

Effect of *Fusarium oxysporum* f.sp. *fragariae* and *Macrophomina phaseolina* inoculum density on strawberry cultivar performance



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Ability to produce fruit in presence of pathogens

- Cultivar resistance
- Fumigation optimization
- Environmental considerations (cool soils slow disease development)
- Non-fumigant approaches (ASD, steam, solarization, biocides)
- Crop rotations
- Soilless culture/hydroponics

How much **Fusarium** in soil can strawberry handle?

Can susceptible cultivars perform at low pathogen levels?



Can resistant resistant cultivars perform at high pathogen level?

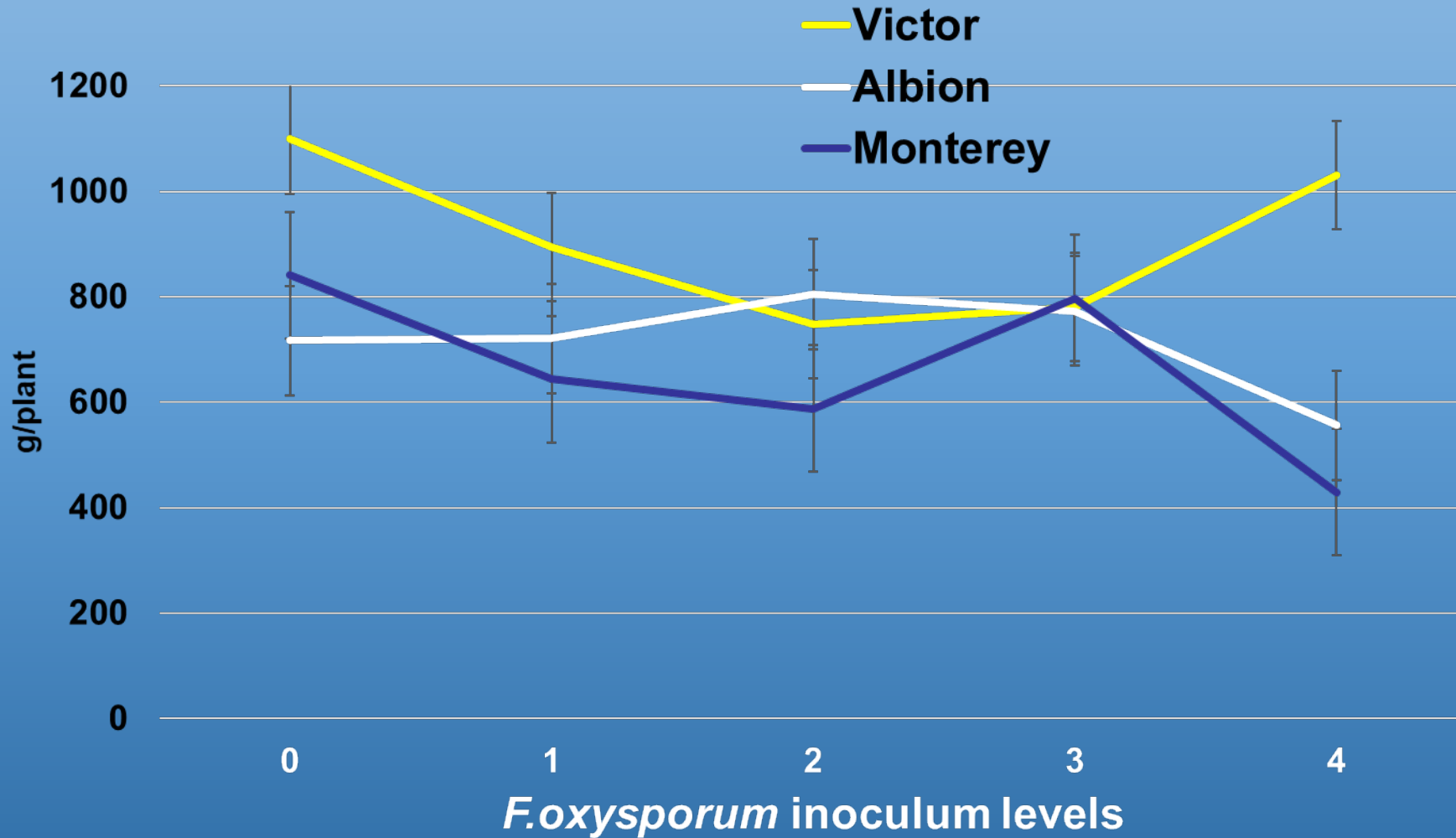
Treatments

- Soil flat fumigated with Chloropicrin at 300 lbs/A, beds made with black TIF , holes cut
- Soil excavated from planting holes (1L) is mixed with **Fusarium-inoculated** or **Macrophomina-inoculated** sand (0.1L) and returned to planting holes
- 3 cultivars Planted in RCBD plots with 4 reps

