Ozone and the Shelf Life of Cut Roses: Test Tubes to Trials

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Agenda

- Rose Stats

- Bacteria Problem

- Current Antibacterials & Ozone as a Solution

- Experimental Setup

- Results

- Significance of Research

- Future Research

- Acknowledgements

Rose Stats

- Canadian floriculture sales in 2002 were CDN $1.42 billion; roses were the #1 cut flower sold

- Premature wilting of cut roses results in an economic loss for growers; on average about 20%, but up to 50%

Bacteria Problems

- Shelf-life of cut roses is directly related to water uptake

- Addition of antibacterial compounds to cut rose storage water increases water uptake, enhancing shelf-life

Bacteria ⟷ **Water Uptake** ⟷ **Value of Rose Crop**

Current Antibacterials

- In the cut rose industry, a lot of money is spent on antibacterials that have limited effectiveness

Antimicrobial Agent	Problem
HQC	Expensive, Resistance
Chlorine	Toxicity
Acid	Expensive, Moulds, Toxicity
Sugars	Provides bacteria with C

Ozone: An Ideal Candidate

- Less expensive than current antibacterials

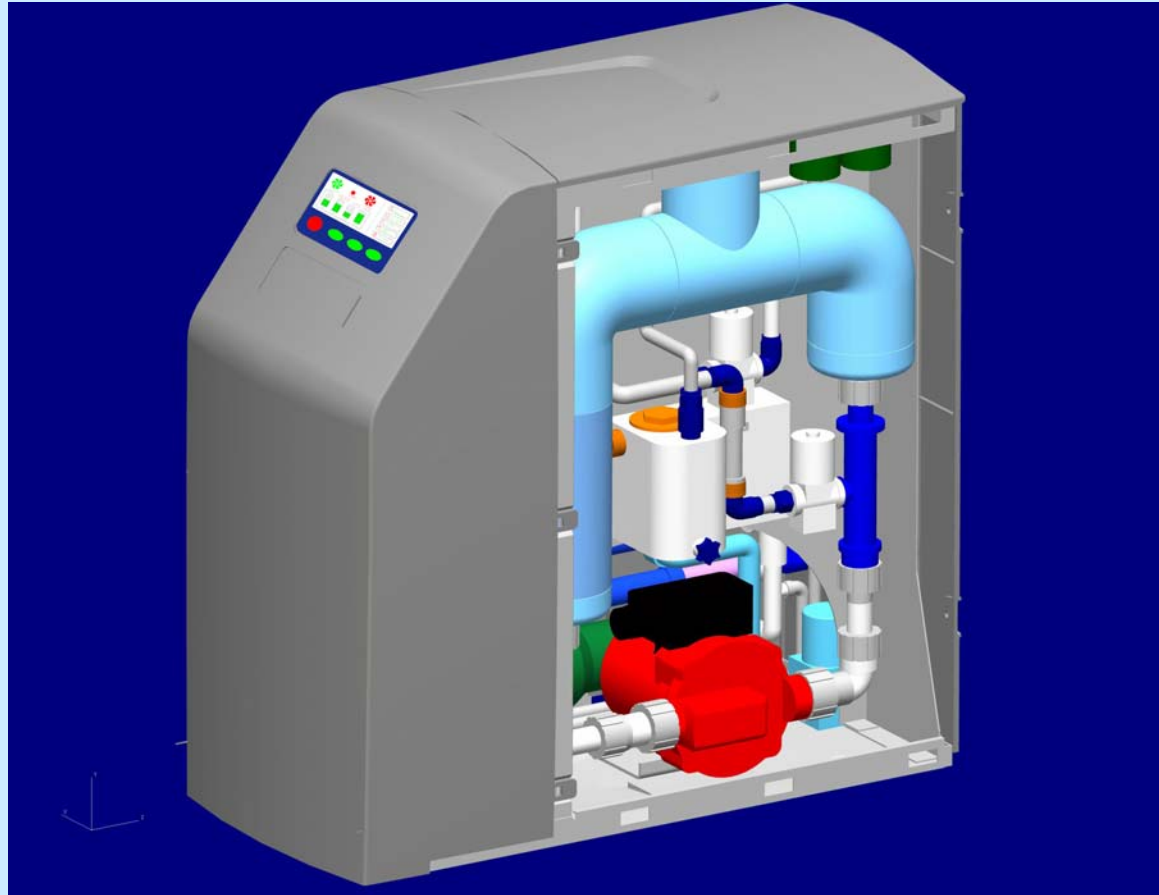- Safer for both roses and workers

- More effective
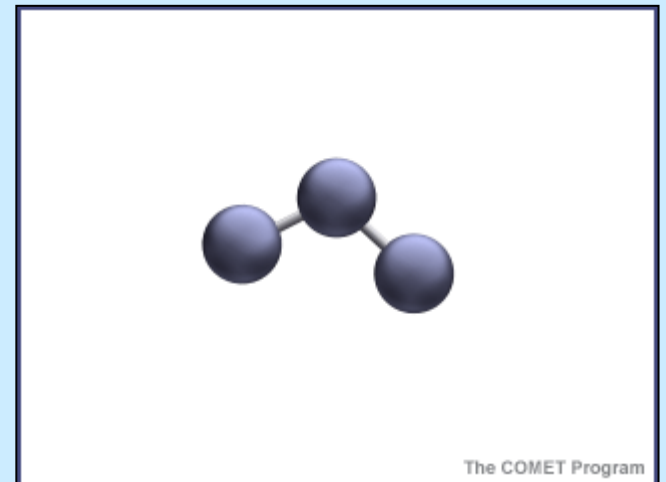
My Research

To determine the efficacy of aqueous ozone at increasing the shelf-life of cut roses

