

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 **pathogen** in soil can
strawberry handle?

Can susceptible
cultivars perform at low
pathogen levels?



Can resistant cultivars
perform at high pathogen
level?

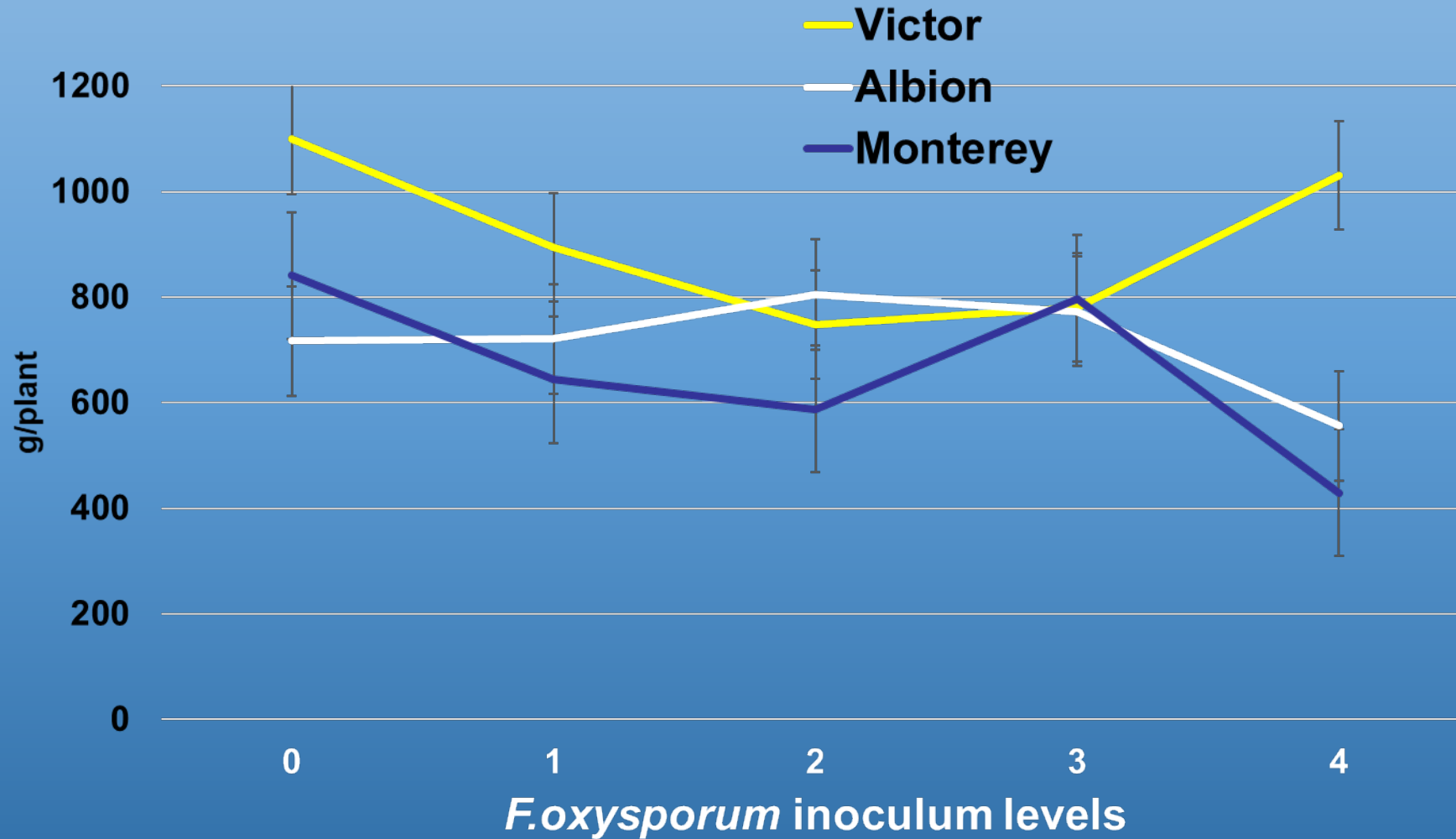
Methods

