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Sooty bark disease of maples in the Pacific Northwest:

History and scientific advancement.

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Sooty Bark Disease in the PNW

Cryptostroma corticale is an opportunistic pathogen that causes sooty bark disease (SBD) on *Acer pseudoplatanus* (sycamore maple) and *A. saccharinum* (silver maple)^{1,2}. Symptoms of SBD include sloughing of the bark, wilting, and dieback of infected trees and branches^{3,4}. In Europe, periods of drought and high temperatures have been associated with increased SBD incidence and mortality of sycamore maple^{1,3,4}.

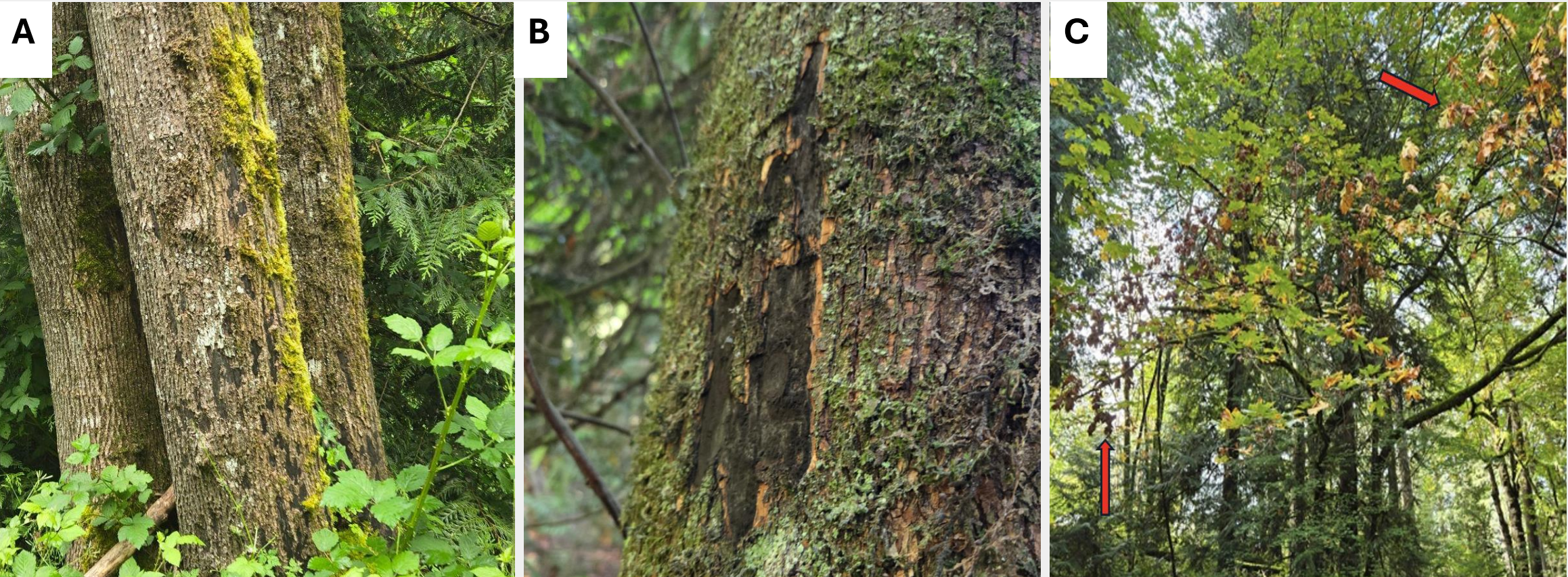


Fig. 1. Bigleaf maple trees in the PNW with signs and symptoms of SBD. (A) Old lesions caused by *C. corticale*. (B) Freshly exposed SBD lesion covered in *C. corticale* spores (conidia). (C) Dieback of *A. macrophyllum* associated with *C. corticale*. Photos: T. McNees

