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Characterization of Root Exudates From Crested Wheatgrass (*Agropyron cristatum*)

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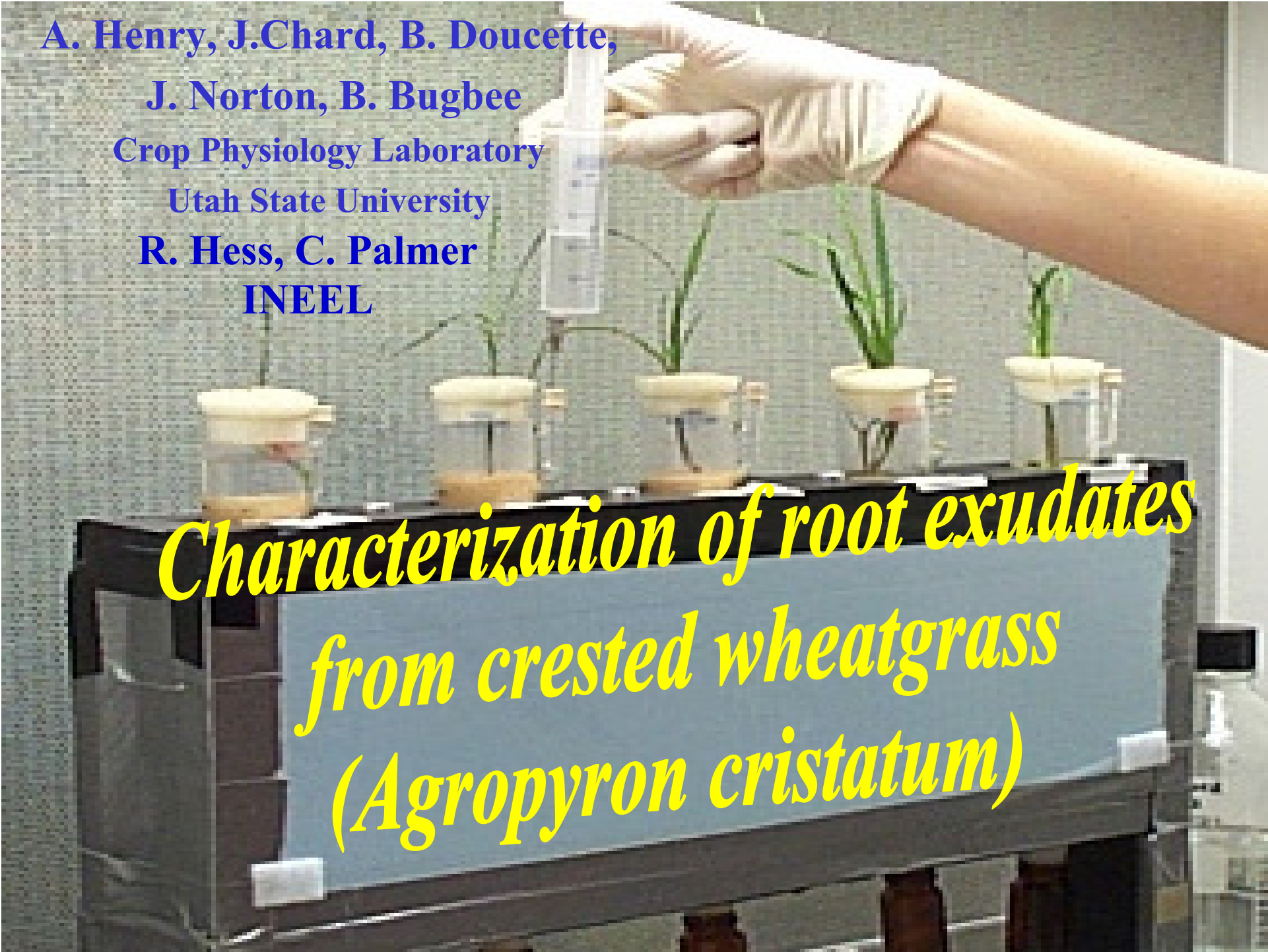
J. Norton, B. Bugbee

