Plocek, G. and Simpson C. The Effects of Salinity on Broccoli (*Brassica oleracae*) and Purslane (*Portulaca oleracea*) Microgreens. Southern Region American Horticultural Sciences annual meeting. New Orleans, LA. February 10-13, 2022

Abstract

Saline water has become an increasing problem in agriculture. The total dissolved solids (TDS) level in Texas has been observed in excess of the TCEQ upper limit of 1000 ppm of salts. Irrigating crops with saline water can cause osmotic stress, reduce plant yield, and, in severe cases, cause crop failure. Different species of crop plants also have differing salinity tolerances ranging from sensitive to highly tolerant. Knowledge of these categories are important for sprout and microgreen cultivation as these tender plants generally have a lower tolerance for stress. The goal of this experiment is to compare the physiological and chemical effects of saline water on *Brassica oleracae* (broccoli, moderately tolerant) and *Poetulaca oleracea* (purslane, highly tolerant) microgreens. Both varieties of microgreens were cultivated under the same conditions and irrigated with a salinity treatment ranging from 0 dS/m to 1.5 dS/m. Once harvested, each sample was analyzed for fresh/dry weight yields to evaluate physiological effects. Vitamin C and proline content were also analyzed. The results show no effect on dry weight for either broccoli or purslane. There was an increase in fresh weight for broccoli irrigated with 1 dS/m in one of the trials. These results indicate that salinity levels commonly found in tap water have no negative effects on microgreen growth, and in some cases, some increases in yield were found. Salinity also had no effect on the Vitamin C content of the purslane microgreens. In one of the trials, Vitamin C was highest in the broccoli microgreens irrigated with 0 dS/m. In another trial the broccoli microgreens irrigated with 1.5 dS/m yielded the highest AsA content while 0-1 dS/m yielded the highest T-AsA content. These results indicate that Vitamin C varies with salinity in broccoli.

The Effects of Salinity on Broccoli (*Brassica oleracae*) and Purslane (*Portulaca oleracea*) Microgreens.

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Authors: Gretchen Plocek*, and Catherine Simpson

INTRODUCTION

- ***Salinity:*** The United States EPA reports a secondary drinking water standard of Total Dissolved Solids (TDS) as 500 ppm. However, the Texas Commission on Environmental Quality reports TDS above 1000 ppm is considered harmful for consumption.
- ***Microgreens:*** Microgreens are young, cotyledonary plants grown for consumption at immature stages. They are typically sensitive to salts, but some varieties have variable tolerances that can range from sensitive to highly tolerant.
- ***Experiment:*** This experiment aims to identify the physiochemical effects of saline water on broccoli (moderate tolerance) and purslane (moderate-high tolerance) microgreens by analyzing fresh weight after harvest and Vitamin C.

METHODS

- This experiment was conducted under an average PAR of 4.4 µmol, and an average temperature of 20^{O}C while using LED lights 10 hrs. a day.
- Broccoli and purslane microgreens were grown for approximately 2 weeks and were irrigated with RO water containing NaCl at 0 dS/m, 0.5 dS/m, 1 dS/m, and 1.5 dS/m.
- After harvest, each microgreen treatment was weighed for fresh weight.
- Microgreens were then analyzed for Total Ascorbic Acid (T-AsA) and Reduced Ascorbic Acid (AsA)

OBJECTIVES

- To determine the effects of low levels of salinity on microgreen biomass.
- To observe the effects of low salinity levels on microgreen ascorbic acid content.

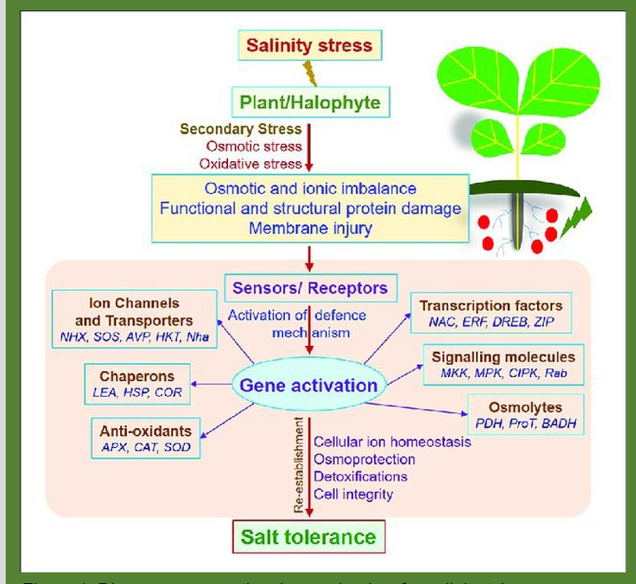

Figure 1: Diagram representing the mechanism for salinity tolerance in plants. Adapted from "Halophytes: Potential Resources for Salt Stress Tolerance Genes and Promoters," by A. Michra, and B. Tanna, 2017, May 18, *Frontiers in Plant Science*, 8. Copyright 2017 by Mishra and Tanna.

Figure 2: US TDS level averages and what they represent. Adapted from "Watering Carniverous Plants," by curiousplant, 2017, *Curious Plant Carniverous Plant Nursery*. Retrieved January 25, 2022, from https://curiousplant.com/watering-carnivorous-plants/. Copyright 2022 by Curious Plant, LLC.

