

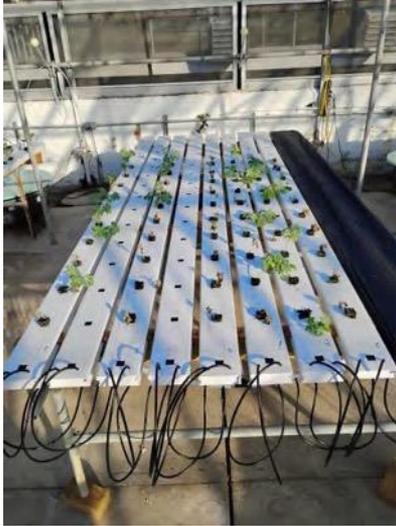
Impacts of Rising Soil Salinity on Organic Watermelon Production

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LS22-369

Effects of Salinity on Plant Growth



Left: watermelon plants grown in a hydroponic solution containing 30% artificial seawater



Right: watermelon plants grown in a hydroponic solution containing no seawater

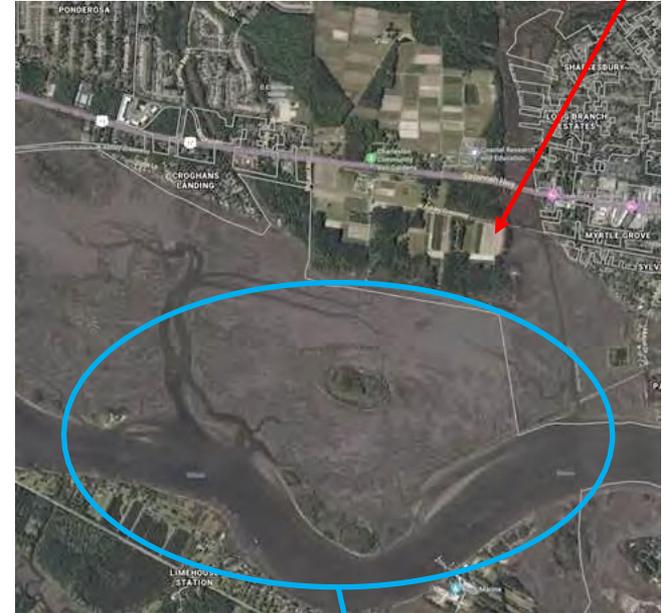
- The initial symptoms of salinity stress can appear very similar to drought stress
- As time passes plants can accumulate toxic levels of ions in the plant cells, further disrupting plant growth and yield.
- Plants experiencing salinity stress can experience stunted or delayed growth, changes in pigmentation, and at high concentrations it will lead to plant death.
- Variations in salt tolerance can result in modified crop-weed interactions and may give an advantage to certain weed species. (V. Cirillo et. al)

Charleston, SC

Field F16



Low points in the terrain allow water to collect and create highly saline “hotspots” in the field.



Marsh

Courtesy of Bing Maps © 2024 Microsoft

Weed Control

- Plasticulture is a common method of weed control in watermelon production and is one of the most effective methods of organic weed control.
- Yellow nutsedge (*Cyperus esculentus*) remains a major pest in watermelon production, especially in plasticulture systems.
- The critical weed free period for watermelon is two to four weeks after transplant



A bed of watermelons overrun with yellow nutsedge

Research Objectives

1. Identify potentially salt resistant rootstocks.
2. Investigate the impact of saline soil on watermelon-weed competition.



Salinity Field Trial

- For this field trial, watermelons were grafted onto two rootstock varieties, along with a grafted and a non-grafted control
- The scion used for all plants was Melody, a common seedless watermelon variety.
- The experiment was conducted using organic techniques and plastic mulch was used for weed control.



Transplanting the watermelons into the field

Field Layout

- The field was arranged in a Latin Square Design, with each set of blocks receiving a different salinity treatment.
- Sea water was obtained locally and mixed in a 250gal plastic container on site prior to irrigation.



