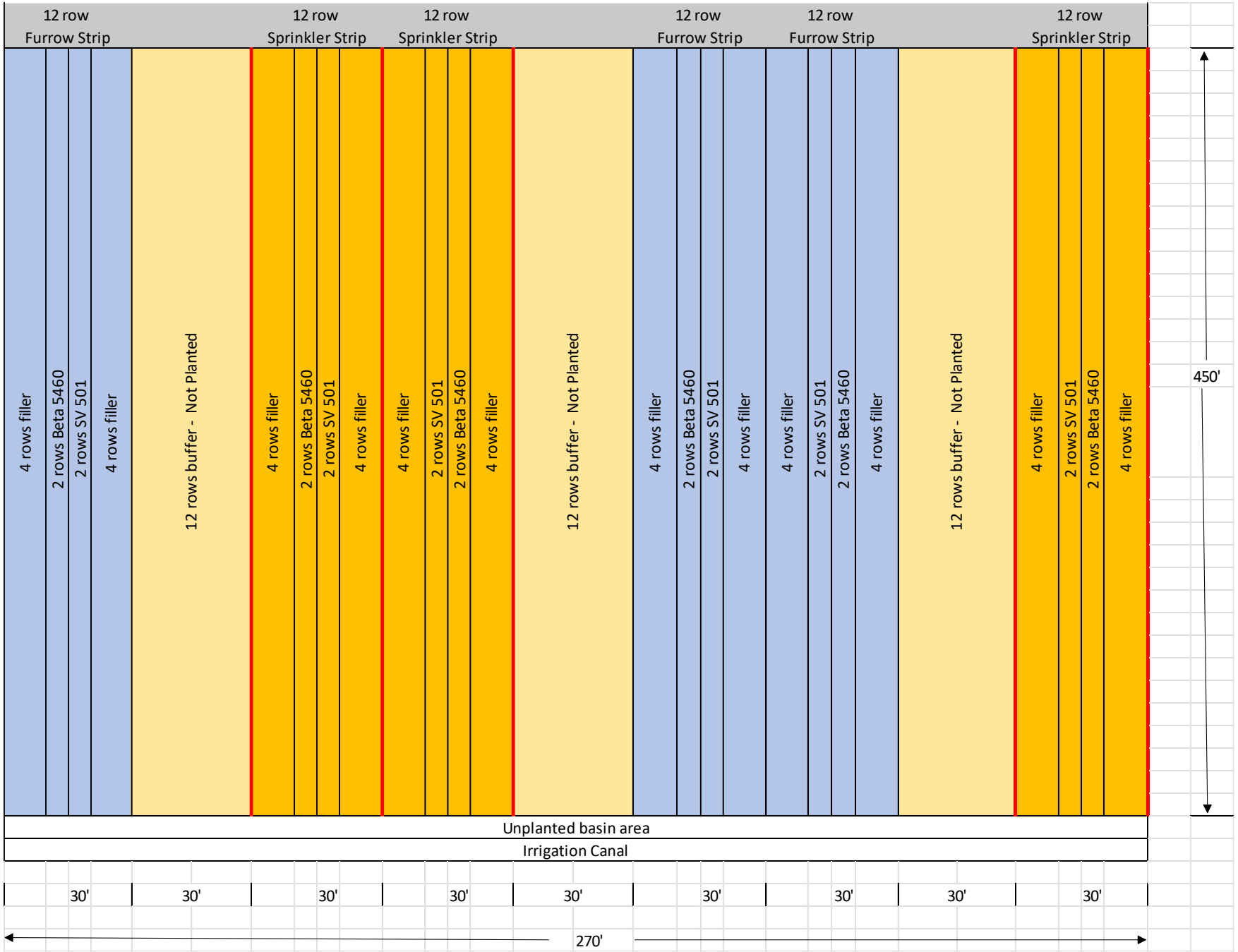
https://www.wunderground.com/history/weekly/us/ca/imperial

Trial Objective

- Determine the effect of sprinkler irrigation versus furrow irrigation and variety tolerance on late rot development, root yield, and root quality during the July harvest period.

Materials and Methods

- RCBD in split plot arrangement.
  - Whole plot – irrigation type.
  - Subplot – variety SV 501 (susceptible) & Beta 5460 (tolerant).
- 3 replications.
- 12 row-wide strips of each irrigation treatment.
- 450’ strip length.
- 30’ sub-plots established in each strip.