2000 CFUs per gram (4),
1000 CFUs per gram (3),
500 CFUs per gram (2),
100 CFUs per gram (1),
0 CFU (just sand) (0).



Fruit yield (total) in response to Fusarium



Albion without Fusarium - May



Albion in response to Fusarium - May



1



2

Albion in response to Fusarium - May

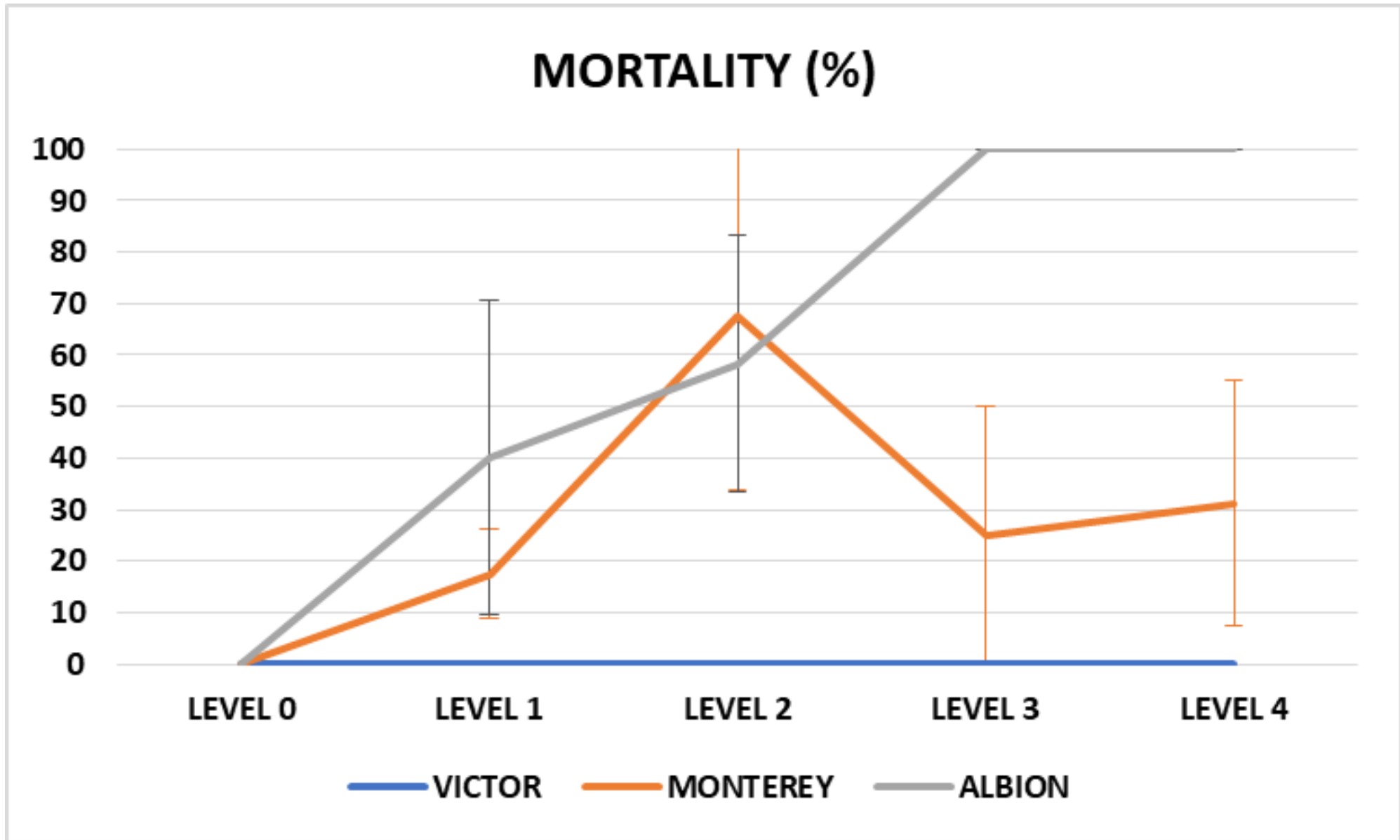


3

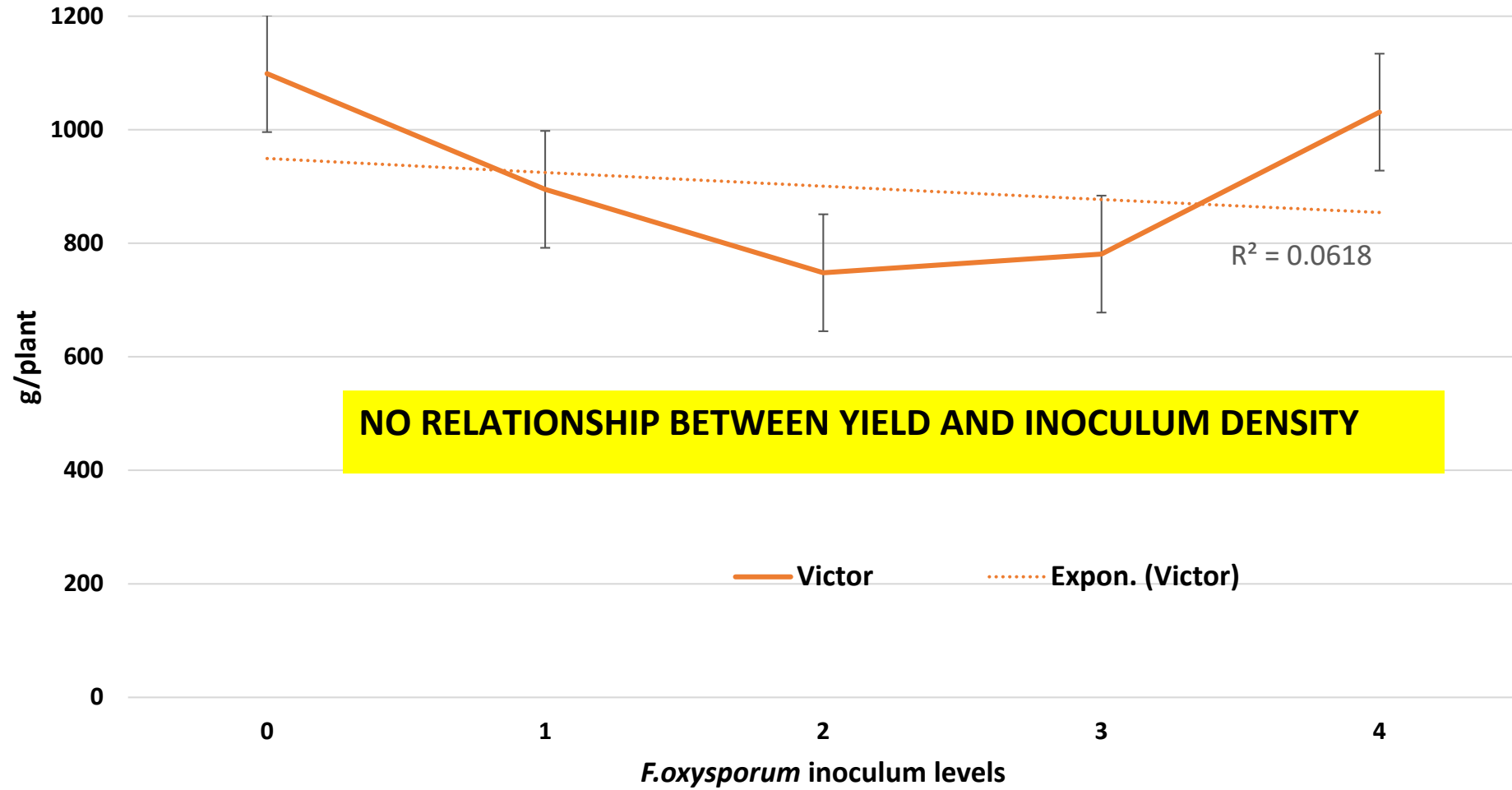


4

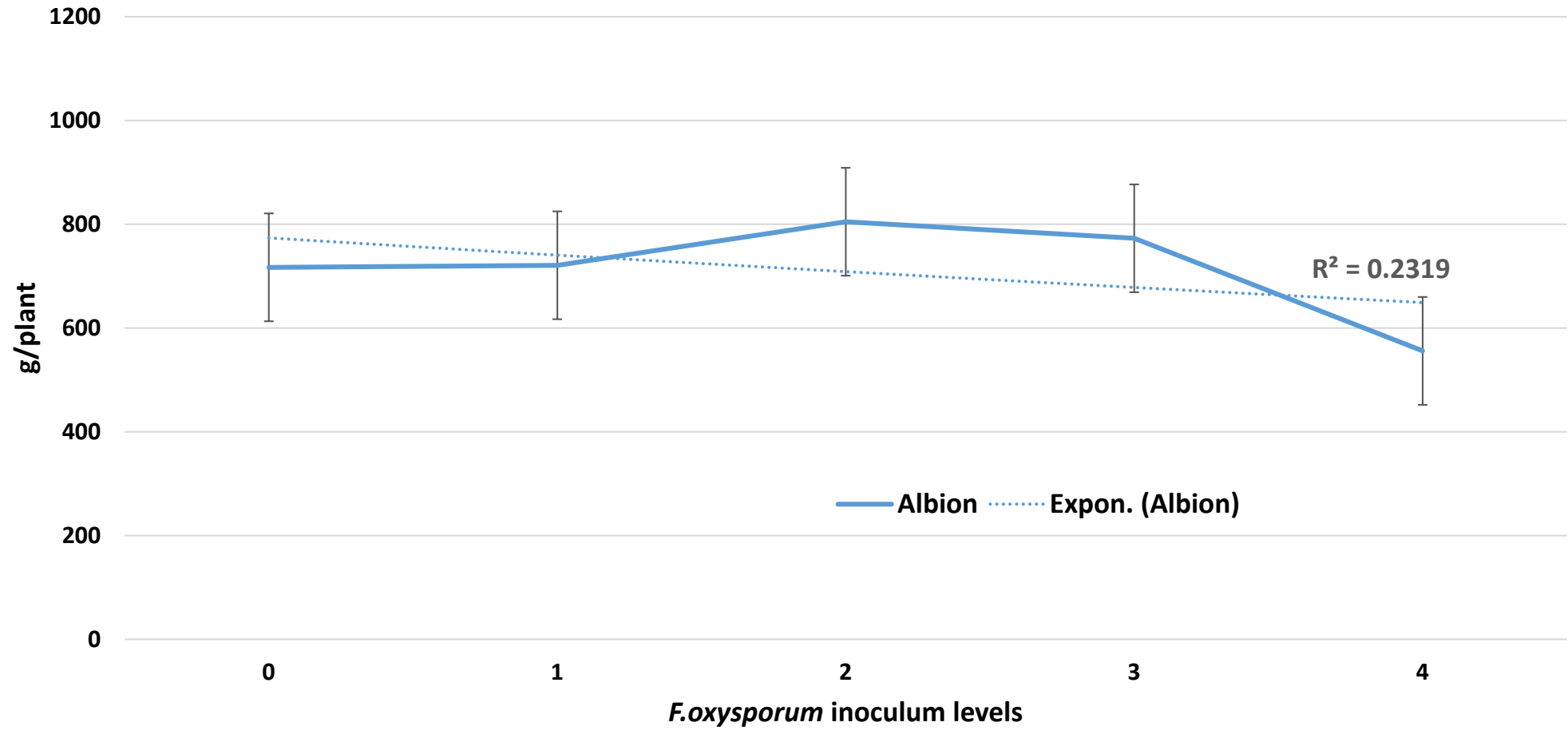
MORTALITY CAUSED BY *F. OXYSPORUM* F. SP. FRAGARIAE AT THE END OF THE EXPERIMENT



