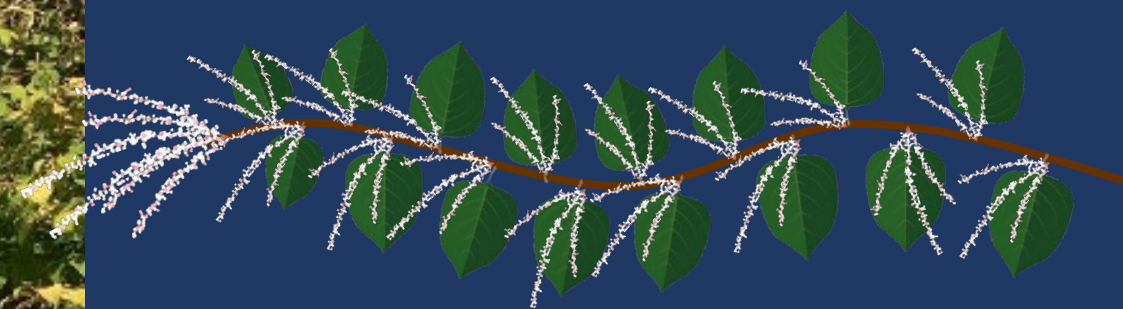




Inducing Mortality in Bohemian Knotweed (*Reynoutria × bohemica*) Propagules Using Thermal Treatment and Drowning Techniques



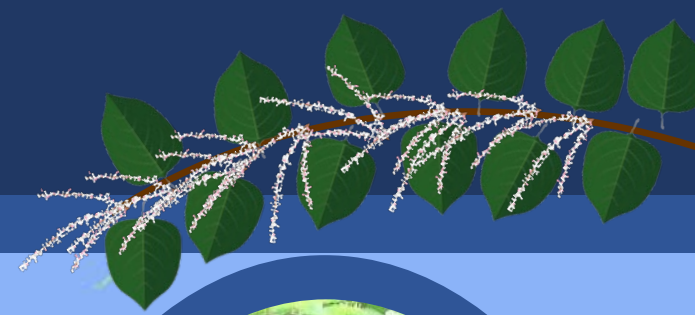
Getting Down and Dirty with BC's Knottiest Weed

Presentation by Adam Soames

With the Help of Committee Members

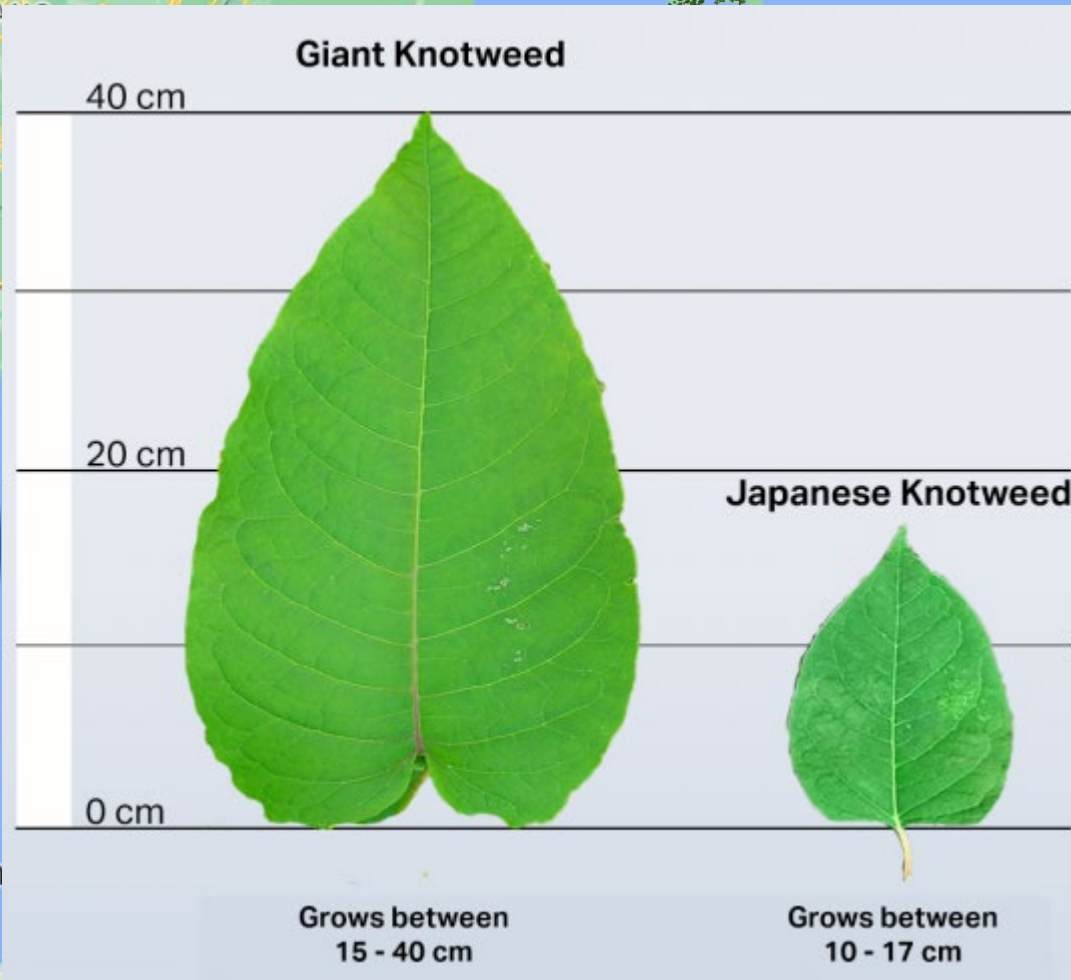
Dr. Wendy Gardner, Dr. Lauchlan Fraser, Dr. Catherine Tarasoff, and Grahame Gielens

Origin of a Villain



Giant Knotweed

Source: Washington State
Noxious Weed Control Board,
<https://www.nwcb.wa.gov/weeds/giant-knotweed>



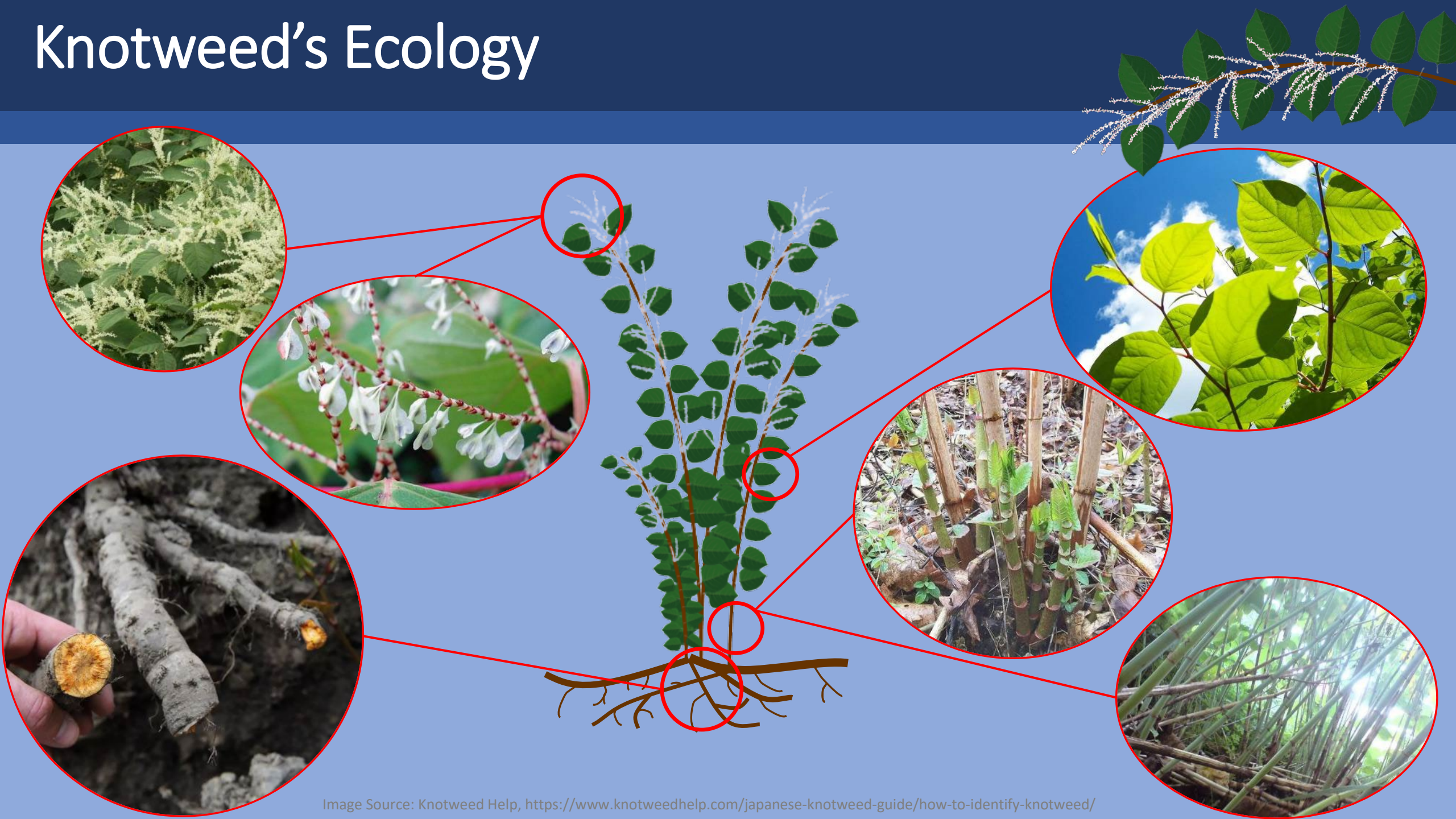
Source: JKW Claims, <https://www.housingtrriage.com/top-tips-for-identifying-japanese-knotweed>

Map Source: Google Maps

Japanese Knotweed

Source: Newsweek
<https://www.newsweek.com/japanese-knotweed-growing-man-mountain-25>

Knotweed's Ecology



Knotweed's Quest for World Domination

Asexual spread versus sexual reproduction in Japanese Knotweed *s.l.* sets the stage of the Clones"

John P. Bailey · Kateřina Bímová ·
Bohumil Mandák

Time to kill the beast – Importance of taxa, timing during application of glyphosate to kill

Martina Kadlecová¹ | Martin Vojík¹ | Josef Kutlvašr^{1,2} | Kateřina Bímová¹

100 OF THE WORLD'S WORST INVASIVE ALIEN SPECIES

A SELECTION FROM THE GLOBAL
INVASIVE SPECIES DATABASE



Contribution to the Global Invasive Species Programme (GISP)

IUCN
The World Conservation Union

SPECIES SURVIVAL COMMISSION

In Association with



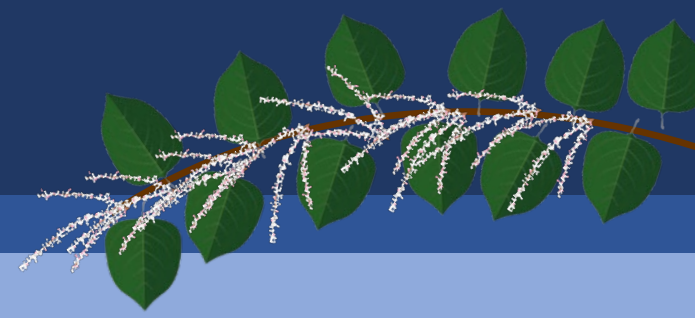
JAPANESE KNOTWEED – the world's largest female!
... describes efforts to control this invasive weed in the UK, especially using...

