

Evaluation of novel materials in post-harvest storage of bare-root nursery stock



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Introduction

- 20 years of experience at Agriculture Canada
- Conducted research on horticultural crops
 - Precooling
 - CA storage
 - Physical treatment
 - Handling
 - Instrumentation and control



Introduction

Eliminate bulky soil-filled containers for nursery trees

- To reduce transportation cost
- To provide reasonable price to purchase
- To meet international trade regulations

Consider production parameters

- Timing in lifting and planting
- Environmental conditions through storage and transport
- Postharvest management to favor the highest survival rate



Bare-root project

- Literature review on bare-root production
 - Promising methods/parameters and challenges
 - Missing science
- Set up an experimental design
 - Exploratory study



Literature review

Introduction

Production

- Plant water availability
- Morphological characteristics
- Physiological characteristics

Cultural practices

- Fertilization
- Growth regulator
- Diseases and management

Post-harvest

- Pruning and trimming
- treatment and conservation methods
- Storage parameters
- Acclimatization
- Moisture loss
- Timing

Quality attributes

Purchasing decisions

Literature review

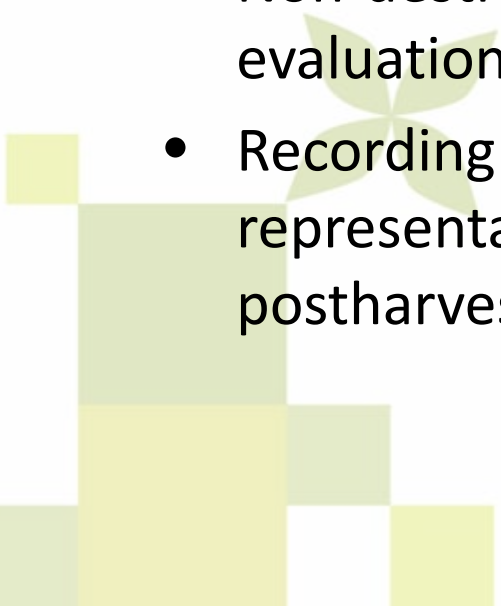
- Most important to determine dormancy of plant
 - Living status
- Moisture is a determinant factor
- Production is crop and site specific
- Timing in production is important

Would be of interest to:

- Have a non-destructive method to assess quality
- Record respiration through storage to evaluate quality
 - no method to assess real-time living/physiological status

Exploratory study: Objective

Measure the respiration rate to understand the effect of storage temperature-stress on bare-root seedlings through a real-time assessment of their living status.

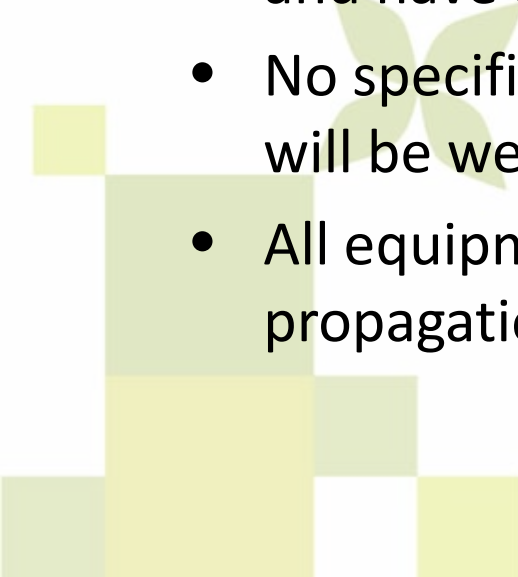
- Non-destructive method, not requiring exhaustive evaluations with results readily available
 - Recording respiration rate will allow to establish a representative scheme of the plant reaction through postharvest management.
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Material and methods: plant material