- 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

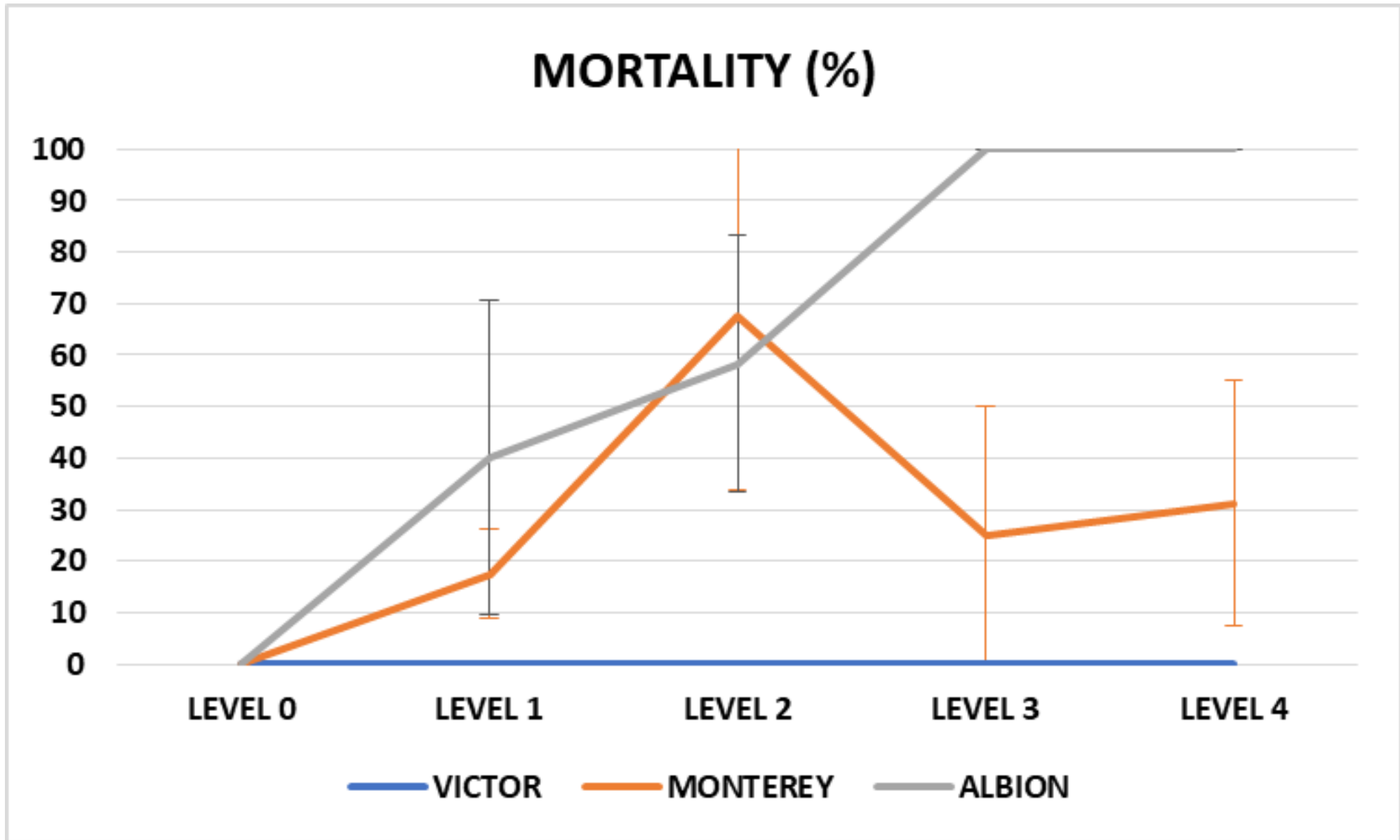


3

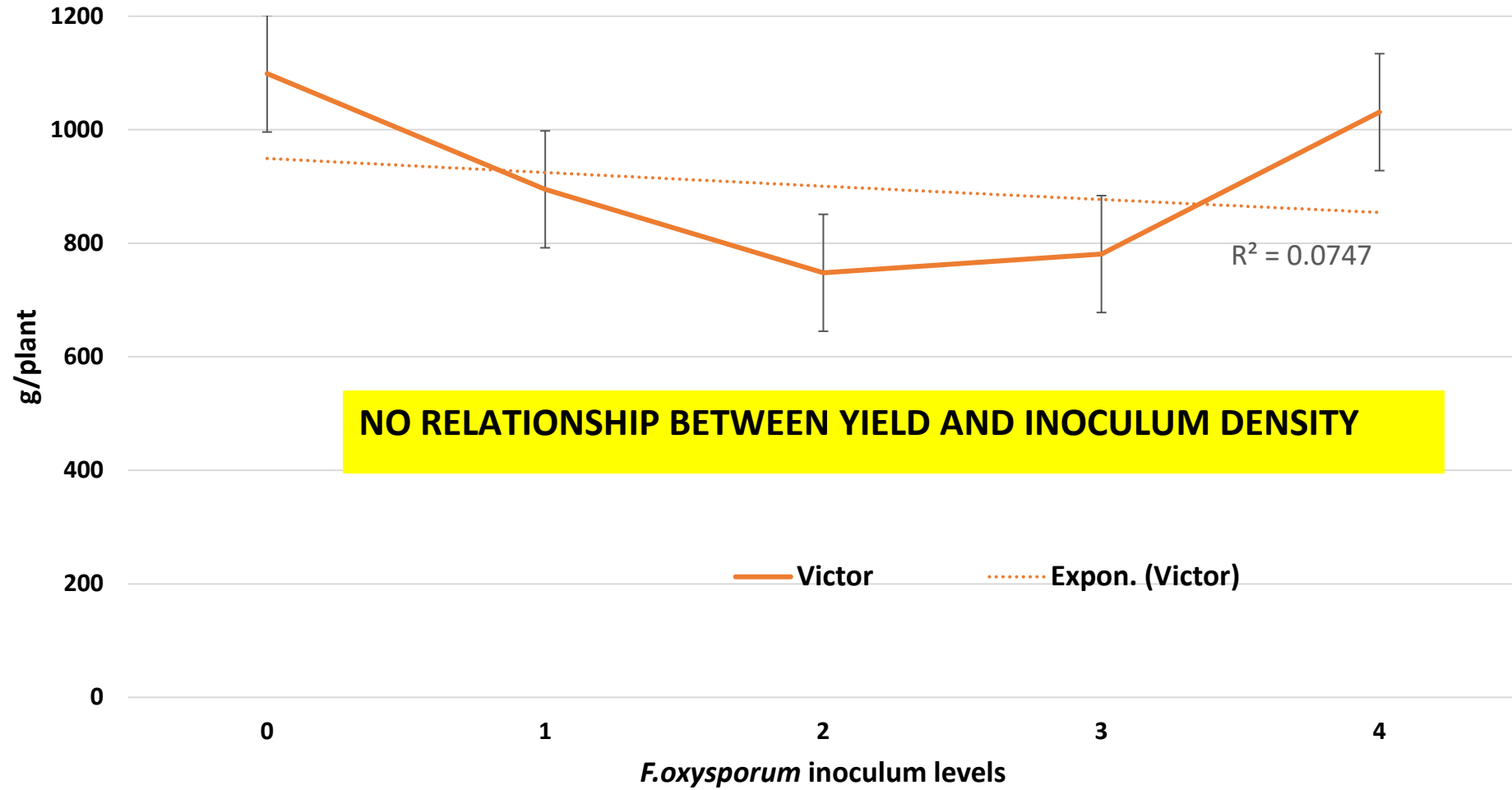


4

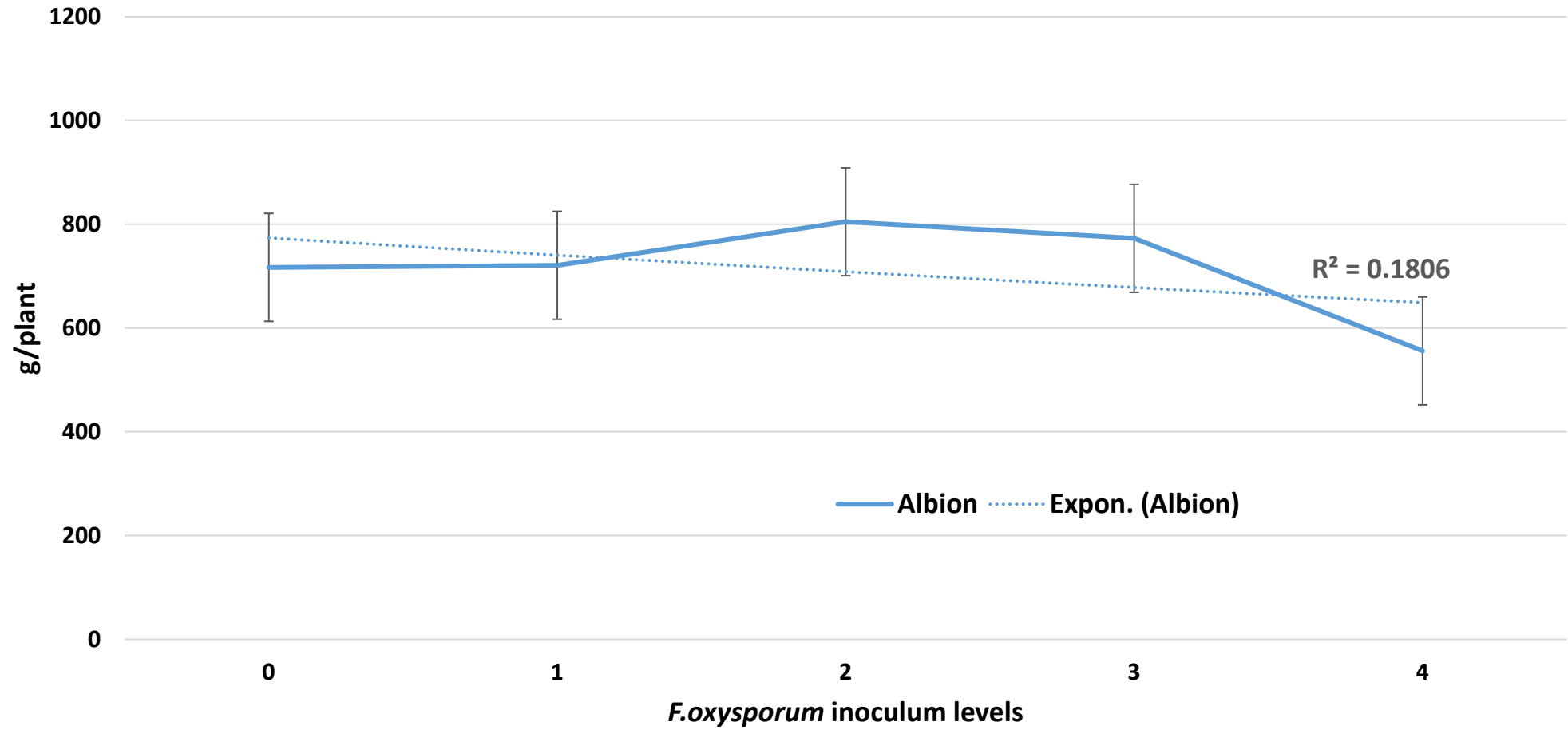
MORTALITY CAUSED BY *F. OXYSPORUM* F. SP. FRAGARIAE AT THE END OF THE EXPERIMENT



