Laurel Wilt Susceptibility of Avocado Scions and Rootstocks In Relation to Physiology and Stem Anatomy

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What we know about physiological responses to laurel wilt

Susceptibility varies among cultivars with West Indian cvs. most susceptible

Hypothesis

- The higher the sap flow rate, the greater the susceptibility to laurel wilt
- This is related to the size of xylem vessels
- Size of xylem vessels differs among WI, M and G races

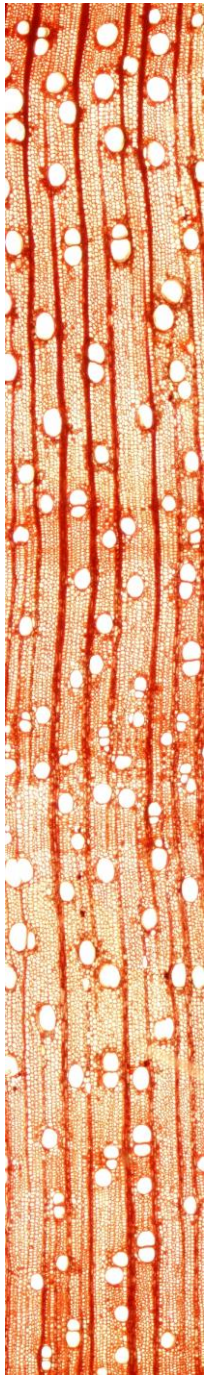
Preliminary Evidence

WI cvs. (the most susceptible) have the largest xylem vessels and highest sap flow

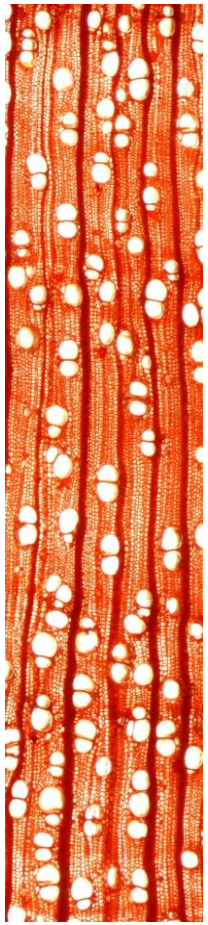
One More Thing

Grafting can significantly affect the xylem sap flow rate

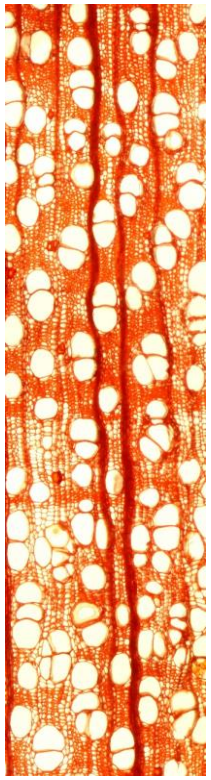
Xylem vessel size of avocado races



‘Egas’(M)



‘Nabal’ (G)



‘Simmonds’(WI)

R. Ploetz, R. Blanchette & G. Beier, Unpublished data

Specific Objectives

- To compare laurel wilt susceptibility among combinations of Mexican (M), West Indian (WI) and Guatemalan (G) rootstocks and scion/rootstock combinations using clonal plant material

- To relate laurel wilt susceptibility among the 3 races (rootstocks and scion/rootstock combinations) to whole plant physiology and xylem anatomy

Clonal Plants From Brokaw Nursery, CA

- <u>Cultivars of Different Races</u>
- ‘Waldin’ (WI)
- ‘Simmonds’ (WI)
- ‘Duke-7’ (M)
- ‘Zutano’ (M)
- ‘Reed’ (G)
- ‘Nabal’ (G)

Non-grafted and grafted combinations WI/WI, WI/M, WI/G etc.

<u>Phytophthora Tolerant Roostocks from CA</u>

Duke-7 (M)
Dusa (G x M)
Toro Canyon (M)

Non-grafted & grafted with ‘Hass’ (G x M) and with ‘Simmonds’ (WI) scions

- ❑ We are testing plants as soon as the reach adequate size for inoculation and physiological measurements

Methodology

Inoculation with 3,000 conidia per plant

Control plants - inoculated with deionized water

Daily symptom assessment –

visual rating scale (0-10)

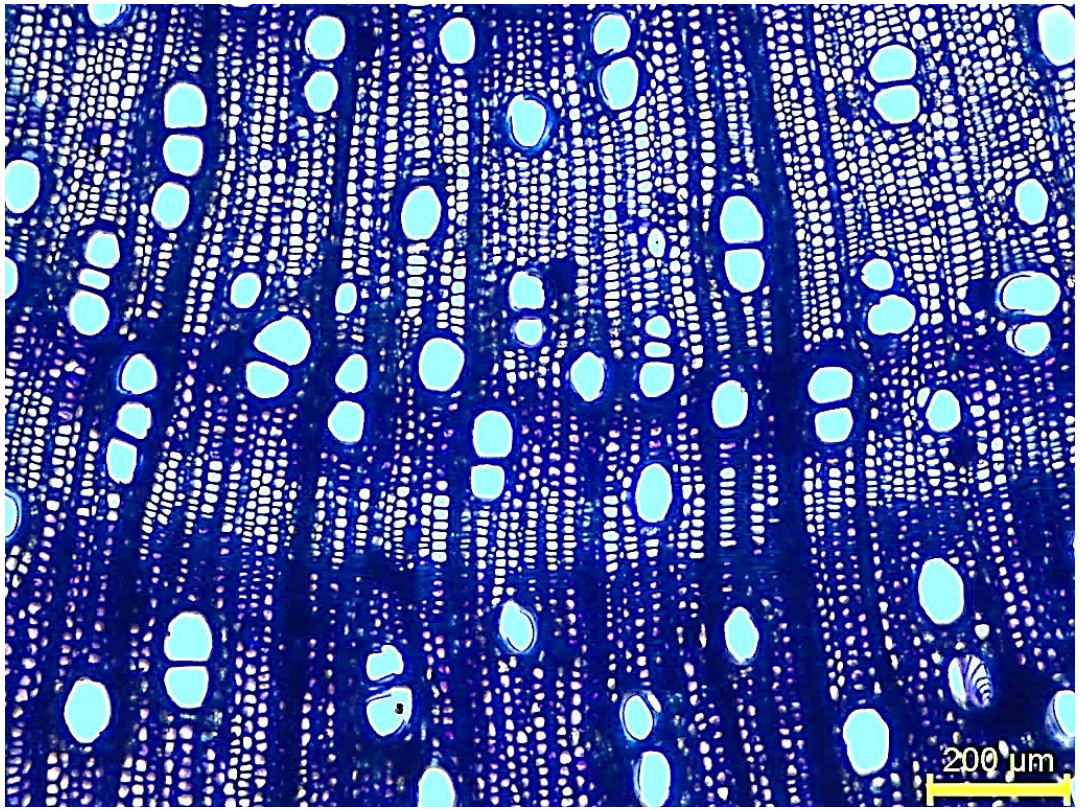
Leaf gas exchange (photosynthesis, transpiration, stomatal conductance)

