

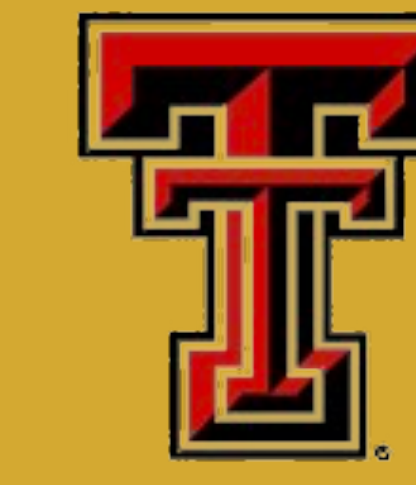


Effects of Se on growth and physiochemical properties in hydroponically produced Indian Mustard (*Brassica juncea* cv. Red Giant)

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Agricultural Research Service



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Introduction

- Selenium (Se) is an essential nutrient in human and animal diets.
- Deficiencies exist worldwide and plants are the primary source of Se to human nutrition.
- Se is not essential for plant growth and development but can be beneficial in mitigating abiotic stress factors in the production environment.
- Biofortifying produce with Se can increase Se concentration in plants while alleviating stress from unfavorable conditions such as drought, extreme temperatures, excess salinity, herbivory, and pathogens.
- Above its beneficial threshold, Se can act as a pro-oxidant and reduce photosynthetic activity by inducing the production of reactive oxygen species and reduce overall yield.

Objectives

- Demonstrate Se as a beneficial element in plant growth and development.
- Determine which Se concentration is considered beneficial in Indian mustard
- Illustrate Se biofortification methods in hydroponically produced Indian mustard.

Materials and Methods

- 50% Hoagland No. 2 Basal Salt Mixture added to 3 5-gallon reservoirs
 - Reservoir 1: Control (0 μ M Se)
 - Reservoir 2: Low-dose (10 μ M Se)
 - Reservoir 3: High-dose (20 μ M Se)
- Harvested after 5 weeks
- Growth and environment measurements taken weekly or via datalogger
- Tissues analyzed via ICP-EOS