12 row Furrow Strip
12 row Sprinkler Strip
12 row Sprinkler Strip
12 row Furrow Strip
12 row Furrow Strip
12 row Sprinkler Strip
4 rows filler
2 rows Beta 5460
2 rows SV 501
4 rows filler
12 rows buffer - Not Planted
4 rows filler
2 rows Beta 5460
2 rows SV 501
4 rows filler
4 rows filler
2 rows SV 501
2 rows Beta 5460
4 rows filler
12 rows buffer - Not Planted
4 rows filler
2 rows Beta 5460
2 rows SV 501
4 rows filler
4 rows filler
2 rows SV 501
2 rows Beta 5460
4 rows filler
12 rows buffer - Not Planted
4 rows filler
2 rows SV 501
2 rows Beta 5460
4 rows filler
450'
Unplanted basin area
Irrigation Canal
30'
30'
30'
30'
30'
30'
30'
30'
30'
270'

Materials and Methods

- Entire trial was sprinkler irrigated for emergence and converted to furrow after stand establishment.
- Furrow irrigation on entire trial until irrigation treatments start in late May.
- Crop protection products applied as needed across entire trial area.
- SWIMM/Jain Logic system installed to monitor water availability in both irrigation treatments.

Trial Information

2023 Trial

- Planted: 10/5/2022
- First water: 10/8/2022
- Final stand counts: 10/31/2022
- Irrigation treatment installation: late May.
- Harvest: 8/15/2023

Trial Information

2023 Trial

- Planted: 10/5/2022
- First water: 10/8/2022
- Final stand counts: 10/31/2022
- Irrigation treatment installation: late May.
- Harvest: 8/15/2023

2024 Trial

- Planted: 10/6/2023
- First water: 10/9/2023
- Final stand counts: 11/7/2023
- Irrigation treatment installation: late May.
- Harvest: 8/5-6/2024

Harvest

- Visual rot counts.
- Rogued rot beets out of the row.
- Harvest with a 2-row research harvester.
- Sugar samples analyzed by Spreckels tare lab.
- Data Analysis: SAS Proc Mixed.
  - Analyzed as a split plot with sampling.
  - Differences considered significant at 0.1 significance level.