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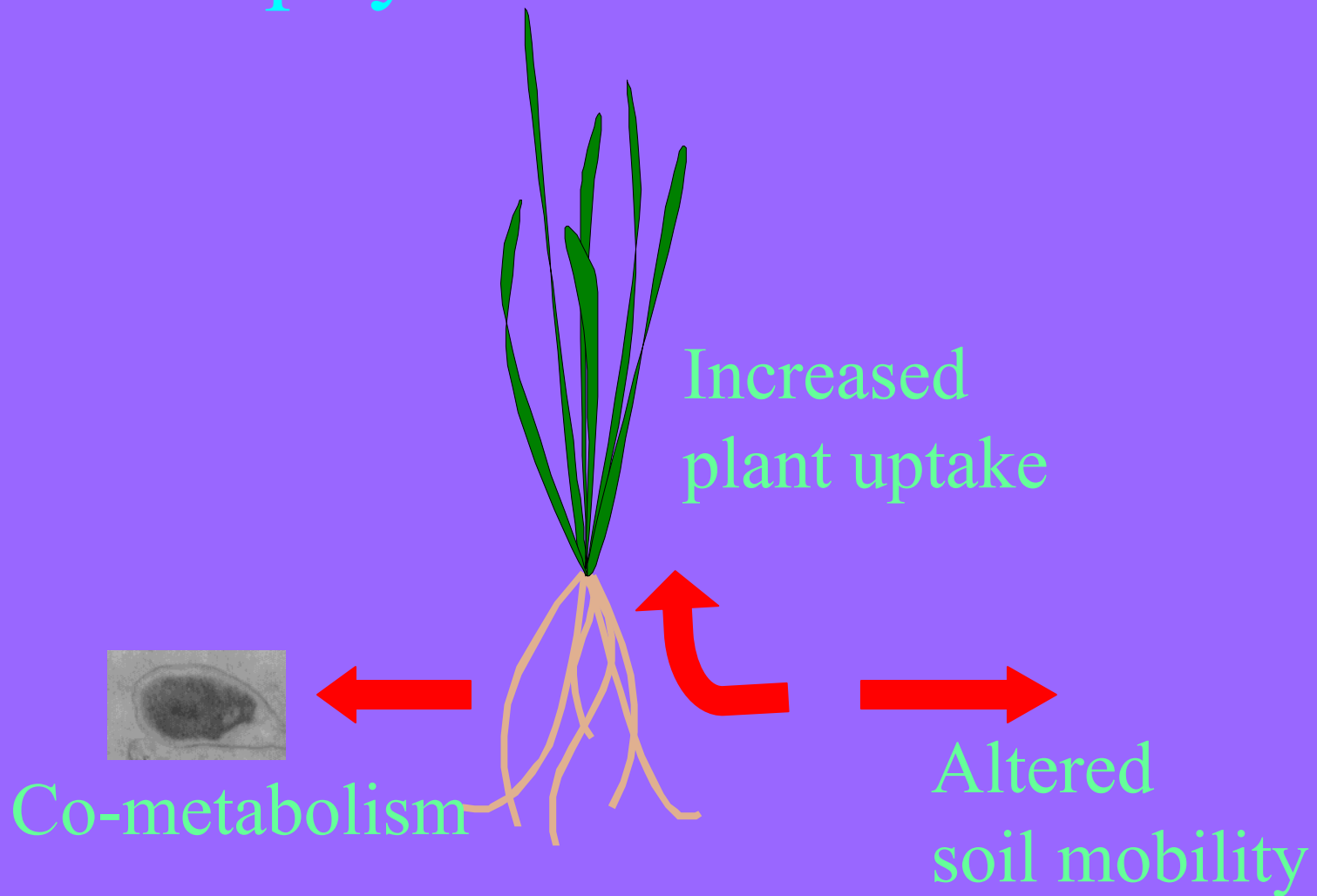
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***Characterization of root exudates
from crested wheatgrass
(*Agropyron cristatum*)***