Top: a front view of the field showing all four rows

Right: an aerial view of the field showing the irrigation setup for the field



Weed Counts

- The field used for this trial contained a thick stand of yellow nutsedge and was suspected to contain rice flatsedge (*Cyperus iria*) as well.
- A one-meter quadrat was used for the weed counts



The quadrat used for nutsedge counts, placed directly over the crown root of a watermelon plant.



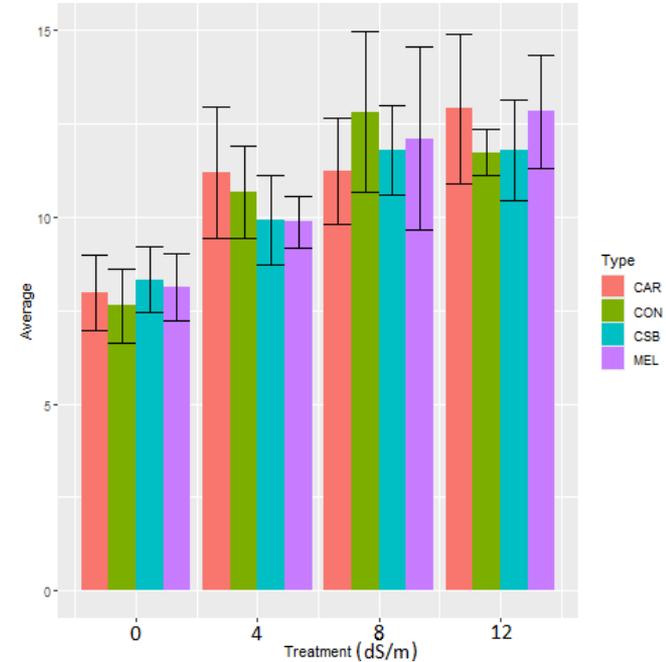
Weed stands prior to preparing the field. Most of the field was densely covered in yellow nutsedge, but the areas with the highest salinity would only grow purslanes.

Weed Control – Early Season

- During the early part of the growing season the weed counts were higher in treated areas of the field.
- This effect is possibly the result of a thinner canopy in the watermelon plants



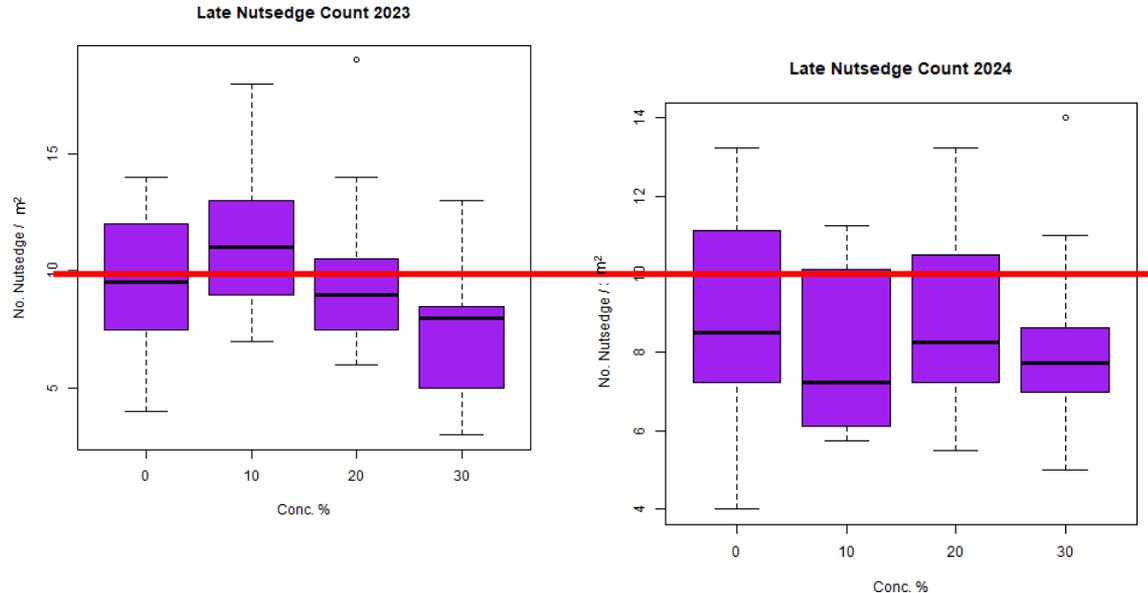
A watermelon bed irrigated with saline water(left) and freshwater(right).