**My: Application of ATR-FTIR
to invasive species control**

John Paul Bailey², Jane Elizabeth Taylor¹, Frank Martin³,
...sh¹

...e, Lancaster University, Lancaster, United Kingdom, ² Department of
Leicester University, Leicester, United Kingdom, ³ Biocel Ltd, Hull, United
...ton, United Kingdom

Knotweed's Quest for World Domination



Giant

Bohemian

Japanese



Giant Knotweed Distribution
(June 2016)



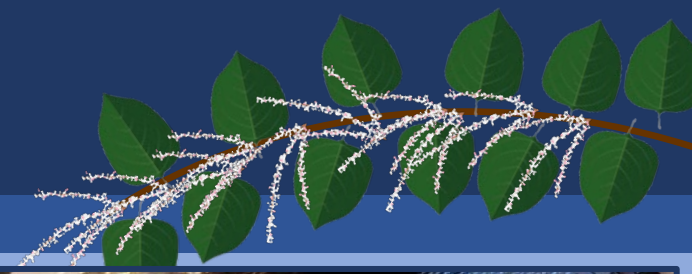
Japanese Knotweed Distribution
(June 2016)



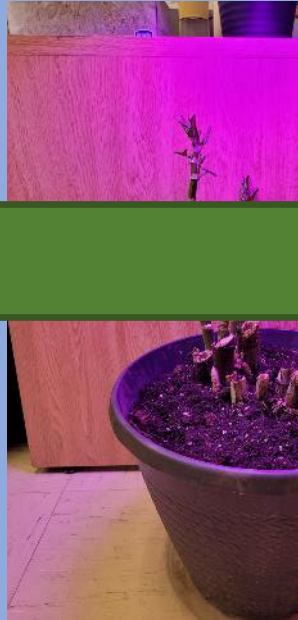
Bohemian Knotweed Distribution
(June 2016)



Knotweed's Quest for World Domination



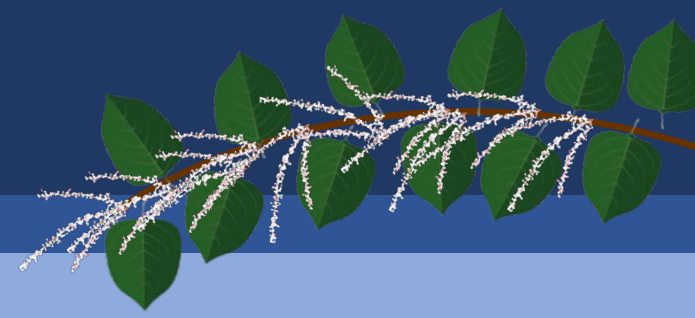
Day 1



Day 2



How Do We Stop It?



Source: Wikipedia,
https://en.wikipedia.org/wiki/Reynoutria_japonica



Source: CABI Digital Library,
<https://www.cabidigitallibrary.org/doi/10.1079/cabicompendium.107901>



Source: Knotweed Help,
<https://www.knotweethelp.com/japanese-knotweed-avoid-getting-rid-of-knotweed/>

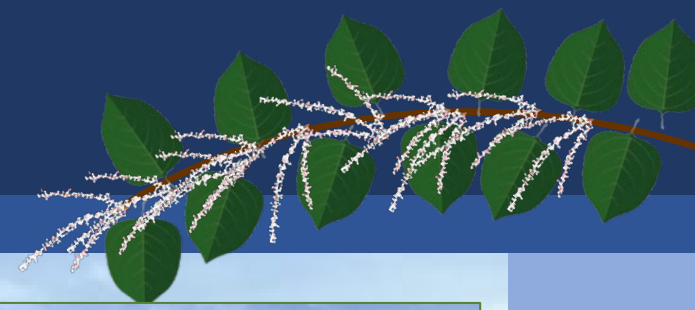


Source: Ecological Landscape Alliance,
<https://www.ecolandscaping.org/09/developing-healthy-landscapes/restoration/controlling-invasive-species-during-restoration/>

Prevention & Control

- Reporting infestations currently in
- Dig/Aphelasia and trade this
- Biological control in research
- Managing to establish healthy
- Planting in riparian areas
- Ensuring soil, gravel, and other fill material are not contaminated
- Bag or tarp plants before transporting

The Project



Source: Ministry of Transportation and Infrastructure



My Experiments

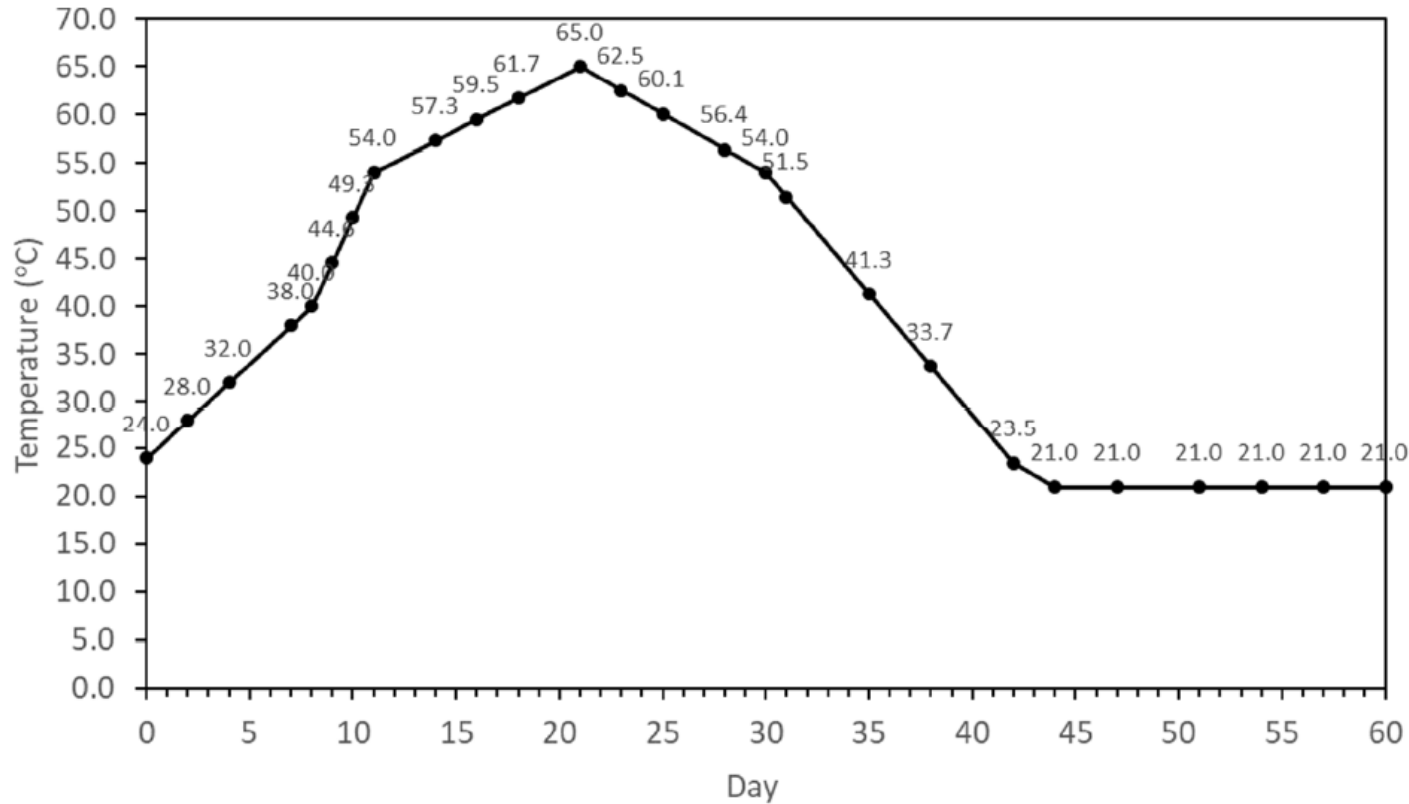
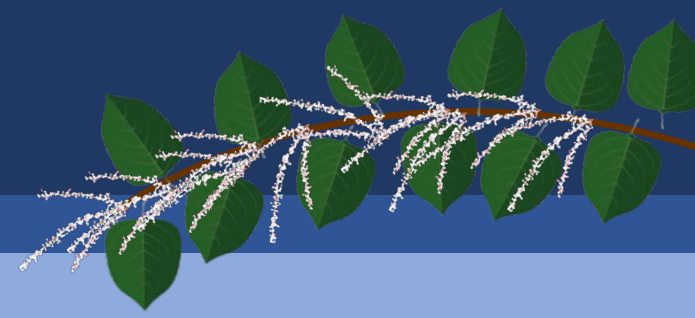
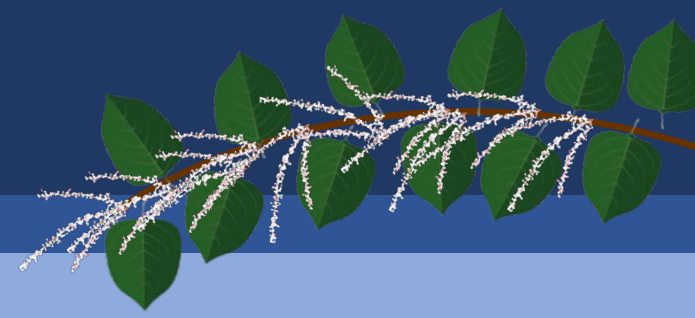


Figure 1. The temperature profile of the composting temperature treatment in the study.

Source: Westerman & Gerowitt, 2013

Thermal Trials

- Will find temperatures that will kill knotweed propagules.
- Can determine if composting would be effective.
- Can confirm other thermal treatments would be effective



Suffocation Trials

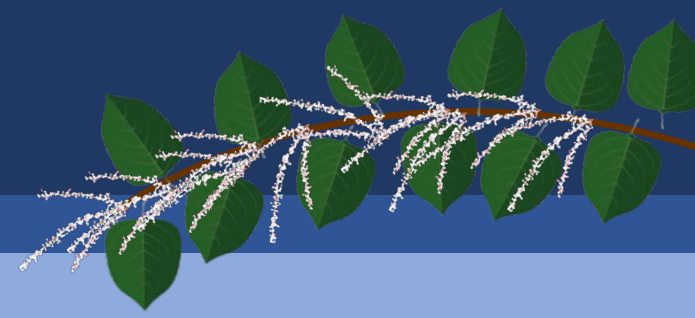
- Create anoxic conditions that could kill plant.
- Results in acetaldehyde production.
- Can determine if benthic barrier treatments, or other methods would be effective



A floating blanket constructed from builders' black plastic

Phil Moran

My Experiments



Temperature

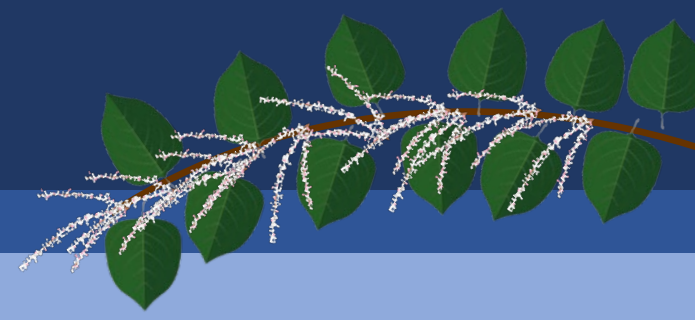
- Aerobic Composting
- Direct Thermal Treatment
- Microwave Treatments
- Solarization