Discussion & Conclusion

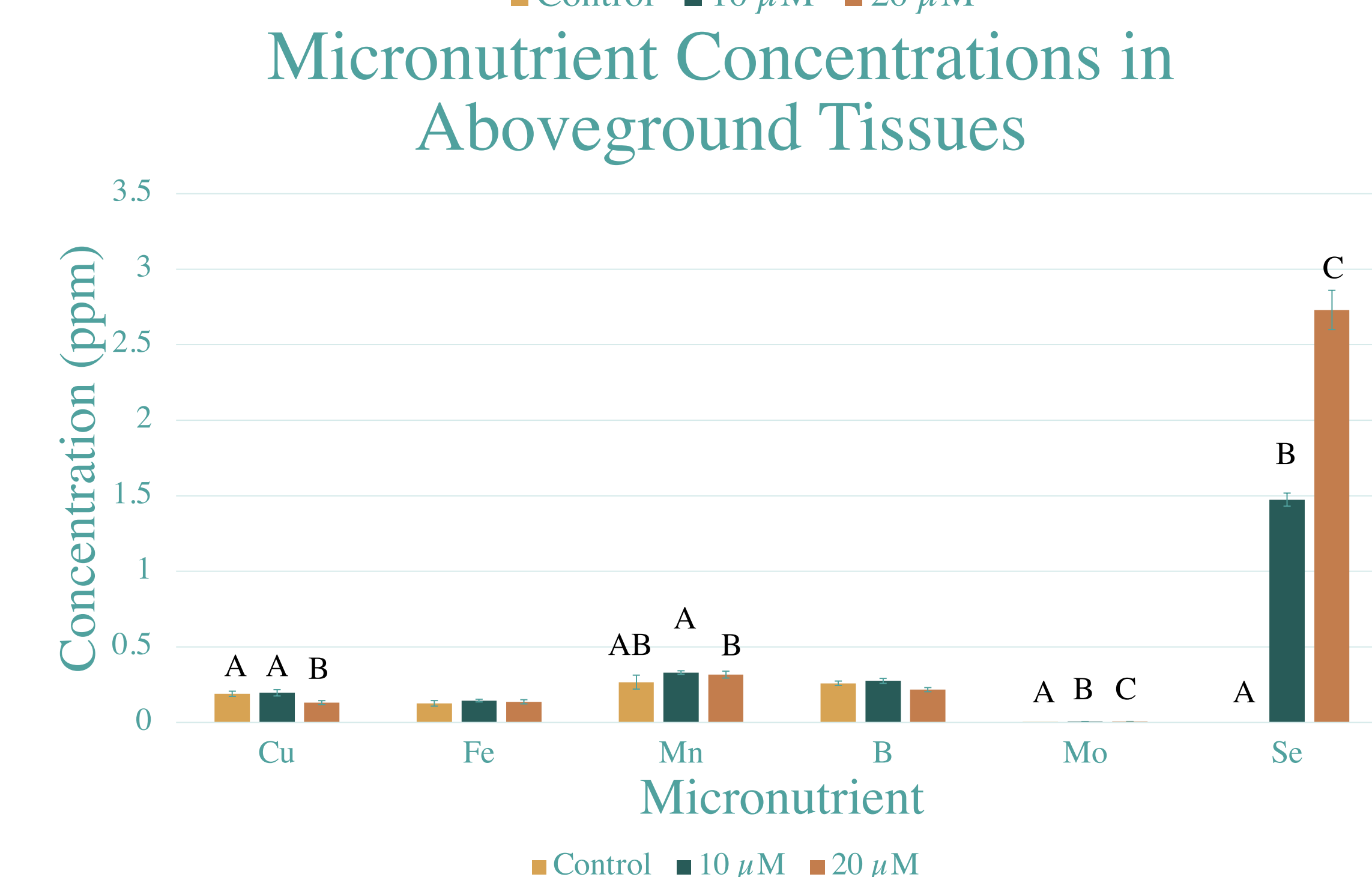
