Identification of adaptive physiological mechanisms in saline condition:

Tetragonia tetragonioides and *Chenopodium quinoa*

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INTRODUCTION

Salinity in agricultural soils is increasing through seawater intrusion and irrigation with saline or brackish water and inappropriate leaching. Salinization is currently one of the challenges of modern agriculture. It is expected to further aggravate in the future mainly because of persistent drought and sea level rise, putting food production at risk.

The cultivation of salt-tolerant crops represents a valid option for sustaining food production in regions affected by salinity:

BUT HOW DO TOLERANT PLANTS DEAL WITH SALT?

METHODOLOGY

2D experimental set-up (Rhyzoslides) was selected to investigate Na+ distribution around the plant roots and along filter paper. Discs were collected at different heights on the rhizoslide and at different distances from the root apparatus. The plastic bag was sealed to evaluate the transpiration

SET UP

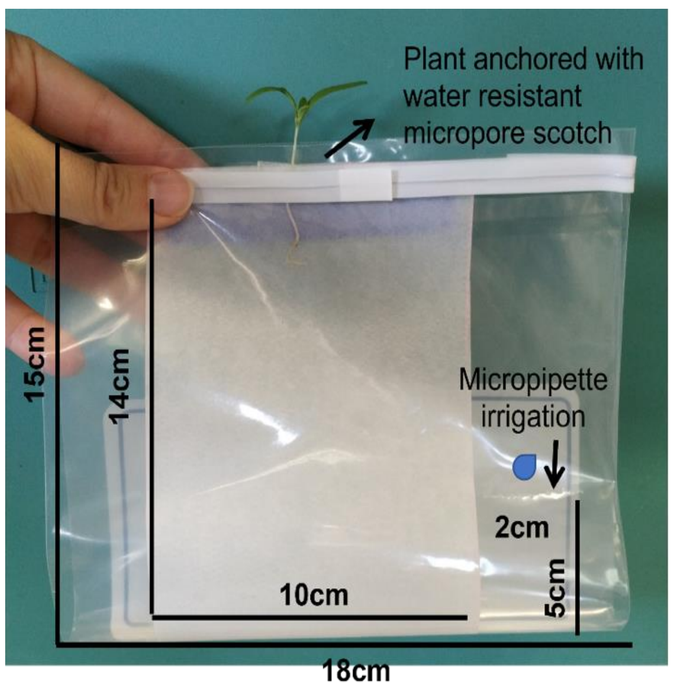

Figure 1: Rhyzoslide set up

RESULTS

- Salinity affected both root architecture and plant transpiration
- New Zealand spinach accumulated sodium and showed increased WUE at 100 mM NaCl
- New Zealand spinach showed both sodium-includer characteristics and recretohalophytes traits
- Quinoa, known to be part of the recretohalophytes due to its salt bladders on the leaves' surface, also presented salt excluder characteristics