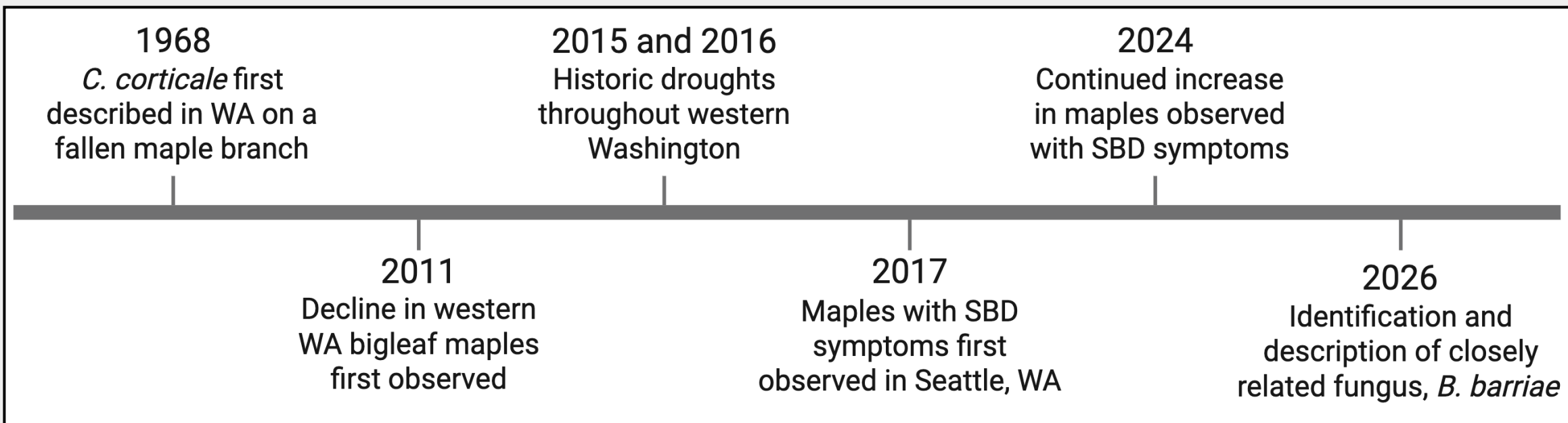


Fig. 2. History of SBD in Washington State. *Cryptostroma corticale* was first observed in WA in 1968 on a dead maple branch. Following historic droughts in 2015 and 2016, cases of SBD on living maple have continued to rise in western WA.

A recent study describes a new species of *Biscogniauxia* (*B. barriae*) that also causes SBD-like fruiting bodies (stromata) on *Acer* trees in the PNW⁷(Fig. 3).



Fig. 3. Morphological comparison of *C. corticale* and *B. barriae*. *C. corticale* (left) forms black stomata on the inner layer of the bark. *B. barriae* (right) produces a crust-like stomata with pore-like perithecia. Photos: T. McNees

Research Objectives

- Experimentally assess whether *C. corticale* and/or *B. barriae* cause disease on healthy bigleaf maple seedlings grown in the greenhouse.
- Determine the effect of low and high water-stress on fungal growth and disease development in bigleaf maple seedlings.
- Measure *in planta* fungal growth under different temperatures.

Infecting Trees

- Bigleaf maple seedlings (~2 years old) from seeds collected in western WA were used for all experiments.
- For fungal inoculations, bark was removed using a 5 mm borer and colonized agar plugs (or PDA-only) were placed onto the cambial tissue
- All fungal strains originated from *A. macrophyllum*.

Effect of Water Stress

Preliminary trial

- 36 bigleaf maple seedlings were subjected to 3 inoculation (*C. corticale*, *B. barriae*, and PDA) and 3 watering treatments (low, medium, and well-watered). Data were collected over a period of four months.
- No trees showed any symptom development (e.g., wilting, lesion formation, dieback).
- Stems of seedlings inoculated with *C. corticale* or *B. barriae* had clear discoloration of xylem tissue, while control plants had minimal to no discoloration (Fig. 4, 5).