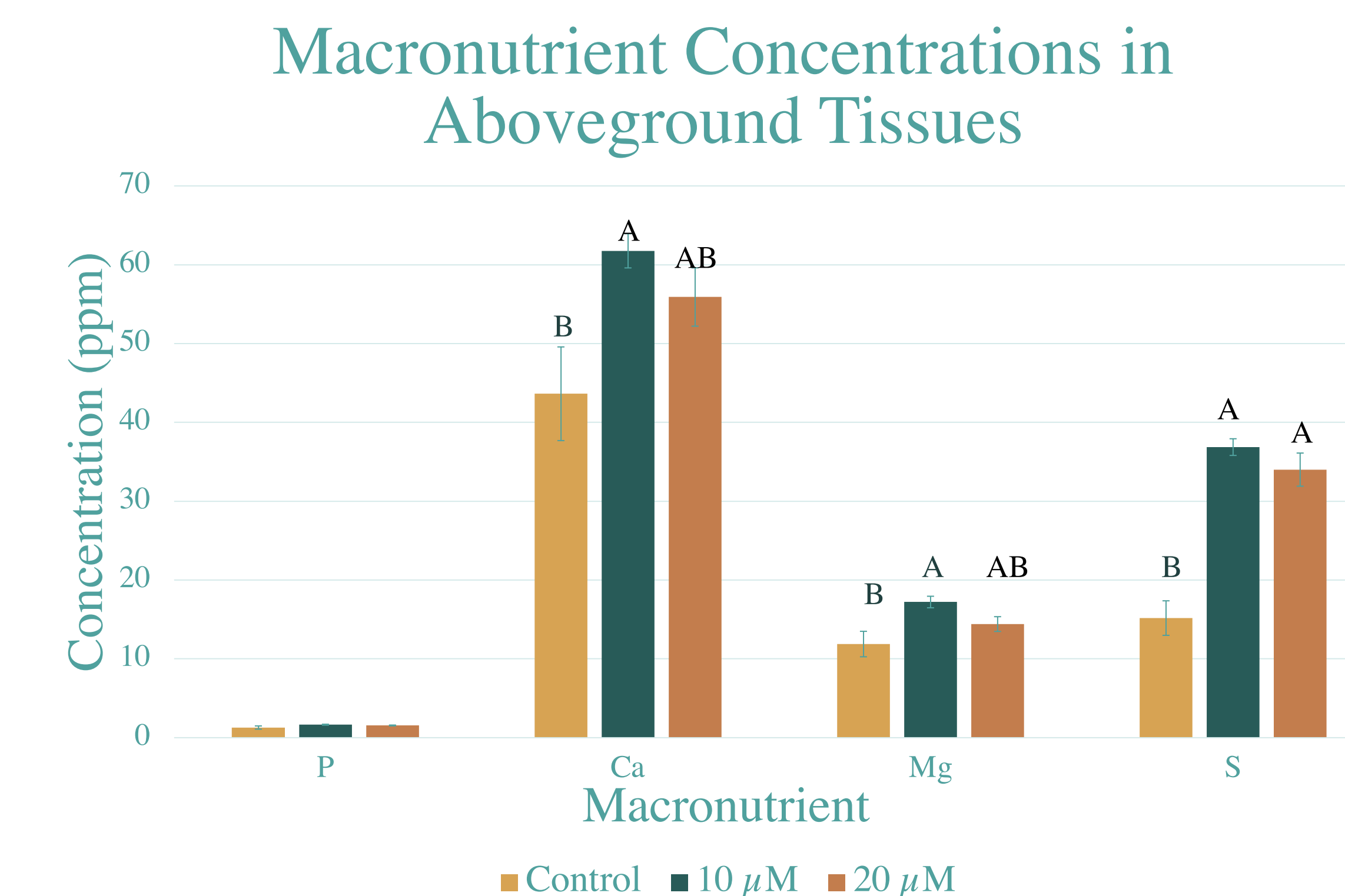