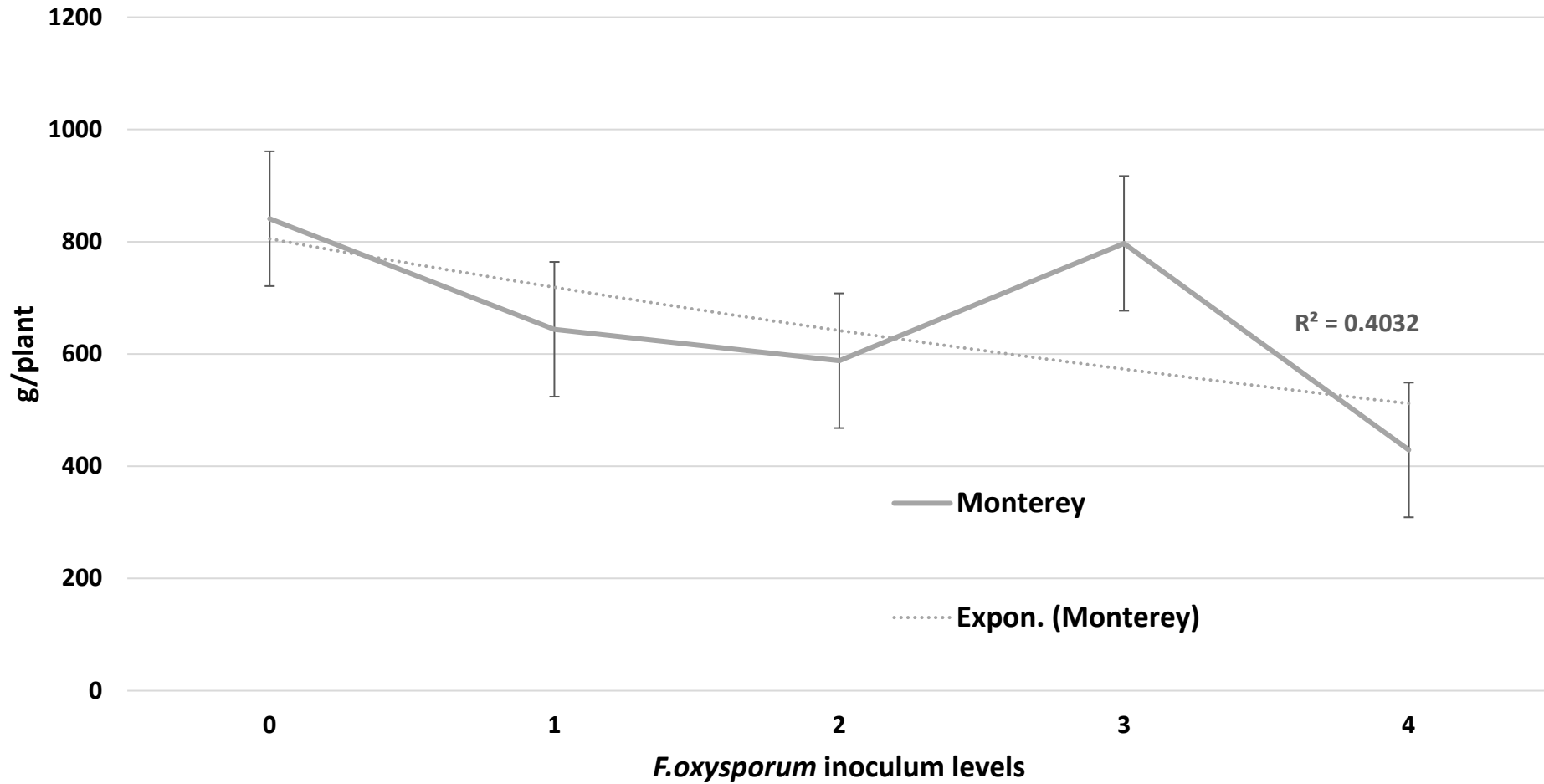
Total Fruit Yield, 2019- Victor



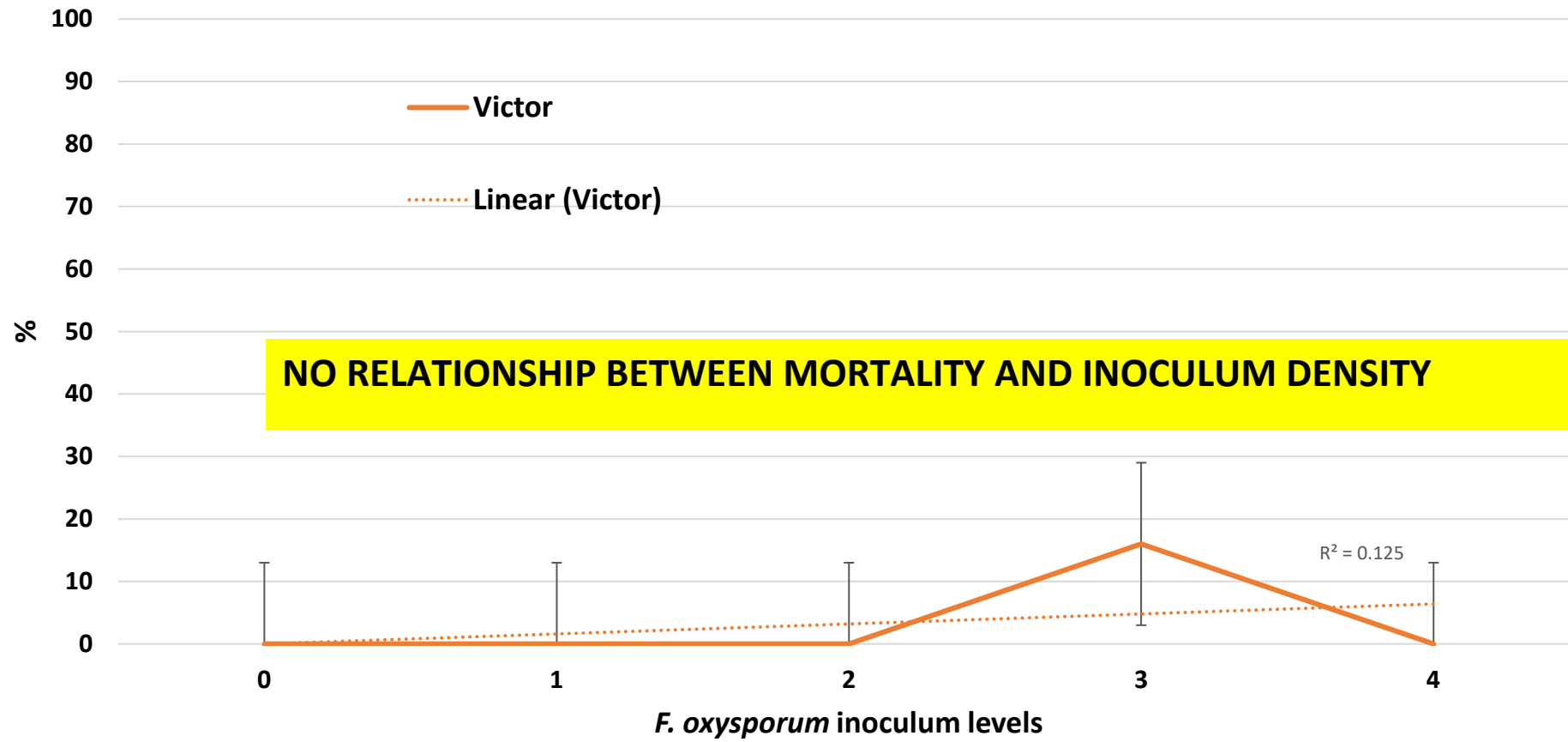
Total Fruit Yield, Albion, 2019



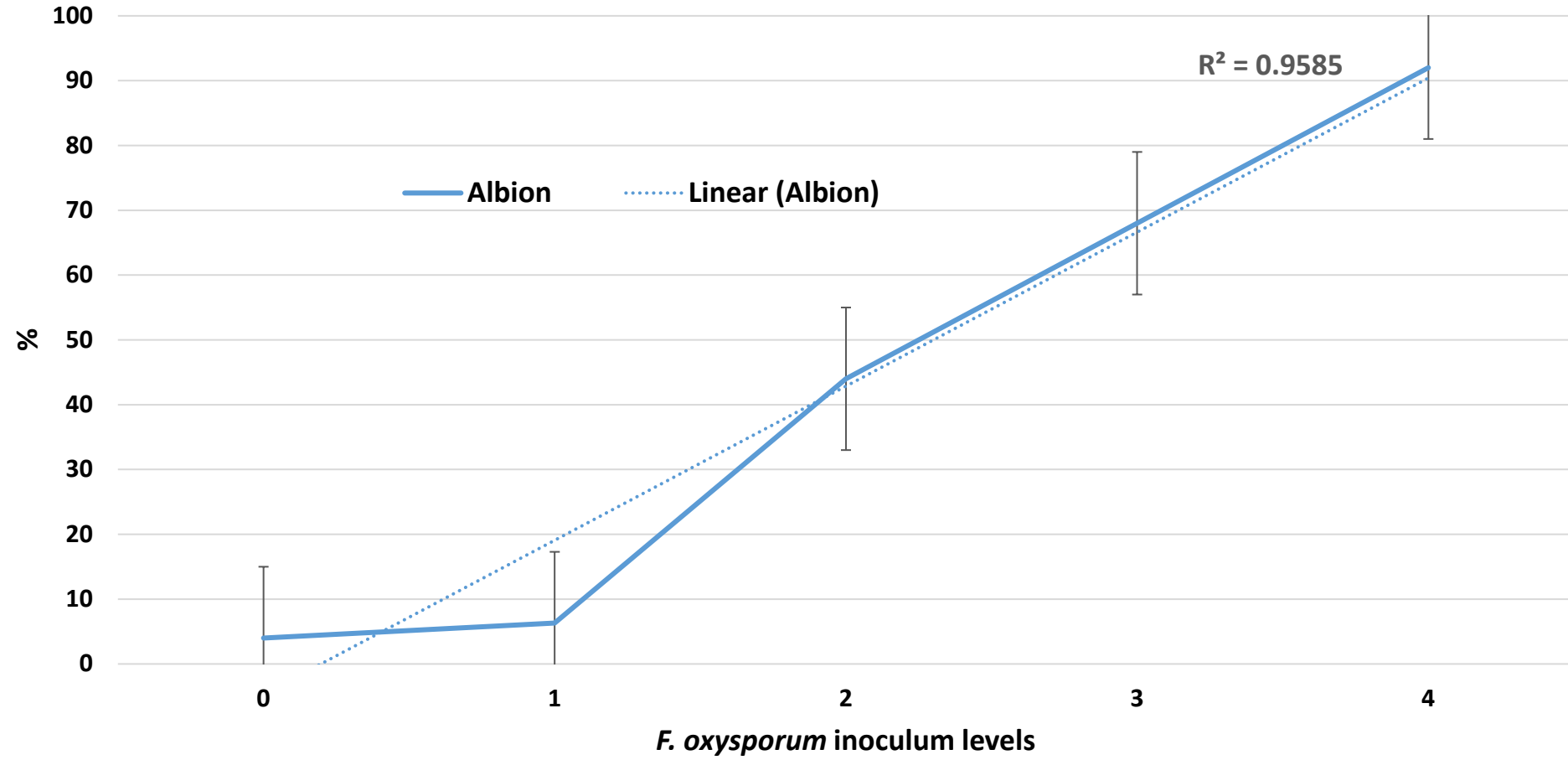
Total Fruit Yield, Monterey, 2019



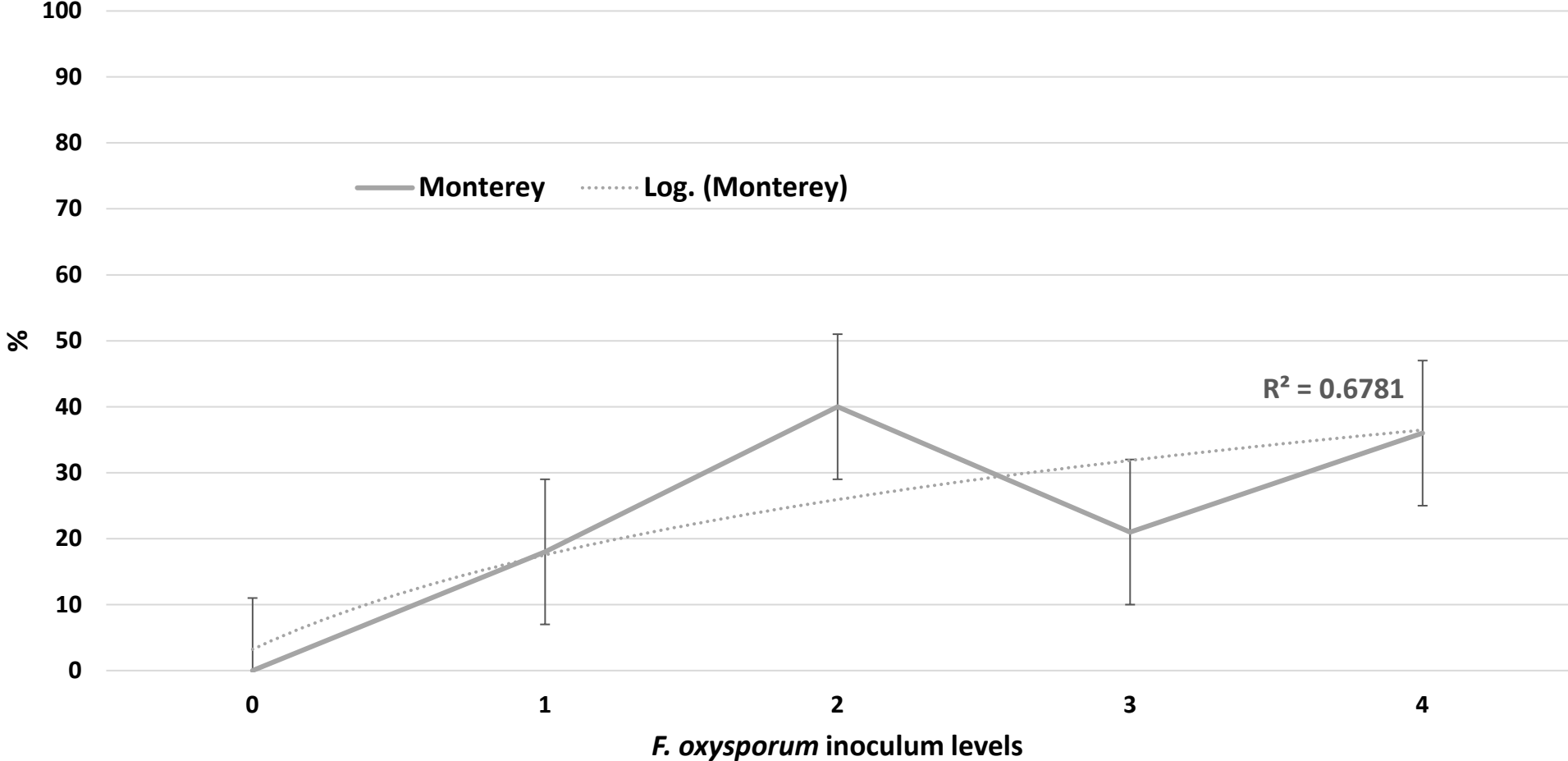
Percent mortality, Victor, July 2019



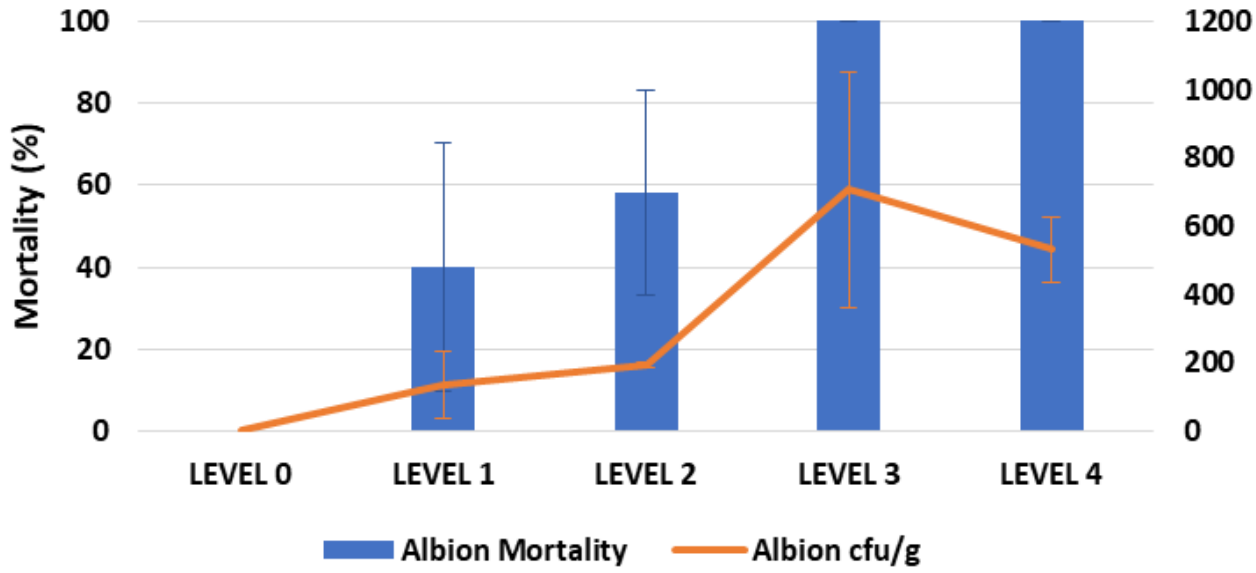