Exudates are important to phytoremediation

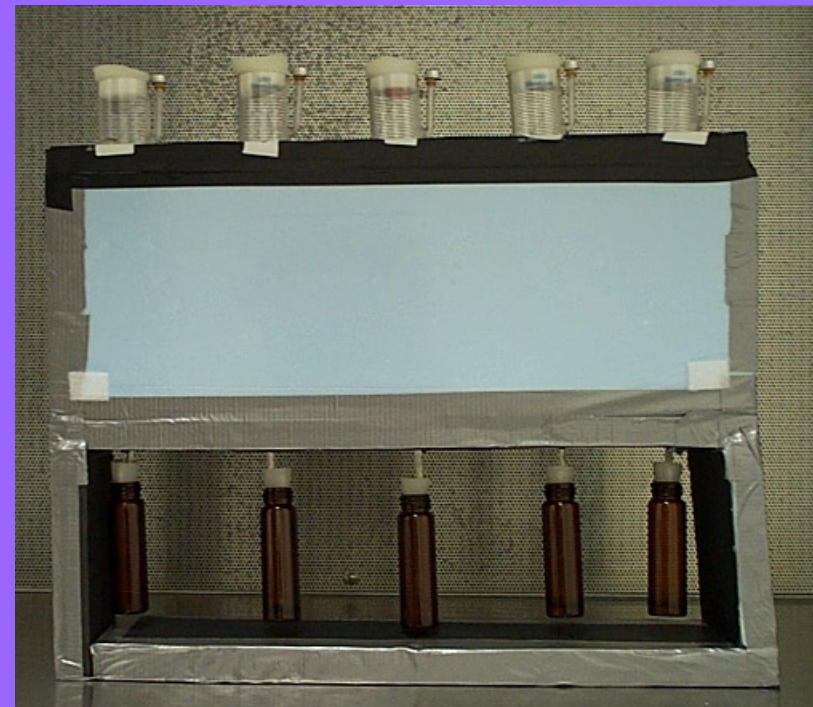
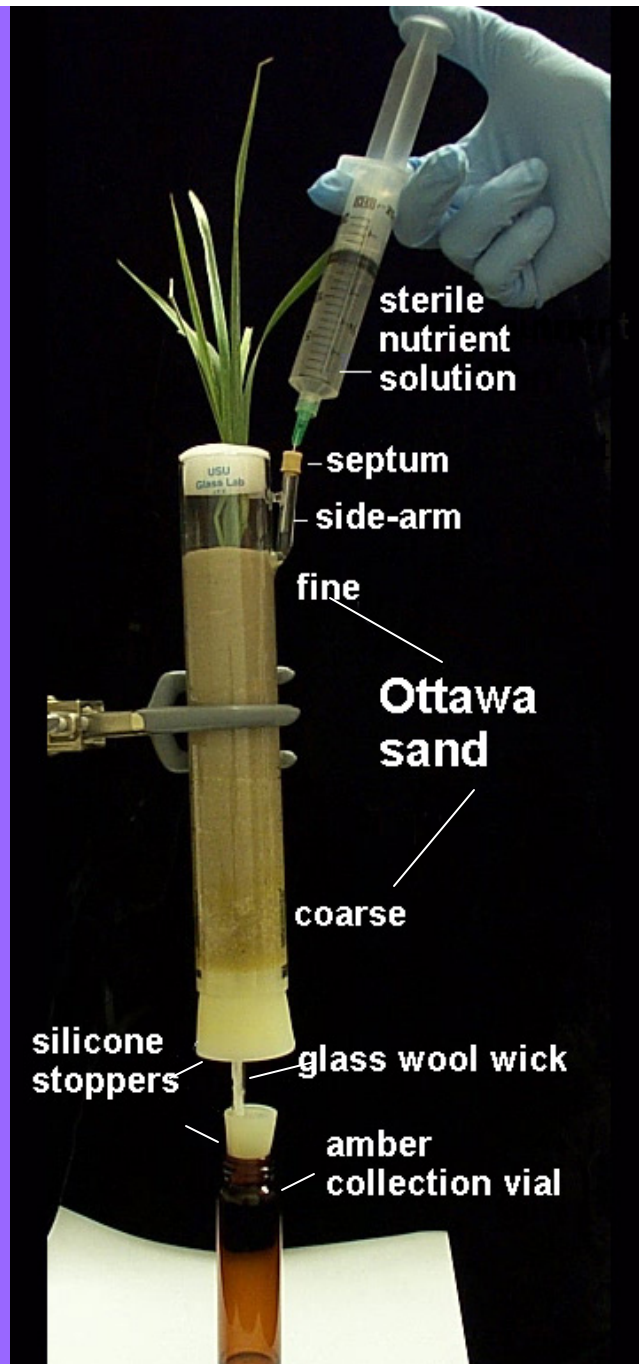