Experimental Setup

Central Purification System

Experimental Setup, cont'd

Controlled Climate Chamber

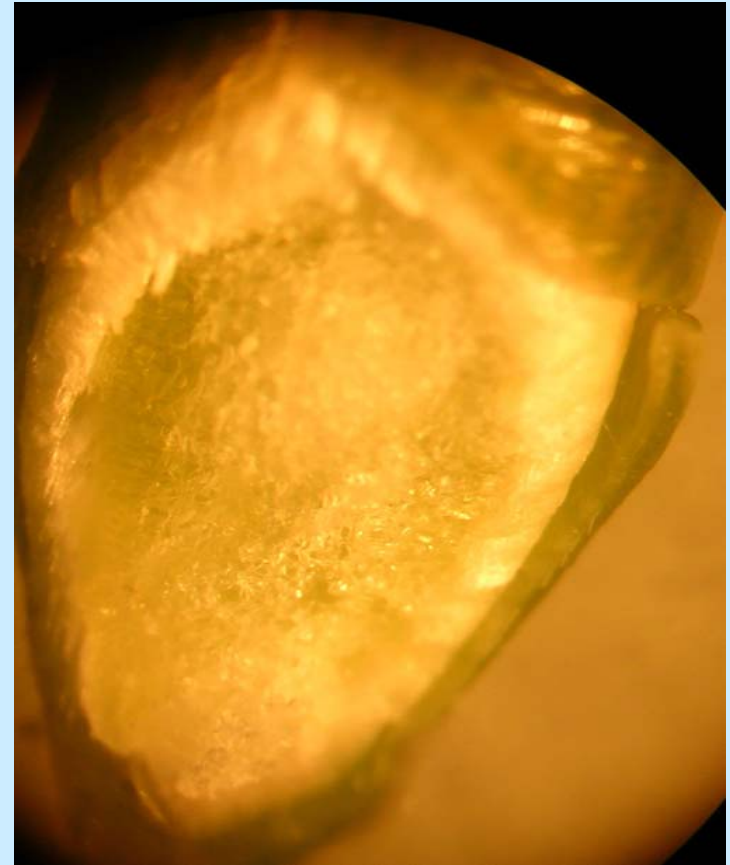# Results

Aesthetic Appearance

Day 5 - Deionized Water
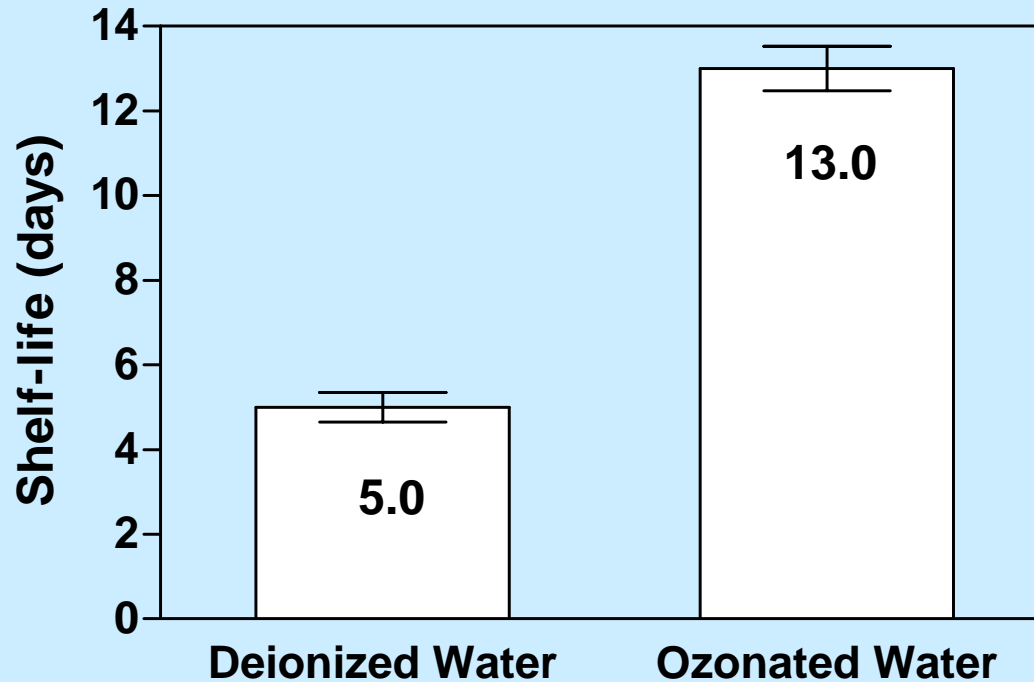
Day 5 - Ozonated Water