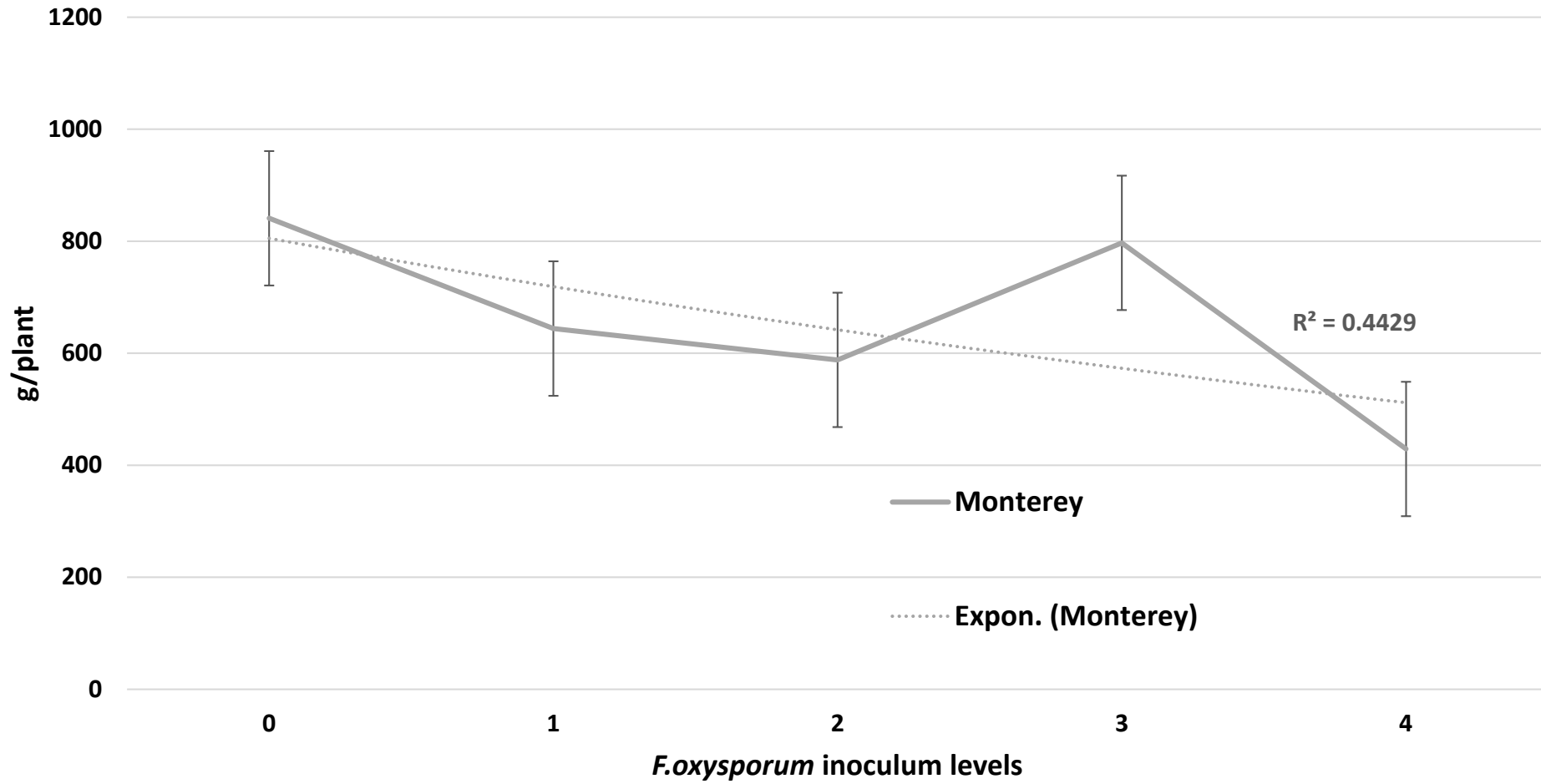
Total Fruit Yield, 2019- Victor



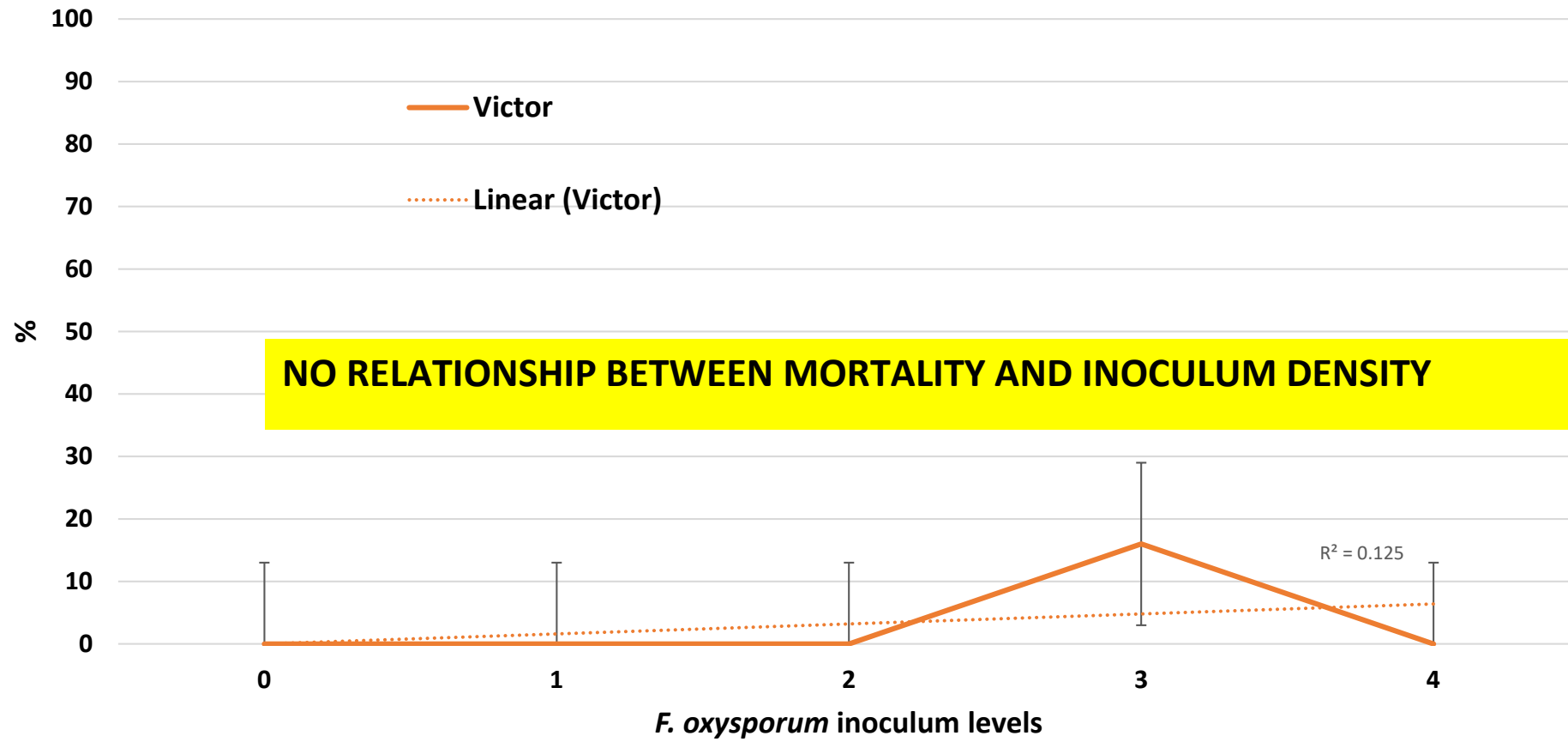
Total Fruit Yield, Albion, 2019



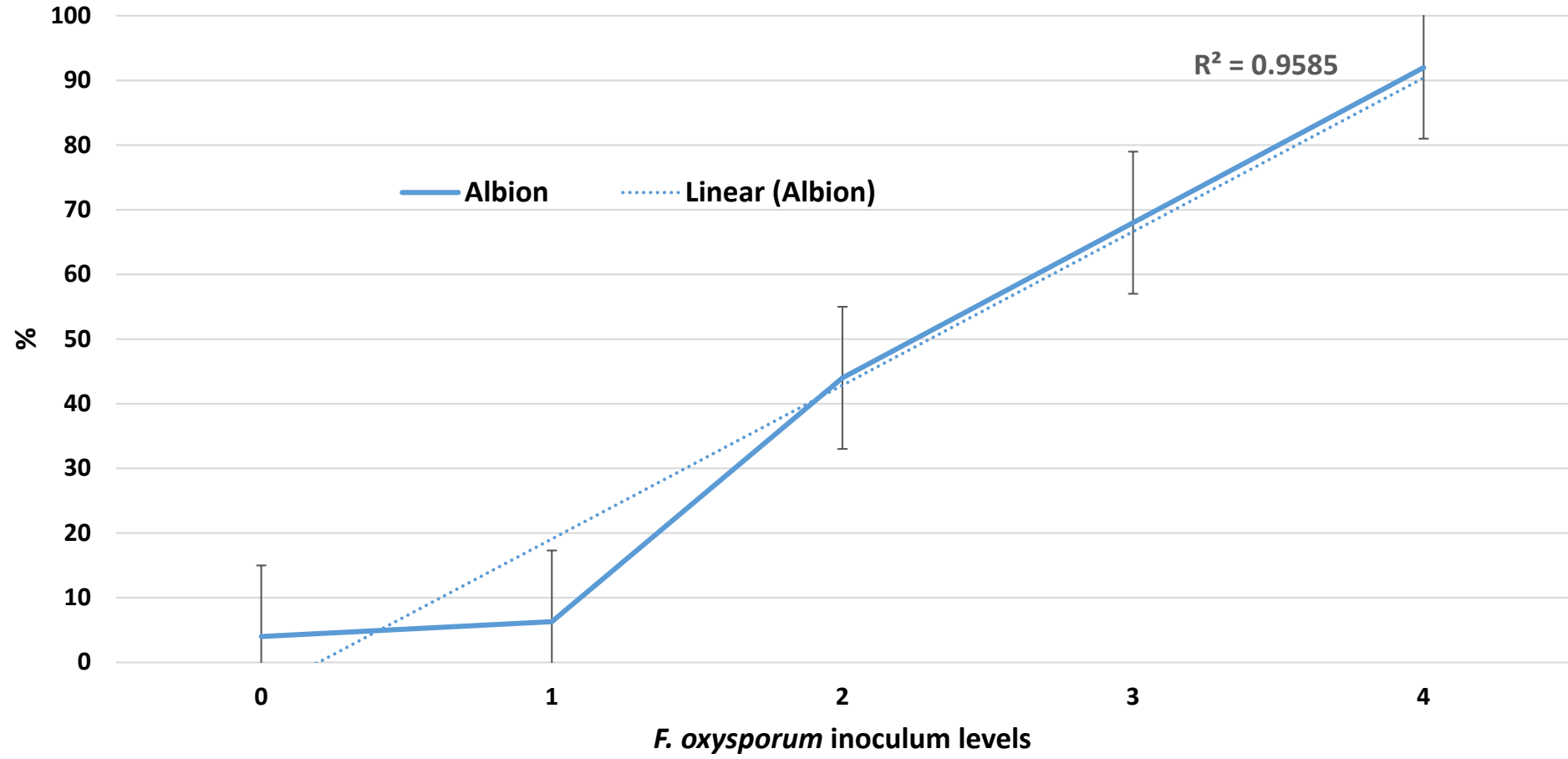
Total Fruit Yield, Monterey, 2019



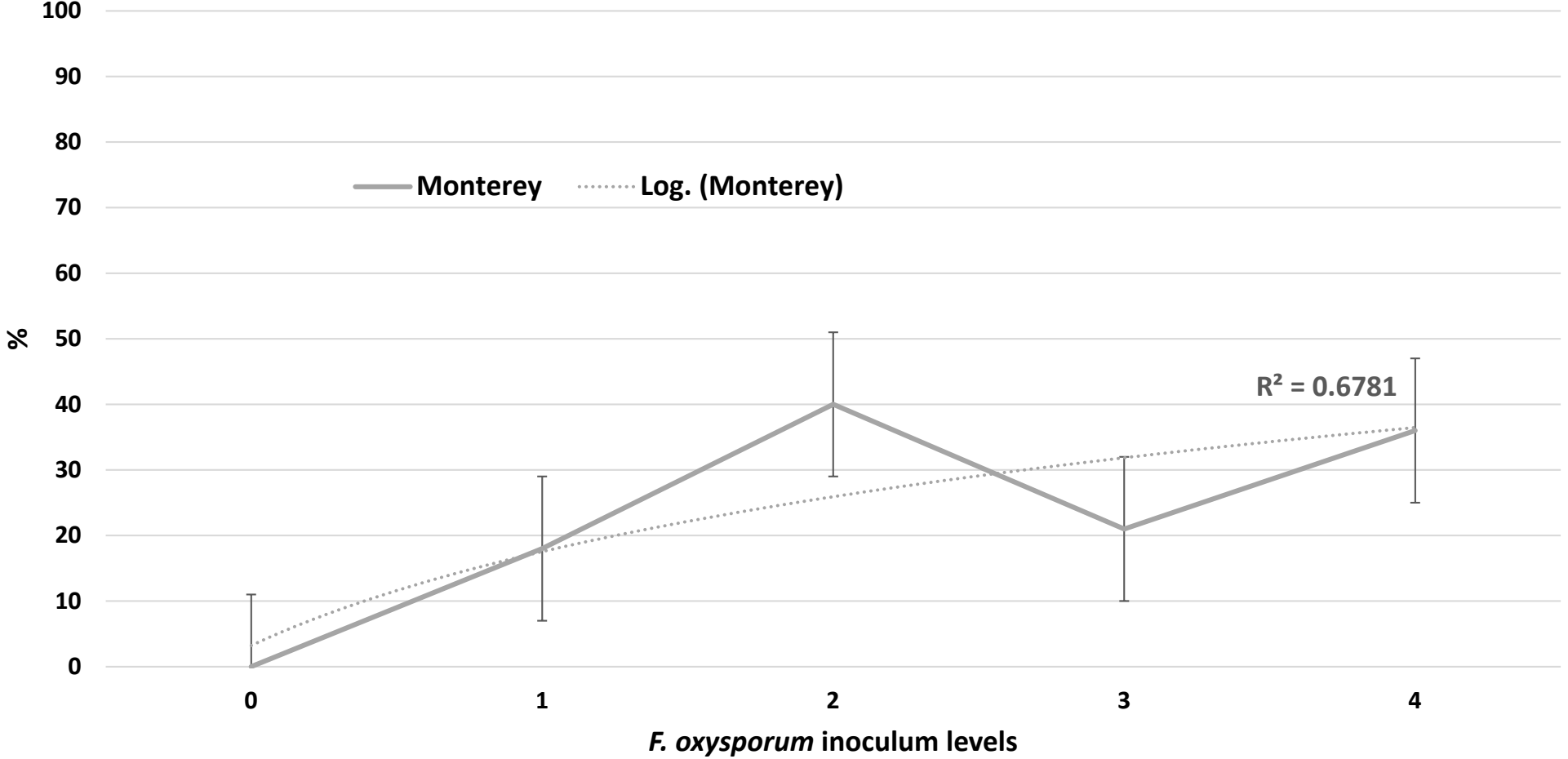
Percent mortality, Victor, July 2019



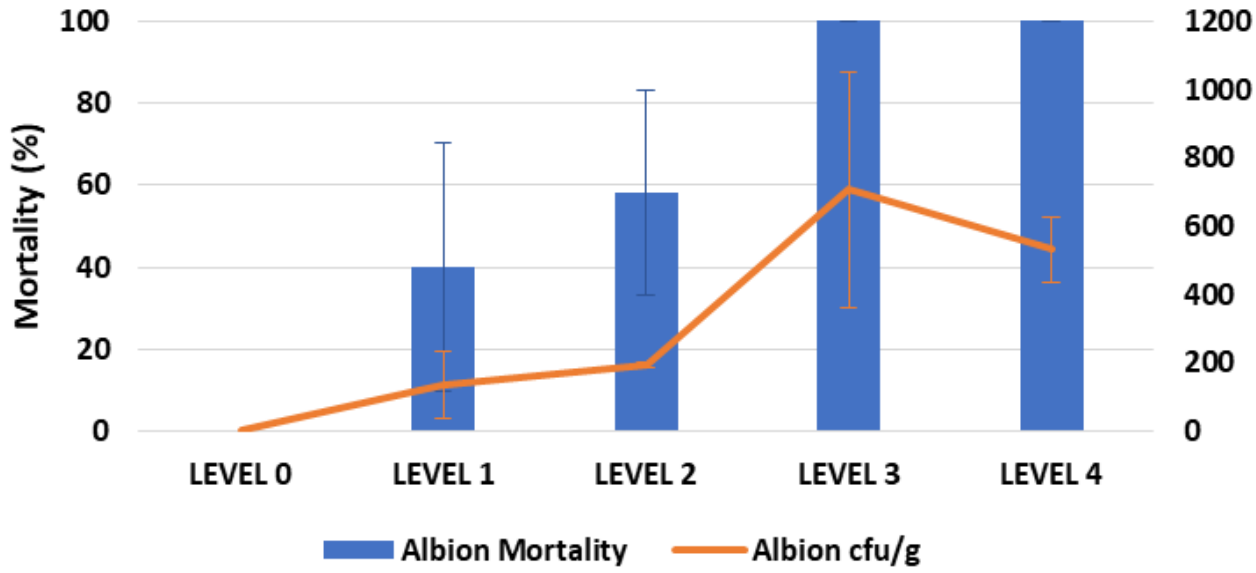