Xylem sap flow

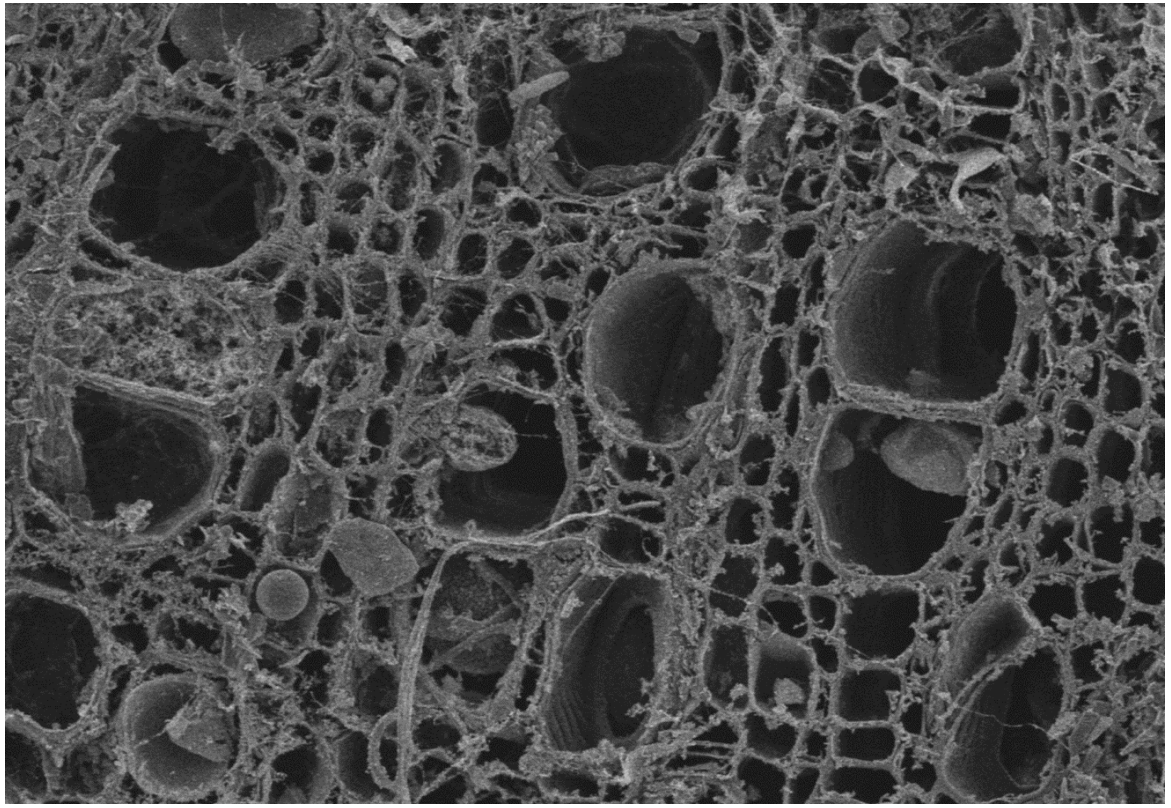
Rate of water movement up the plant stem

Anatomical Measurements

Number and size of xylem vessels



Tyloses formation

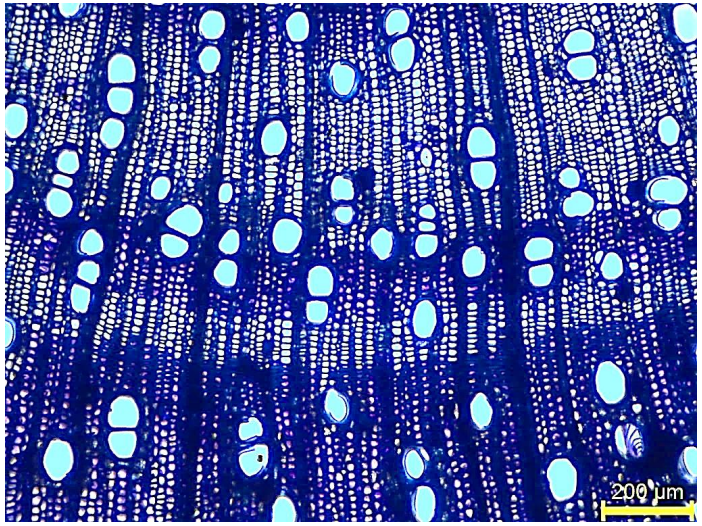


Root and Stem Hydraulic Conductivity

High pressure flow meter

Calculated from xylem vessel anatomy

- Vessel frequency and diameter
- Relative hydraulic conductivity, RC=r^4VF
- Vulnerability index, V=VD/VF
- % Vessel occlusion



- Internal LW Symptom Rating (0-10)

Based on the amount of vascular staining

- Recover the L.W. fungus (*R. lauricola*)