Percent mortality, Albion, July 2019



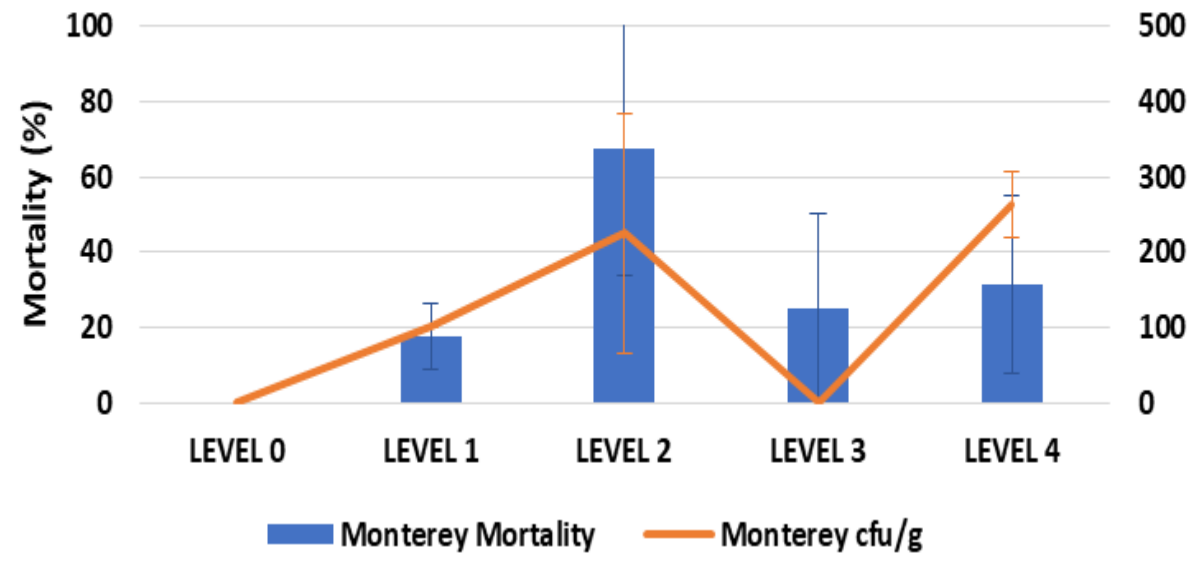
Percent mortality, Monterey, July 2019



ALBION - END POINT



MONTEREY - END POINT



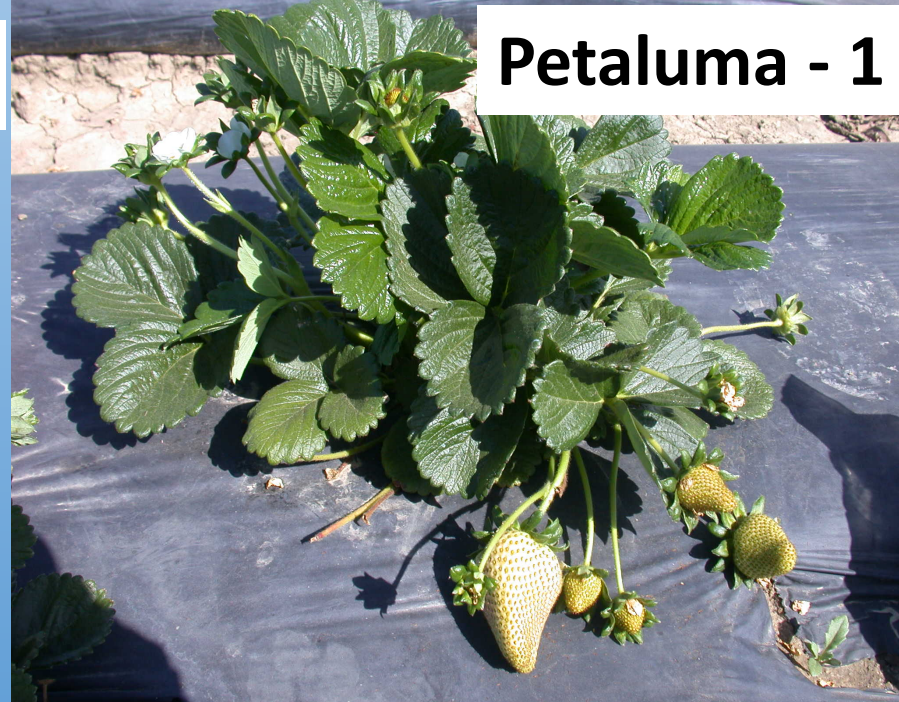
2019-2020 Season: short day cultivars

- 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

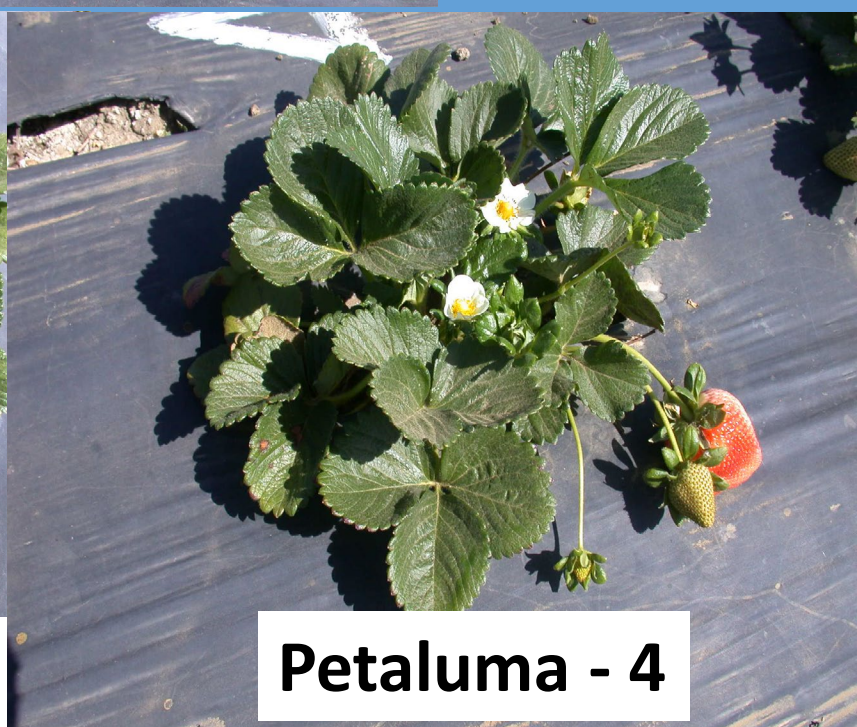
4/28/2020



Petaluma - 2