Percent mortality, Albion, July 2019



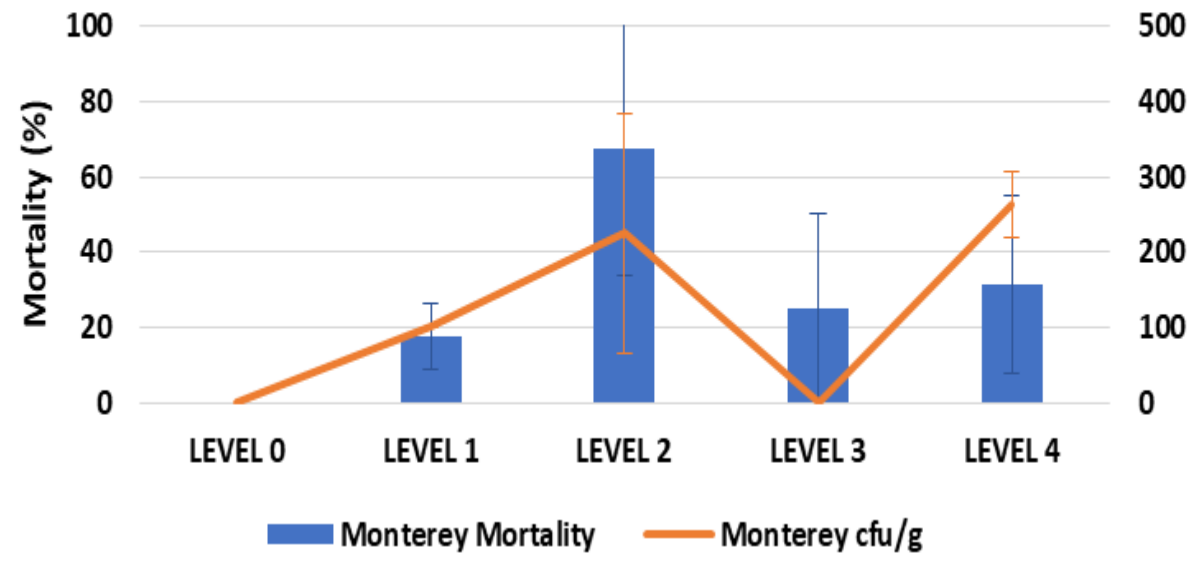
Percent mortality, Monterey, July 2019



ALBION - END POINT



MONTEREY - END POINT



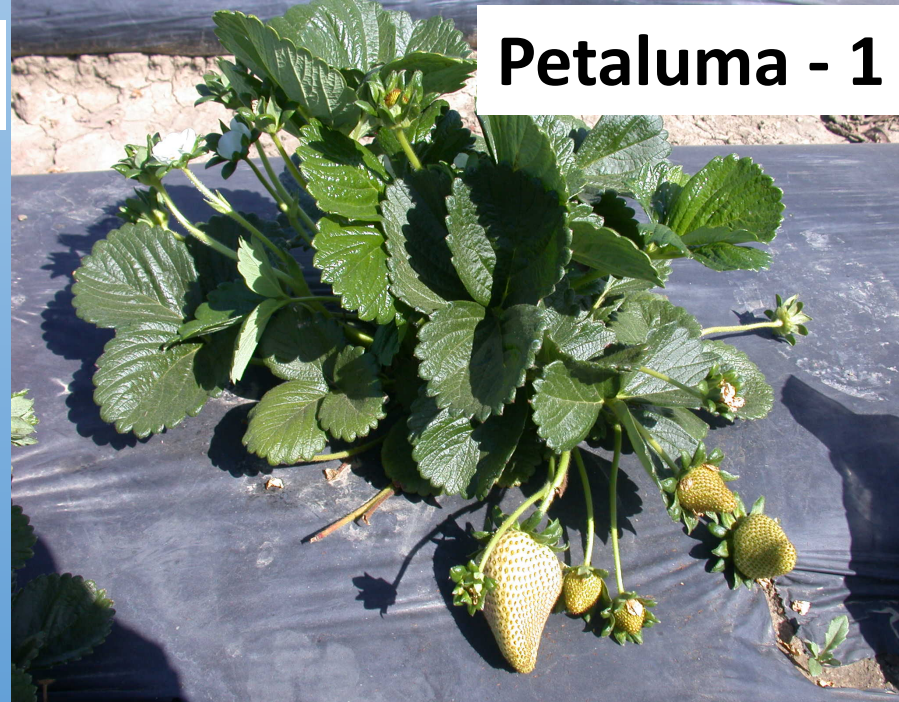
2019-2020 Season: short day cultivars

- Petaluma (Fusarium susceptible)
- Victor (Fusarium resistant)
- Warrior (Fusarium resistant)

