UNIVERSITY OF HOHENHEIM

EXALT Coupling Desalination with Hydroponics

MEWAC Middle East Regional Water Research Cooperation Program

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Institute of Agricultural Sciences in the Tropics (Hans-Ruthenberg-Institute) (490)

Effect of Salinity on Growth and Ion Concentration of two Genotypes of *Solanum lycopersicum* L. and *Cucumis sativus* L. under contrasting VPD Levels

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Introduction

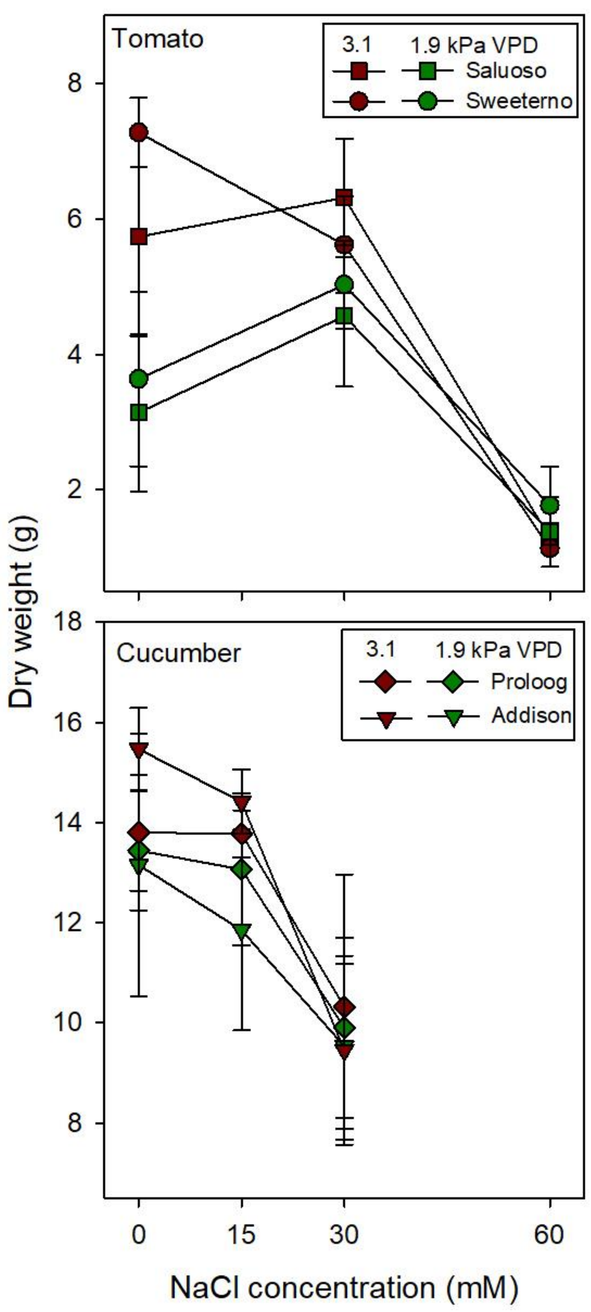
Salt stress causes osmotic stress, ion toxicity, and nutrient imbalances and thus affects plant growth. The atmospheric demand for moisture (**V**apor **P**ressure **D**eficit) affects transpiration rates. High VPD may increase transpiration and thus increase salt uptake, resulting in aggravated salinity effects. Little is known on the combined effects of high VPD and elevated root zone salinity in tomato and cucumber.

VPD Growth Chamber

Conclusions

- Tomato is more salt tolerant than cucumber.
- Up to the salinity threshold, dry air conditions increase dry matter accumulation in both species.
- VPD has no effect on ion accumulation in both species.
- Ion concentrations in tomato are higher than cucumber.