Petaluma - 3



Petaluma - 4



Victor - 0



Victor - 1

4/28/2020



Victor - 2



Victor - 3



Victor - 4



Warrior - 0



Warrior - 1

4/28/2020



Warrior - 2



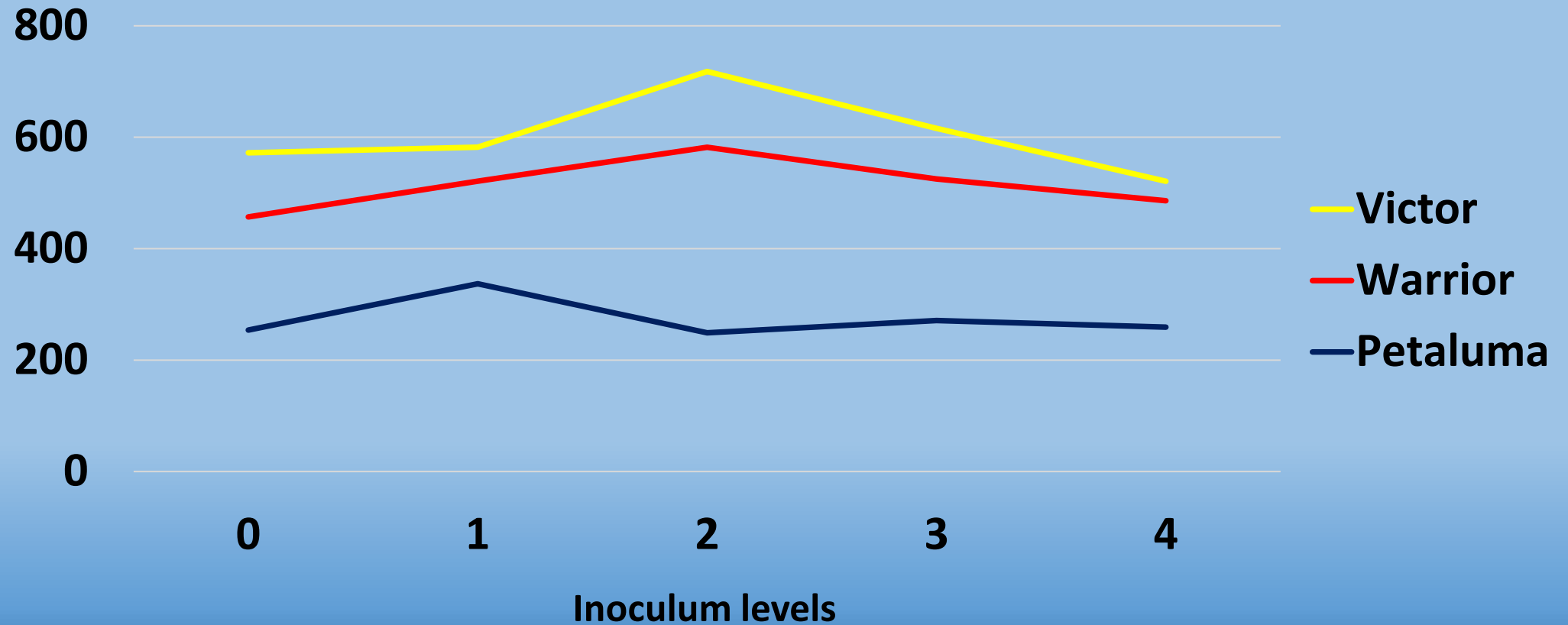
Warrior - 3



Warrior - 4

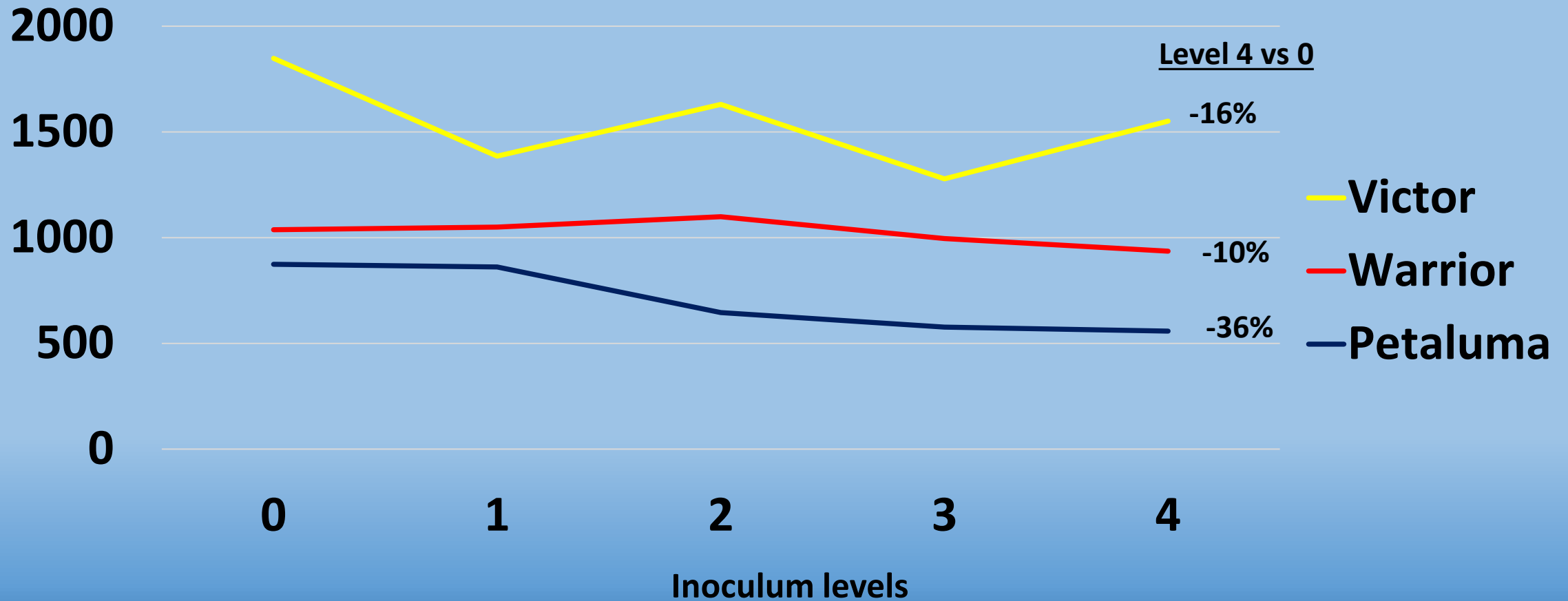
Fruit yields Jan-April 2020

Yield, g/plant through April 2020