Weed counts in each salinity treatment for both growing seasons

Weed Control - Postharvest

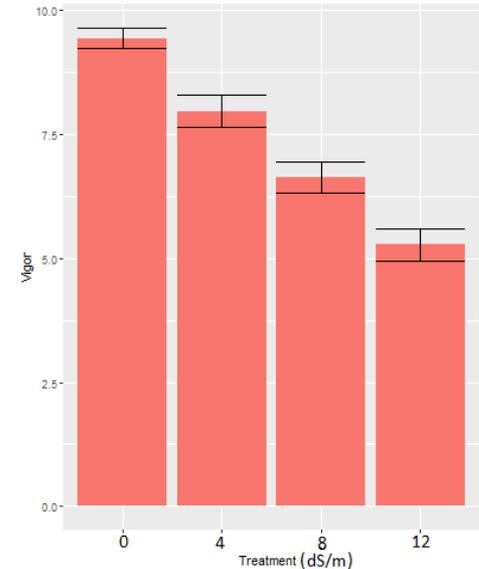
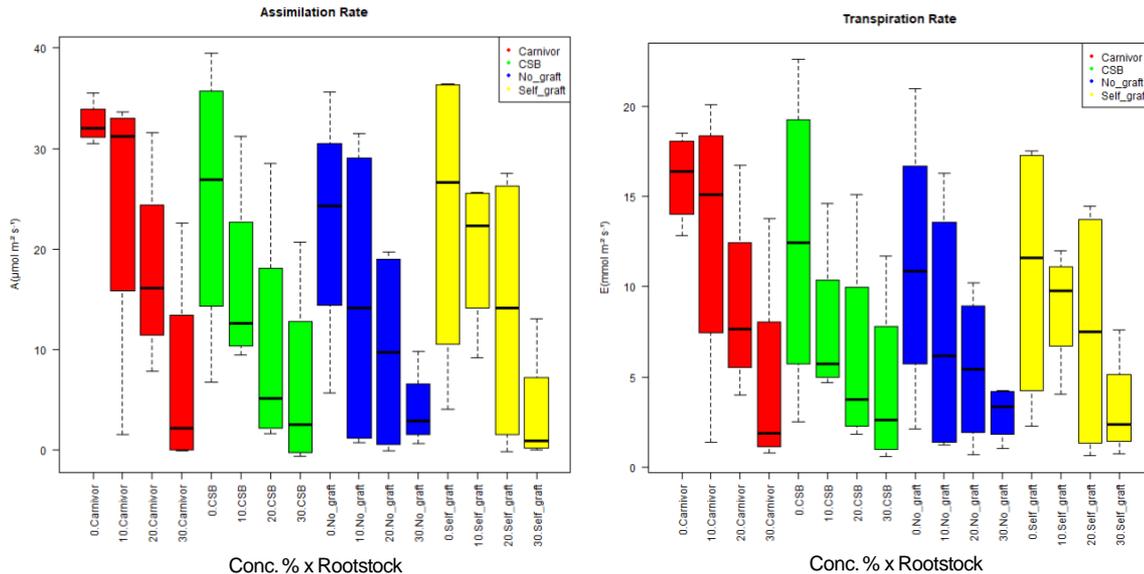
- During the first field trial there was a decrease in average nutsedge counts by the end of the season, however in the second season it did not follow this pattern
- The average post-harvest nutsedge counts for all plots were lower in the second season



Postharvest yellow nutsedge counts in 2023 (left) and 2024 (right)