PLANT SIZES, DEC 11	CM²
• Petaluma	168 a
• Victor	113 b
• Warrior	138 b



Petaluma - 0



Petaluma - 1

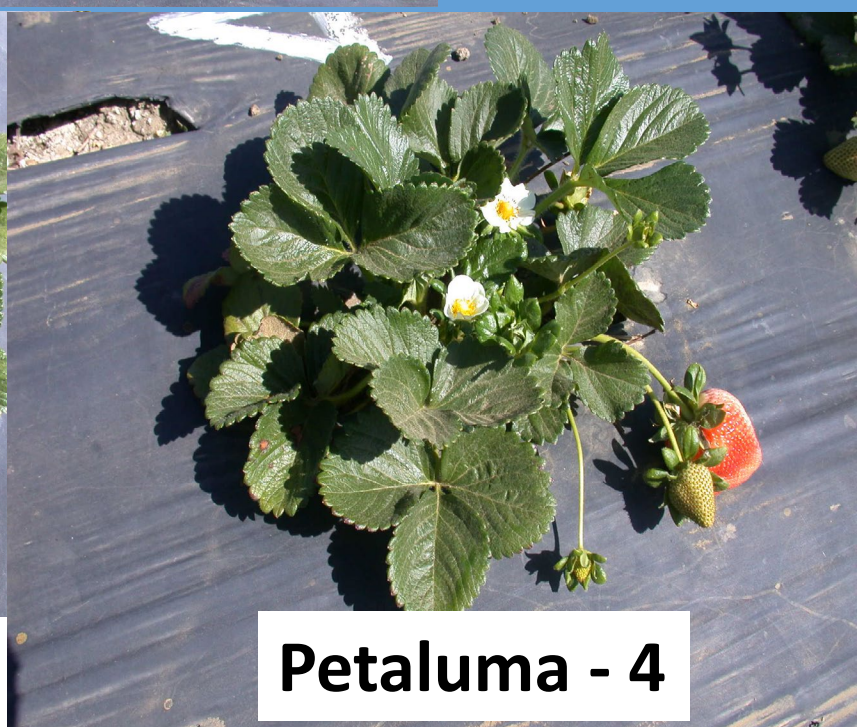
4/28/2020



Petaluma - 2



Petaluma - 3



Petaluma - 4



4/28/2020





Warrior - 0



Warrior - 1

4/28/2020



Warrior - 2



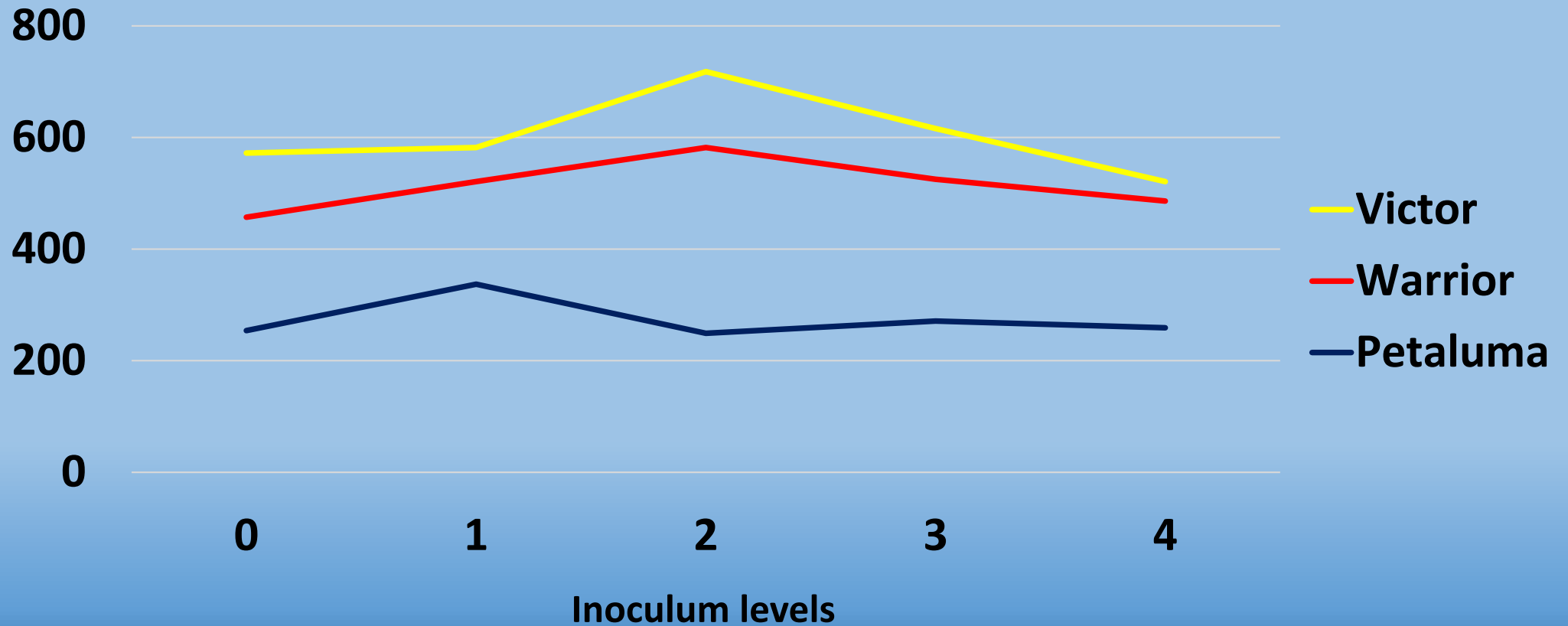
Warrior - 3



Warrior - 4

