Cyanobacterial Toxin Uptake in Food Crops and Implications for Human Health

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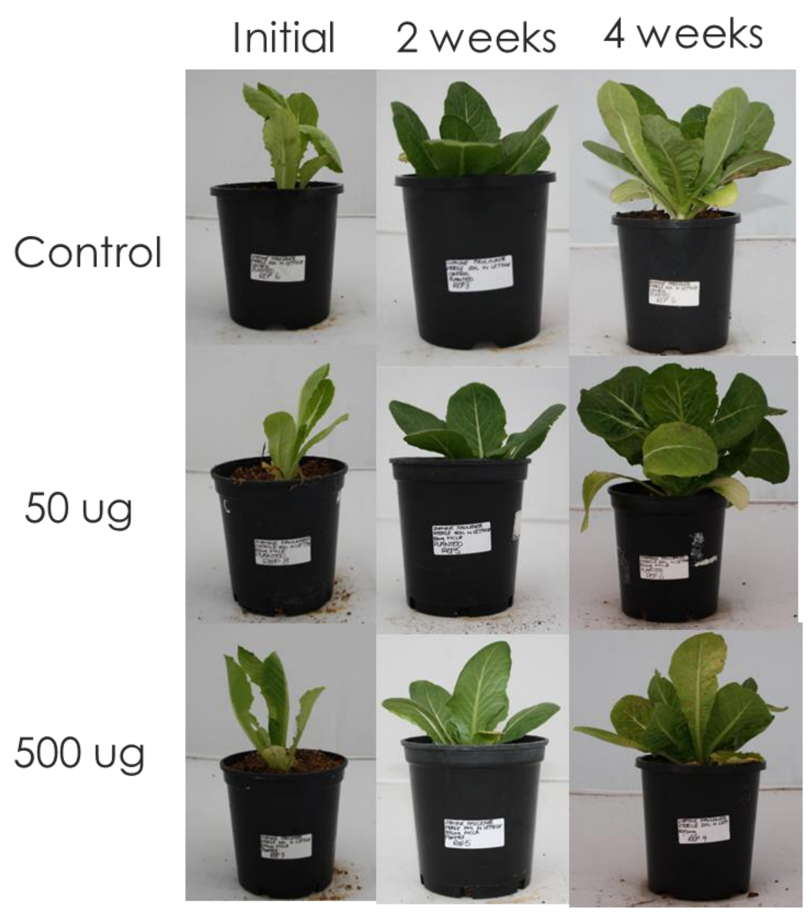

Figure 2 showing growth of plants exposed to toxin from approximately 3 weeks old.

Figure 4 showing growth of plants exposed to toxin from approximately 7 weeks old.

Background

• Recycled water is increasingly used for irrigation, with South Australia being the nation's second-largest recycler
• Cyanobacterial blooms in water sources pose risks, including toxin production
• Most common toxin: Microcystin-LR (MC-LR)
• Potential for toxins to enter the food chain via irrigation

Significance

• Addresses food safety concerns related to recycled water use in agriculture
• Provides insights into toxin internalization and accumulation in edible crops
• Informs risk assessment and management strategies for safe use of recycled water in irrigation

Connection to Challenge 1

• Building community understanding of healthy waterways in the face of climate change - providing insights into the health impacts of cyanobacterial blooms, which may become more prevalent with climate change.
• Building community water security foresight capability - helping assess potential future risks to water quality and human health under different climate scenarios.
• Stress testing integrated water delivery operations - identifying potential water quality issues that water delivery systems need to be prepared to handle.
• Anticipating transformation for communities, agriculture and the environment - highlighting potential future challenges for water use and management due to increased cyanobacterial blooms.