Results and Discussion

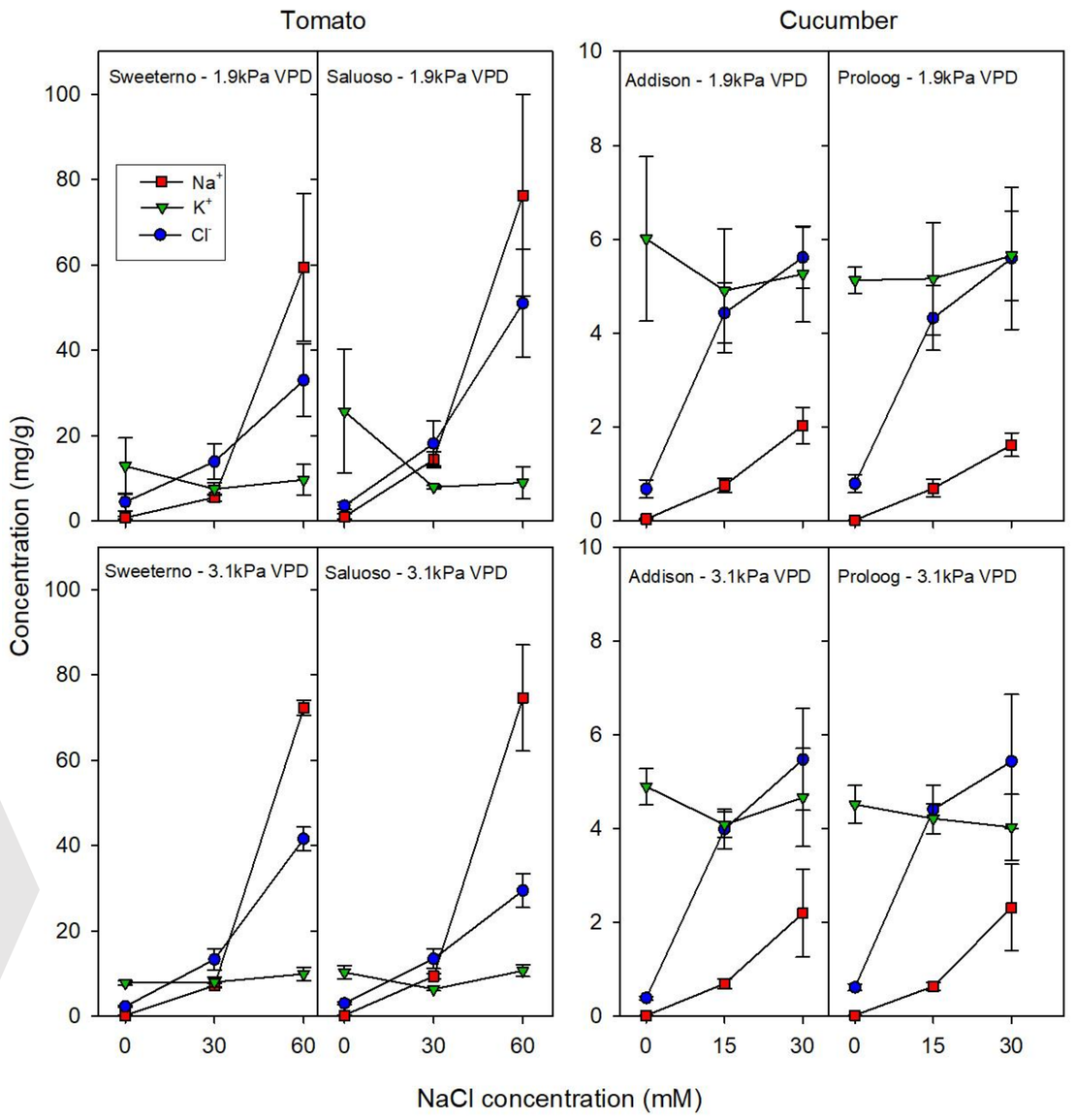


Total plant dry weights of 48 days old plants for 2 tomato and 2 cucumber varieties grown hydroponically under 3 levels of root zone salinity and 2 levels of VPD.

- High VPD increased dry matter accumulation.
- At high salinity, VPD has no effect on dry matter accumulation.
- Cucumber accumulated more dry matter but was less salinity tolerant.

- VPD effects on dry matter were more pronounced in tomato.
- In cucumber, variety Addison responded more strongly to high VPD.
- No variety effect in tomato.

Total plant Na^+, K^+, and Cl^- concentrations of 48 days old plants for 2 varieties of tomato and cucumber, grown under 3 levels of root zone salinity and 2 levels of VPD.



- Differences between VPD levels and between varieties were minor in both species.
- K^+ concentrations were similar for all plants, Na^+ concentrations were up to 5 times higher in tomato.

- Higher tolerance to salinity allows tomato plants to accumulate higher concentrations of Na^+ and Cl^-.
- Increases in Na^+ and Cl^- concentrations were strongly linked to decreases in biomass accumulation.

Materials and Methods

Two varieties of tomato (Sweeterno; Saluoso) and cucumber (Addison; Prolog) were grown in a hydroponic set-up in VPD-regulated growth chambers in the Phytotechnikum of the University of Hohenheim, Germany. 28-day-old seedlings were transplanted into INTEGAR nutrient solution with 40 ppm nitrate. Two VPD levels (1.9 kPa and 3.1 kPa) were maintained inside the chambers. Plants were subjected to root zone salinity at 0 mM, 15 mM, and 30 mM (cucumber), and 0 mM, 30 mM, and 60 mM (tomato) for 20 days. Plants were then dried at 65°C for 72h and dry weights determined. Dried samples were ground using a ball mill and analyzed for Na^+, K^+, and Cl^- by the flame photometer and autoanalyzer.