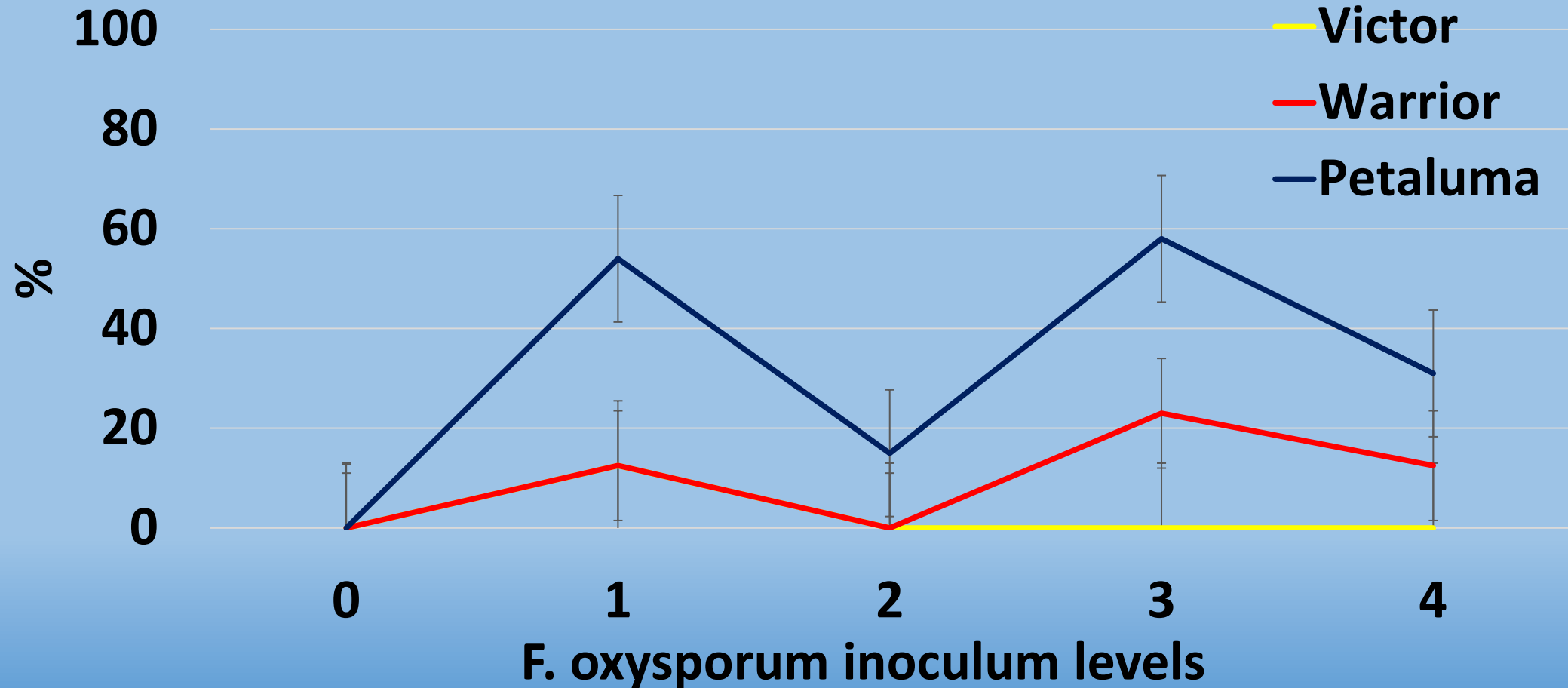


Fruit yields Jan-July 2020

Yield, g/plant Jan - July 2020



Percent mortality, July 2020

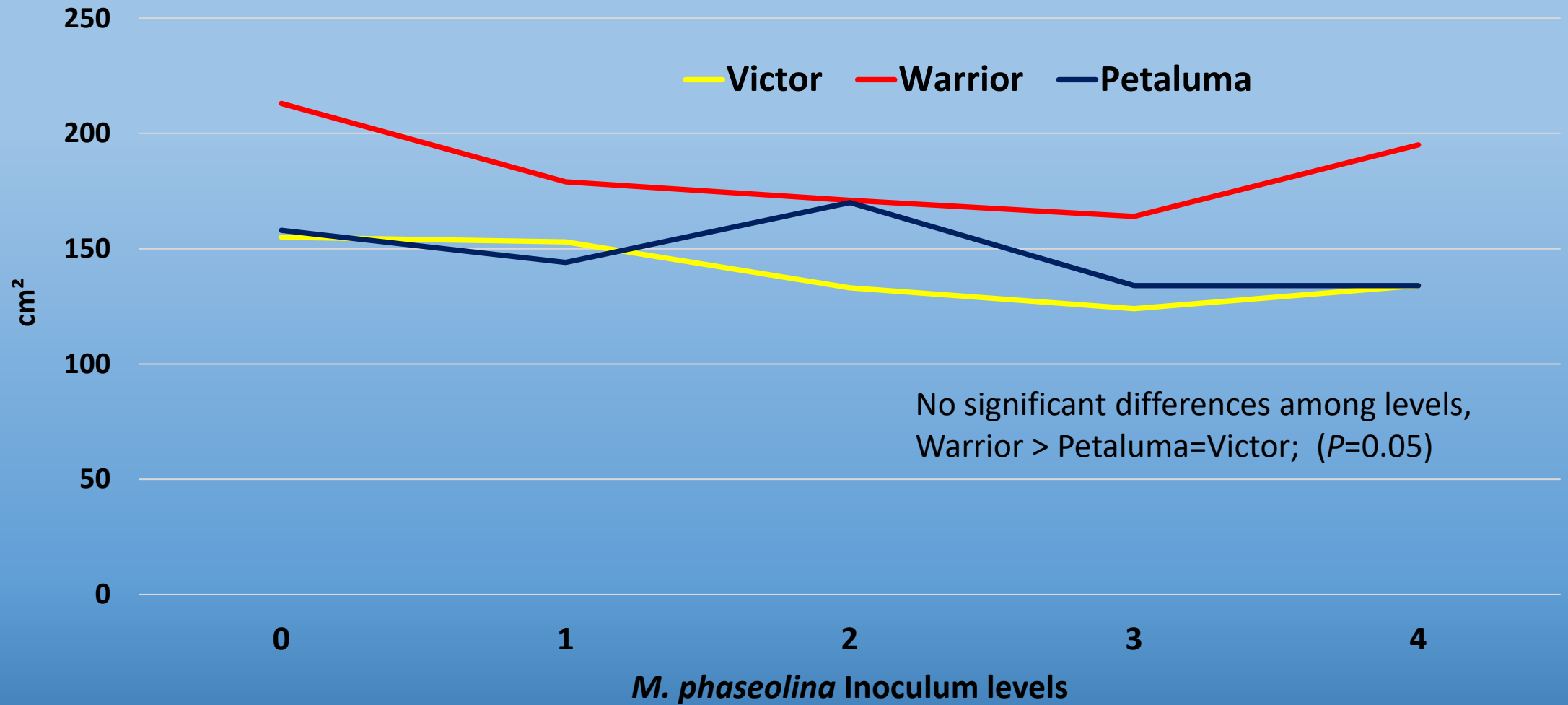


How much **Macrophomina** in soil can strawberry handle?

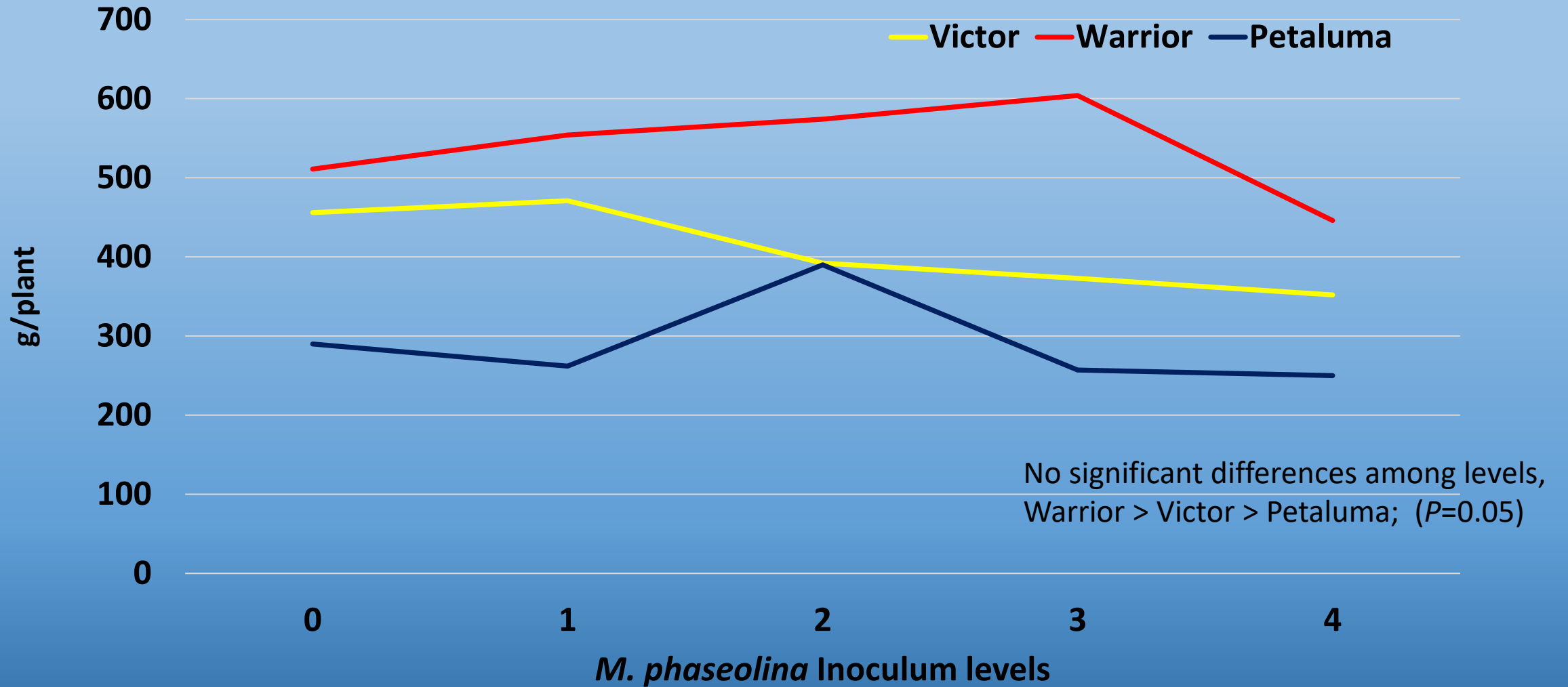
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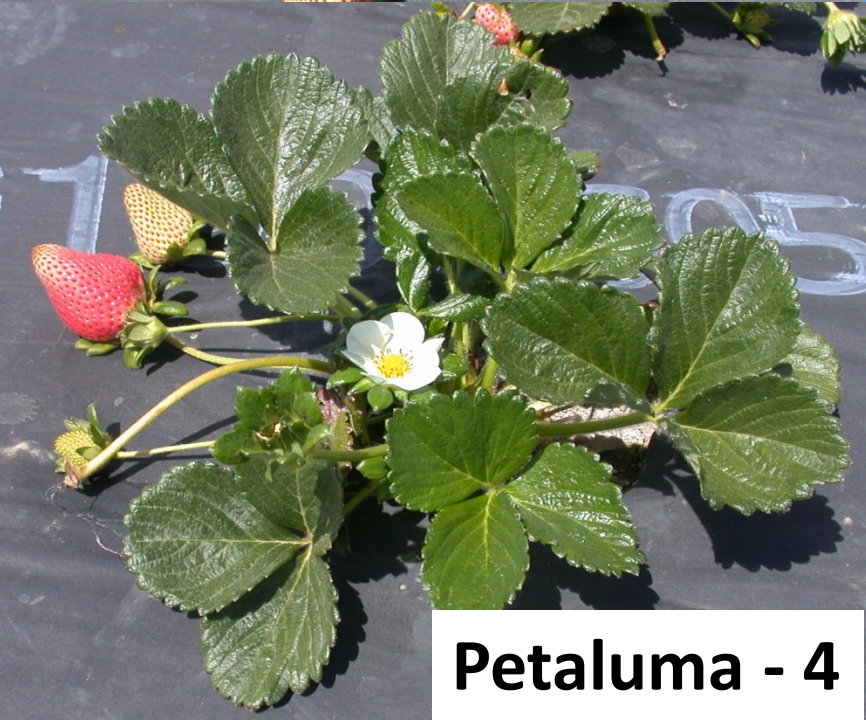