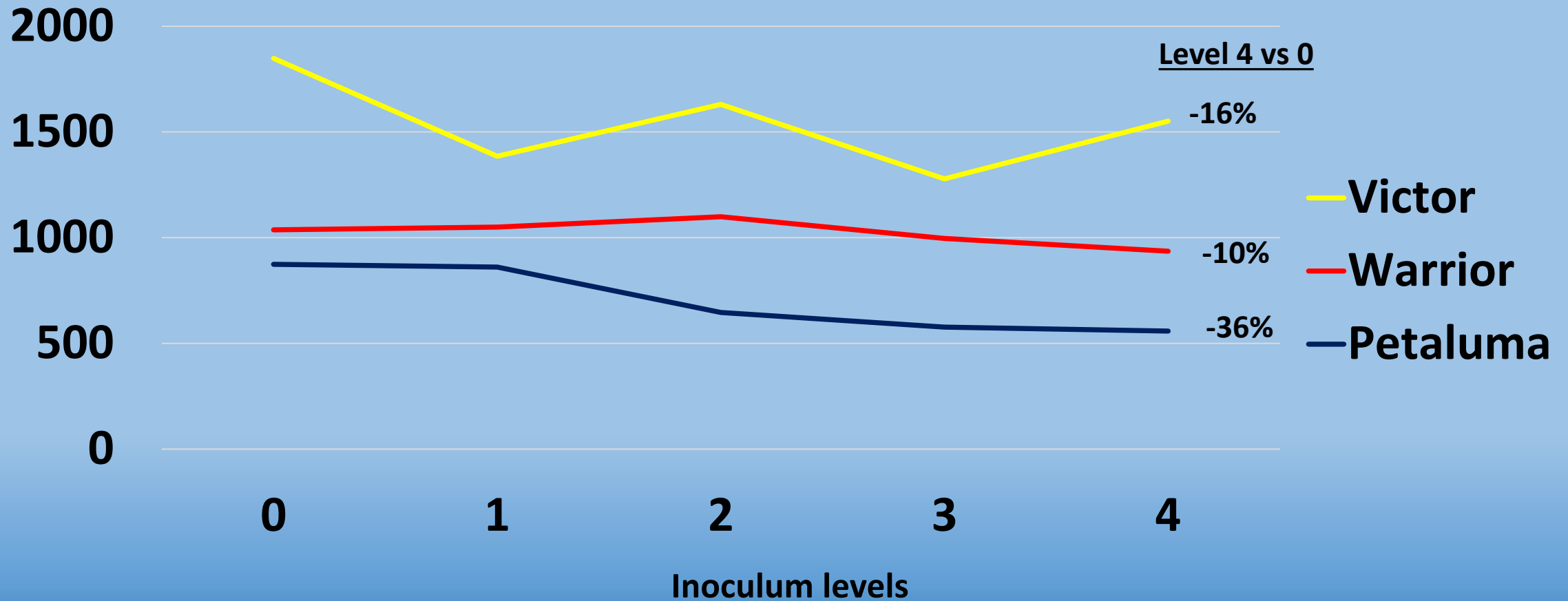
Fruit yields Jan-April 2020

Yield, g/plant through April 2020



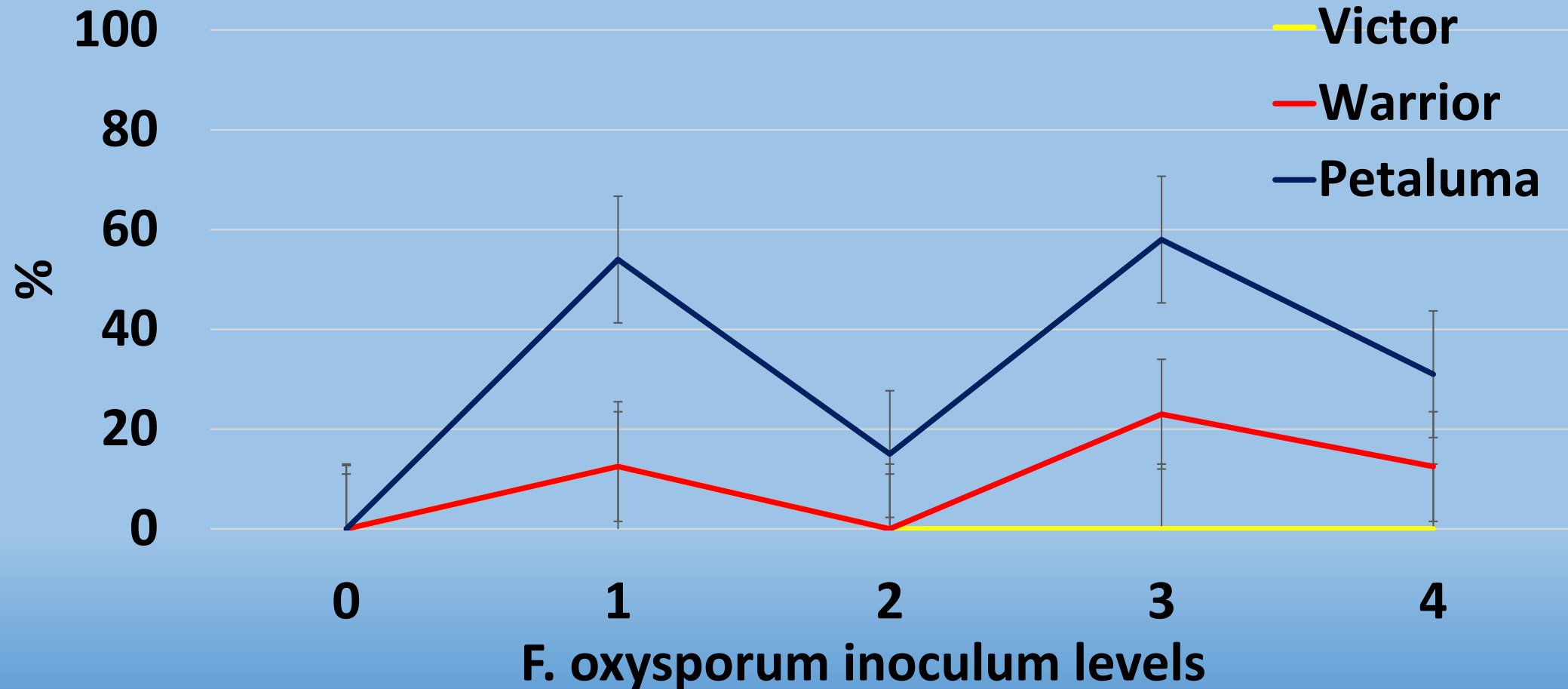
Fruit yields Jan-July 2020

Yield, g/plant Jan - July 2020



Percent mortality, July 2020

Level 4 vs 0

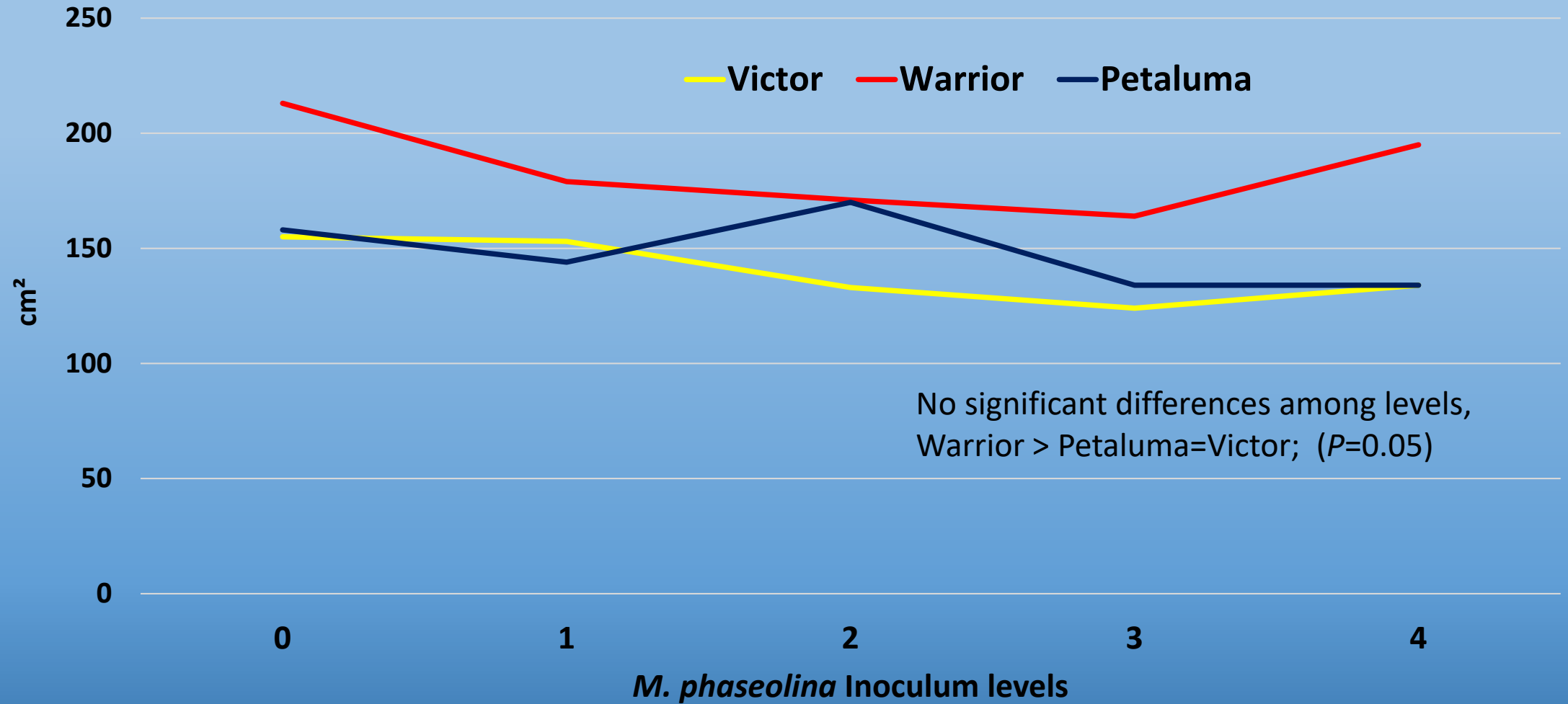


How much **Macrophomina** in soil can strawberry handle?