Objectives

1. Develop cultural system to grow healthy plants
2. Develop procedures for aseptic culture of:
 - a. Seeds
 - b. Plants
3. Develop procedures to manipulate exudation with:
 K^+ , NH_4^+ , O_2 , H_2O
4. Develop procedures to quantify exudates
 - a. TOC
 - b. GC-MS, HPLC, ion chromatography



Plant Growth Containers



Growing healthy plants: Materials and Methods

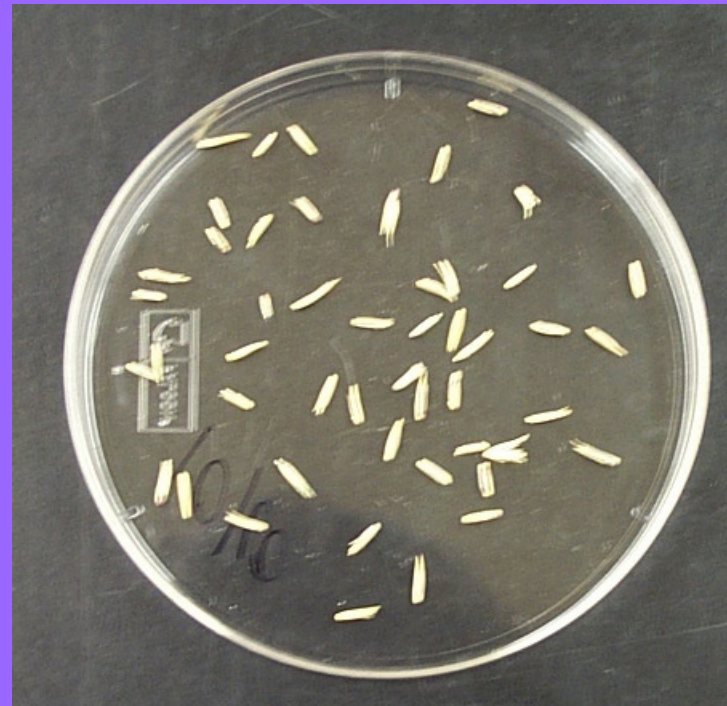
- Nutrient solution: standard hydroponic solution, no chelate
- Growth medium: Ottawa sand
- Photoperiod: 16 hours