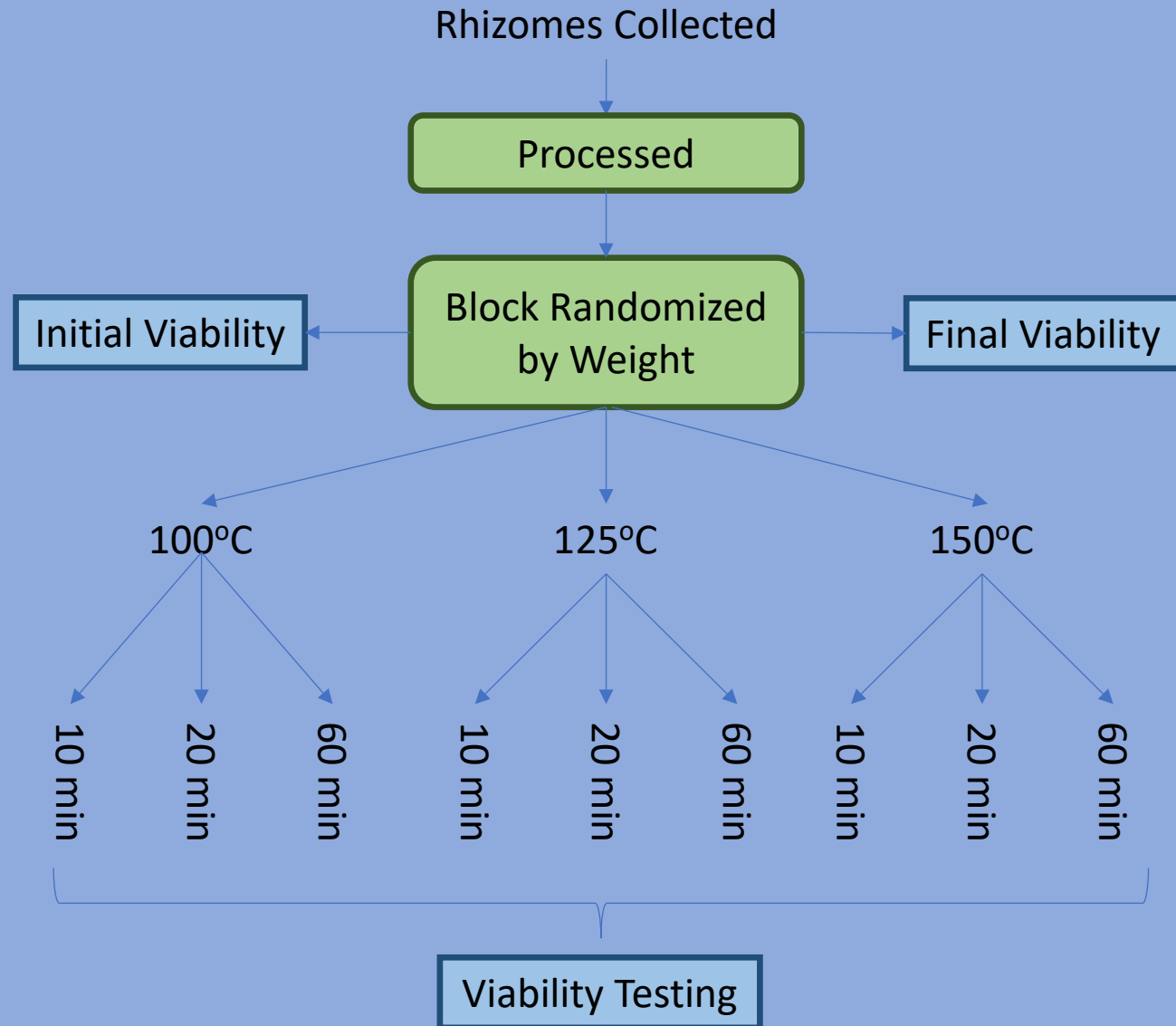
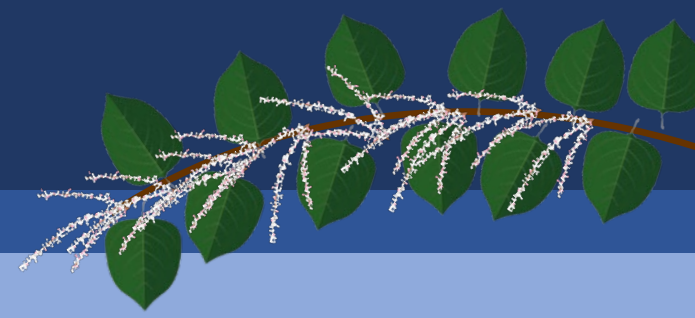
Oxygen

- Anaerobic Composting
- Drowning
- Benthic Barriers
- Tarping

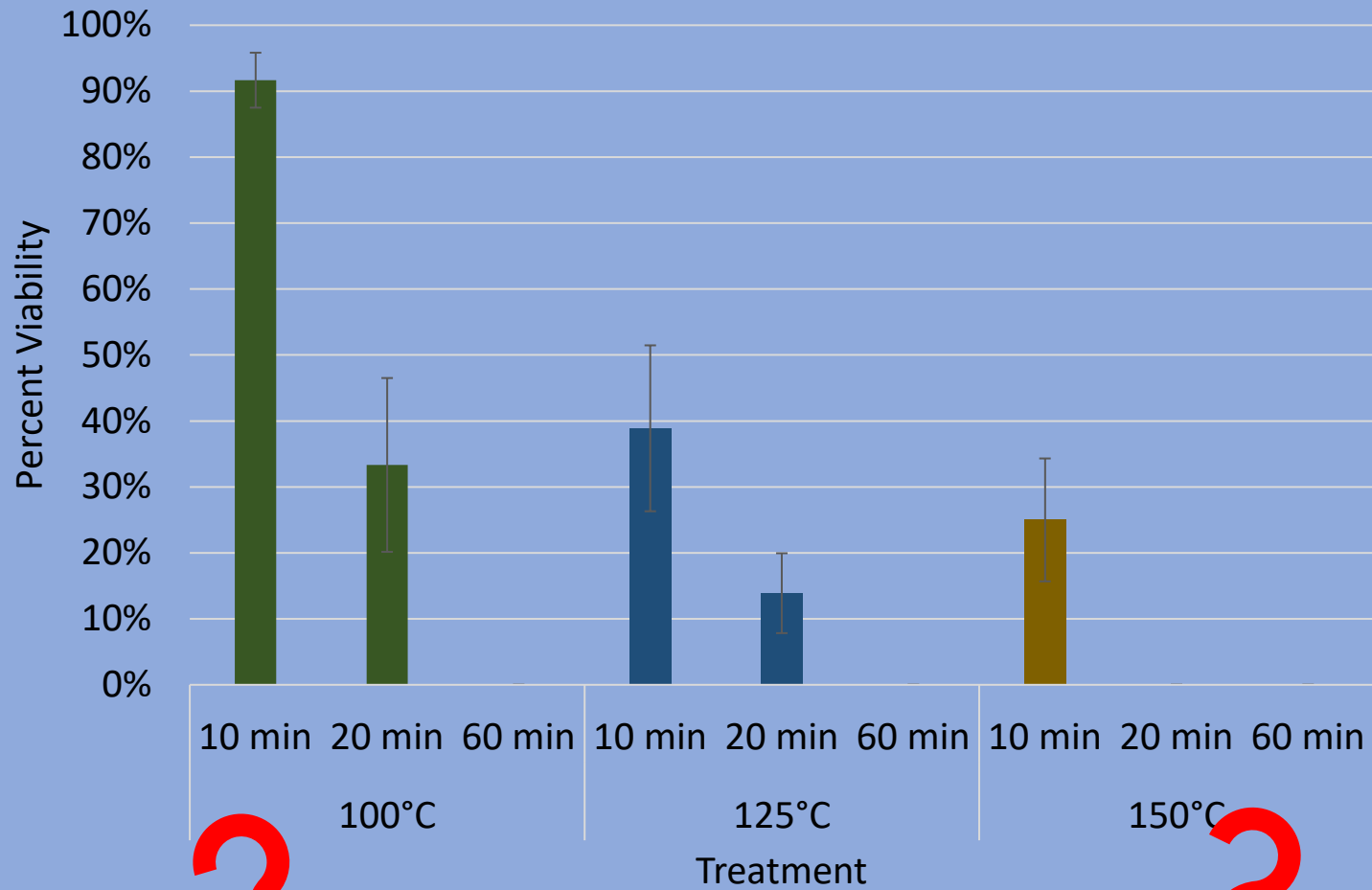
Thermal Trials



Rhizome Thermal Trials



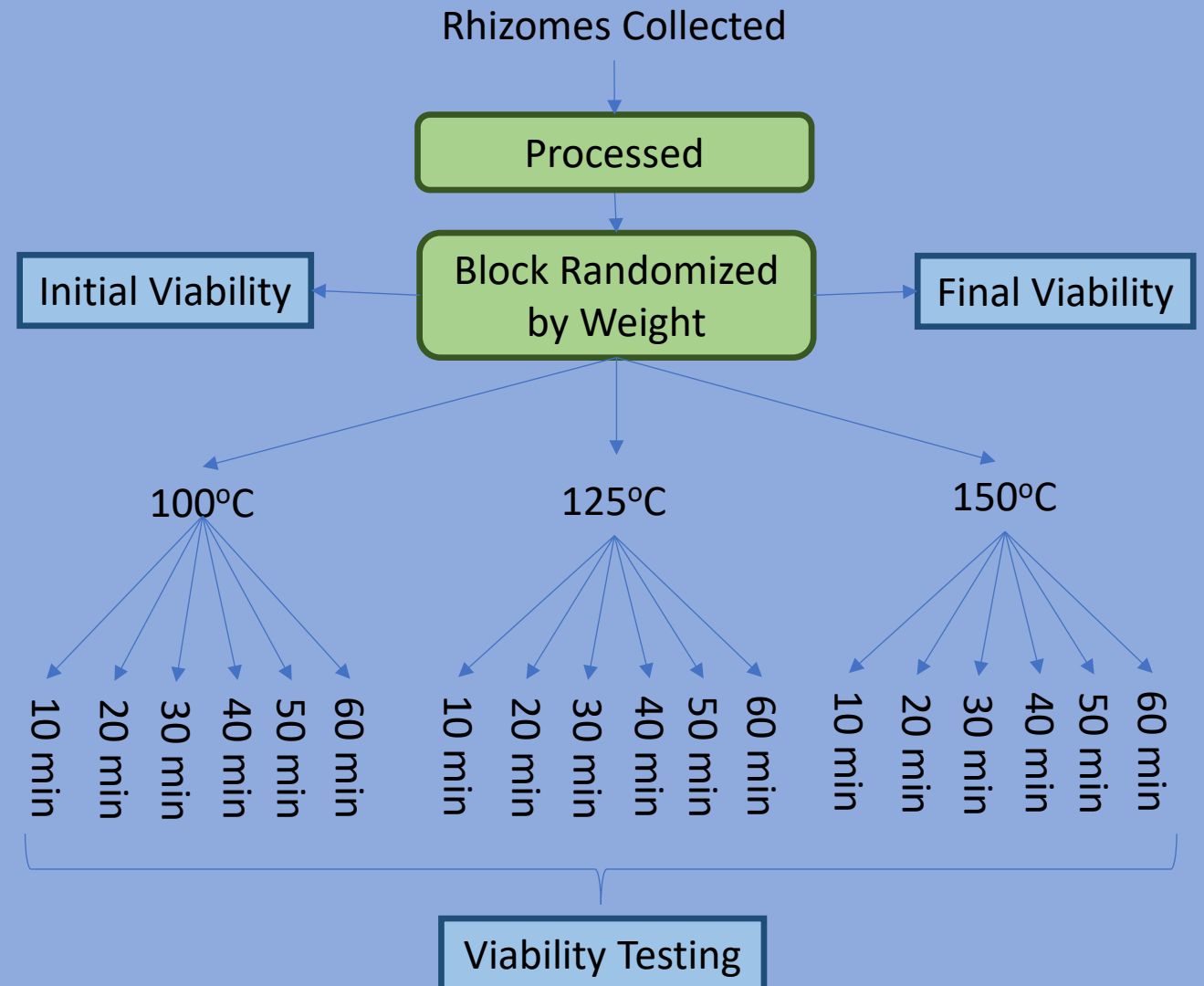
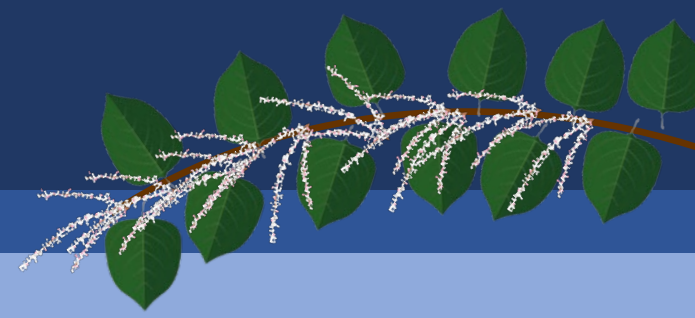
Thermal Rhizome Trials