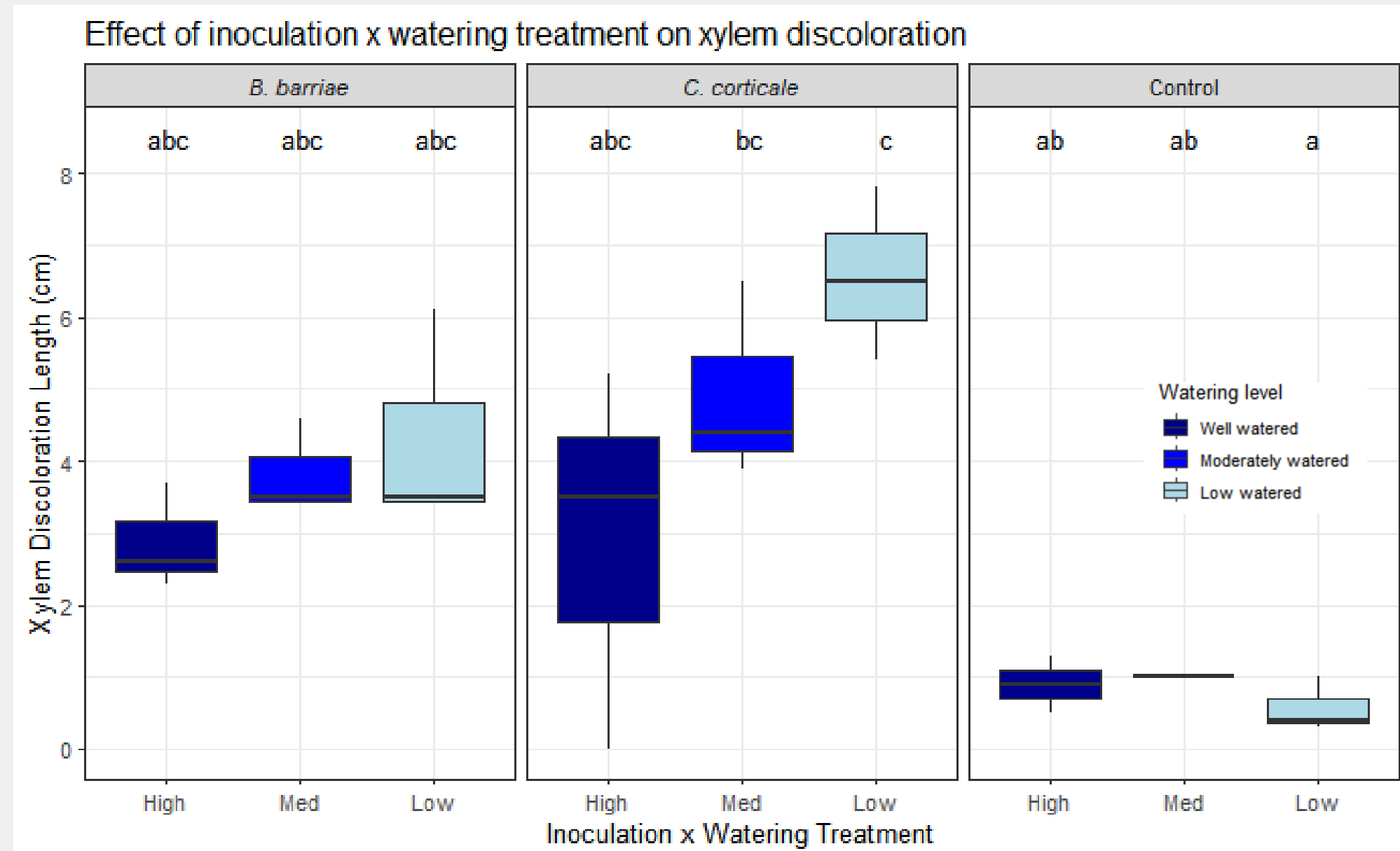


Fig. 4: Effect of inoculation x watering treatment on xylem discoloration. Boxplot showing the relationship between each watering and inoculation treatment on xylem discoloration length. Means sharing the same letter are not significantly different (Two-way ANOVA, $\alpha = 0.05$, Tukey-adjusted comparison).



Fig. 5: Stems of seedlings inoculated with *C. corticale* or *B. barriae* with discoloration of xylem tissue. Examples of vertical and horizontal xylem staining associated with *C. corticale* (Cc), *B. barriae* (Bb), and PDA (PDA) inoculation under low watering.

Main experiment (in progress)

- In May 2026, 120 *A. macrophyllum* seedlings were set up following the preliminary trial, except 2 strains of *C. corticale* were used.
- Seedlings are being monitored each week for symptom development.
- Because maples are difficult to adequately drought-stress without causing mortality, pre-dawn water potentials were taken on a subset of trees (n=48) five weeks after inoculation to look for physiological differences in water treatments (Fig. 6).