  Plate stem segments on selective medium

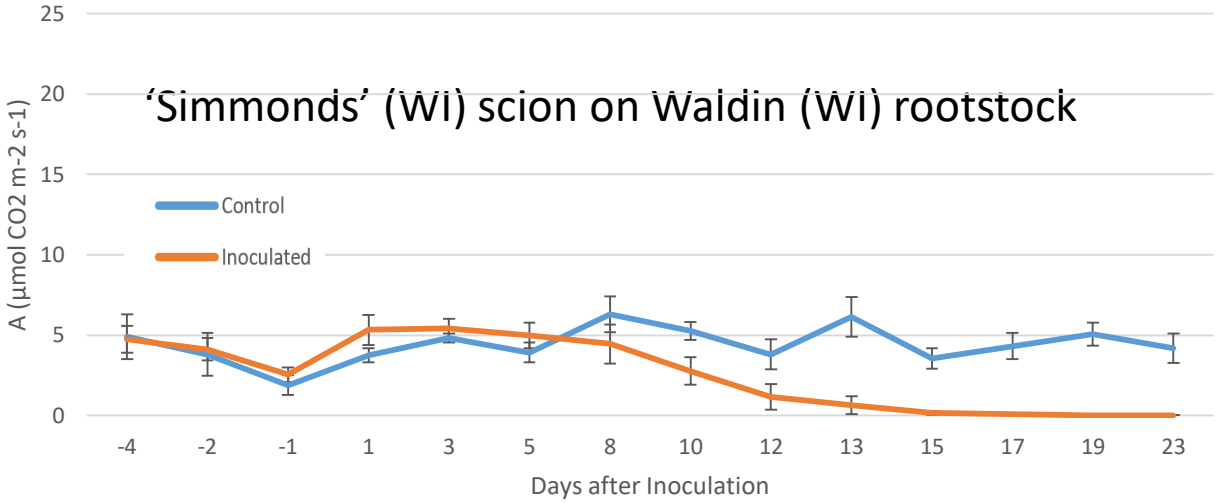
Results – 3 Examples of Cultivar Comparisons

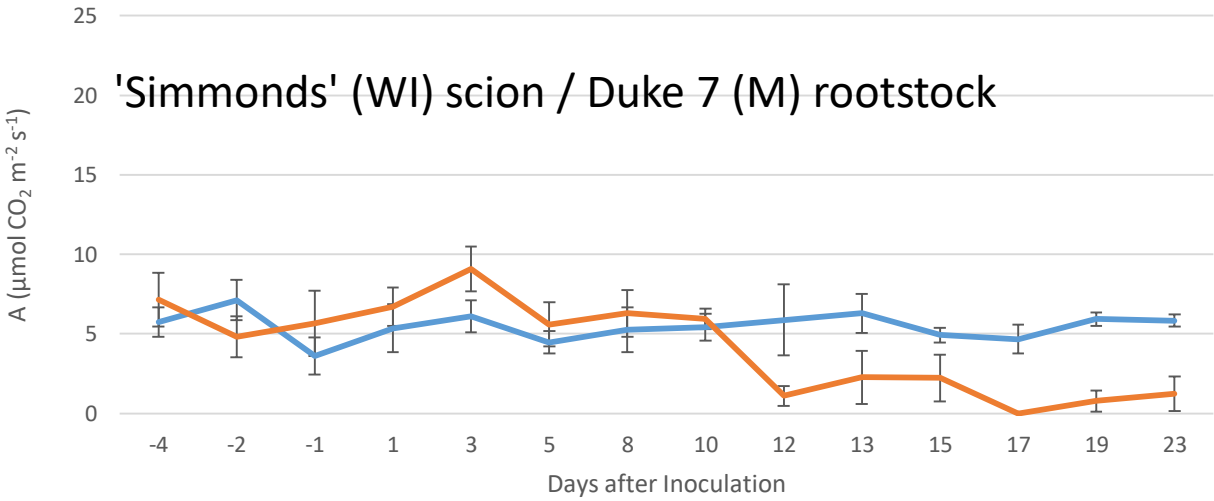
Example 1

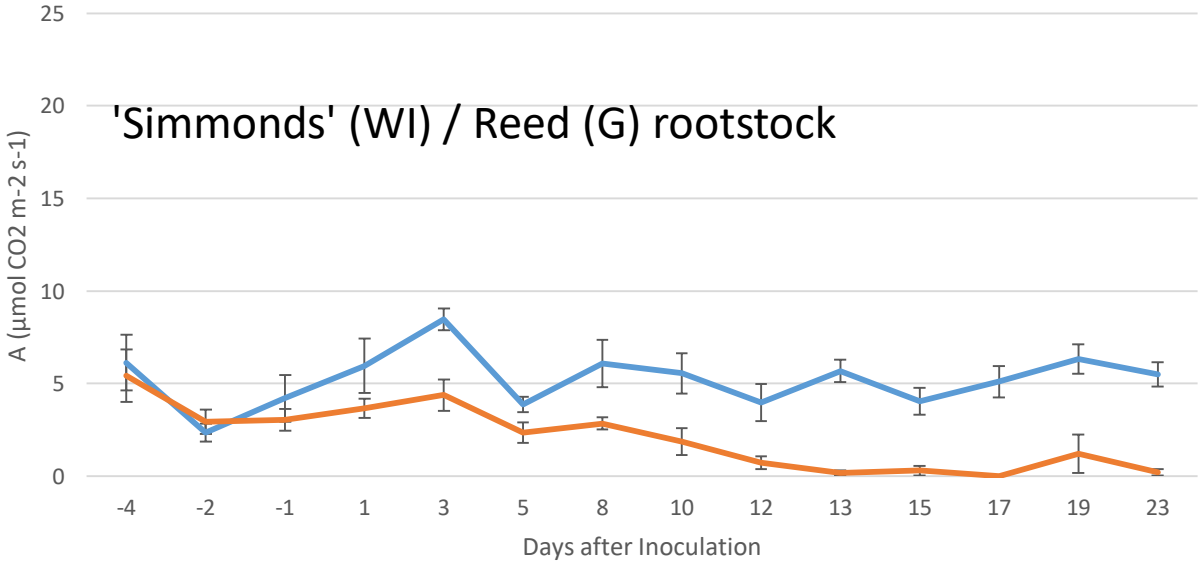
Grafted clonal scions and clonal rootstocks