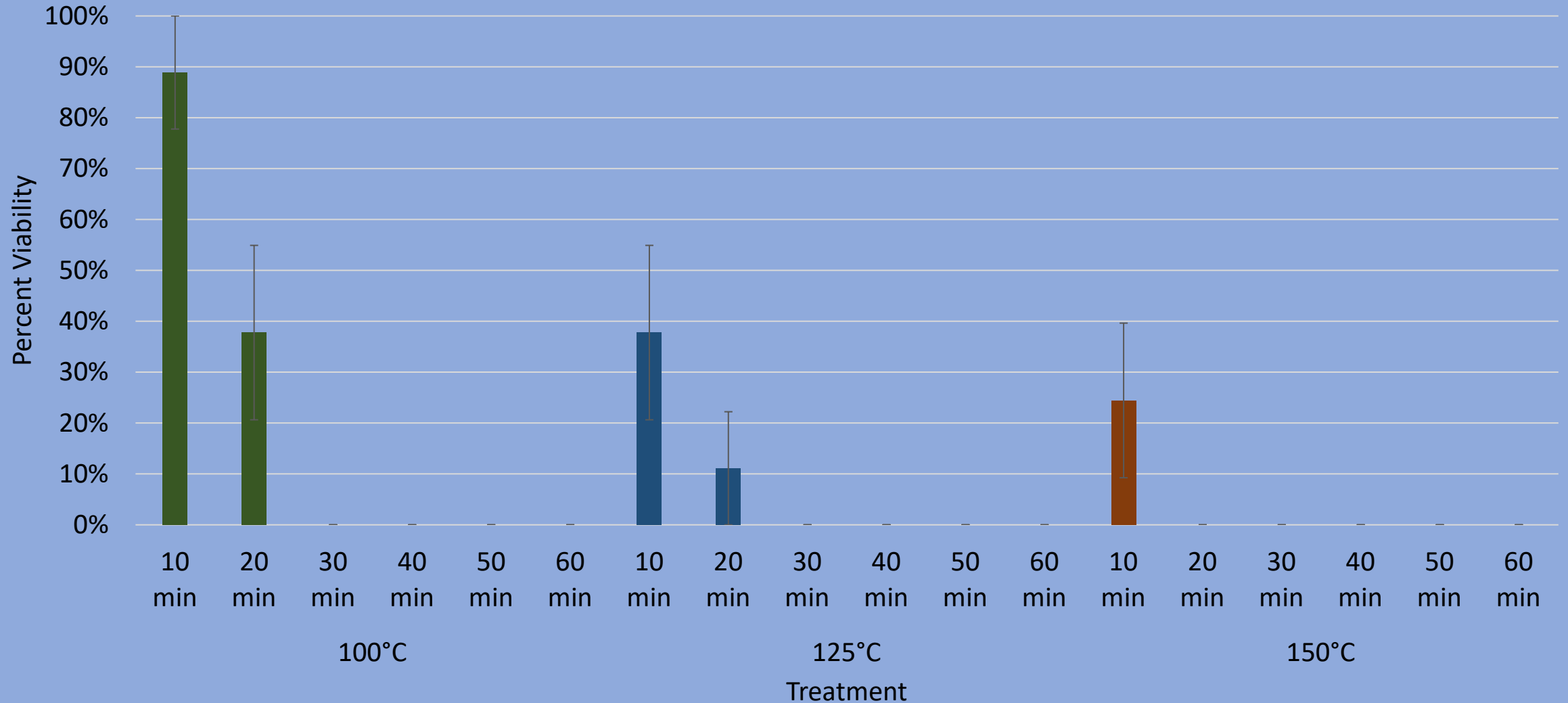
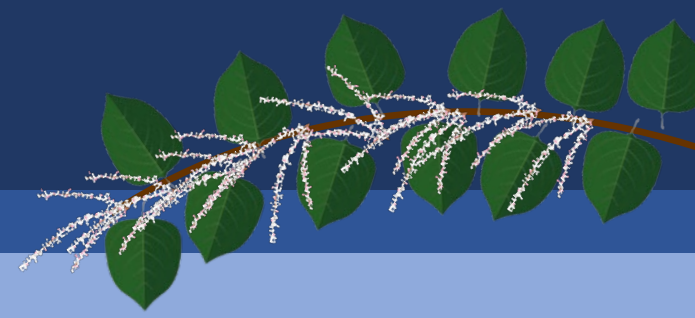
What about at 30, 40 and 50 minutes?



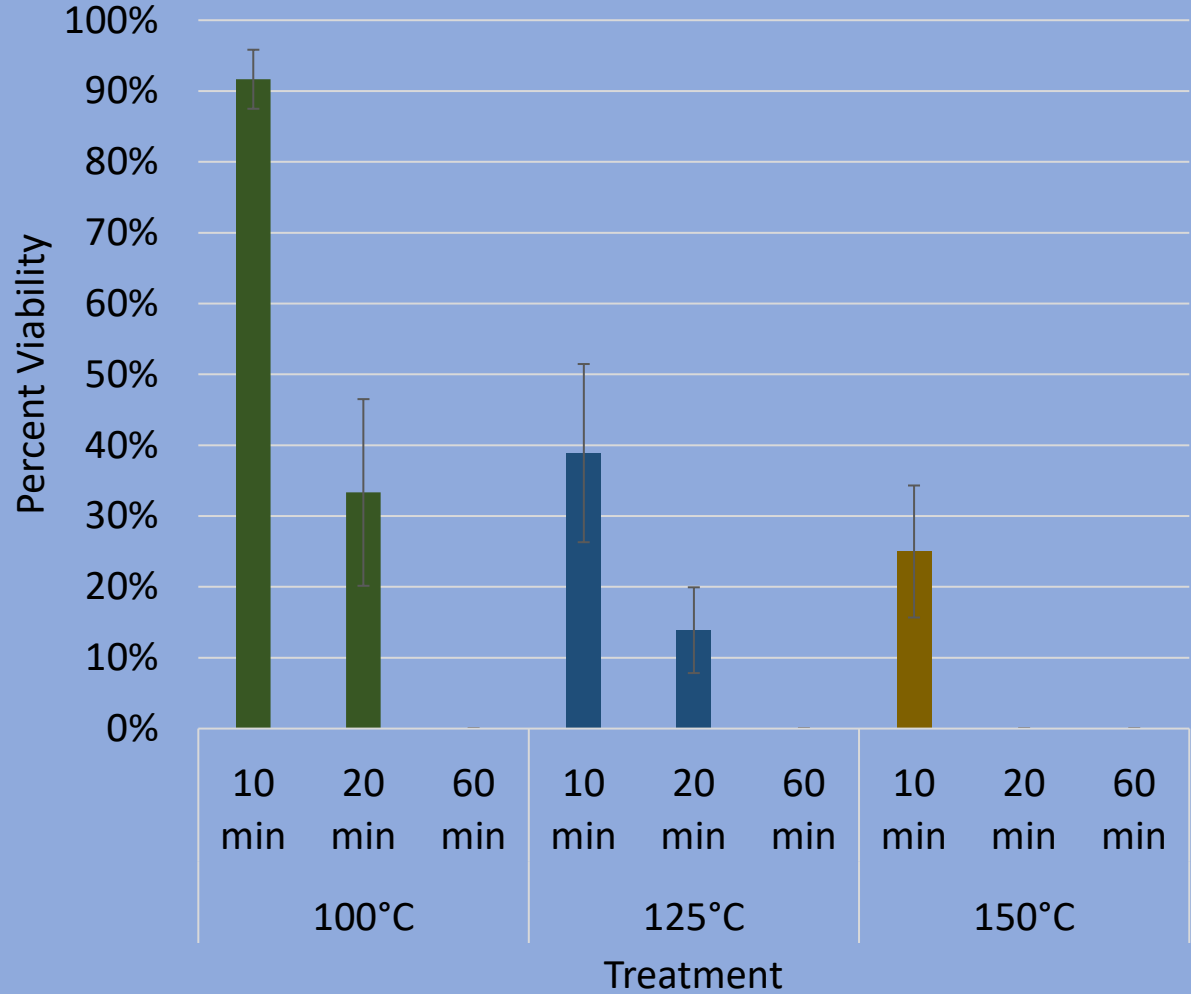
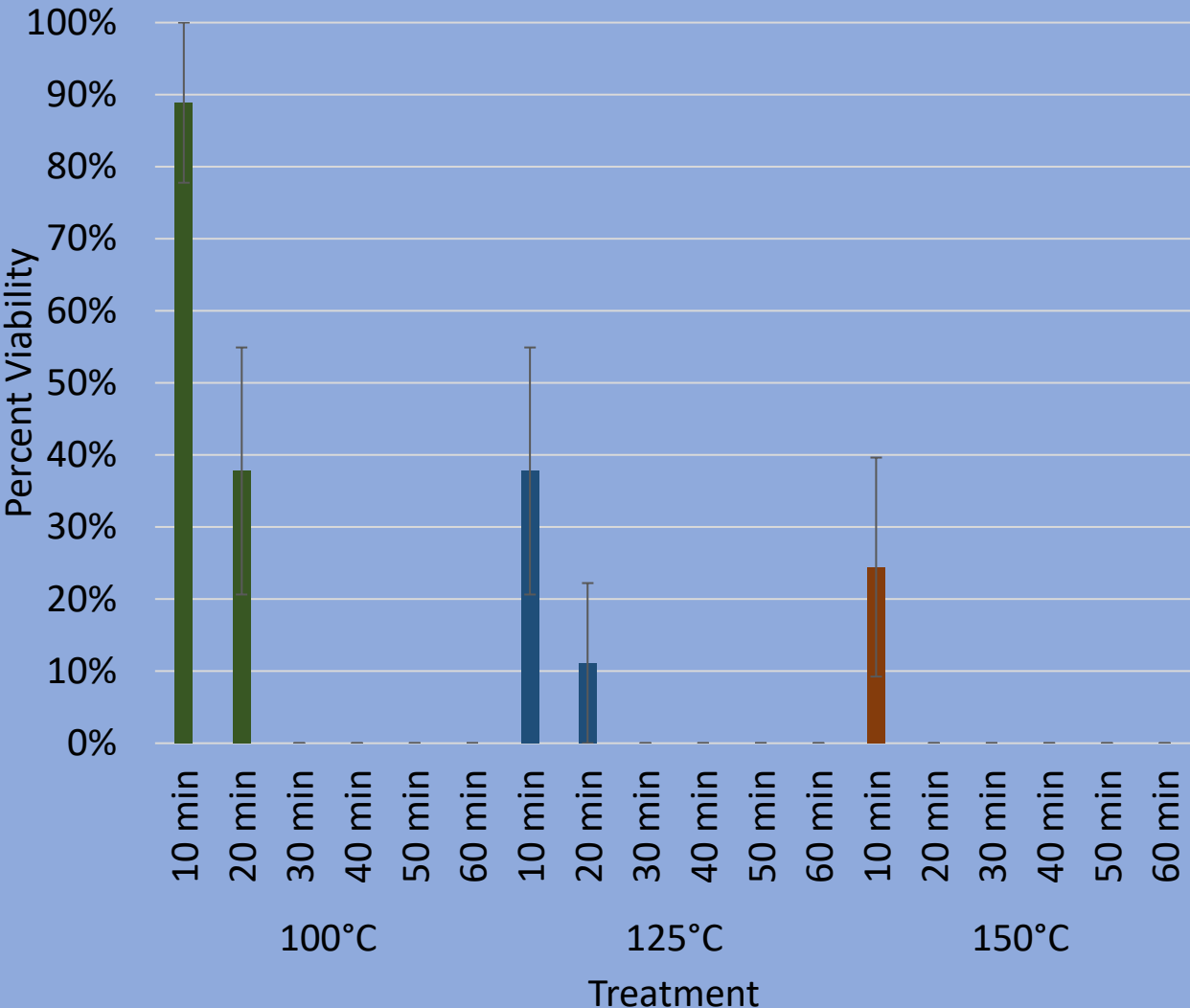
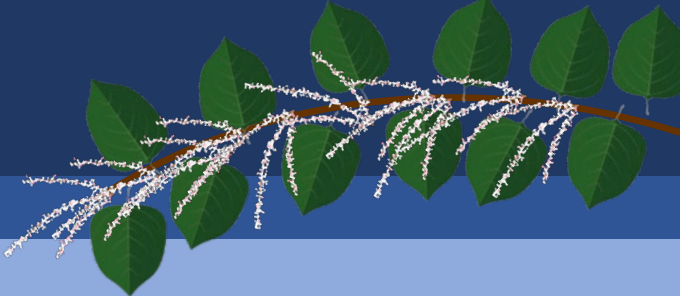
Thermal Rhizome Trials



