Impacts of recycled water on plant physiology and growth

Bert Cregg, Ph.D.
Michigan State University

Department of Horticulture
Department of Forestry
Is recycled water safe for my crops?
What are potential impacts of recycled water on crops?

- Salts/EC
- pH
- Solids/deposition
- Pesticides
- Pathogens
Salts/EC

- Direct toxicity
- Indirect effects
- Osmotic effects
Irrigation EC impacts growth of *Sequoia sempervirens* ‘Aptos blue’

Nackley et al., 2015
pH effects

- pH of retention basins can vary widely
  - Season
  - Time of day
  - Depth within basin
The pH factor

Features - Irrigation: water recycling

Water pH in recycling irrigation ponds changes seasonally. Test the pH regularly to ensure healthy crops.

June 5, 2017
Haibo Zhang and Chuan Hong
pH of water from nursery run-off catchment basins in MD, MS and VA

<table>
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<th>Waterway</th>
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</tr>
</tbody>
</table>

Preferred range: 5.2–6.8

Copes et al., 2017
Recycled water pH varies widely

Recycled water pH ranges and relative dominance

Zhang and Hong. 2017
Recycled water pH also varies with depth.

Zhang and Hong. 2017
Solids/deposition
Solids/deposition

• Various materials in irrigation water can result in deposits on leaves
• Inhibits photosynthesis
• Clog stomatal pores
• Aesthetic issues
Pesticides

- Various pesticides have potential for phytotoxic effects
  - Herbicides
  - Insecticides
  - Fungicides
  - PGR’s
Type of exposure

• Surface (leaf) deposition
• Uptake from media
Herbicides

• Basis of herbicide selectivity
Residual herbicide impacts shoot growth of fountain grass

Adapted from Bhandary et al., 1997
Variation in crop sensitivity to residual Oryzalin

Adapted from Bhandary et al., 1997
Insecticides
Effect of residual chlorpyrifos on crop growth

Parween et al., 2011
Growth and physiology of *Hydrangea* in response to chlorpyrifos application
Irrigation with simulated run-off did not affect photosynthetic efficiency.
Pathogens
Pathogens

- Largest risk to crops from water recycling
  - Fungi
    - Phytophthora
    - Fusarium
  - Bacteria
  - Viruses
  - Nematodes
Minimizing potential adverse impacts of recycled water

• Follow BMP’s
  – Reduce inputs from run-off
Minimizing potential adverse impacts of recycled water

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Minimizing potential adverse impacts of recycled water

• Follow BMP’s
  – Filtration
Summary

• Is recycled water safe for nursery crops? Yes
• Main potential issues are pathogens, salts, pH effects, and pesticides
• Risks can be minimize by following BMP’s
Thank you!