Plant size (avg.) on 12/11/2020



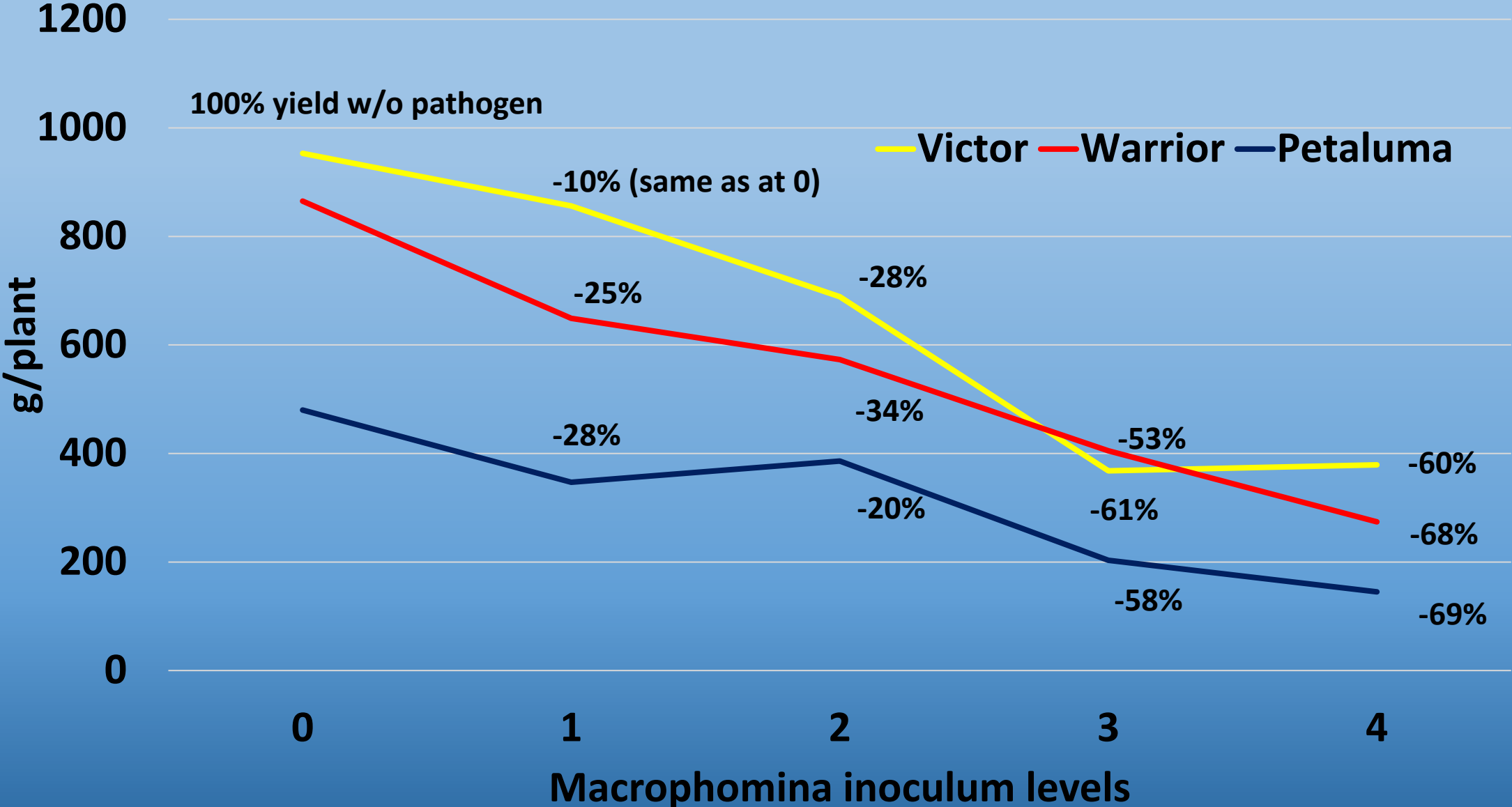
Fruit yields Jan-March 2021





March

Fruit yields Jan-June 2021



March

Victor - 1



Warrior – 72g fruit



May

Petaluma - 2

Victor - 2

Warrior - 2

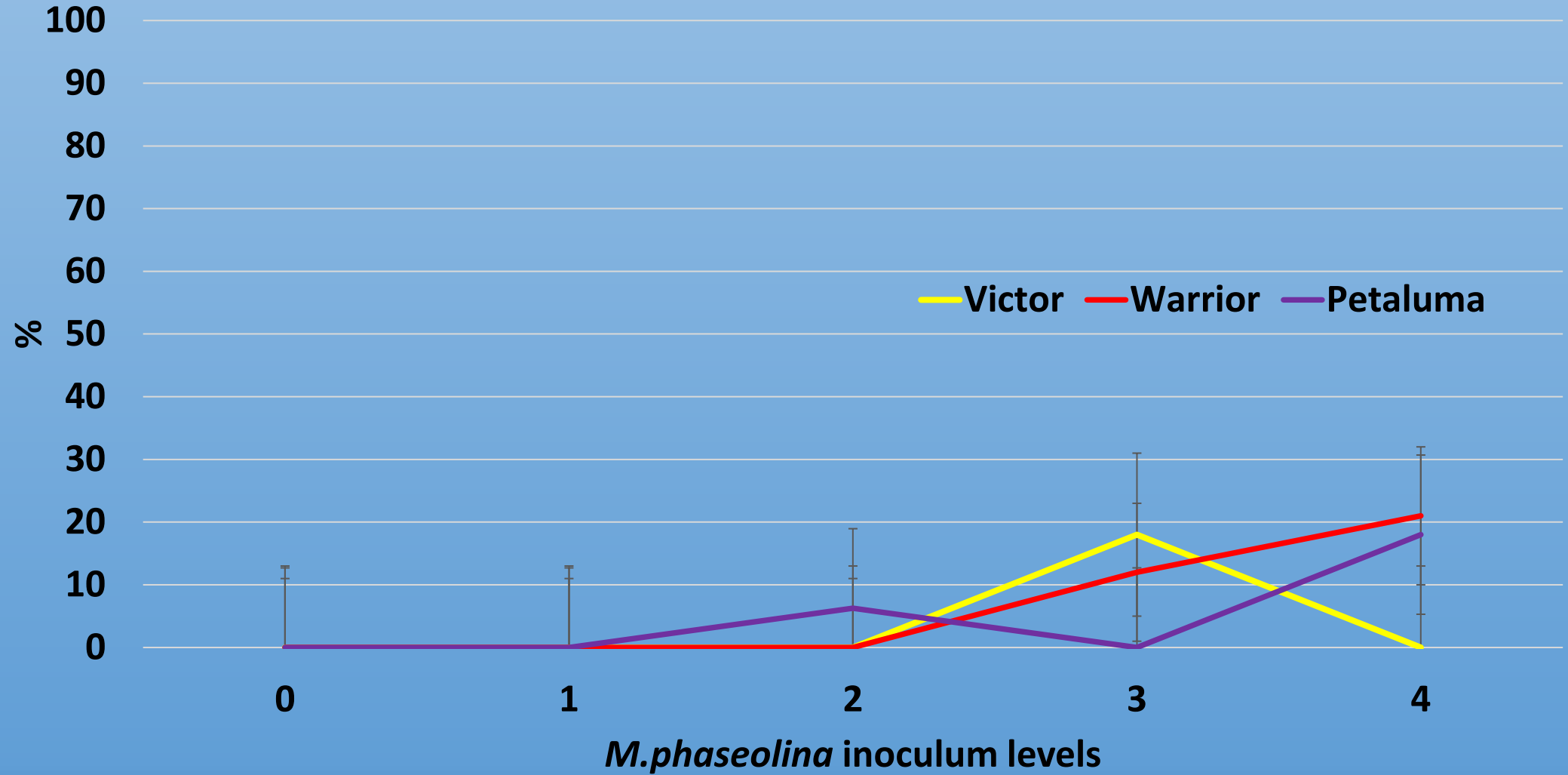
Petaluma - 4

Warrior - 4

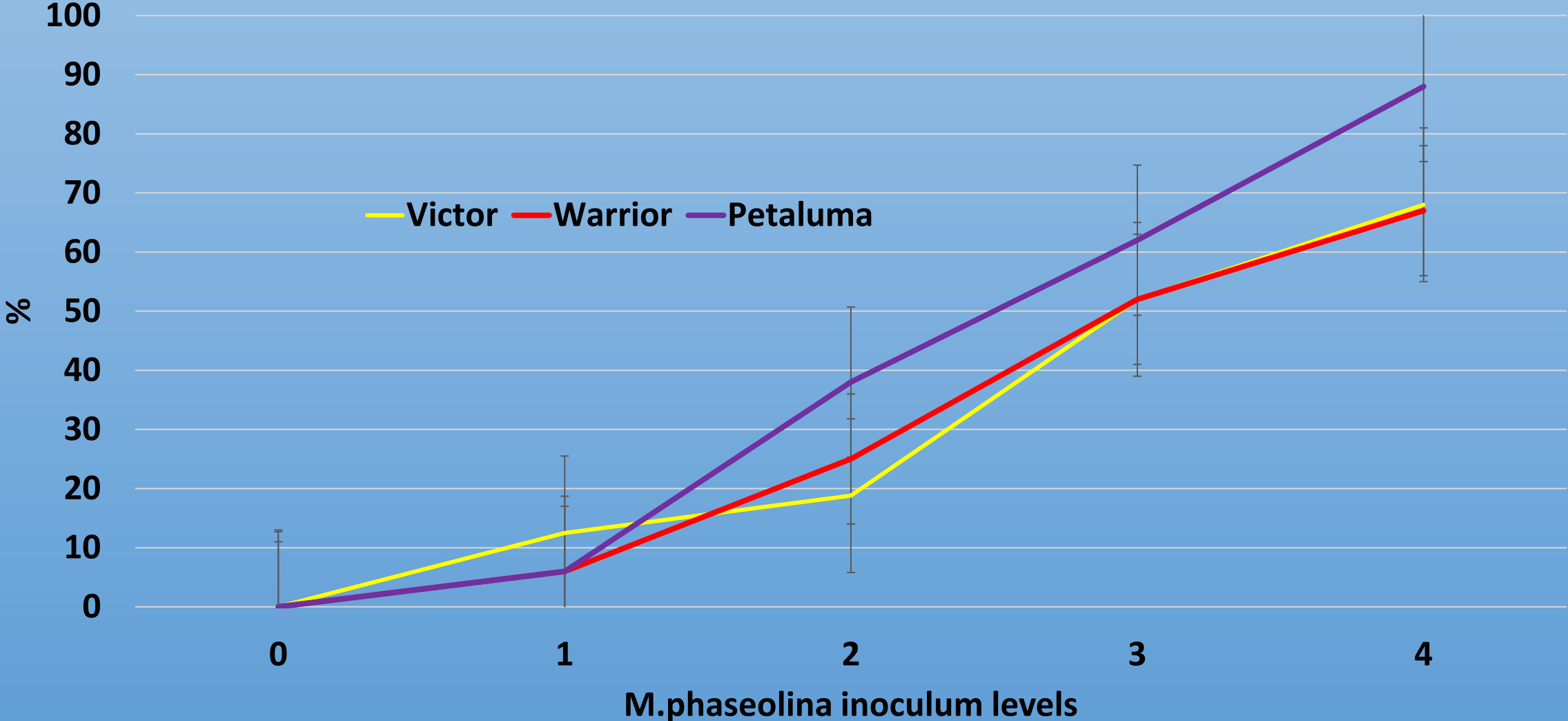
Victor - 4



Percent mortality, April 2021



Percent mortality, May 2021



Cultivar resistance

Fusarium:

- Victor and Warrior resistance at high pathogen 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

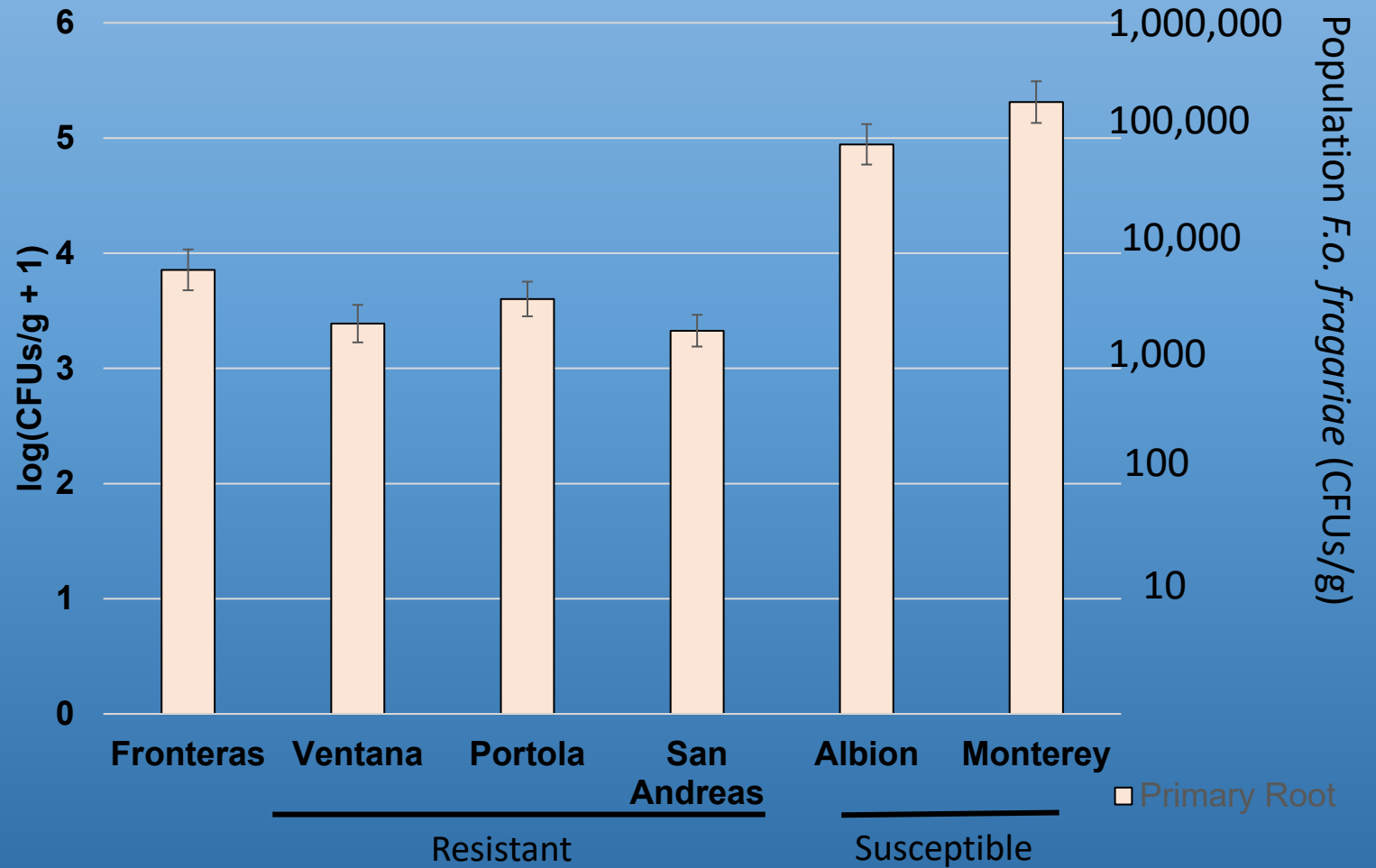