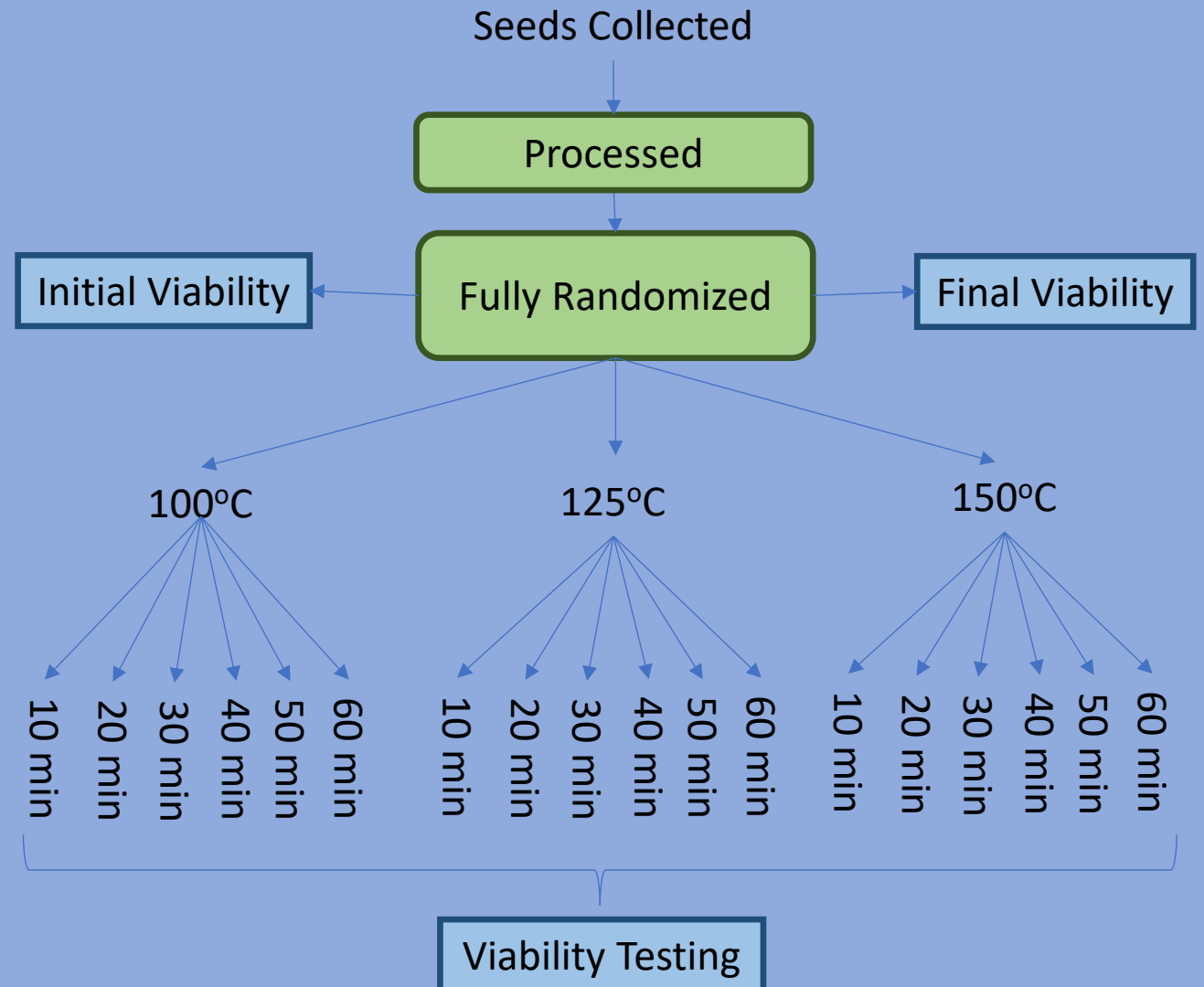
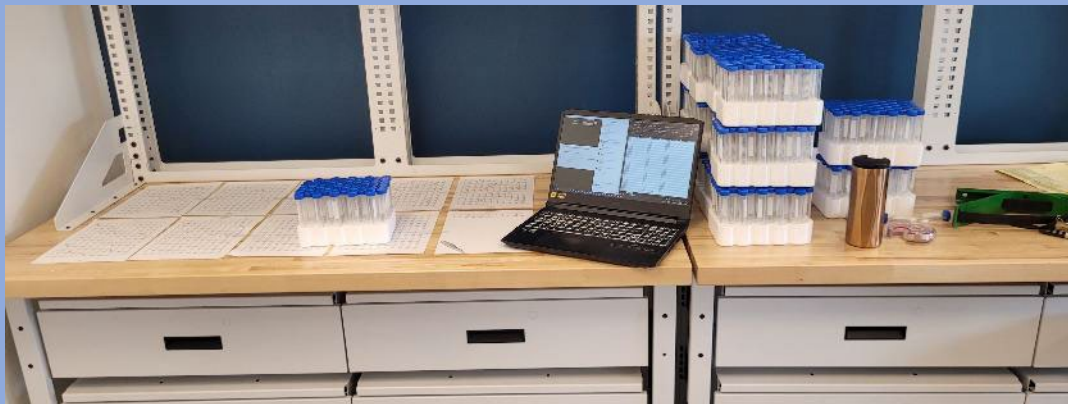
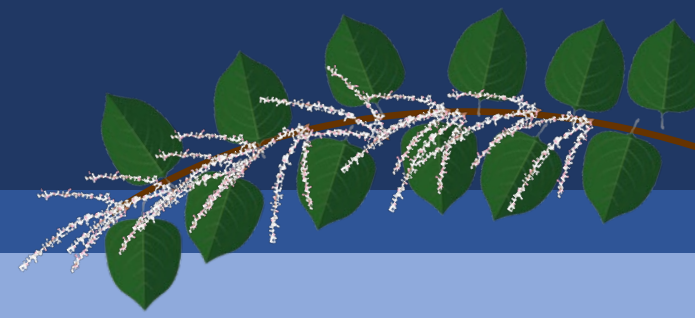
Thermal Rhizome Trials



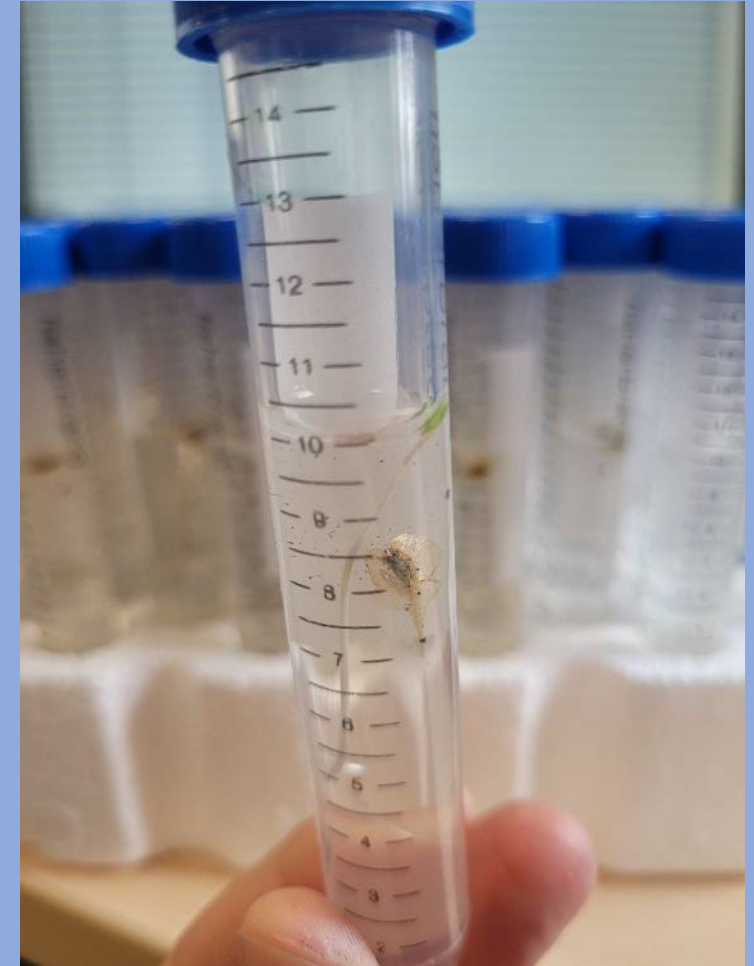
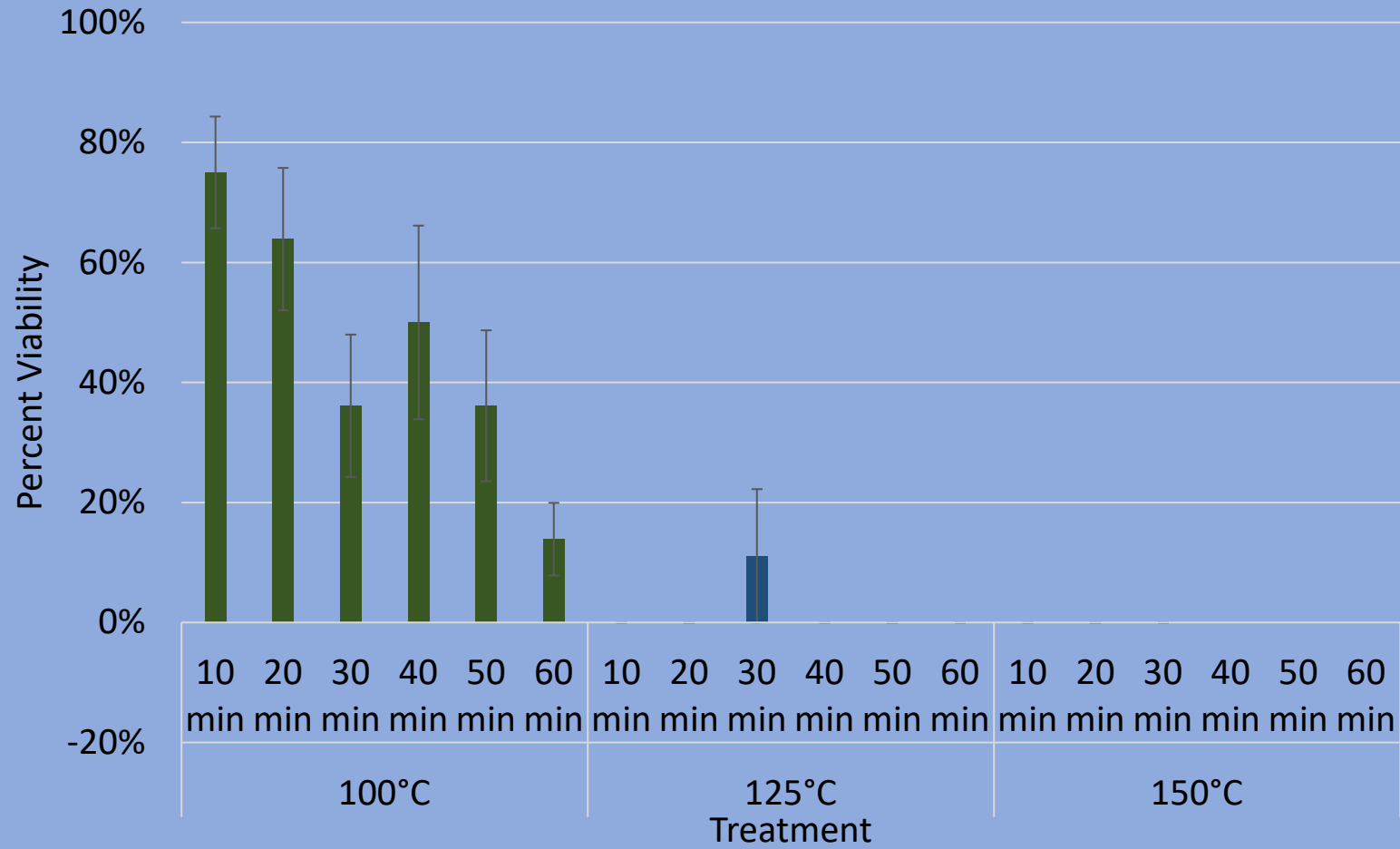
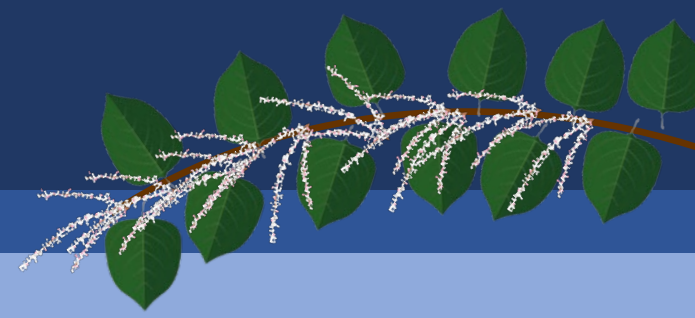
Thermal Rhizome Trials