Techniques for sterilizing seeds



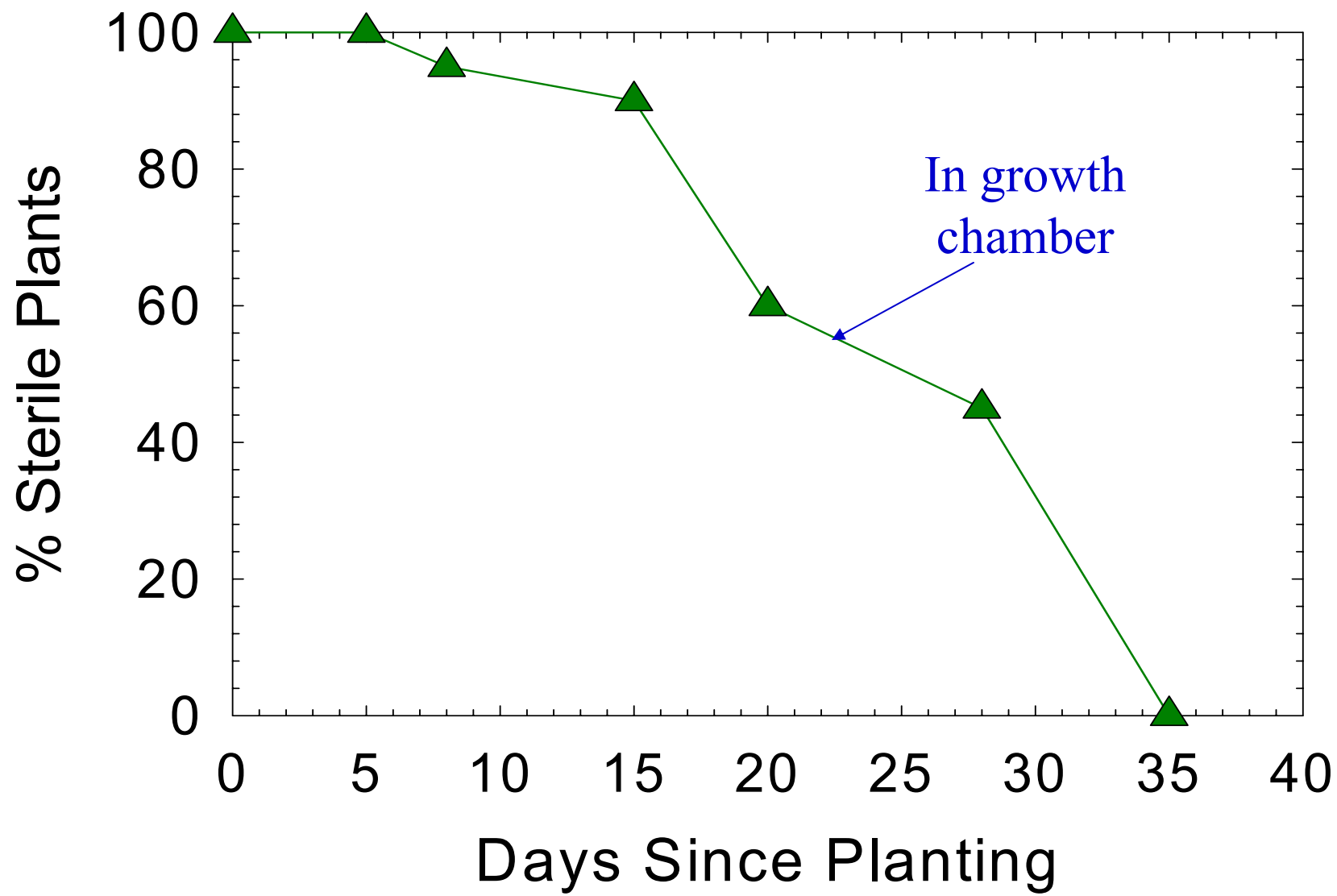
20% Clorox for 60
minutes



Rinse and plate on media
for 3-5 days

Assessing microbial contamination in the columns





Plants are now grown in a
laminar flow hood

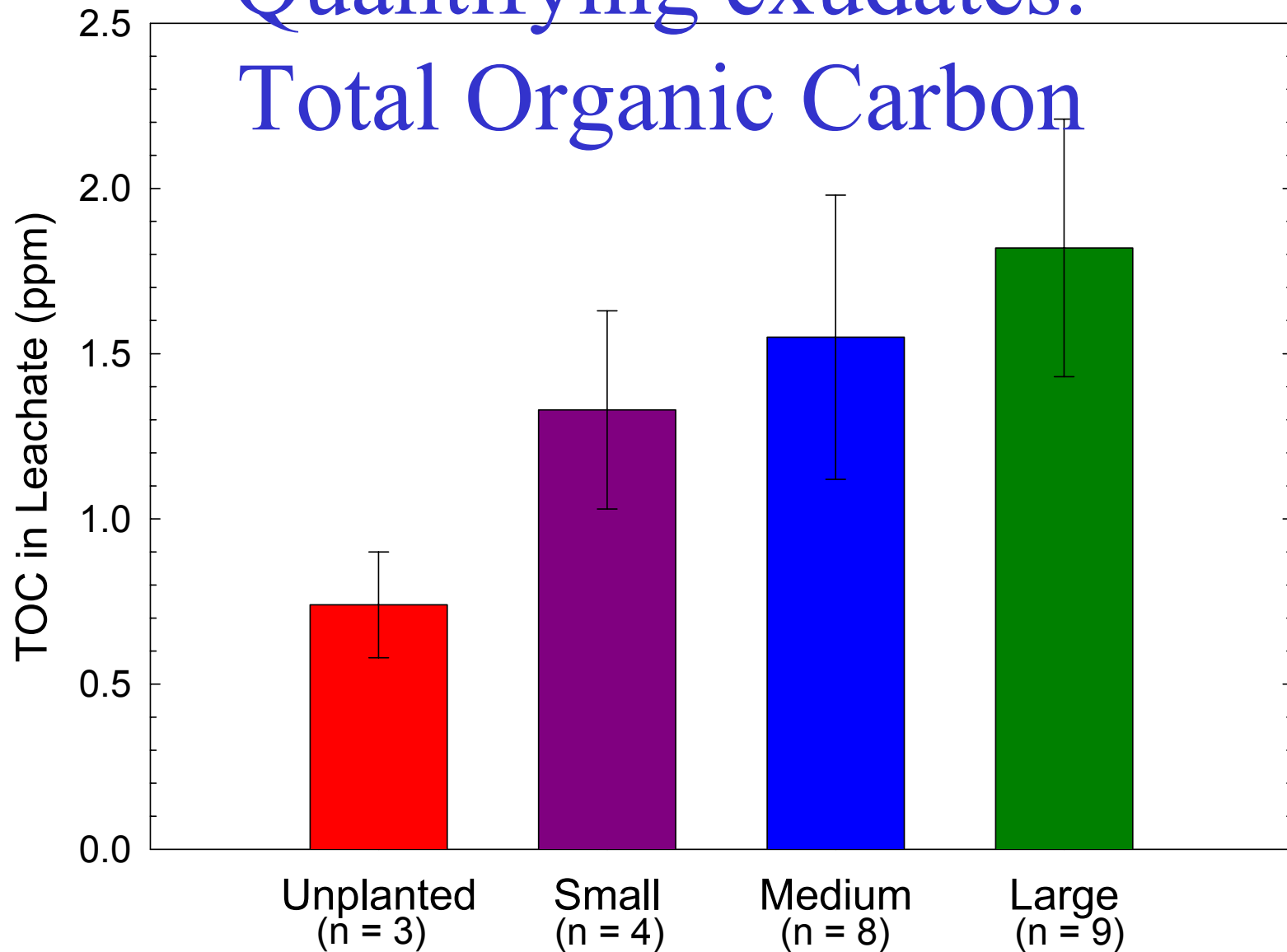


Increasing Exudation