Rootstock Response

- The relationship between rootstock variety and salinity response was insignificant

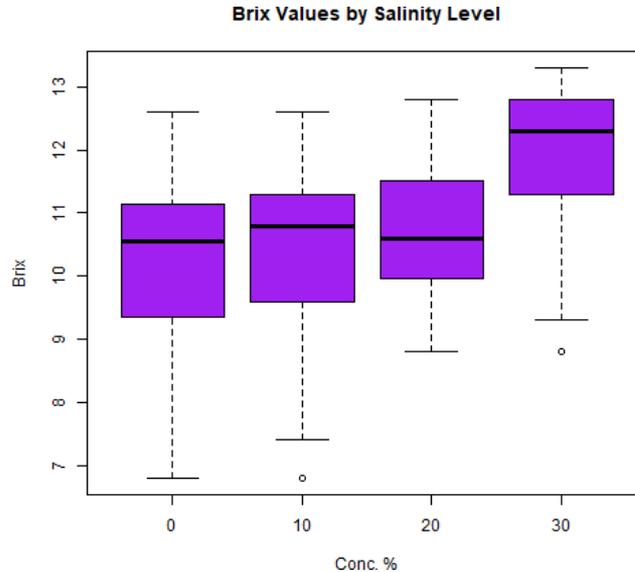


Plant Vigor Ratings by Salinity Treatment. There was no significant difference between rootstocks.

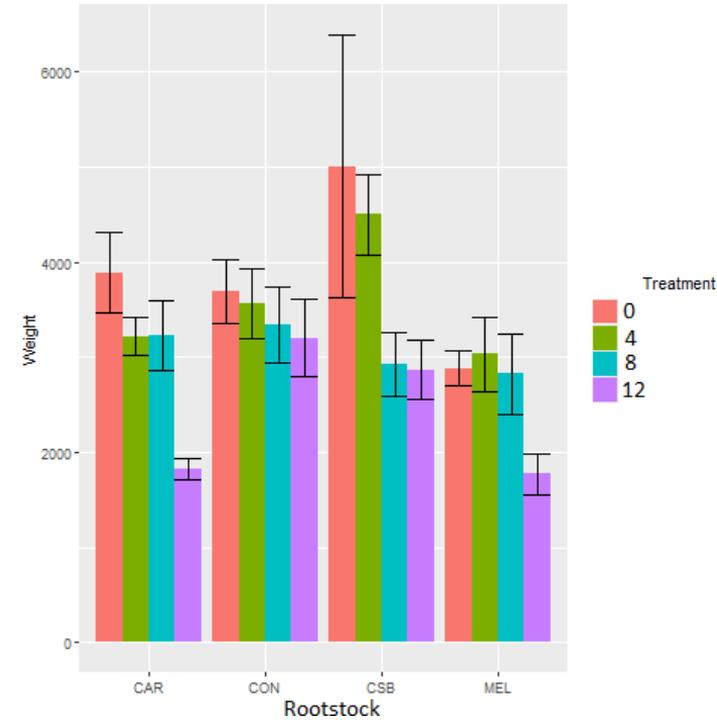
Assimilation (left) and transpiration (right) rates for each salinity-rootstock combination. Measurements were taken using a Licor LI-6800.

Fruit Quality

- Plots treated with higher salinity produced a higher Brix value, potentially due to dissolved salts in the fruit



Fruit Brix values by salinity treatment



Fruit weights for all combinations of rootstock and salinity treatments

Summary

- The rootstock varieties used in this trial did not have a significant impact on plant outlook.
- The early nutsedge counts indicate that elevated salinity levels during the early part of the season can contribute to an increase in the number of nutsedge plants.
- The results of the post harvest weed counts were different between the two seasons.

Future Research

- Based on the results of the nutsedge counts, more work is needed to determine if there is a long-term effect on weed populations.
- Additionally, since none of the rootstocks were effective in improving salinity response, there is a need to identify or develop new salinity tolerant watermelon varieties.

Special Thanks

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