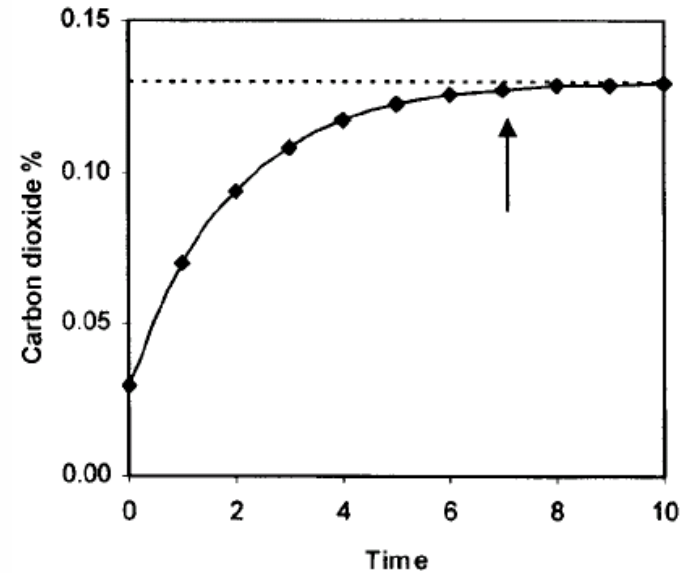
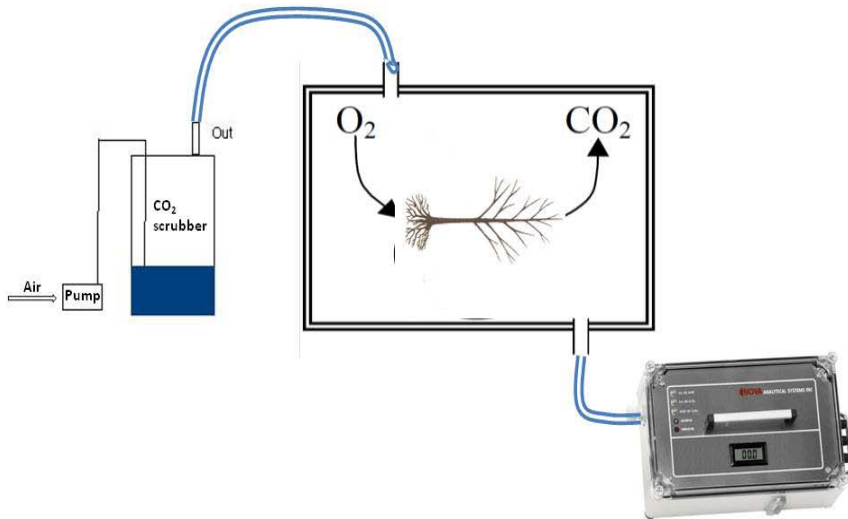
- 3 species will be evaluated:
 - 1 deciduous tree (either red oak, american mountain ash or tulip tree)
 - 1 coniferous tree (either Douglas or Fraser fir)
 - 1 rose (either John Cabot, Martin Frobisher or William Booth)



Material and methods: plant material

- All species should be taken from the same site
 - All seedlings should be dormant at the time of lifting (November)
 - After lifting, the seedlings will be washed and allowed to dry for 2 hours under controlled temperature.
 - Seedlings should all be of the same size, exempt of bruises and have an healthy look.
 - No specific packing will be used but RH and temperature will be well controlled and monitored
 - All equipment should be sanitized to prevent any disease propagation
- 

Material and methods: workbench



$$R \text{ Rate} = (\text{increase \% CO}_2 * \text{flow rate}) / (\text{mass})$$

Bare-root

01/01/12 20/02/12 10/04/12 30/05/12 19/07/12 07/09/12 27/10/12 16/12/12 04/02/13 26/03/13

Litterature review

Literature review on bare roots production: MP



Revision by external reviewer: TBA



Corrections of the final document: MP



Propose an experimental design: MP-BG



Prepare experimental set up: JL and BG



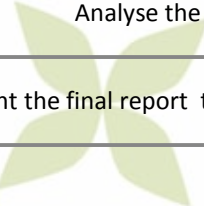
Execute the experiment: JL and BG



Analyse the experimental Data: BG



Write and present the final report to industry: MP and BG



Long term goal

- To predict the survival rate of plants after outplanting by measuring their respiration status during storage.
- To prevent desiccation – hyperbaric storage might be an interesting and appropriate alternative to dipping.



Thank you



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