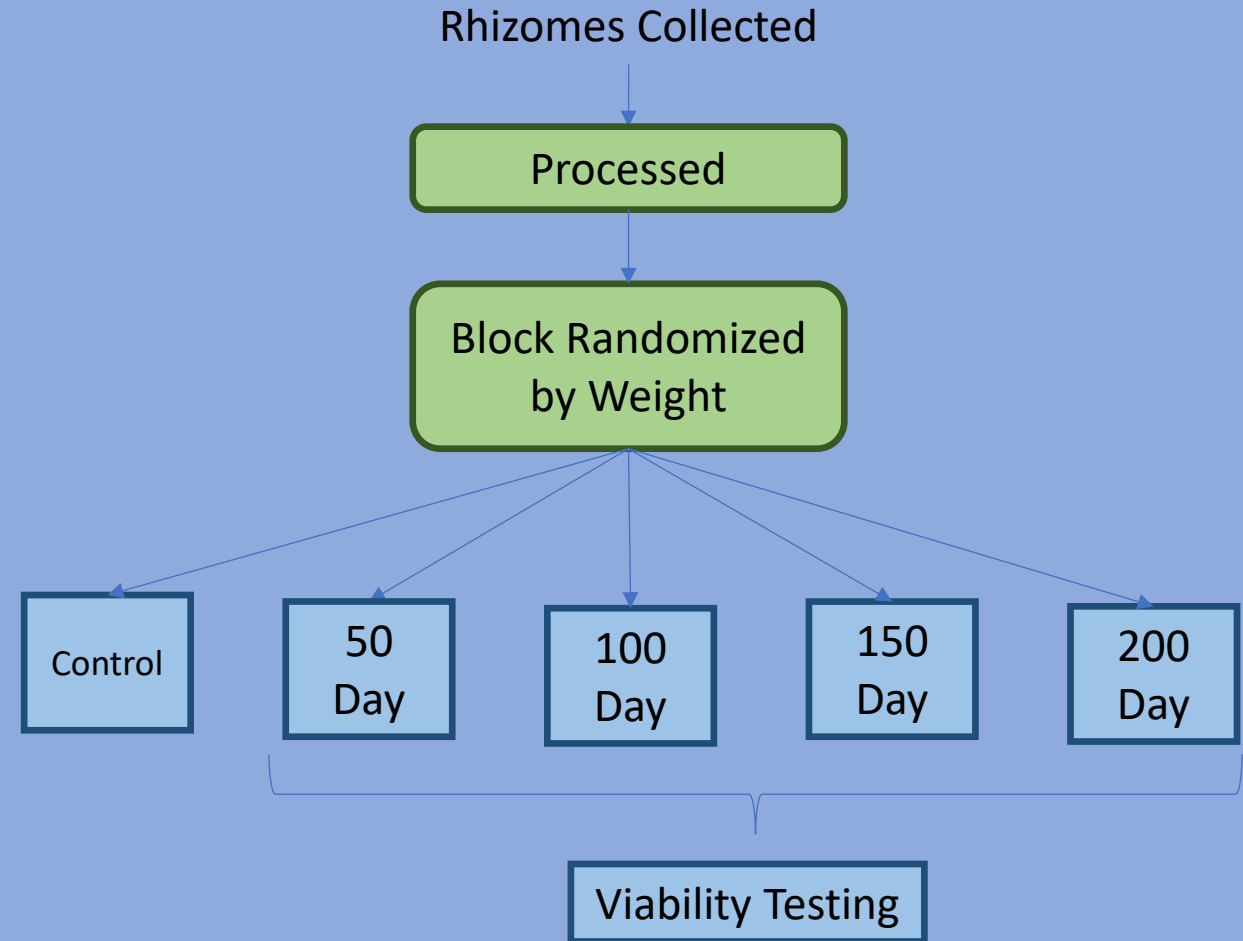
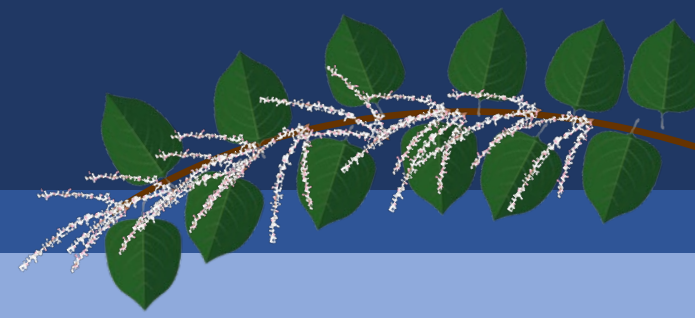
Thermal Seed Trials



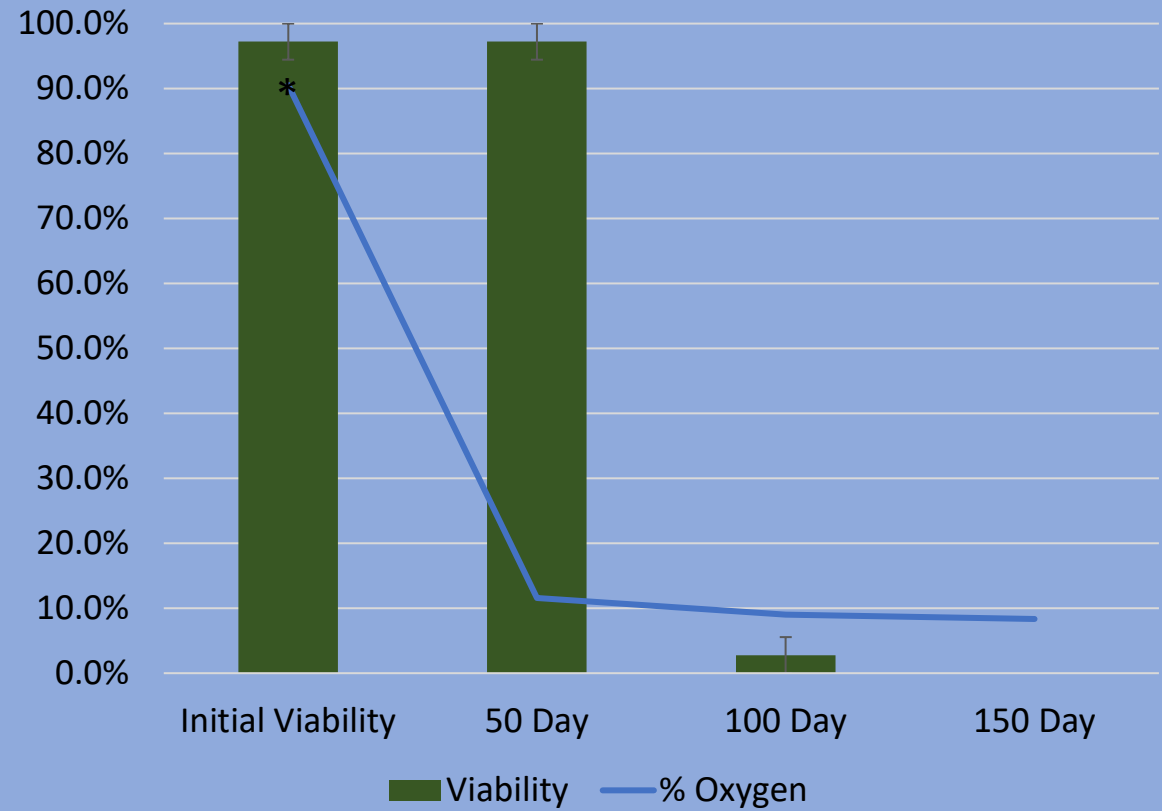
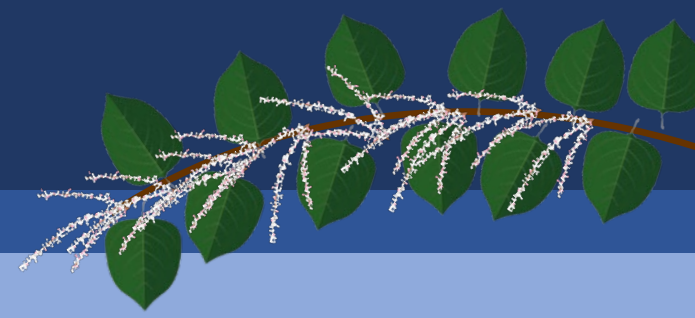
Thermal Seed Trials



Suffocation Trials

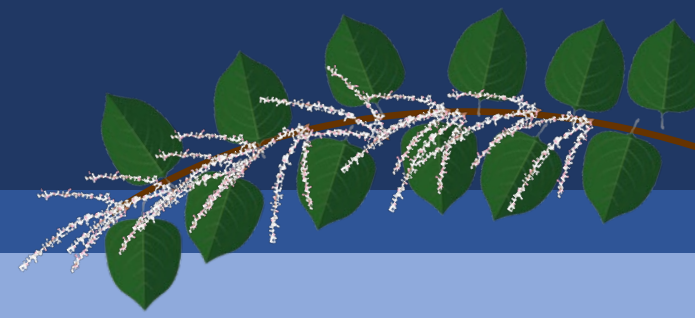


Suffocation Trials



**Initial Oxygen is based on average initial oxygen in all trials.*

Summary



Thermal Trials

- Treatment of 150°C for 60 minutes is likely sufficient to ensure rhizome and seed mortality.
- More tests using shorter time periods will help to flesh out this model.
- Soil properties will likely alter the results. Tests on the effectiveness of key temperatures considering soil moisture and composition should be conducted.