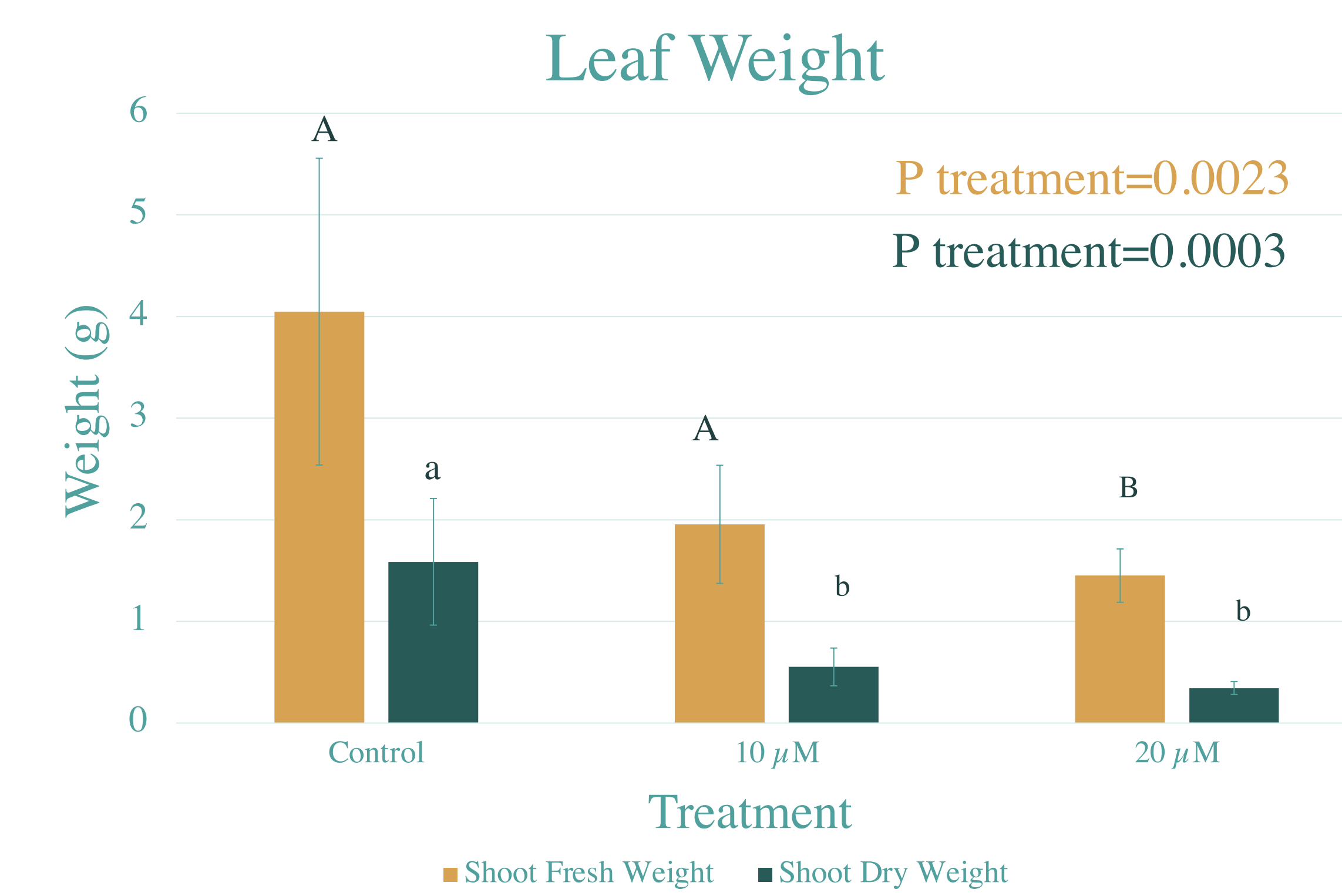
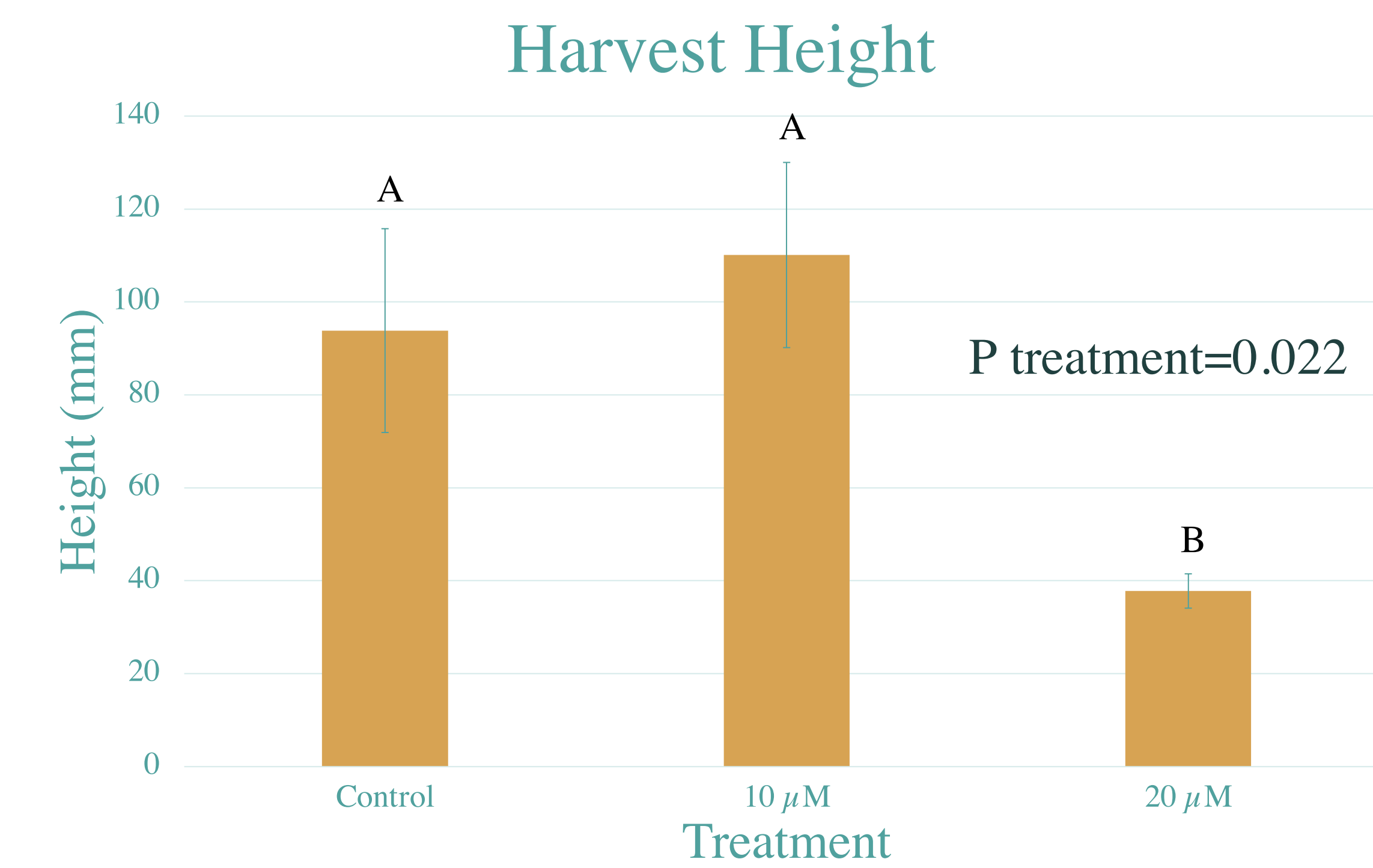