RHIZOSLIDES

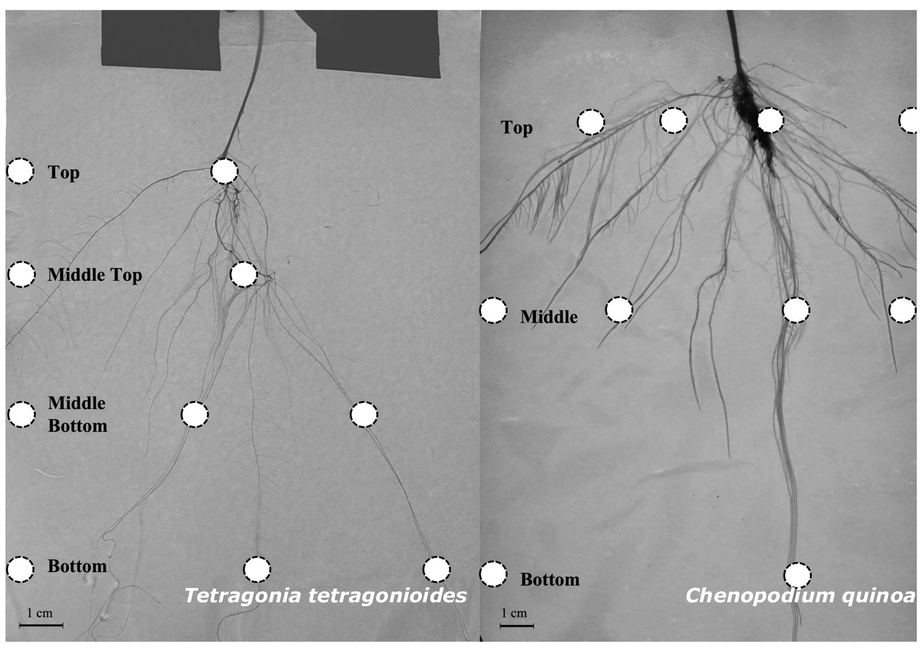

Figure 2: *Spatial arrangement of sampling cutouts designed for quantifying sodium accumulation in* New Zealand spinach *(left) and quinoa (right) rootzone.*

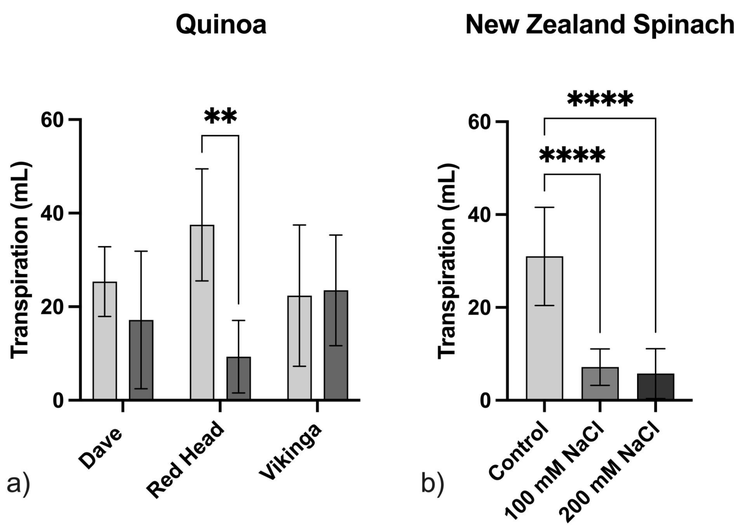

Figure 3 : Transpiration on both species grown under increasing NaCl concentrations

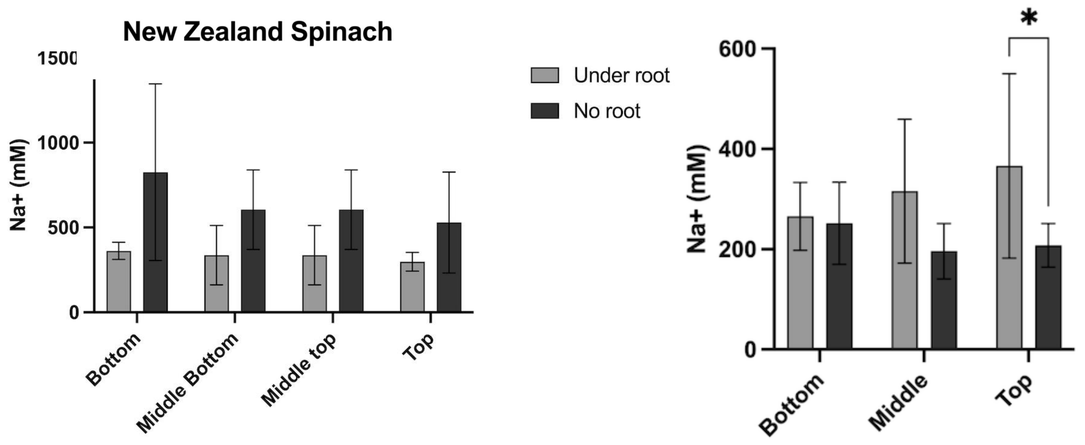

Figure 4 : Comparison of Na+ accumulation on rhizoslides disks collected at various points for the three different salt concentrations

CONCLUSION

Both species are characterized by recretohalophyte traits, but behaved in opposite ways at the root level. New Zealand spinach took up salts into its shoot, increased leaf succulence and compartmentalized excessive salt ions into the vacuole and leaves bladder cells. Quinoa proved to be less tolerant, suggesting that its mechanisms in the frame of recretohalophytes and sodium excluder halophytes were less effective in dealing with the administered salt treatment

International Network of Salt-Affected Soils

Salt-affected soils: threats and potentials

SUSTAIN Sustainable use of salt-affected lands

GLOBAL SOIL PARTNERSHIP