Photo taken July 30, 2024

July 30, 2024 - Pre-Harvest Pictures

Sprinkler

Furrow

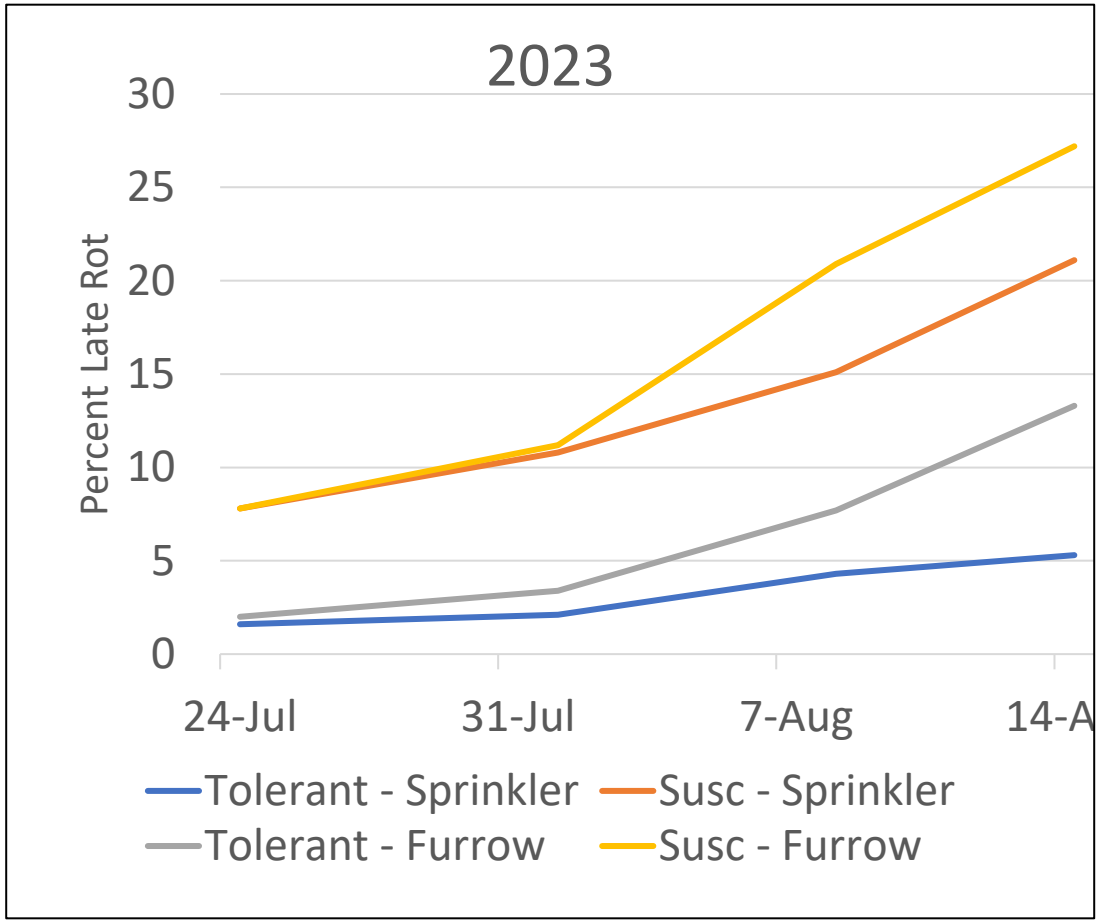
Late Rot Counts and Rouging

- Rot counts – weekly
  - Based on foliage
- Harvest – remove rot beets after defoliation.
- Required practice for delivery of beets in fields that exceed rot parameters.