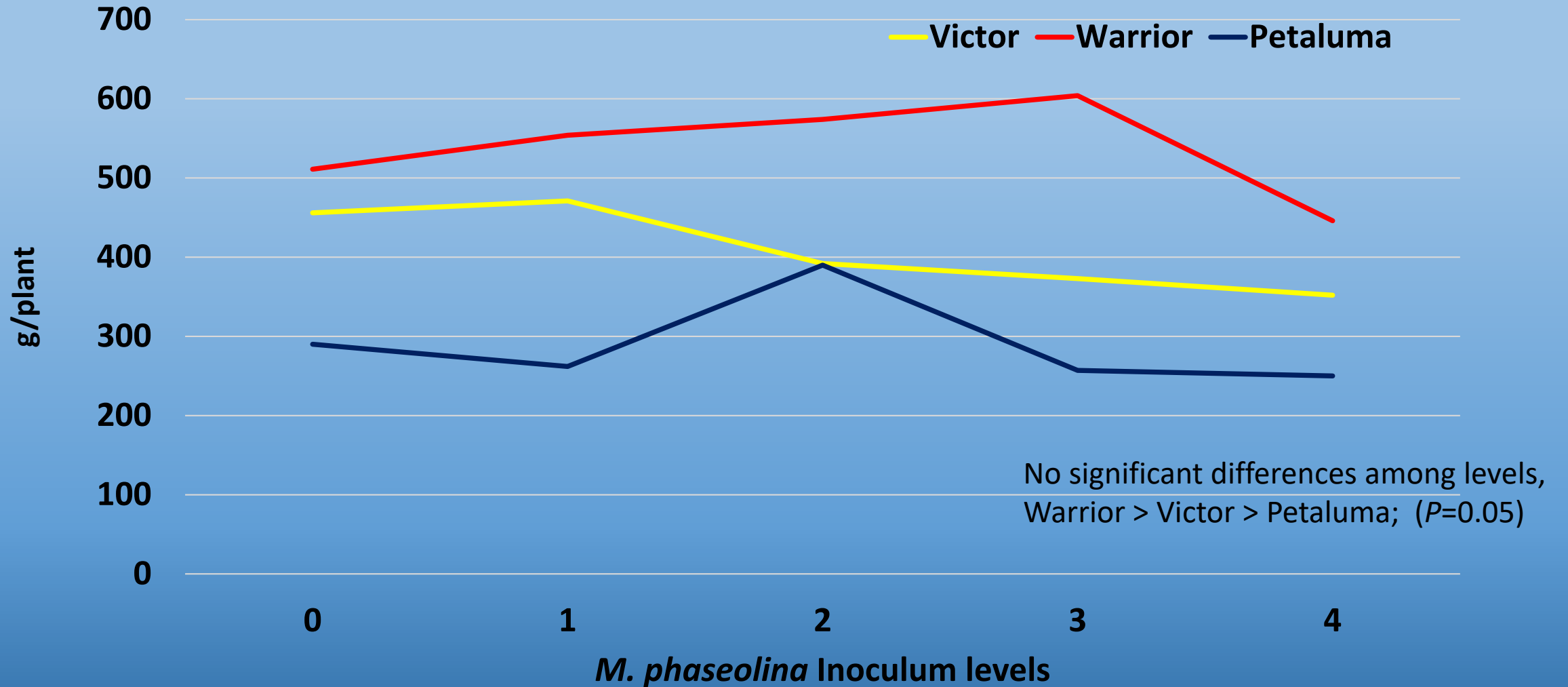
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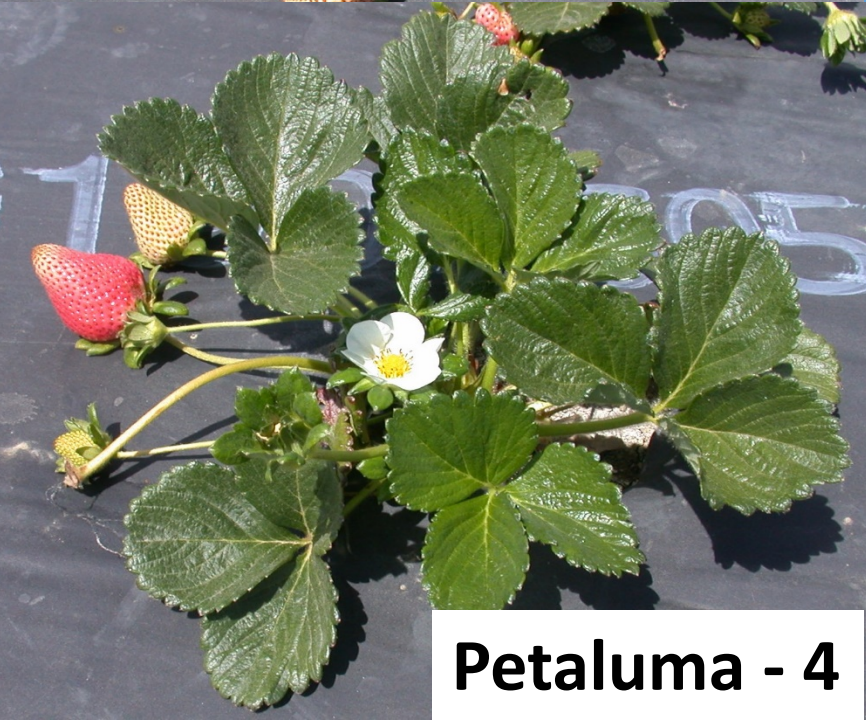


Plant size (avg.) on 12/11/2020



Fruit yields Jan-March 2021





Cultivar resistance

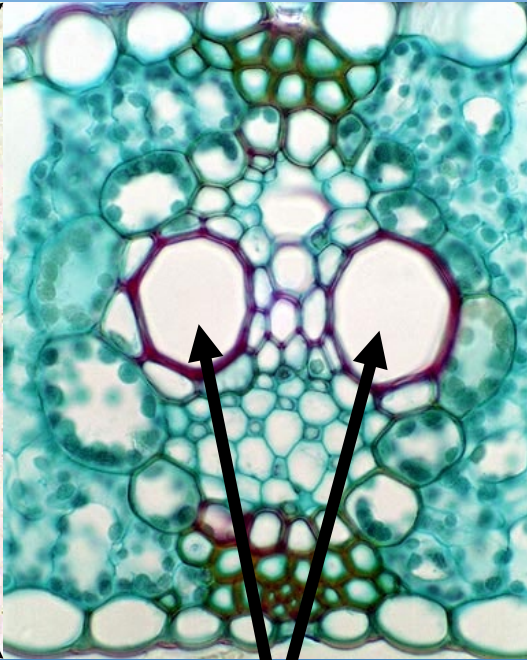
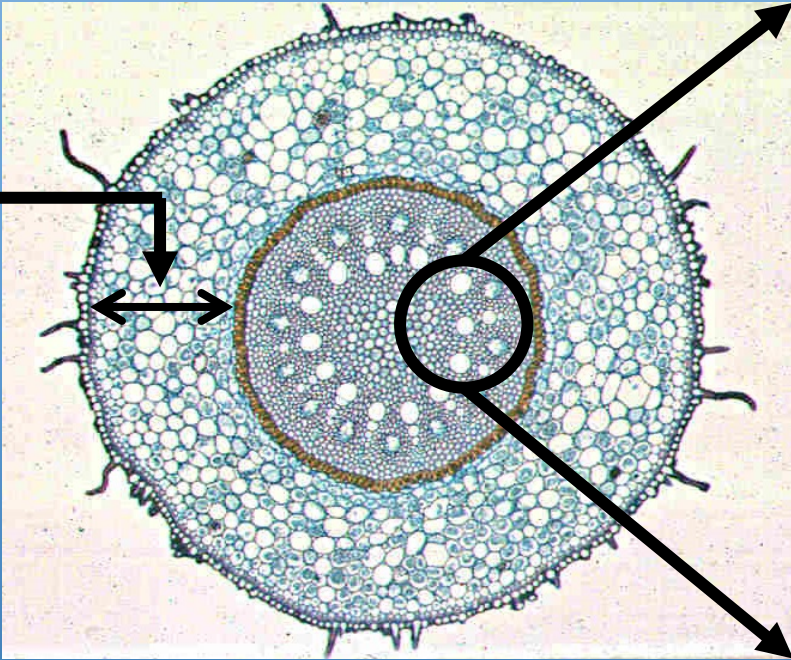
- Victor and Warrior resistance at high Fusarium density in soil (no yielded losses or mortality)
- Susceptible cultivars (Albion, Monterey , Petaluma) can produce most of the season in low-level Fusarium infested soils. Mortality increases rapidly with pathogen density late in the season
- Macrophomina?
- ALL CULTIVARS SUPPORT PATHOGENS