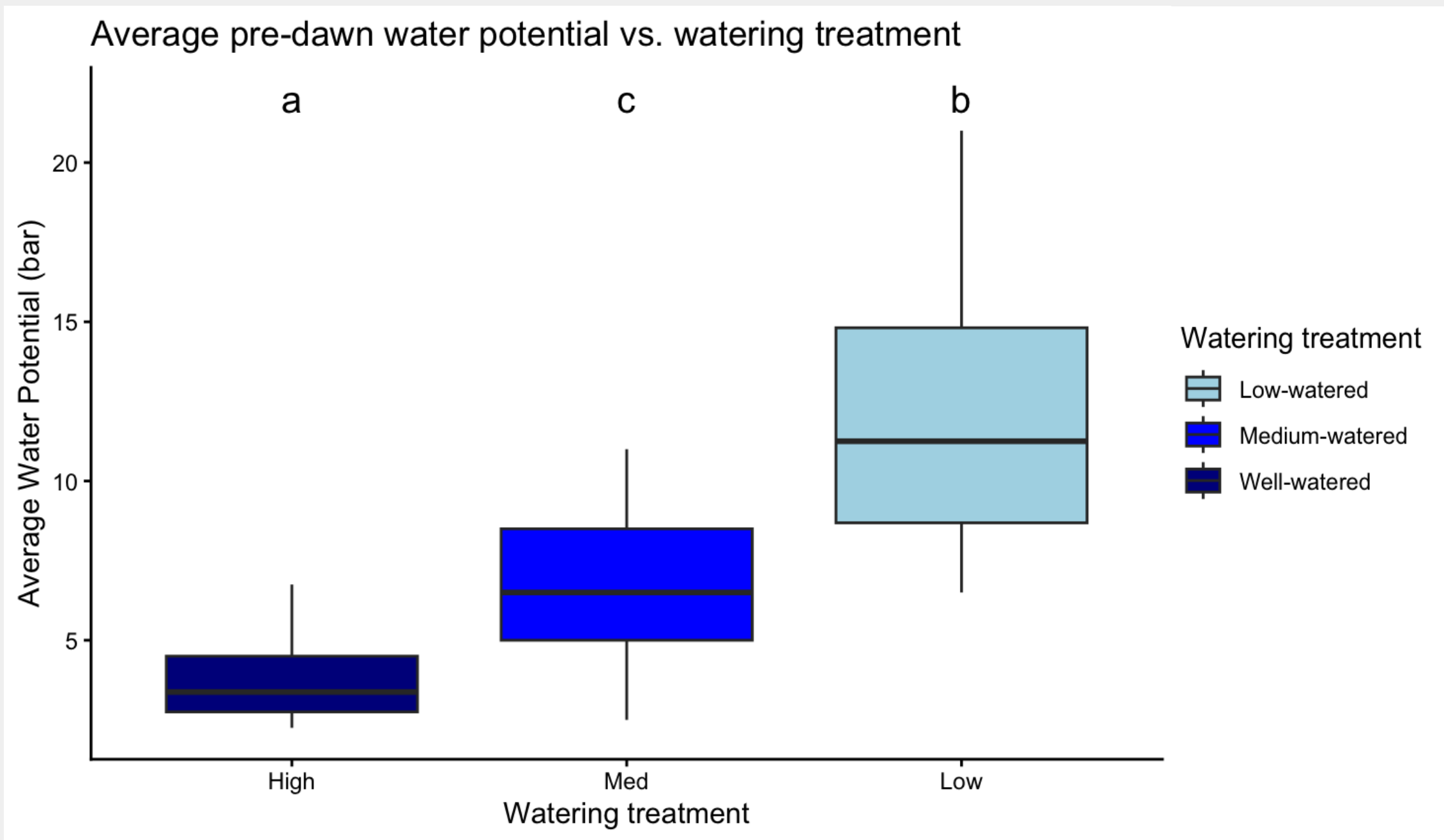