Project Aims

1. Optimise a method for toxin extraction and determination in plant material
2. Determine toxin transport and accumulation from roots to edible plant components
3. Determine the effect of toxin exposure on plant growth
4. Evaluate human health risks from exposure to internalised toxins in edible plants

Methodology

• Experiments using pot plants
• Focus on lettuce
•Testing at different growth stages
  - at approximately 3 weeks old
  - at approximately 7 weeks old
• Toxin exposure for either 2 or 4 weeks
• Analysis using HPLC for toxin quantification
• Plant physiology measurements taken at harvest as well as during experiment

Key Findings

• No visible differences between toxin exposed and control plants
• Potential growth rate impact
• Confirmation that toxin does transport from the roots to the shoots

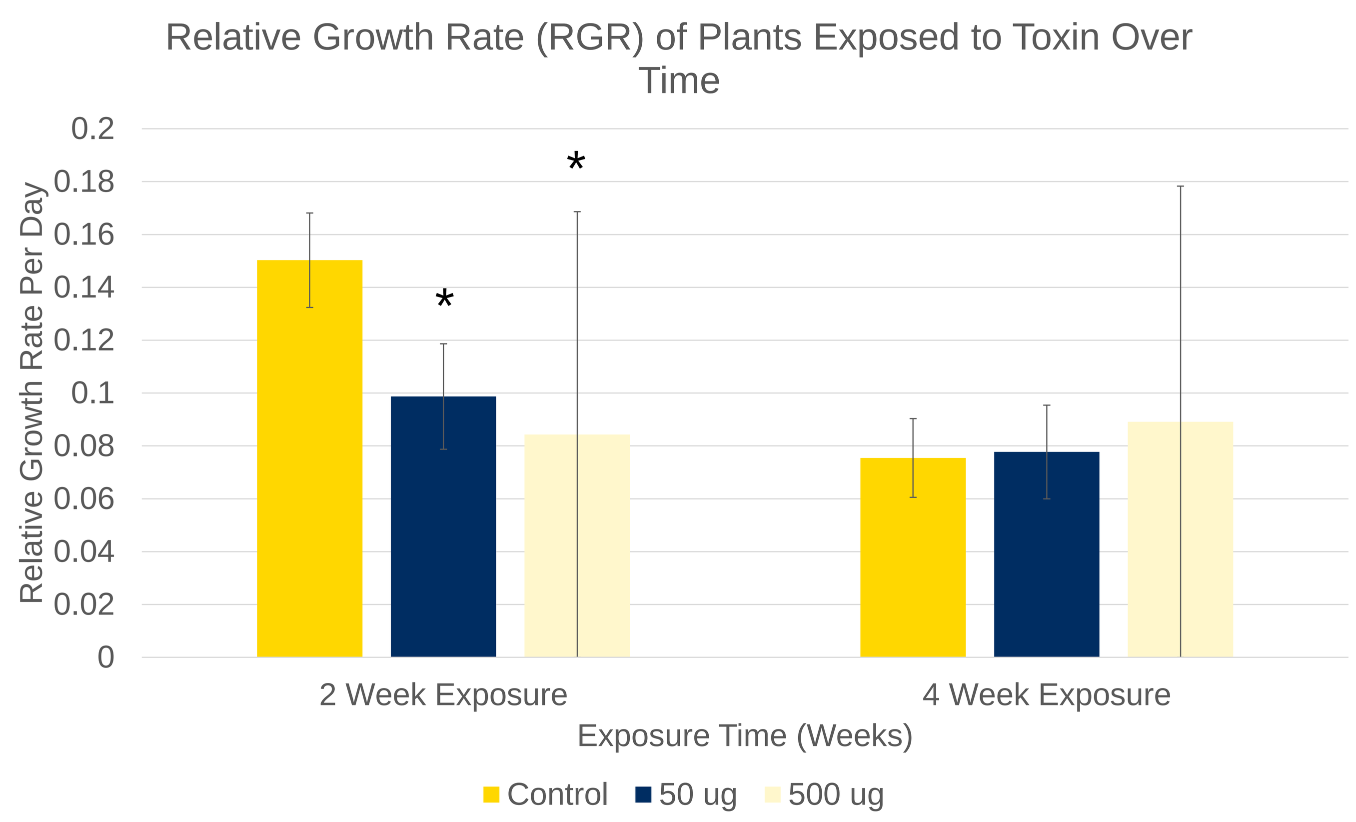

Figure 1 showing the average calculated relative growth rate of plants exposed to toxin after approximately 3 weeks of growth. Error bars showing standard deviation.
* Indicates statistical significance when compared to the control