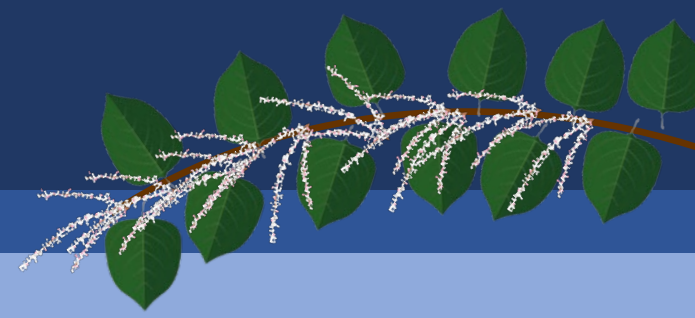


Suffocation Trials

- Sealing rhizomes in containers does result in a significant reduction in dissolved oxygen.
- Suffocation of rhizomes for 150 days results in 100% mortality in knotweed rhizomes.
- Further research is recommended to assess chemical and biological makeup of wastewater.



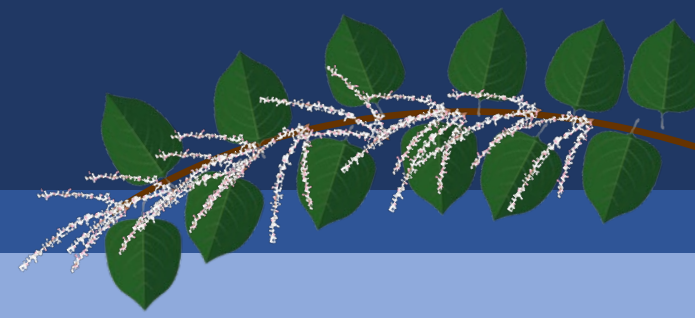
Limitations



How do we know they're dead?



New Recruits



Jordy Major

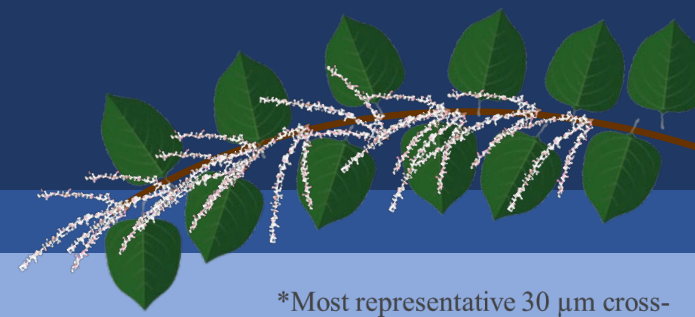
Honours Student, TRU

Assessing cellular viability of knotweed rhizomes following treatment

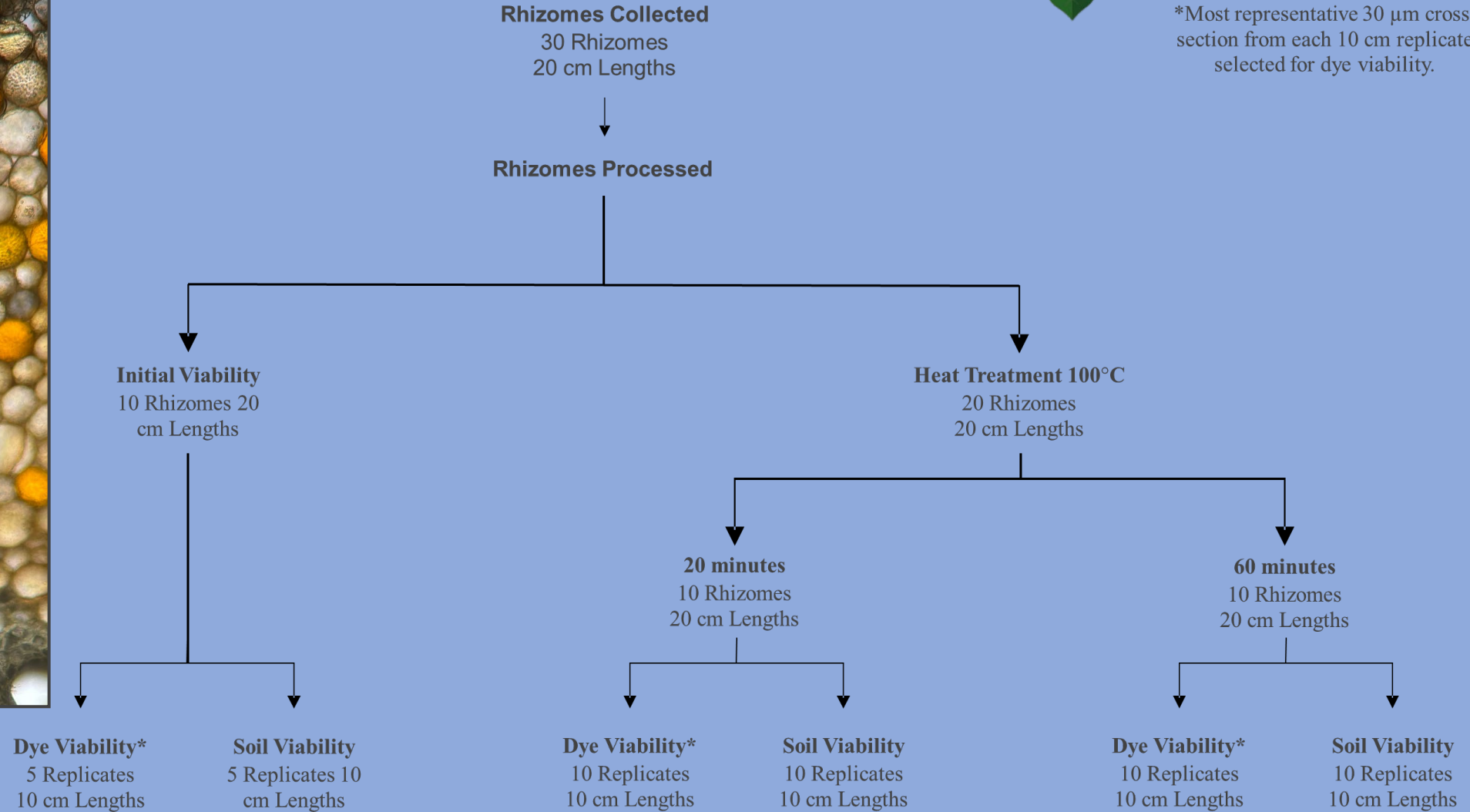
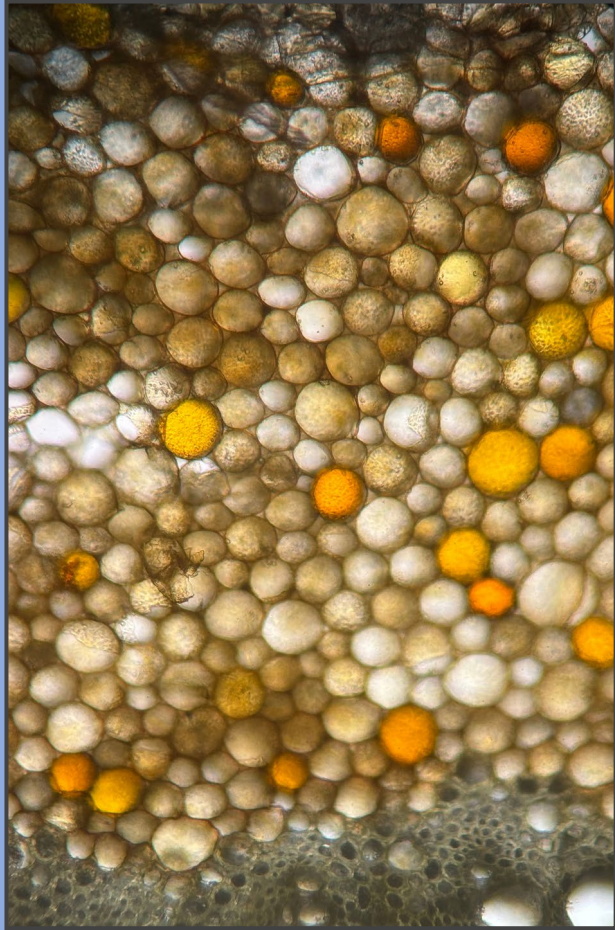
Objectives:

1. Assess cellular viability of heat-treated rhizome piths using Evans blue staining
2. Compare cellular viability with greenhouse growth.
3. Assess if cellular death of rhizome piths indicates death of the plant.

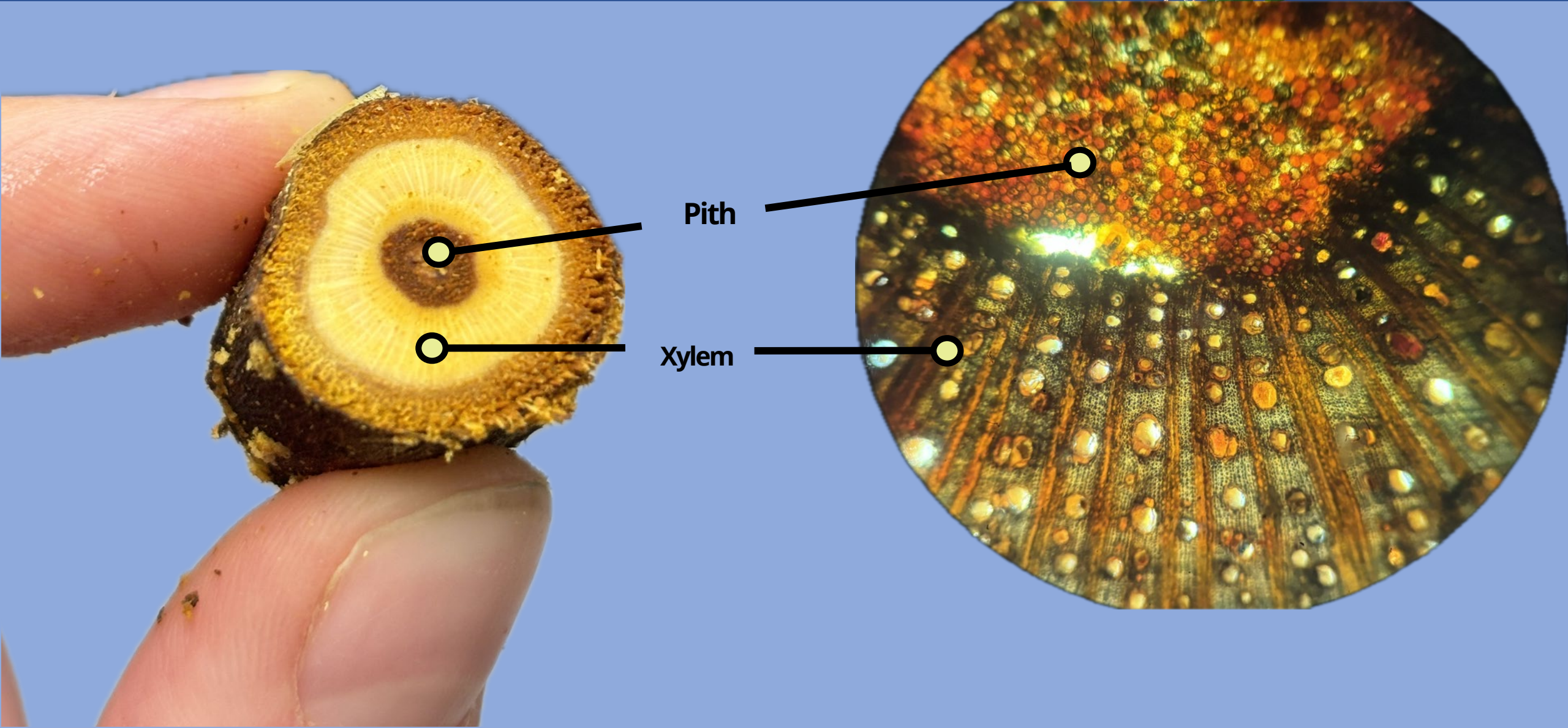
Confirming Mortality



*Most representative 30 μm cross-section from each 10 cm replicate selected for dye viability.