Salinity levels commonly seen in tap water do not affect microgreen growth, but Vitamin C concentration varies with salinity applied to broccoli.

Microgreen tray setup

Broccoli microgreens

Microgreen cultivation setup

Scan the QR Code for more information about the presenter, poster, and abstract.

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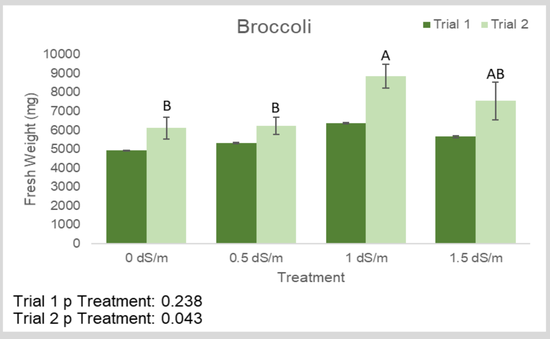
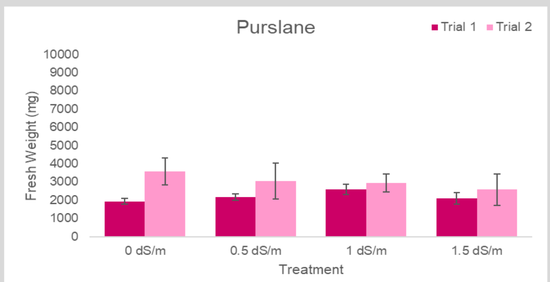
RESULTS

FRESH WEIGHT



Trial 1 p Treatment: 0.238
Trial 2 p Treatment: 0.043

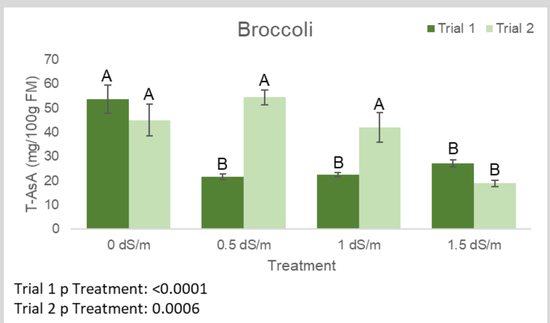
Figure 3. Average fresh weight at harvest. Broccoli fresh weight increased at 1dS/m.



Trial 1 p Treatment: 0.308
Trial 2 p Treatment: 0.847

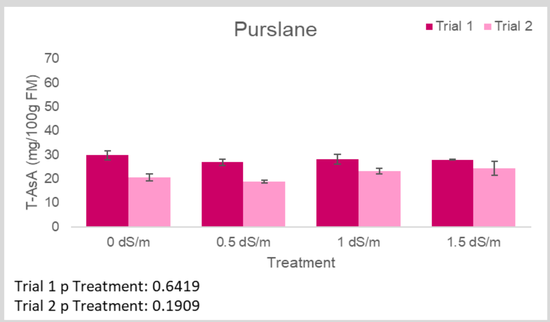
Figure 4. Average fresh weight at harvest. Purslane fresh weight was unaffected.

TOTAL ASCORBIC ACID



Trial 1 p Treatment: <0.0001
Trial 2 p Treatment: 0.0006

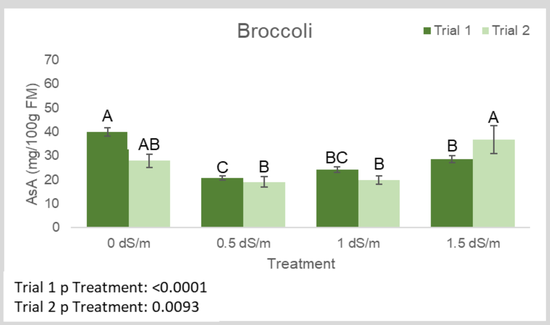
Figure 5. Average Total Ascorbic Acid. T-AsA for broccoli varied.



Trial 1 p Treatment: 0.6419
Trial 2 p Treatment: 0.1909

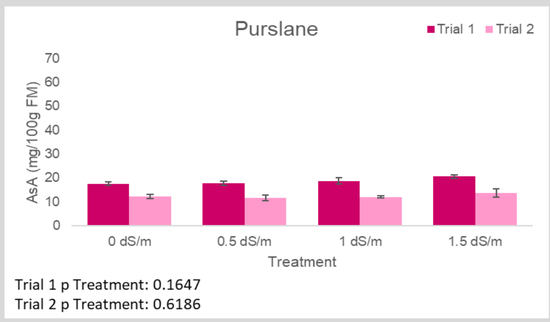
Figure 6. Average Total Ascorbic Acid. T-AsA for purslane showed no negative effect.

ASCORBIC ACID



Trial 1 p Treatment: <0.0001
Trial 2 p Treatment: 0.0093

Figure 7. Average Ascorbic Acid. Ascorbic Acid varied in broccoli.



Trial 1 p Treatment: 0.1647
Trial 2 p Treatment: 0.6186

Figure 8. Average Ascorbic Acid. Ascorbic Acid had no effect on purslane.