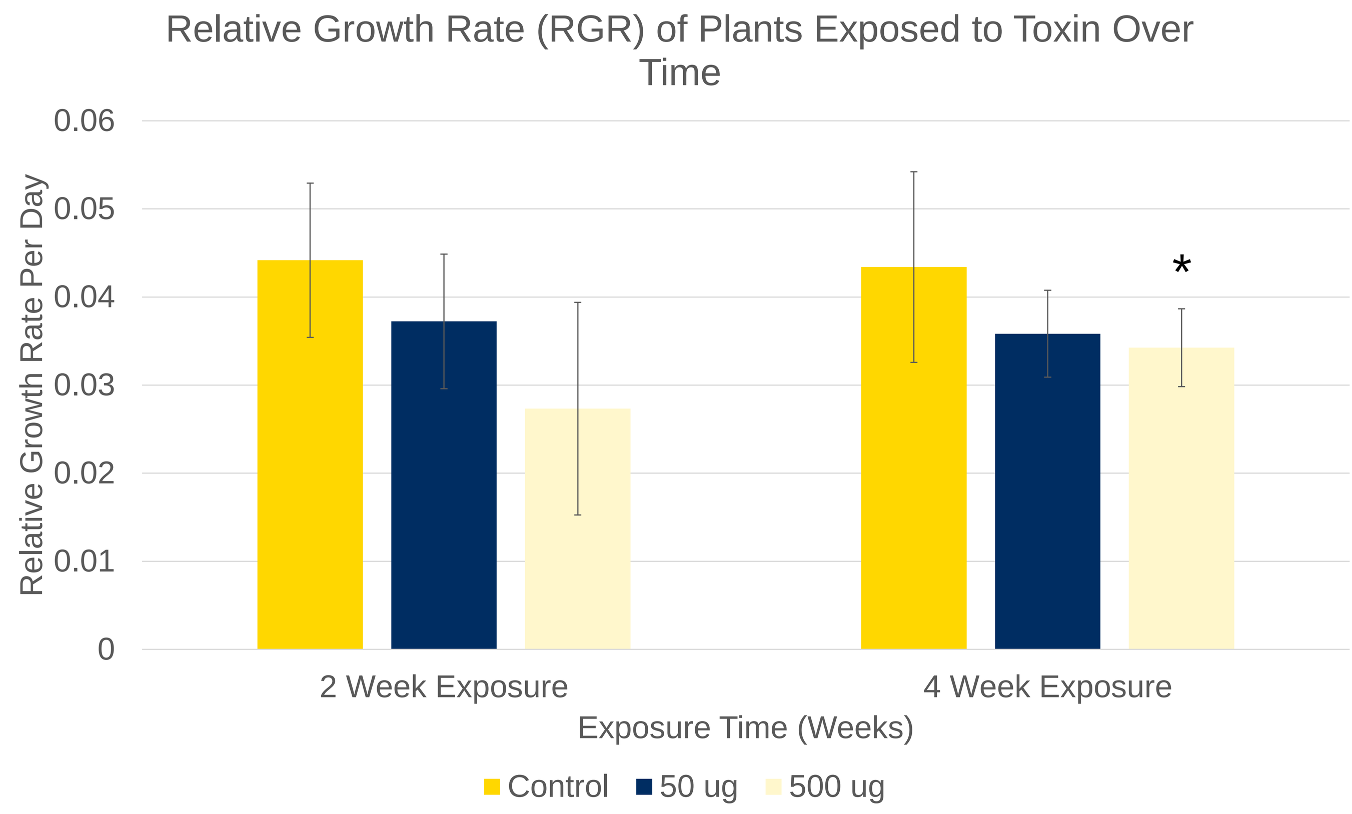

Figure 3 showing the average calculated relative growth rate of plants exposed to toxin after approximately 7 weeks of growth. Error bars showing standard deviation.
* Indicates statistical significance when compared to the control

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