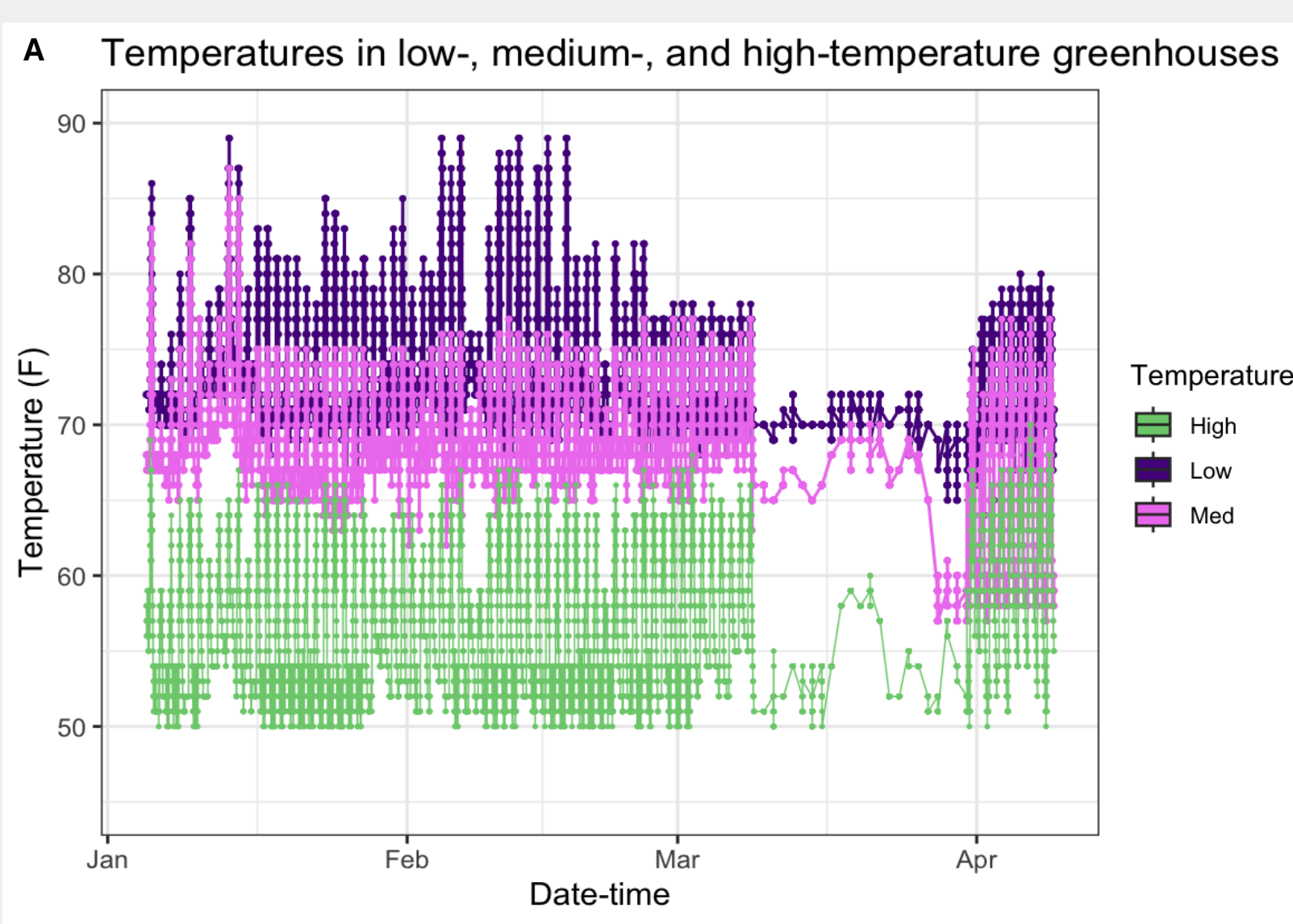