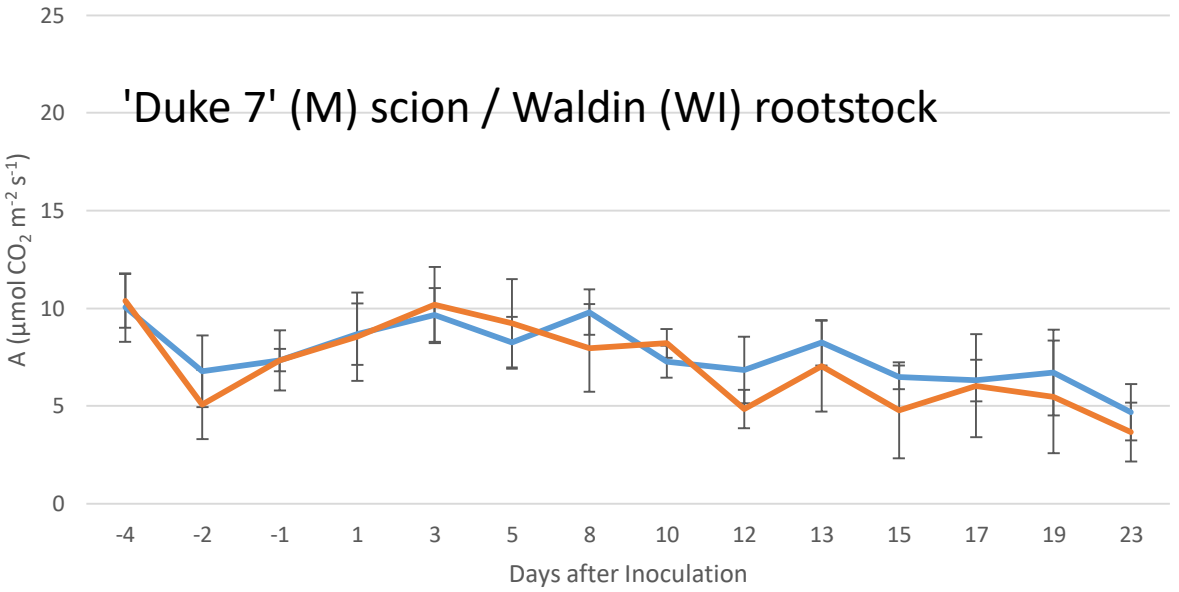
- ‘Simmonds’ (WI) scion / Waldin (WI) rootstock
- ‘Simmonds’ (WI) scion / Reed (G) rootstock
- ‘Simmonds’ (WI) scion / Duke-7 (M) rootstock
- ‘Duke-7’ (M) scion / Waldin (WI) rootstock