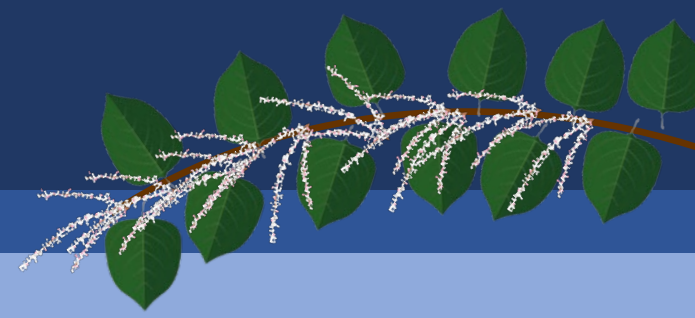
Confirming Mortality



Pith

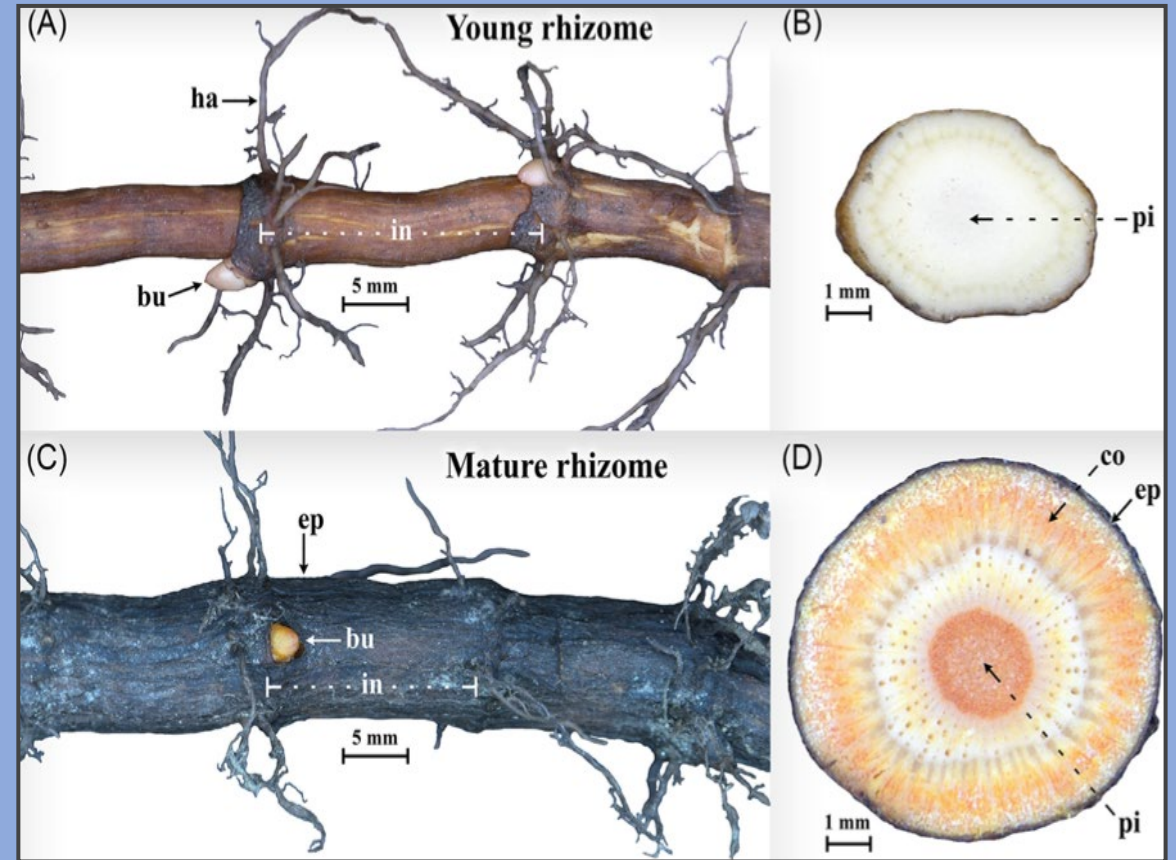
Xylem

Confirming Mortality

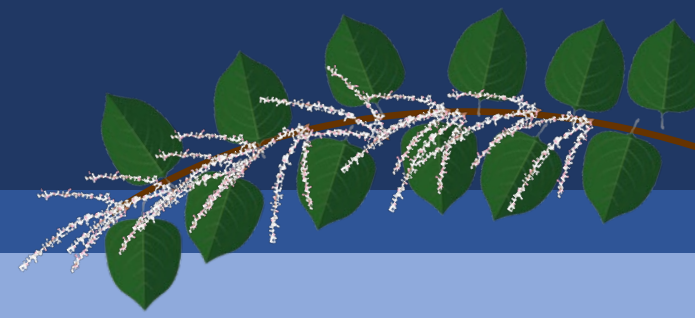


Pith linked to reproduction

- Pith linked to vegetative reproduction (Jousson et al. 2024)
 - clear piths ~97% vegetative growth
 - darker piths ~50% vegetative growth
- limitation → nodes (Lawson et al. 2021)



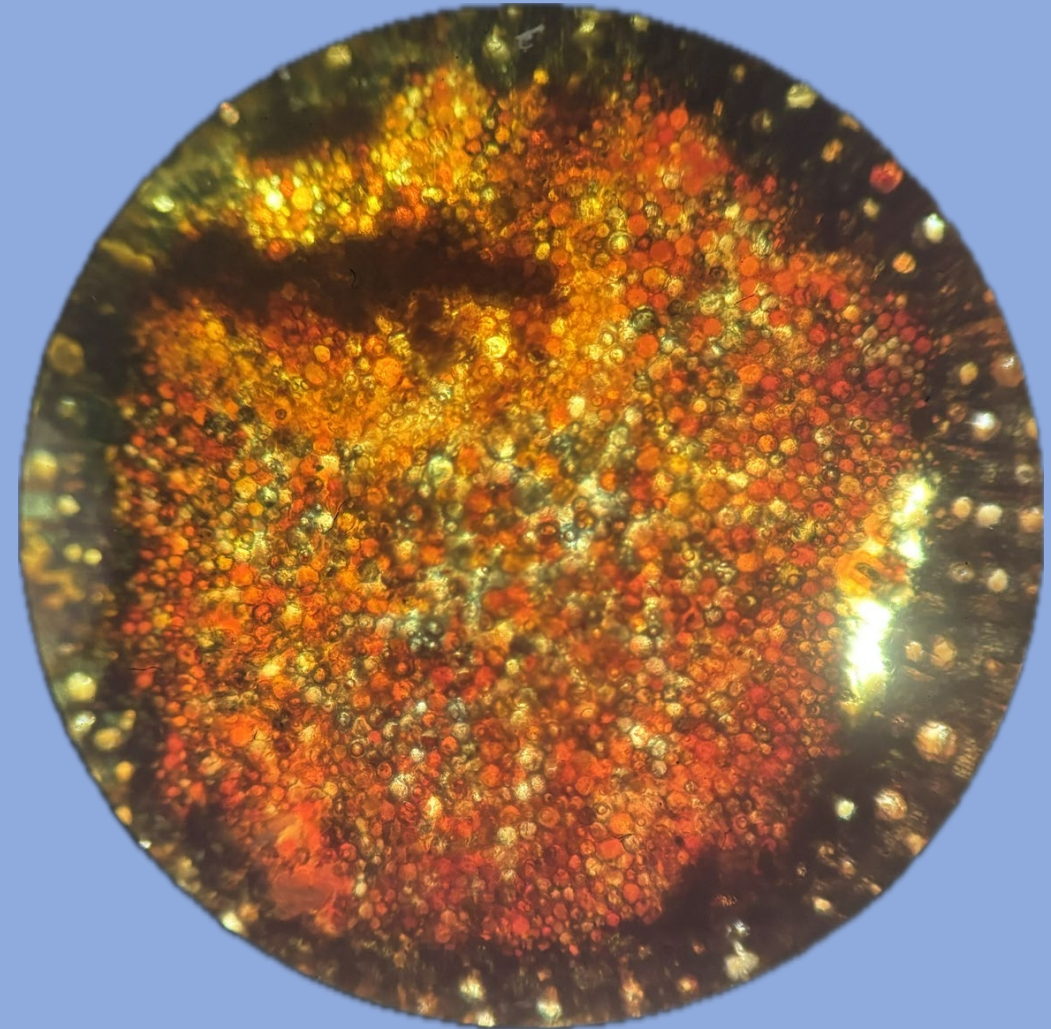
Confirming Mortality



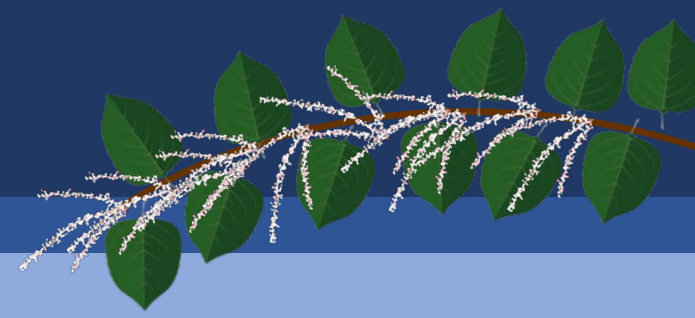
Methods:

- Collect rhizomes in Fall
- Subject to heat treatments
- Run half through greenhouse trials
- Evaluate the other half using the Evans Blue dye method.
- Compare results.

Stay Tuned for Results!



Thank You!



Special Thanks To:

My Committee:

Dr. Wendy Gardner	Thompson Rivers University	Academic Supervisor
Dr. Lauchlan Fraser	Thompson Rivers University	Core Committee Member
Dr. Catherine Tarasoff	(TRU Adjunct) Agrowest Consulting	Core Committee Member
Grahame Gielens	Ministry of Transportation and Infrastructure	Affiliate Committee Member

Research Funded By:



Ministry of
Transportation
and Infrastructure



**THOMPSON
RIVERS
UNIVERSITY**



Agrowest
Consulting Scientists



FRASER LAB



Photo Source: Ministry of Transportation and
Infrastructure

Adam Soames Email: soamesa13@mytru.ca