Salinity Down-regulates Transpiration Rate of *Medicago sativa* to Increasing Vapor Pressure Deficit (VPD)

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Introduction

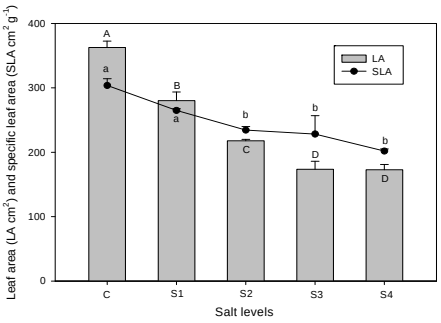
Saline-alkaline soils of the semi-arid Songnen Grassland (Northern China) are affecting plant physiological performance and morphological traits. Alfafa (*Medicago sativa*) is one of the most important forage plant used in the Songnen grassland.

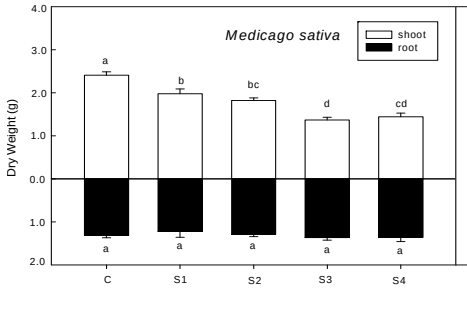
The objective of this study was to analyse whole-plant transpiration response of *M. sativa* over a range of atmospheric water vapor pressure deficits (VPD) at various salt concentrations to identify salt tolerance mechanisms.

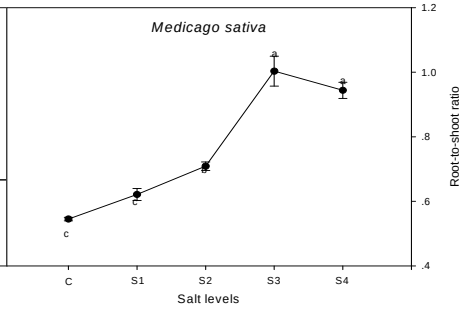
Conclusions

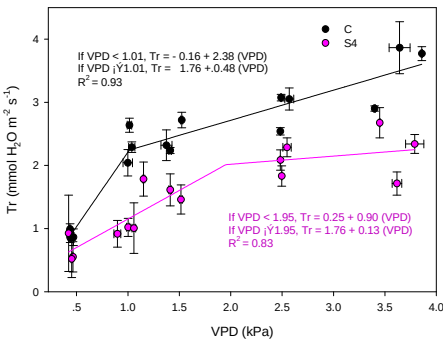
- Root growth was less affected by salinity compared to aboveground biomass, suggesting a relative increase of biomass allocation to roots as a salt-tolerance strategy.
- Salinity reduced the transpiring surface in contrast to the maintenance of water-absorbing tissue.
- The effects of atmospheric water vapor deficits (VPD) should be considered in transpiration studies.
- Results indicate increased transpiration use efficiency of Alfalfa under medium salt levels.

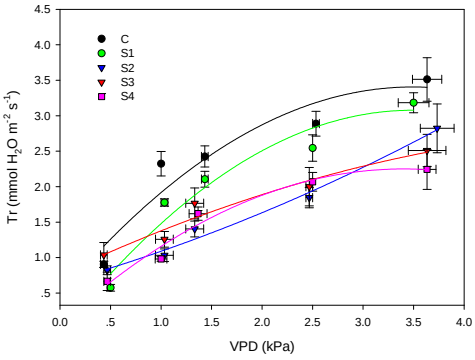
Results and Discussion











- Leaf area and shoot biomass was progressively decreased by salinity.
- Root biomass was not affected by salinity, root : shoot ratio increased.
- Whole-plant transpiration rate (Tr) consistently decreased with increasing salinity, but more significant at higher VPD levels.
- Alfalfa grown under salt levels S1 and S2 produced same biomass, however Tr was lower under the higher salt level.

Materials and Methods

Salt stress treatment: Seedlings (8 weeks old) were subjected to salinity levels of 0, 60, 120, 180, 240 mM Na^+ ($NaCl:Na_2SO_4$ = 1:1) for 14 days.

VPD chamber measurements: Salt-treated plants were enclosed in a controlled environment chamber to examine instantaneous whole-plant transpiration response to increasing VPD (0.5, 1.0, 1.5, 2.5, 3.5 kPa), which was regulated by adjusting temperature and relative humidity.

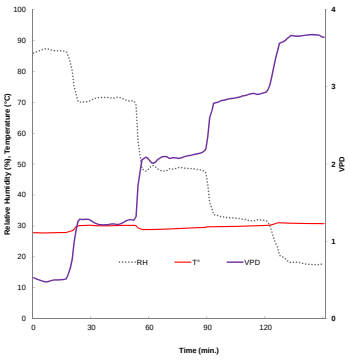


Figure 6: Transpiration Chamber: Relative humidity, temperature and the corresponding VPD levels during the experiment.