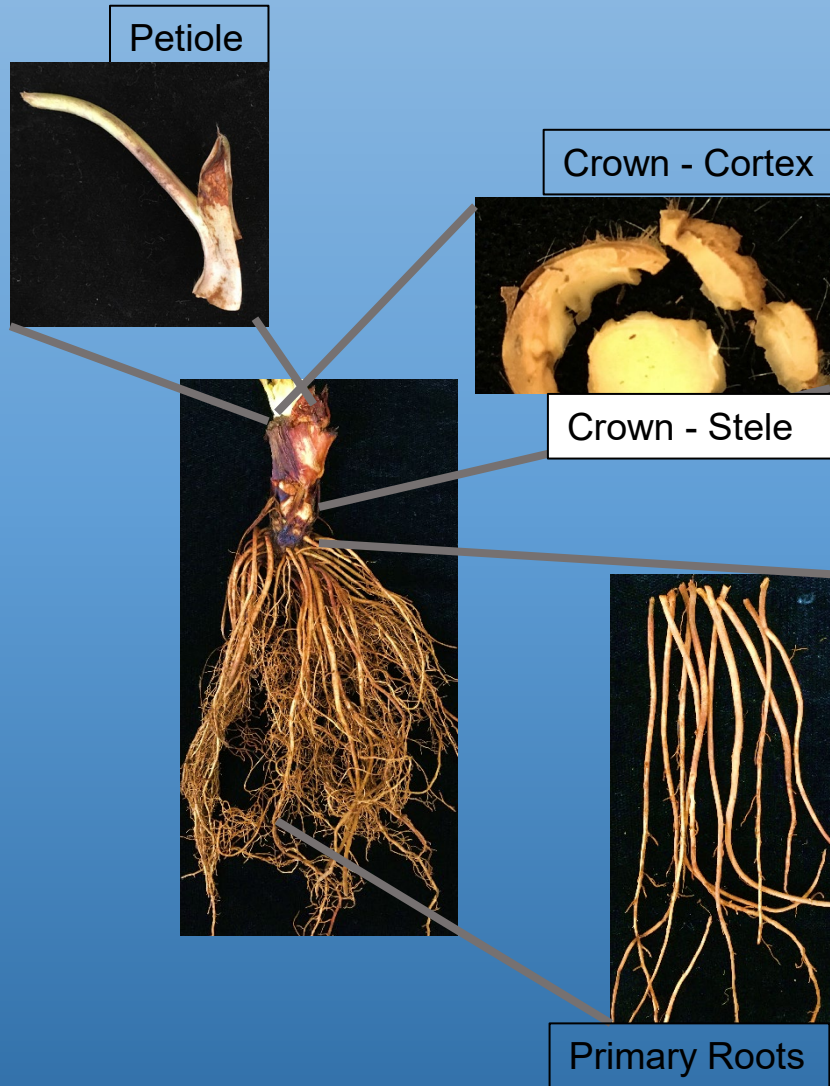
Macrophomina:

- All tested cultivars were susceptible. At low pathogens levels Victor may perform similar to 'clean' soil?

NEXT: evaluate Mojo and Fronteras response to pathogen density

ALL CULTIVARS SUPPORT PATHOGENS

Colonization of resistant cultivars by *Fusarium*



Acknowledgements

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

Quiz questions

- Did increase in Fusarium density in root zone increase mortality equally among all tested cultivars? (Yes/No)
- Does planting of highly resistant strawberry cultivars decrease Fusarium in soil? (Yes/No)