1. Plant height and fresh weight did not significantly differ between the low dose Se (10 μ M) and control treatments.
2. Shoot dry weight was significantly lower in both Se treatments compared to the control.
3. Se concentrations in plant tissue increased with increasing Se application.
4. Ca, Mg, and S concentrations were significantly higher in Se treatments compared to the control.
5. Cu was significantly higher in 10 μ M and controls compared to the 20 μ M treatment.
6. Mo concentrations increased with increasing Se concentrations.
7. Mn concentrations were significantly higher in 10 μ M compared to control and 20 μ M treatments.

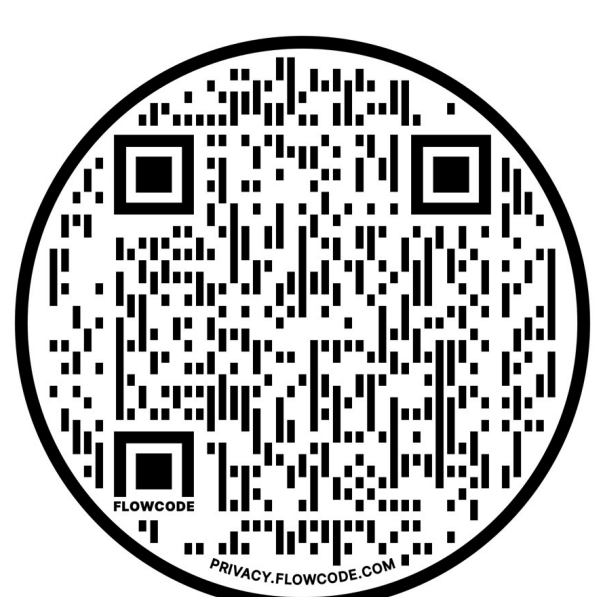
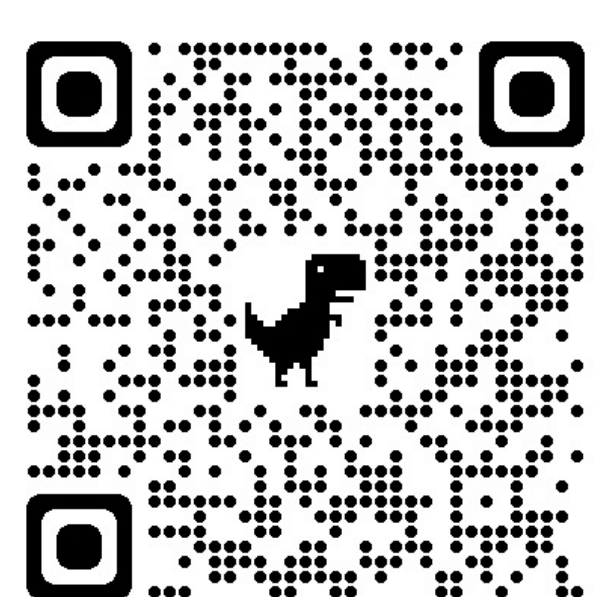


Se application increased nutrient content, but higher rates reduced biomass.

Results



Lab, Abstract, LinkedIn QR Codes



Effects of Se on growth and physiochemical properties in hydroponically produced Indian Mustard (*Brassica juncea* cv. Red Giant) Savannah Cognasi^{1*}, Matthew Siebecker¹, Clinton Williams², and Catherine Simpson¹. Department of Plant and Soil Science, Texas Tech University, Lubbock, TX 79409, 2US Arid-Land Agricultural Research Center, 21881 North Cardon Lane, Maricopa, AZ 85138. (savannah.cognasi@ttu.edu)

Selenium (Se) is an essential nutrient in the human diet and helps build selenoproteins involved in DNA construction, thyroid hormone production, and reproductive success. Plants are the primary source of Se in the human diet and therefore can be deficient if a balanced diet is not achieved. However, Se toxicity can also be detrimental to humans, animals, and plants. Se is naturally occurring in the environment and can be deficient or excessive in different conditions. Therefore, previous studies have endeavored to biofortify or remediate Se to produce Se-enriched produce or remove excess Se in the environment to protect surrounding ecosystems. Incorporating Se into production methods to improve Se concentrations in plants have shown many promising results, but these vary by crop. Though not essential for plant growth and development, Se can be beneficial at specific concentrations. Se can behave as an antioxidant at low concentrations and improve resistance to pests and mitigate abiotic stress influences; however, at high concentrations can act as a pro-oxidant and induce oxidative stress. The delicate balance between beneficial and toxic concentrations is species-specific and depends on environmental conditions and production methodology. Therefore, these experiments were designed to determine the beneficial threshold for Indian mustard biofortification in a hydroponic system. Preliminary results show different effects of Se in the 2 trials performed. In trial 1, 10 μ M of Se increased plant height and fresh weight of roots and shoots. In trial 2, the control plants were not significantly different from the 10 μ M treatment height, fresh and dry weight, but were significantly greater than the 20 μ M treated plants. These results indicate that Indian Mustard growth is negatively affected by 20 μ M of supplemented Se in hydroponics systems.