Non-pathogenic
fungi colonize the
root cortex

*Fusarium
oxysporum*
f. sp. *fragariae*

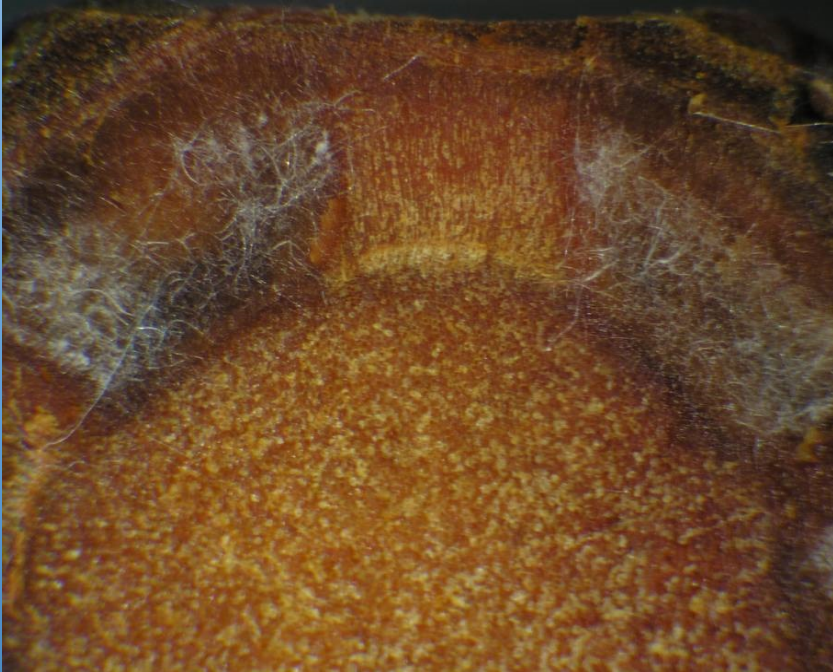


Region of
fungal growth



Xylem vessels

The Pathogen Moves Into The Shoot With **Water**

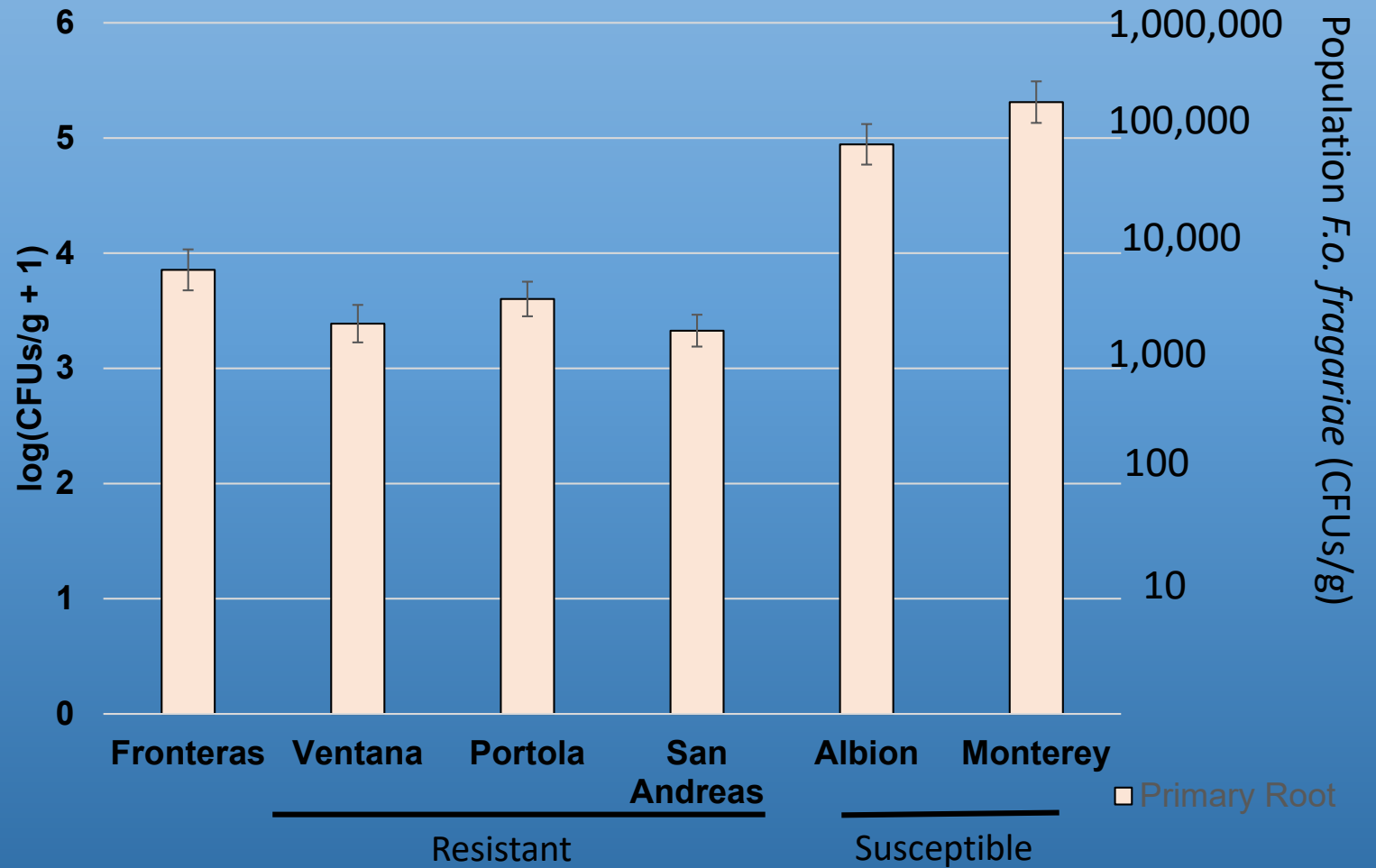
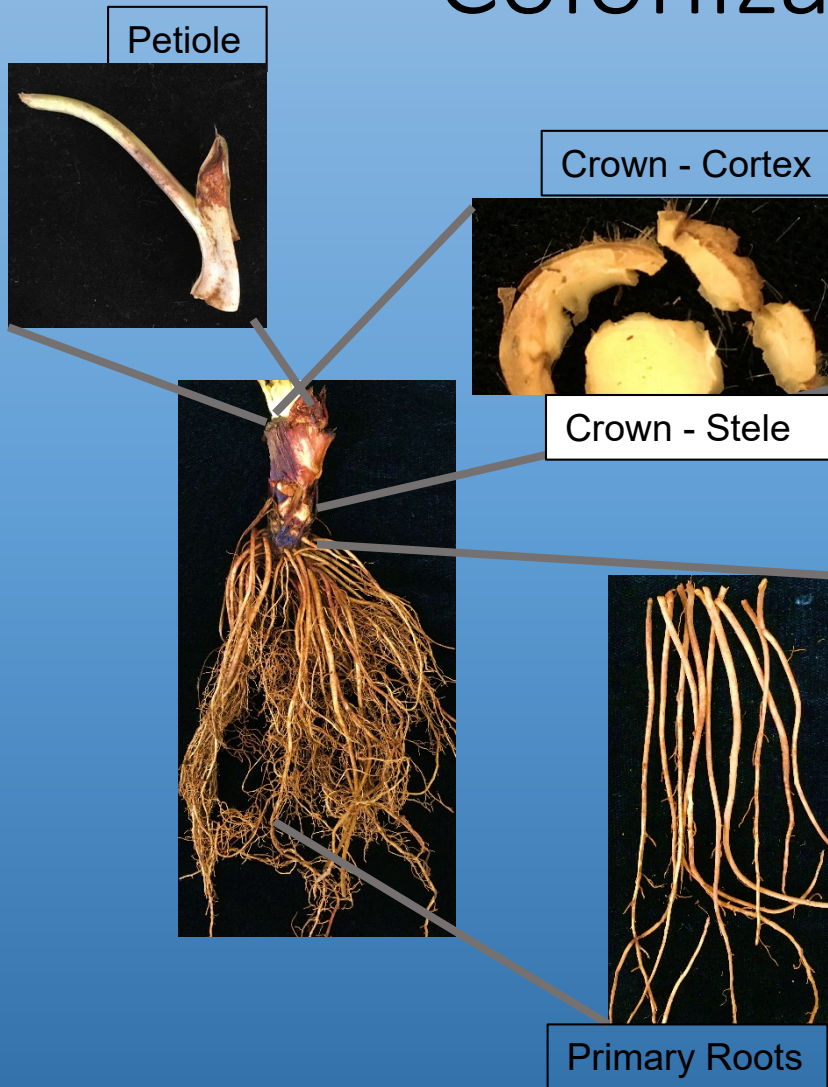


Colonized vascular tissue



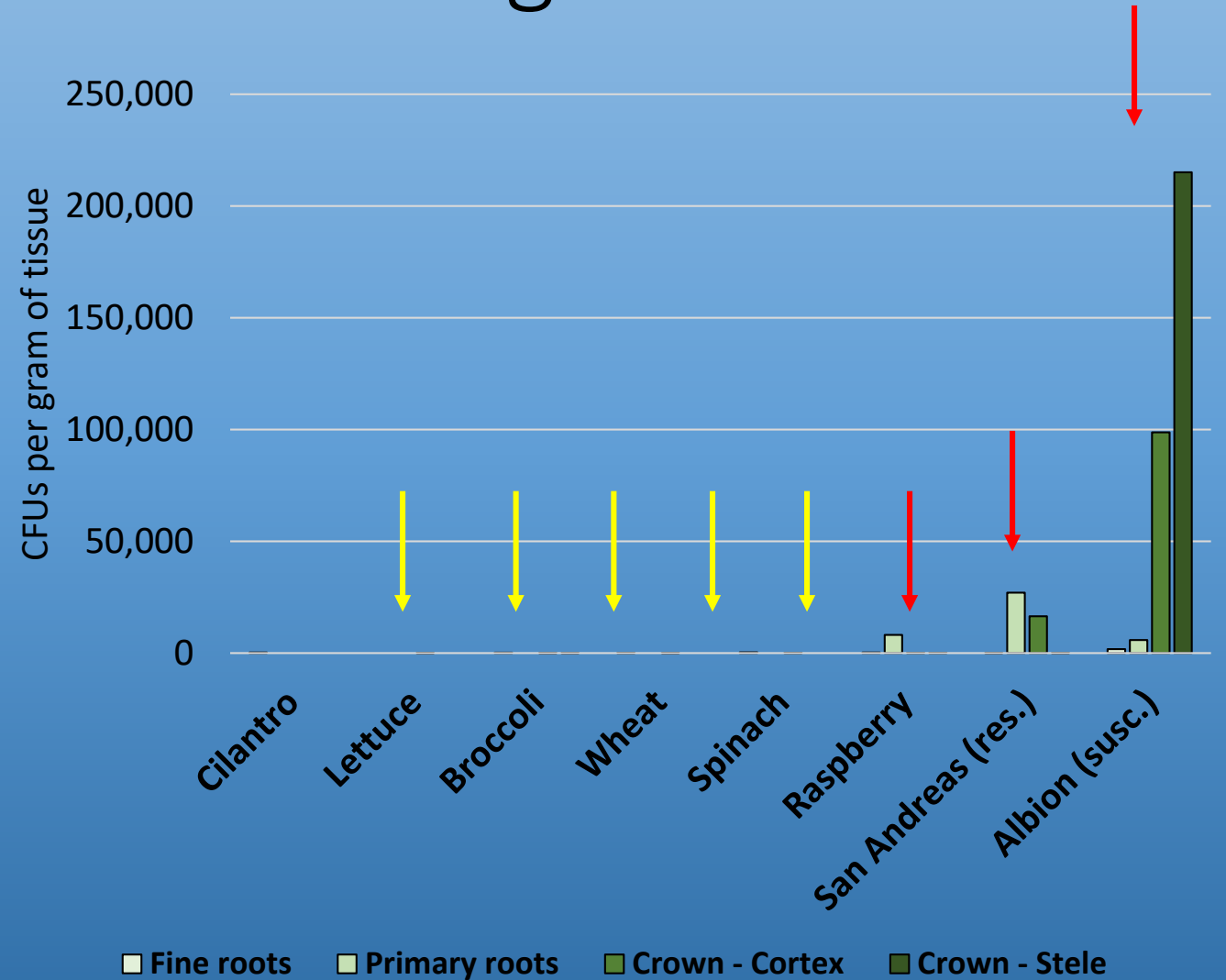
Obstruction of water flow

Colonization of resistant cultivars



Population growth on living tissues

- Soil: high *F.o. fragariae* population
- Very low population growth detected on tissues of rotation crops
- Exception: Raspberry primary roots



Acknowledgements

- UCD breeding Program
- Cedar Point Nursery and Lassen Canyon Nursery
- Hansen REC and UCCE staff
- NIFA grant funding