Bacteria Problems, cont'd

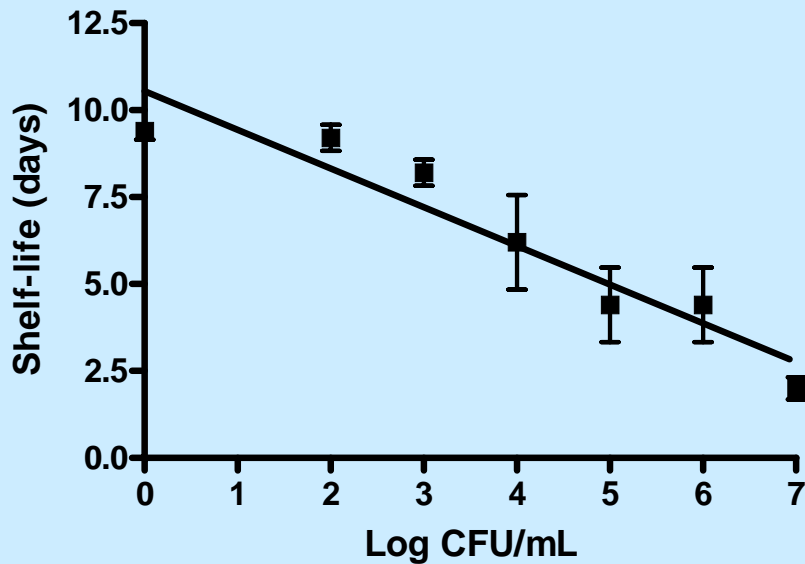**Cut Rose End in Deionized Water**

Cut Rose End in Ozonated Water

Shelf-life

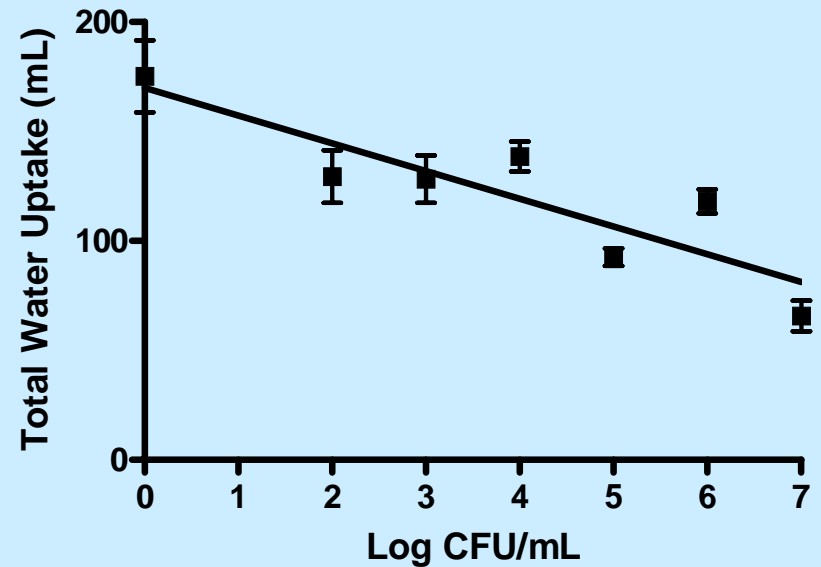**Criteria:** Development