Photosynthesis

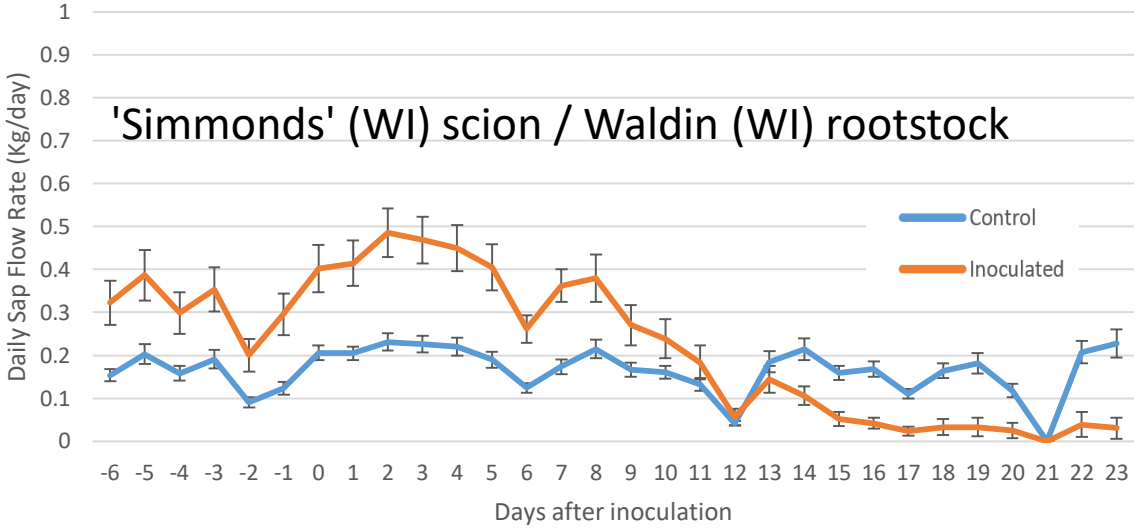


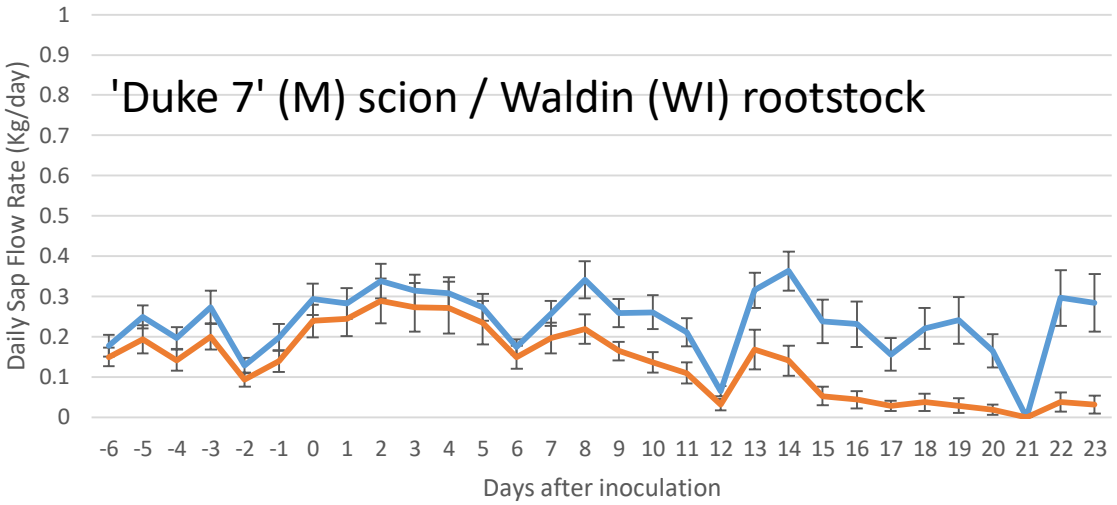


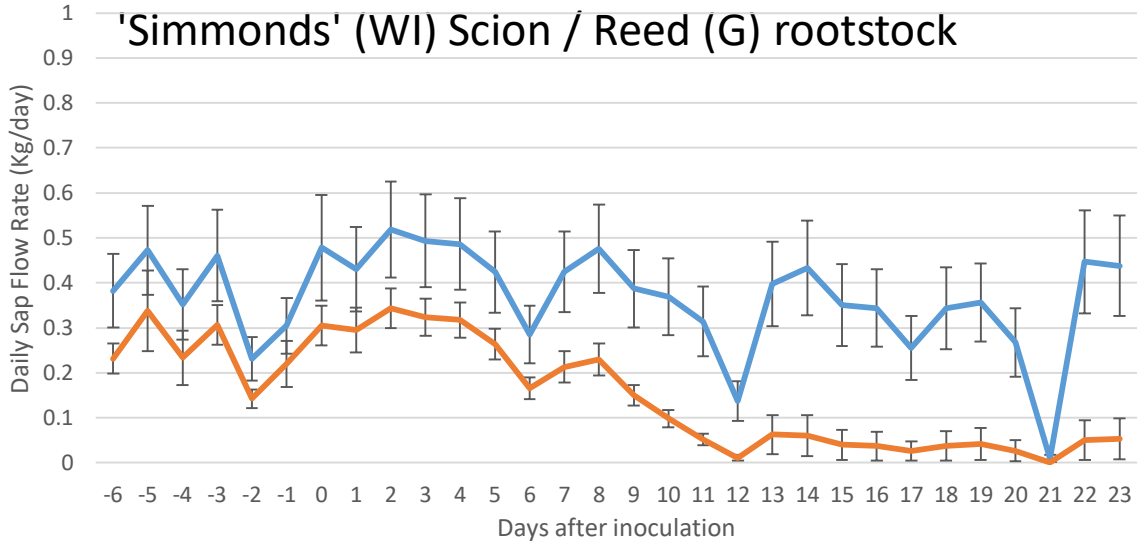


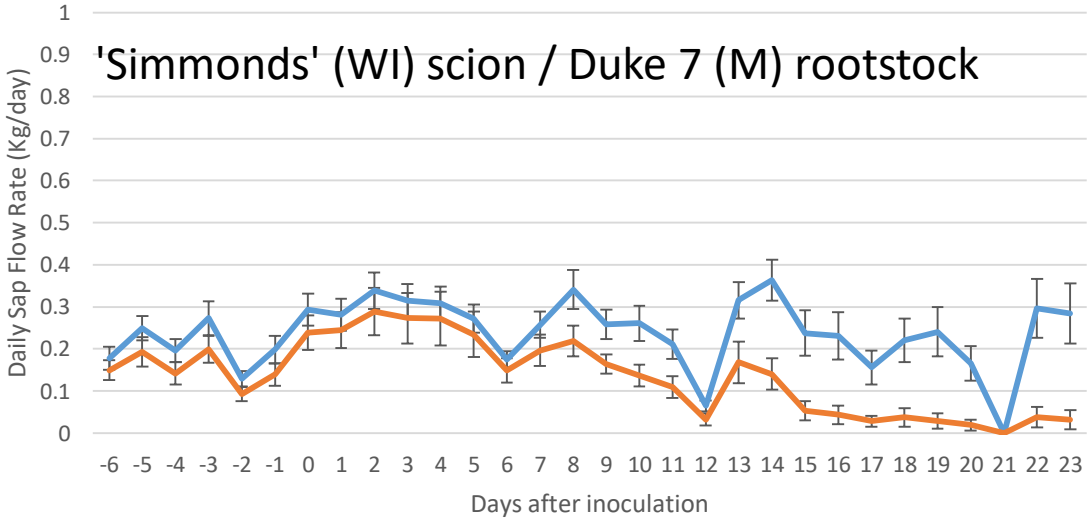


Xylem Sap Flow Rate

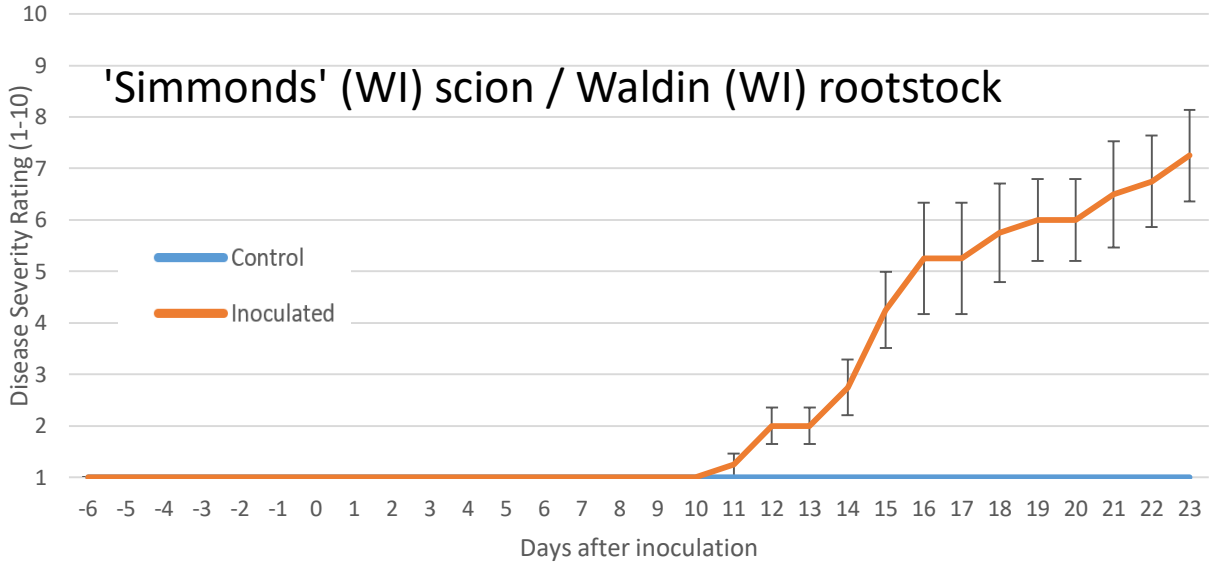


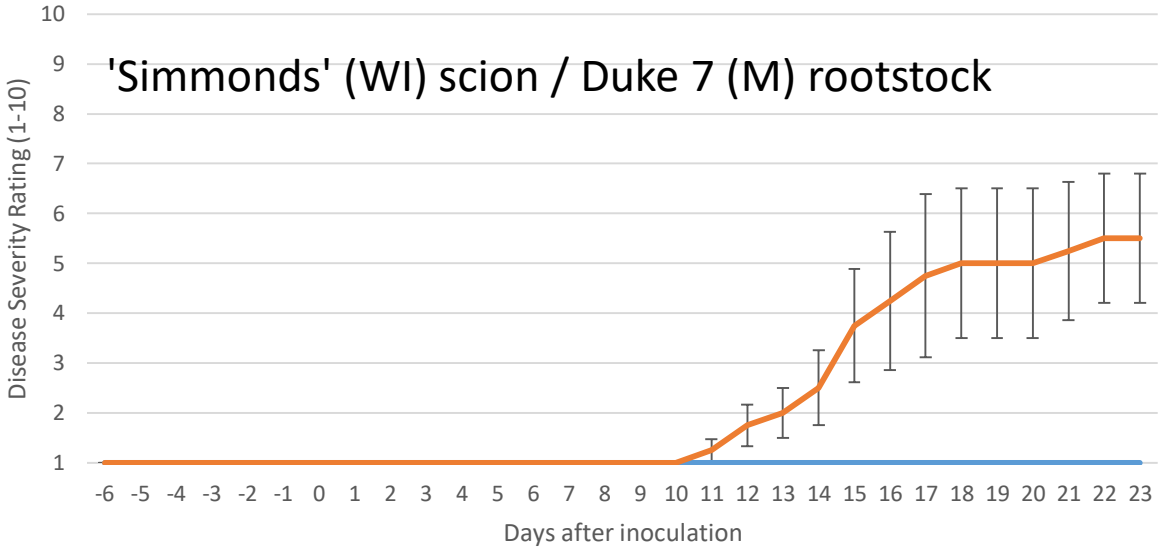


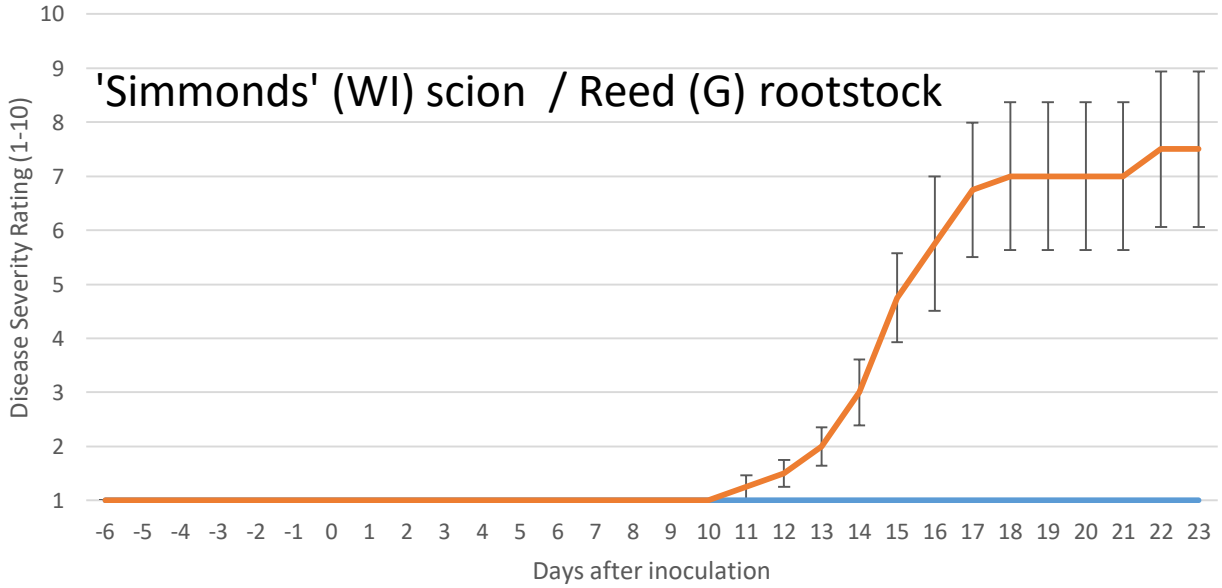


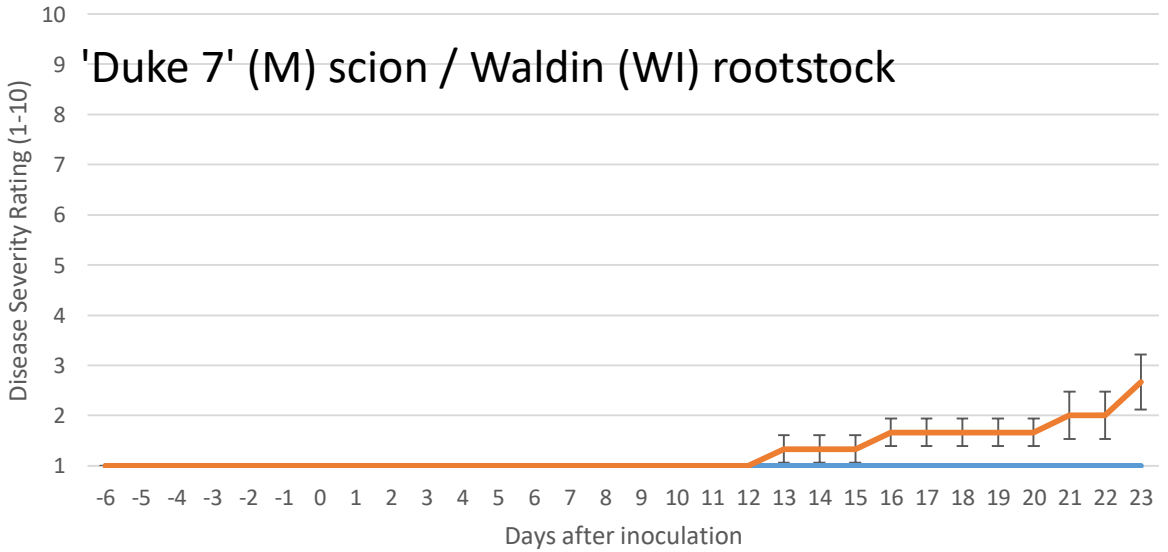


Disease Severity Ratings







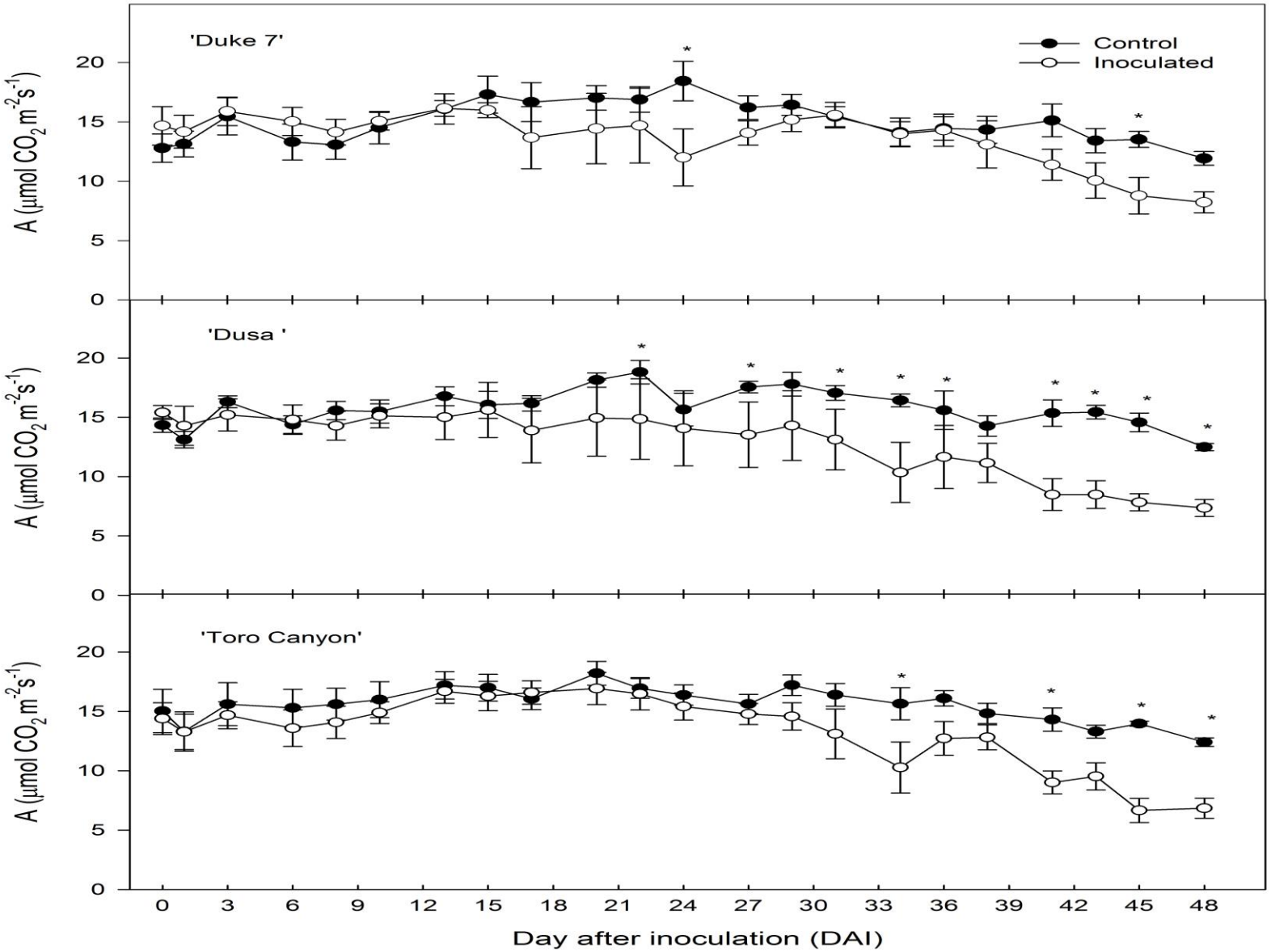


Example 2