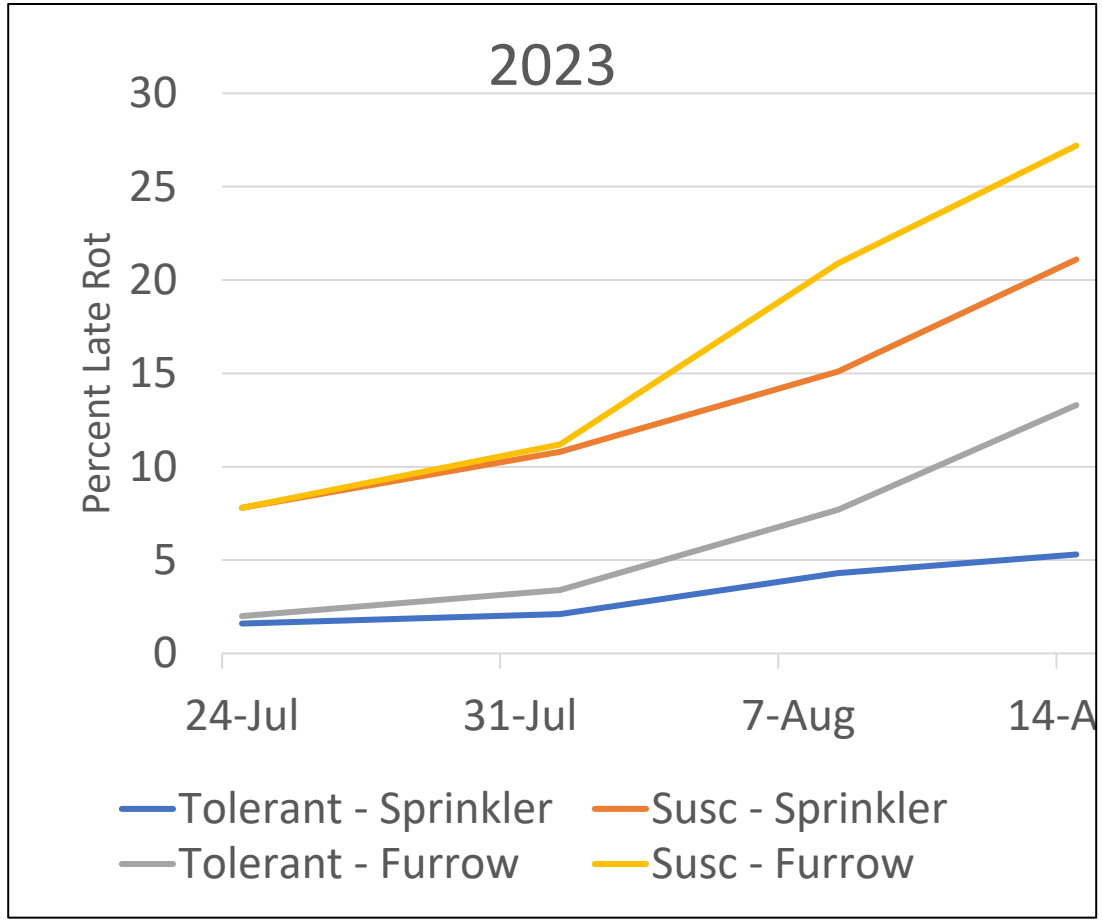
Statistical Analysis

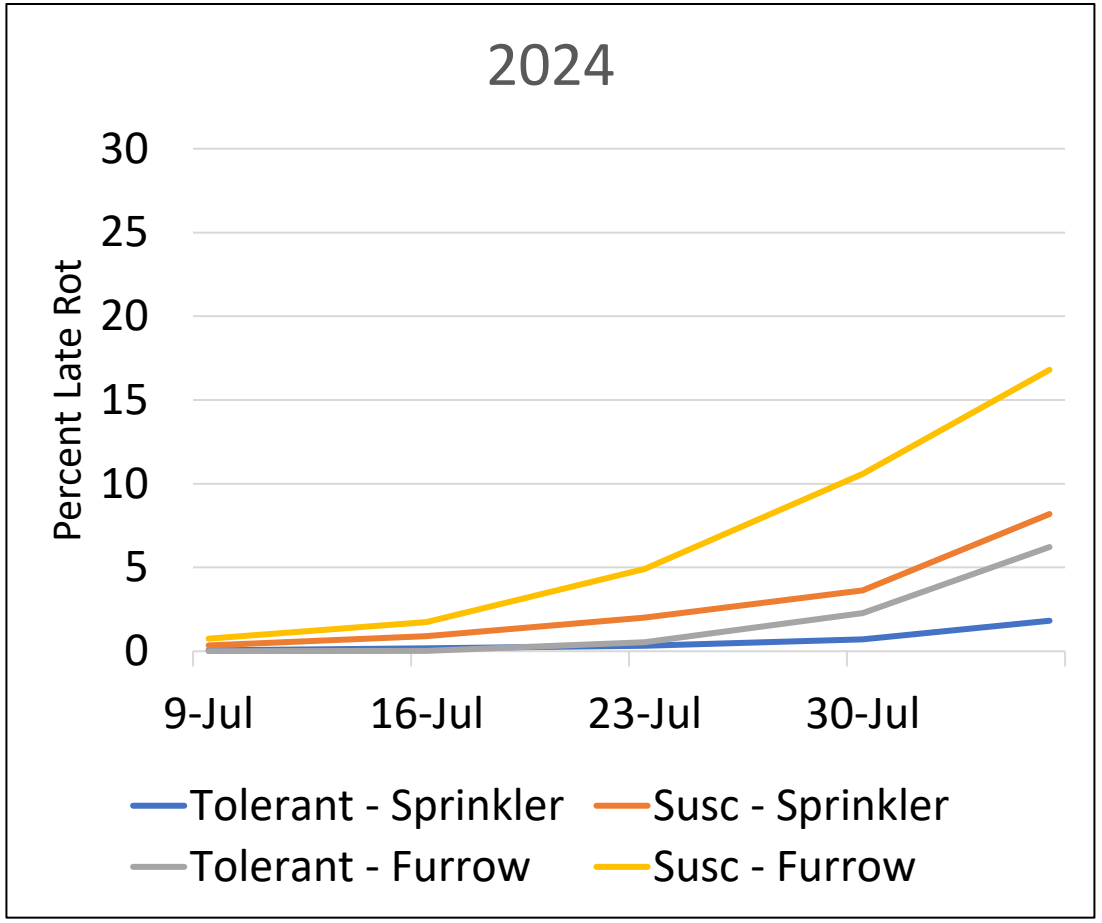
Term	Final Percent Rot 2023 Trial	Final Percent Rot 2024 Trial
Irrigation Type	0.227	0.05
Variety	<0.0001	<0.0001
I x V	0.0421	0.0018

Late Rot Progression



Late Rot Progression





Statistical Analysis

Term	2023 Extractable Sucrose/Acre	2024 Extractable Sucrose/Acre
Irrigation Type	0.489	0.023
Variety	<0.0001	<0.0001
I x V	0.3995	0.1719

Irrigation Type – Ext. Sucrose per Acre

2023

Irrigation Type	Ext. Sucrose/Acre (lbs.)
Sprinkler	12,943
Furrow	11,636
Pr>F	0.489
alpha	0.1
reps	3

2024

Irrigation Type	Ext. Sucrose/Acre (lbs.)
Sprinkler	15,980a
Furrow	13,217b
Pr>F	0.023
alpha	0.1
reps	3

Variety – Ext. Sucrose per Acre

2023

Variety	Ext. Sucrose/Acre (lbs.)
Tolerant (5460)	13,767a
Susceptible (501)	10,811b
Pr>F	<0.0001
alpha	0.1
reps	3

2024

Variety	Ext. Sucrose/Acre (lbs.)
Tolerant (5460)	15,831a
Susceptible (501)	13,365b
Pr>F	<0.0001
alpha	0.1
reps	3

Extractable Sucrose per Acre (2023 and 2024)

Irrigation Type	Variety	2023 ESA (lbs./A)	2024 ESA (lbs./A)
Sprinkler	Tolerant (5460)	14,566	17,030
Sprinkler	Susceptible (501)	11,319	14,929
Furrow	Tolerant (5460)	12,969	14,632
Furrow	Susceptible (501)	10,303	11,802

Project Status

- The 2024-2025 growing season is the 3rd season of the project.
- Full report available at www.spreckelssugar.com. Click on the Research Reports tab.

Picture taken November 25, 2024

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Research

Acknowledgments:

- Co-authors
- CBGA Research Committee
- Spreckels Sugar Ag. Staff
- Jain Logic