of bent neck, petal/leaf discolouration, petal/leaf wilting, petal/leaf abscission
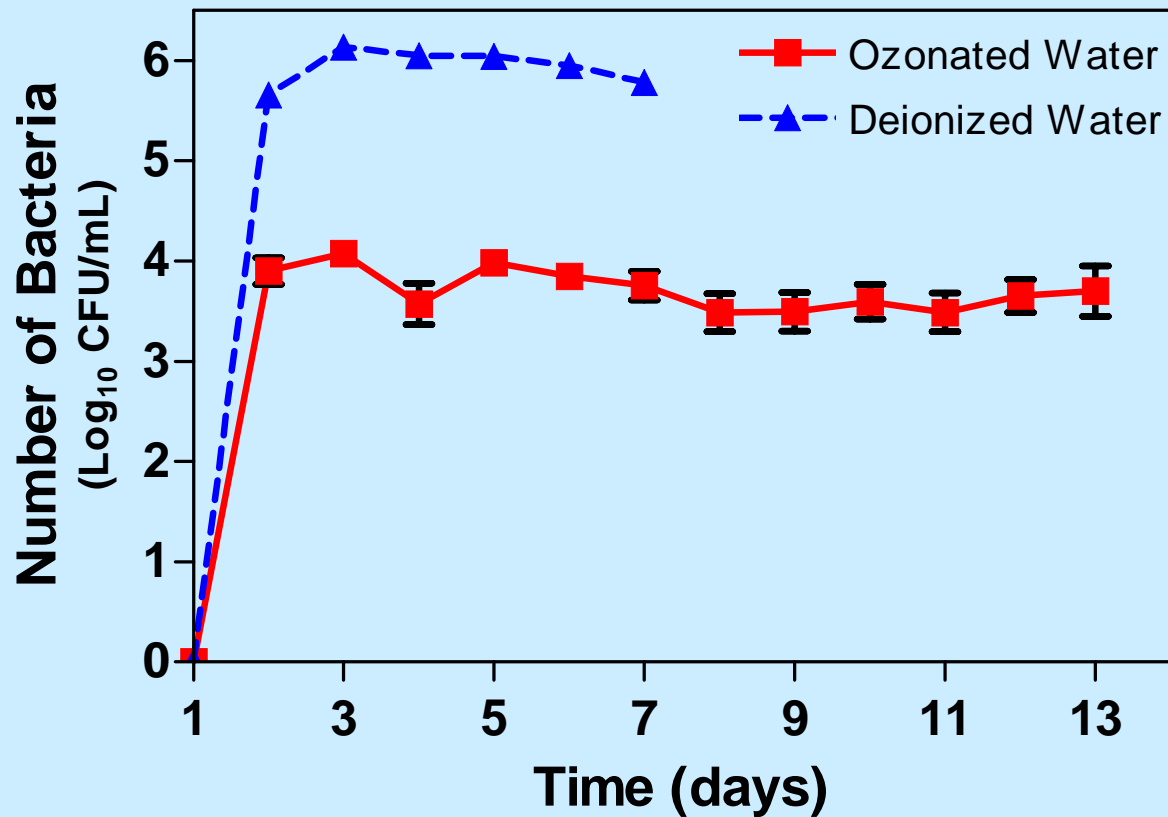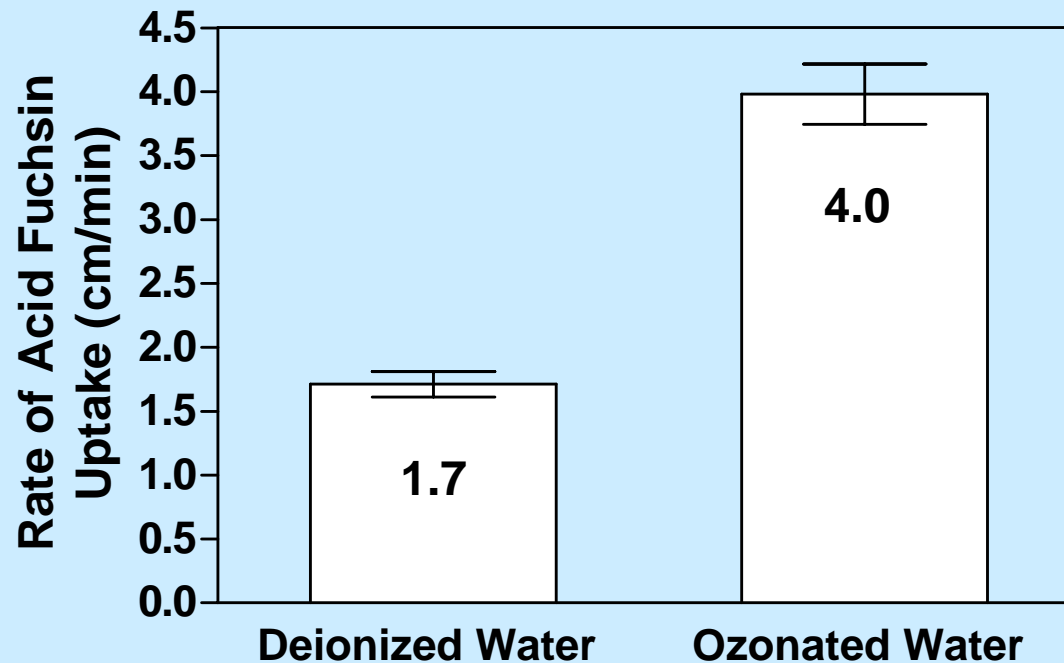
Bacteria & Rose Health