Fig. 6. Average pre-dawn water potential vs. watering treatment. Boxplot showing the relationship between watering treatment on pre-dawn water potential measurements. Means sharing the same letter are not significantly different (ART ANOVA, $\alpha = 0.05$, Games-Howell post-hoc test). No significant relationship was found between inoculation treatment and water potential or the interaction.

Effect of Temperature



- Inoculated detached stems were placed into three with different temperature regimes.
- C. corticale* inoculated trees had significantly more discoloration in the low treatment compared to the medium and high treatments (Fig 7B).

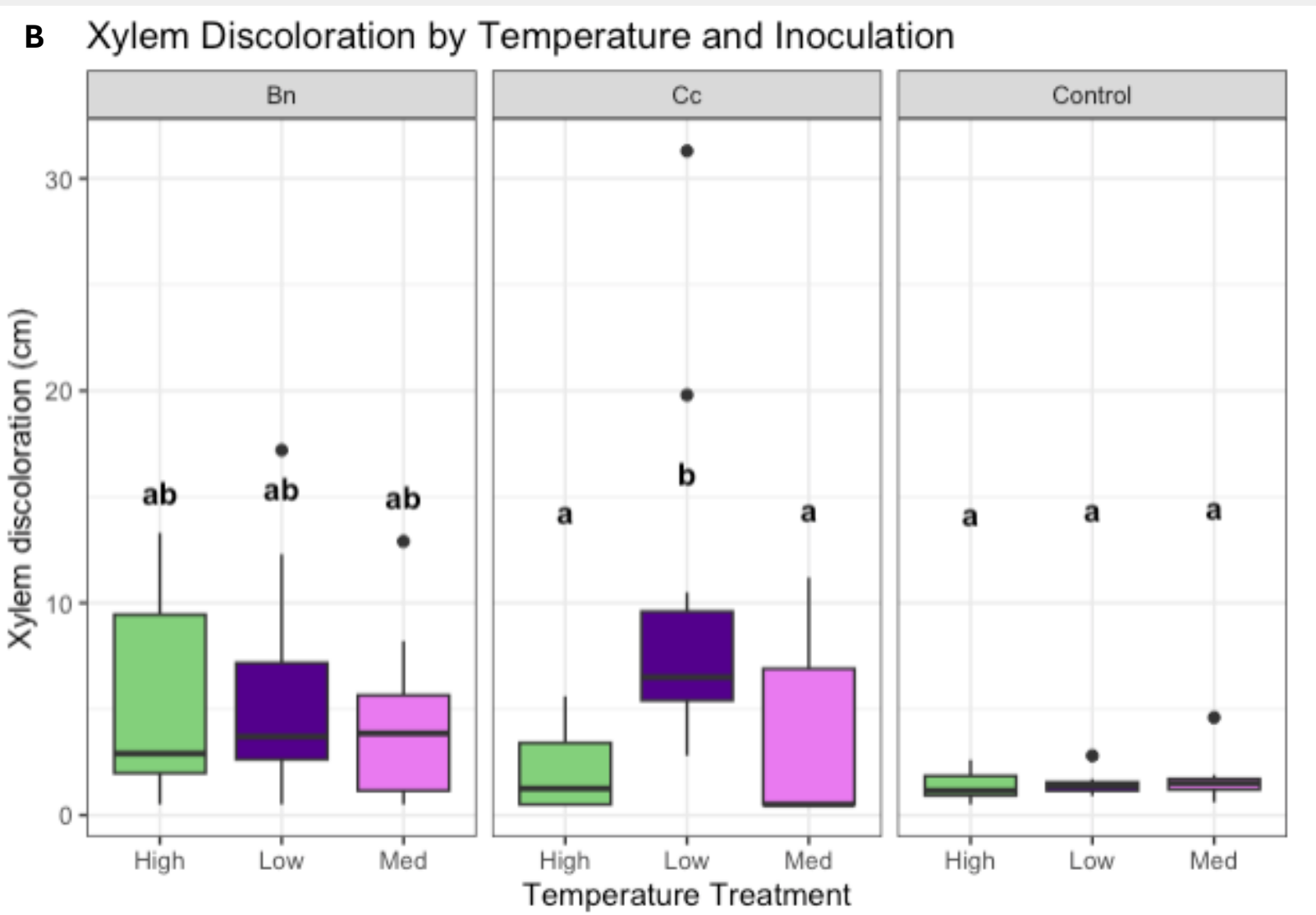


Fig. 7. Effects of temperature treatment on xylem discoloration in bigleaf maple stems. (A): Comparison of temperatures between the three treatments (High, Medium, and Low). (B) Boxplot showing the relationship between each temperature and inoculation treatment on xylem discoloration length. Means sharing the same letter are not significantly different (Two-way ANOVA, $\alpha = 0.05$, Tukey-adjusted comparison).

Xylem Discoloration

- Stems were destructively sampled to examine xylem discoloration (Fig. 8).
- C. corticale* was detected up to, but not beyond, the discoloration margin in inoculated stems using nested PCR⁹.