- Changing $\text{NH}_4^+:\text{NO}_3^-$ ratio
- K^+ stress: $5 \rightarrow 1 \text{ mM K}^+$
- Drought stress
- Hypoxia: flooding



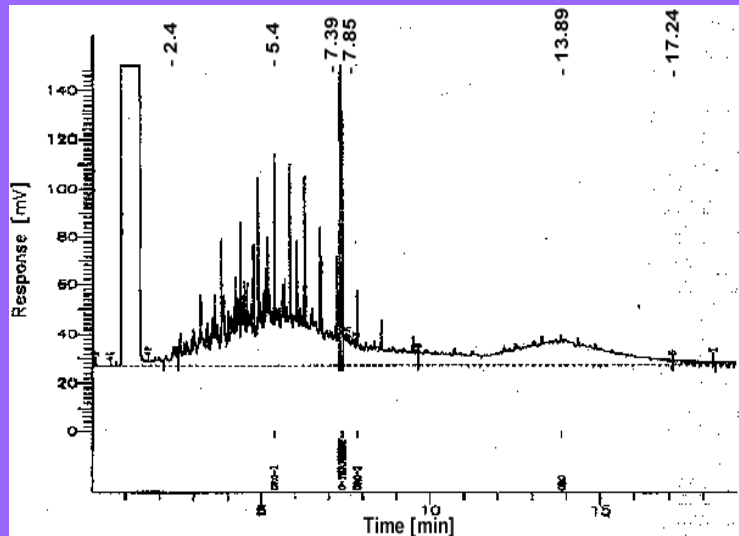
Quantifying exudates: Total Organic Carbon



Carbon Associated with glass wool

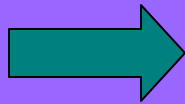
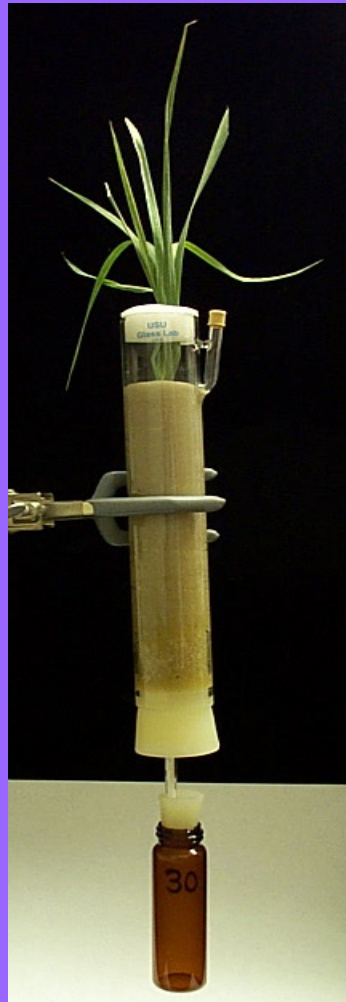