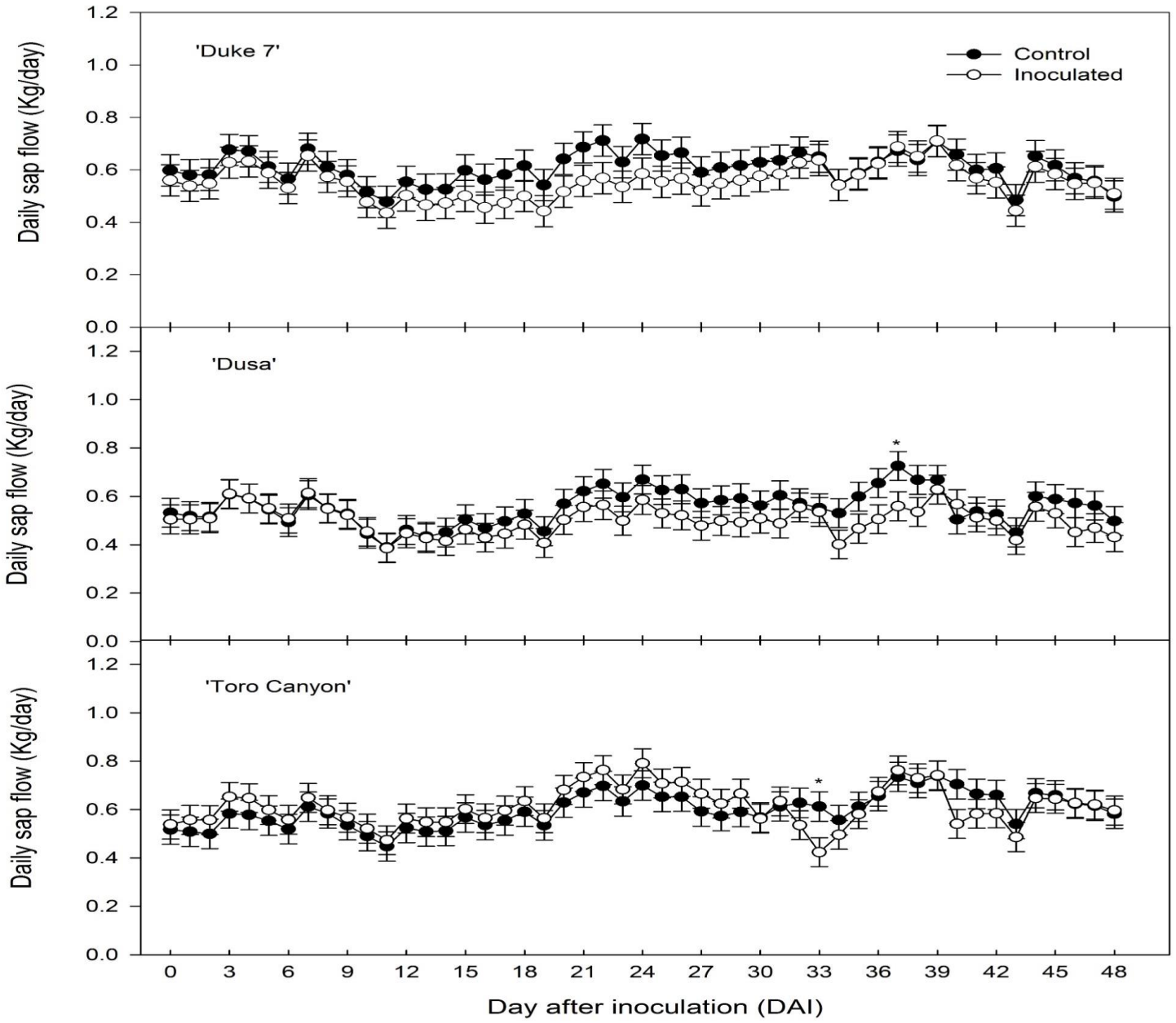
Non-grafted clonal rootstocks

- Toro Canyon rootstock
- Duke-7 rootstock
- Dusa rootstock

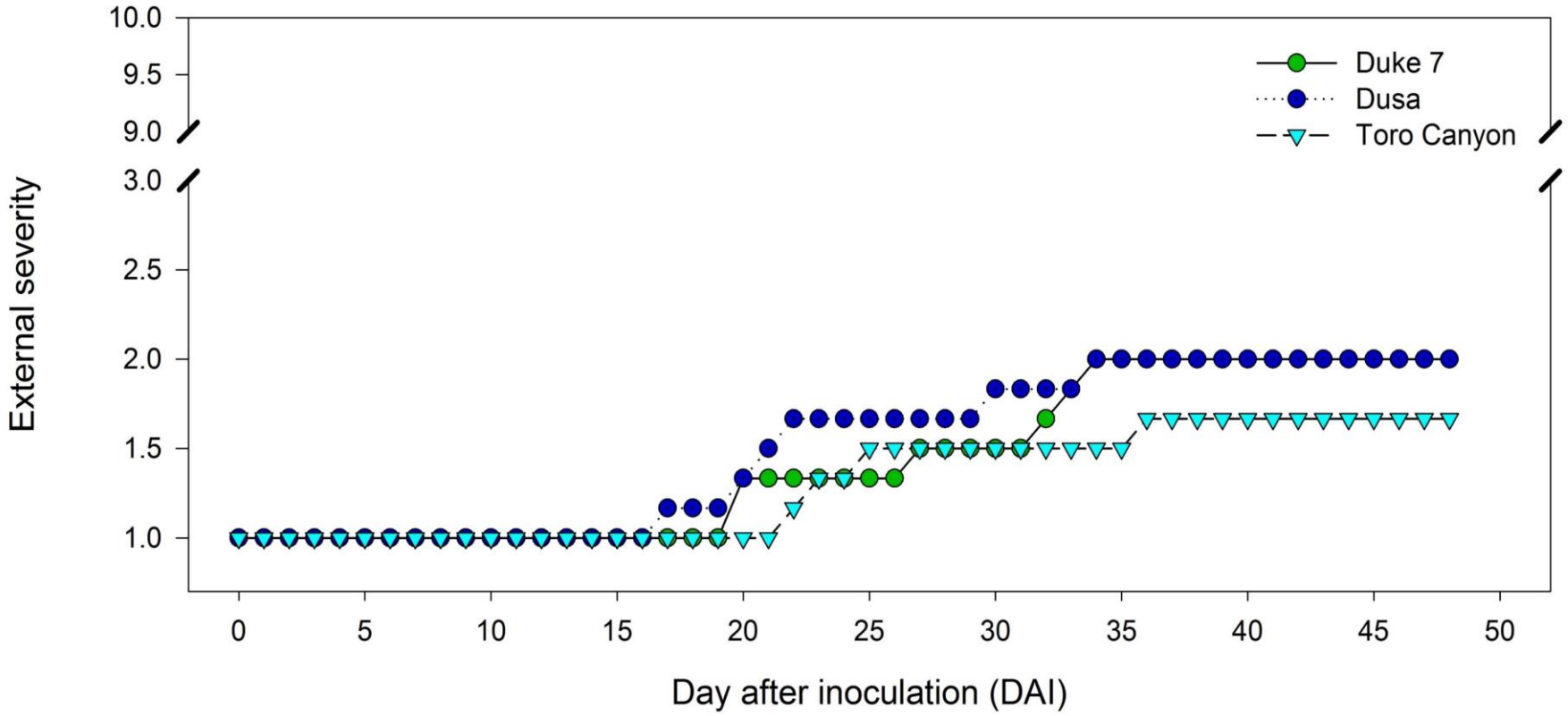
Photosynthesis



Xylem Sap Flow Rate



Visible Symptom Rating



Example 3: Most Recent Experiment

- Waldin (WI) scion /Duke-7 (M) rootstock
- Simmonds (WI) scion / Duke-7 rootstock
- Duke-7 (M) scion / Duke-7 rootstock
- Reed (G) scion /Duke-7 rootstock

Preliminary Results (data not statistically analyzed yet)

- ‘Waldin’ and ‘Simmonds’ (WI) scions - most susceptible
- ‘Duke-7’ (M) scion – susceptible but much slower disease progression
- ‘Reed’ (G) scion – much slower disease progression that all others

Conclusions (so far)

- Scion has more of an influence on LW susceptibility than rootstock
- Rootstock does have some influence on LW susceptibility
- There appears to be a race and a cultivar effect on LW disease progression
    - This appears (at least partially) related to xylem anatomy and physiology

For You folks in California…

In non-grafted, clonal ‘Toro Canyon’, ‘Dusa’ and ‘Duke-7’, LW disease progression is relatively very slow, but they are susceptible

Current Experiment

- ‘Hass’ scion on ‘Duke7’ rootstock
- ‘Hass’ scion on ‘Dusa’ rootstock
- ‘Hass’ scion on ‘Toro Canyon’ rootstock

The Team

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Ana Vargas

Biologist II
Josh Konkol


Thank you for your attention!