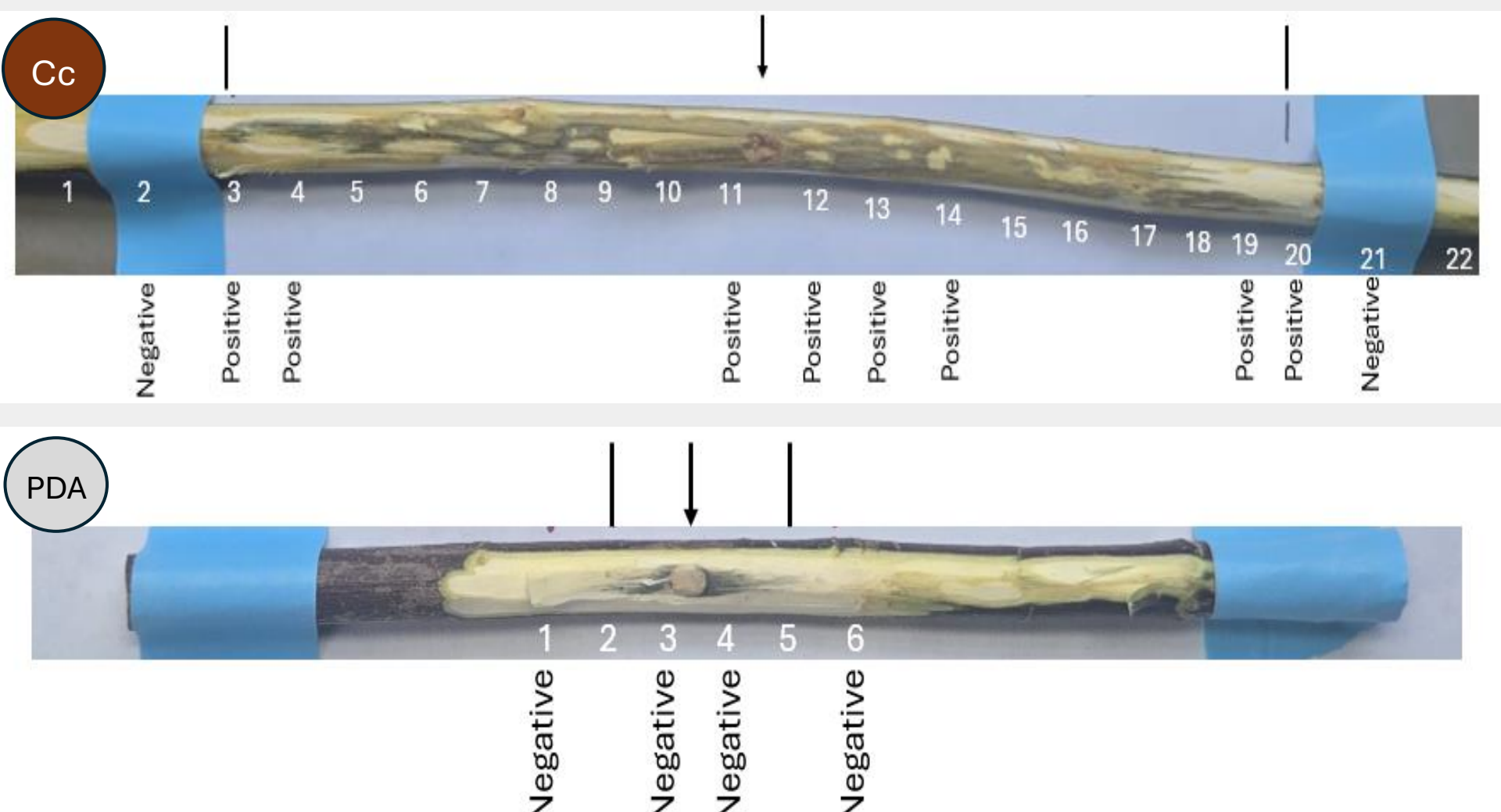


Figure 8. Xylem discoloration subsampling. Top: *C. corticale* inoculated. Bottom: PDA inoculated. Arrows represent inoculation points. Black lines represent the edge of the discoloration. Number represent sampling locations. Nested PCR results are displayed on the bottom of each stem.

Conclusions and Next Steps

- Both *C. corticale* and *B. barriae* can cause xylem discoloration, and this discoloration seems representative of fungal growth. However, no other symptoms have developed thus far.
- The vertical length of xylem discoloration increased with water-stress and decreased with higher temperatures (*C. corticale* only).
- The cause of the xylem discoloration remains unclear. Future work will involve microscopy of discolored tissue to look for evidence of fungal wood decay.

References



Acknowledgements

Funding for this research provided by the State of WA, Dept. of Natural Resources (DNR) and the United States Forest Service Consolidated Payment Grants 23-DG-11062765-767. The research also benefitted from the generous support of the Albert Victor Ravenholt Fund. TM was also funded by fellowship from the Seattle Chapter ARCS Foundation. The authors thank Dr. Daniel Omdal and Dr. Rachel Brooks from the DNR, and Dr. Lindsey du Toit, Dr. Henry Adams, Dr. Marianne Elliott, and Dr. Gary Chastagner at WSU for helpful input.