Quantifying exudates: GC-MS, HPLC, ion chromatography

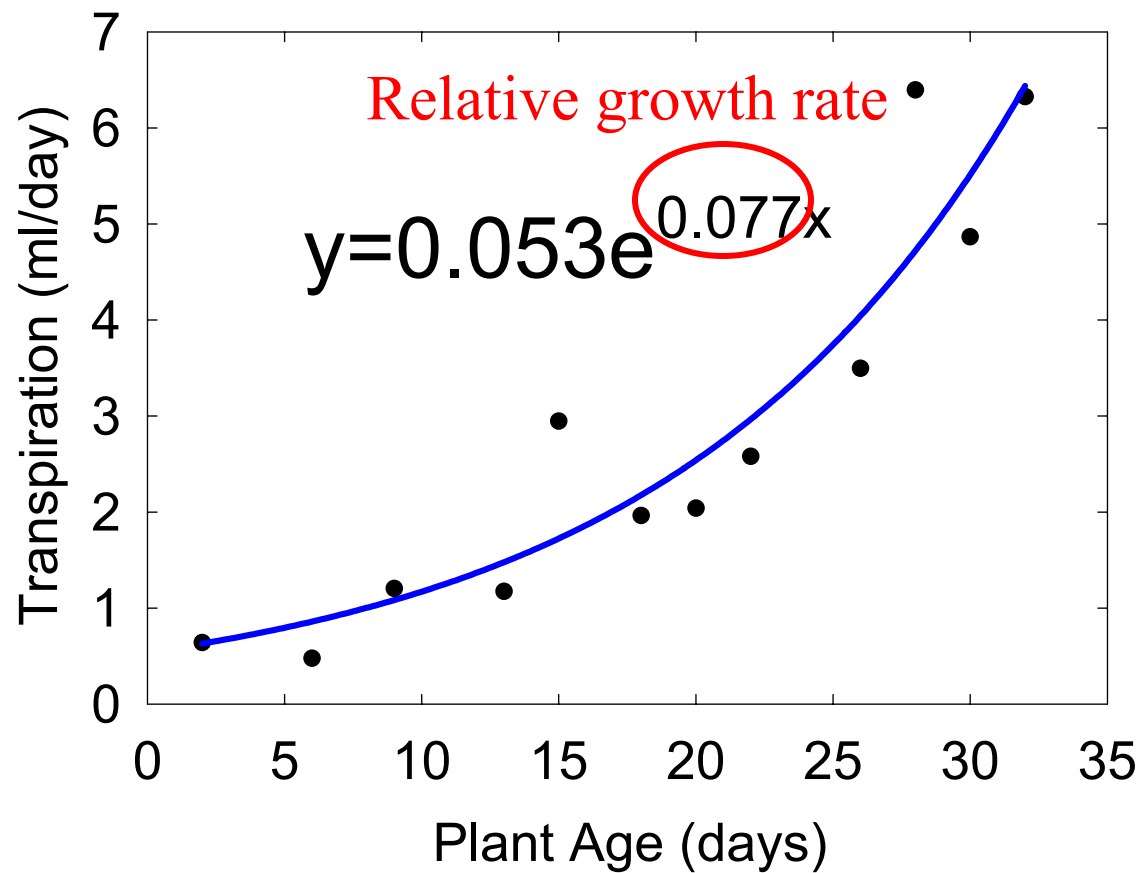


- Organic acids
- Amino Acids
- Sugars
- Phenolics
- Enzymes
- Flavonoids
- Vitamins

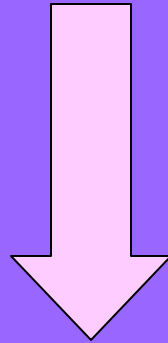
Scaling to the field: Quantifying exudates in terms of growth rate



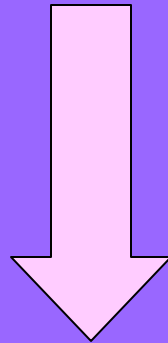
Transpiration Data → Growth Rate



RGR



$\mu\text{g C exuded} * \text{g new growth}^{-1} \text{ day}^{-1}$



Root: shoot

$\mu\text{g C exuded} * \text{g new root growth}^{-1} \text{ day}^{-1}$

Acknowledgement

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Carl Palmer

Jenny Norton

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