n = 5, *P < 0.0001*

Bacteria in storage water

Acid Fuchsin Dye Uptake
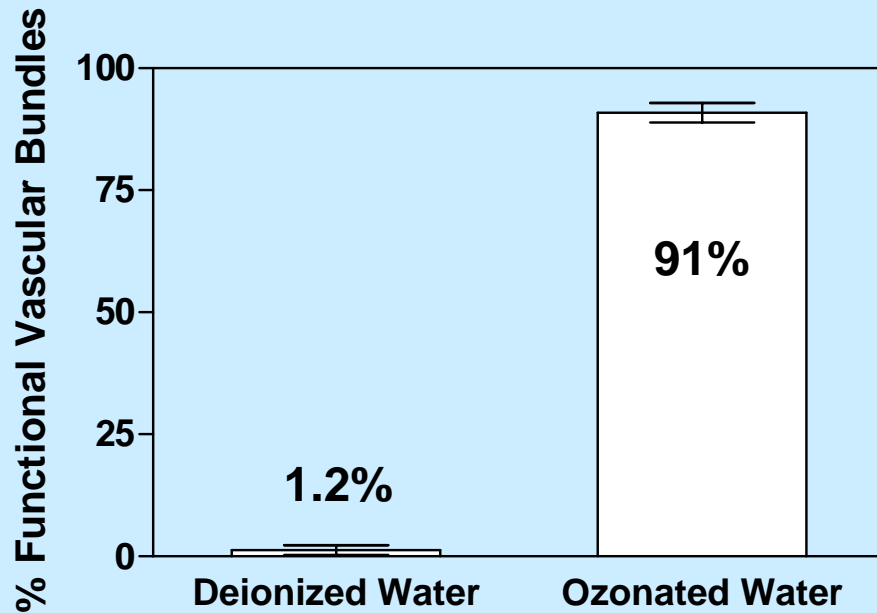

n = 10, *P < 0.0001*

Acid Fuchsin, cont'd

Deionized Water

Ozonated Water

% Functional Vascular Bundles

91%

1.2%
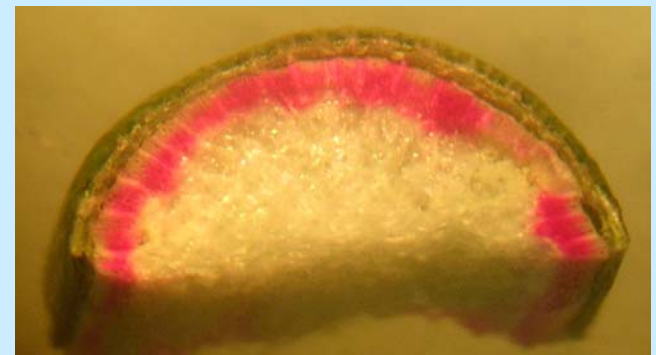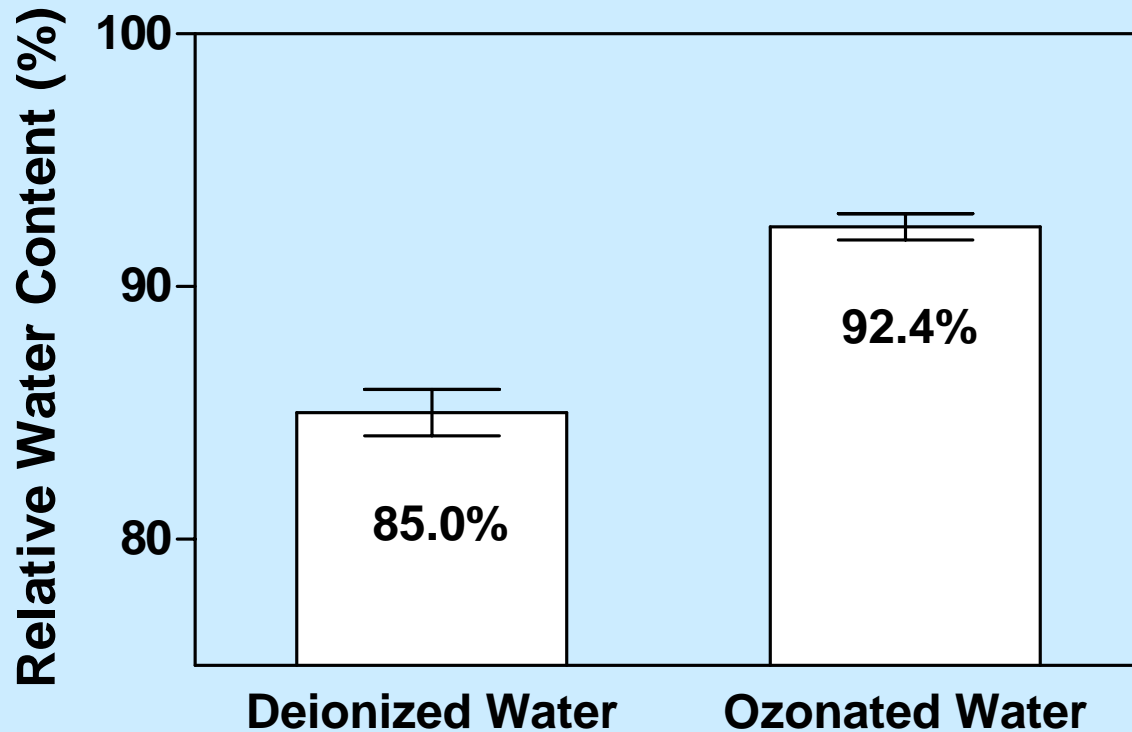
Deionized Water   Ozonated Water

n = 10, *P < 0.0001*

Relative Water Content

n = 10, **P < 0.0001**

Evaluating Ozone

- Ozone, from 1.0 to 5.5 ppm, was effective at reducing the bacterial load in rose storage water

- Roses treated with ozone had three times longer shelf-life

- No sign of toxicity to ozone was seen at concentrations up to 5.5 ppm

Where are we now?

Significance of Research

- Provides growers with an antibacterial agent that is:
  - Effective
  - Safe for workers
  - Non-toxic to roses
  - Economical

- Growers experience less product loss
- Consumers are provided with longer lasting roses

Significance of Research, cont'd

- Once an ozone systems is set up in the greenhouse, it can be used for other applications such as:

  - Surface sterilization
  - Recirculating nutrient solutions
  - Water treatment
  - Likely applicable to other plant species

What Now?

Investigate the mechanism by which bacteria reduce water uptake and shorten cut rose shelf-life
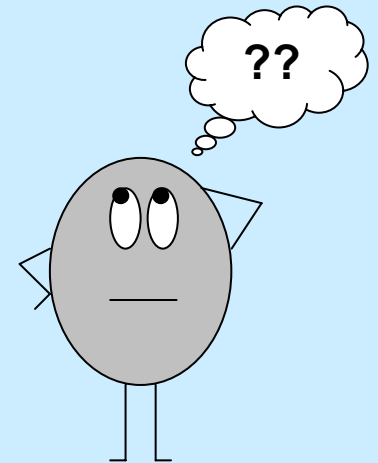
Acknowledgements

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