Hydroponic screening for salinity tolerance in *Chenopodium quinoa* (Quinoa): Physiological mechanisms

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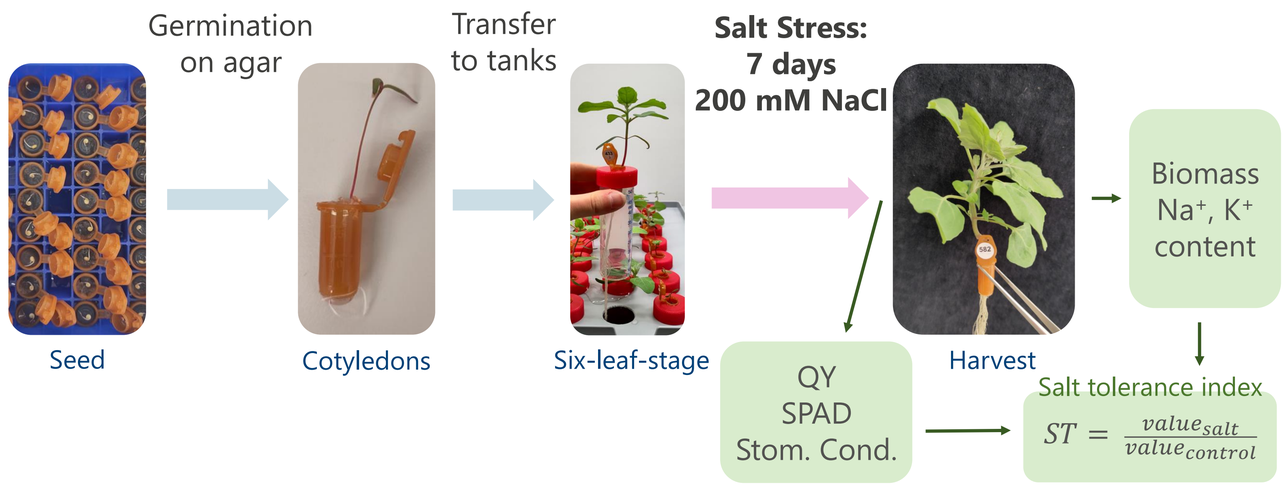
BACKGROUND & OBJECTIVES

- Increased pressure of salinity stress in agriculture, globally
- Use of salt tolerant crops to increase productivity in marginal environments
- Quinoa is a salt tolerant, potentially alternative crop

→ Identify salt tolerant quinoa accessions

→ Investigate which physiological mechanisms contribute to salt tolerance

METHOD - HYDROPONIC SCREENING



Correlation of salt tolerance indices across traits

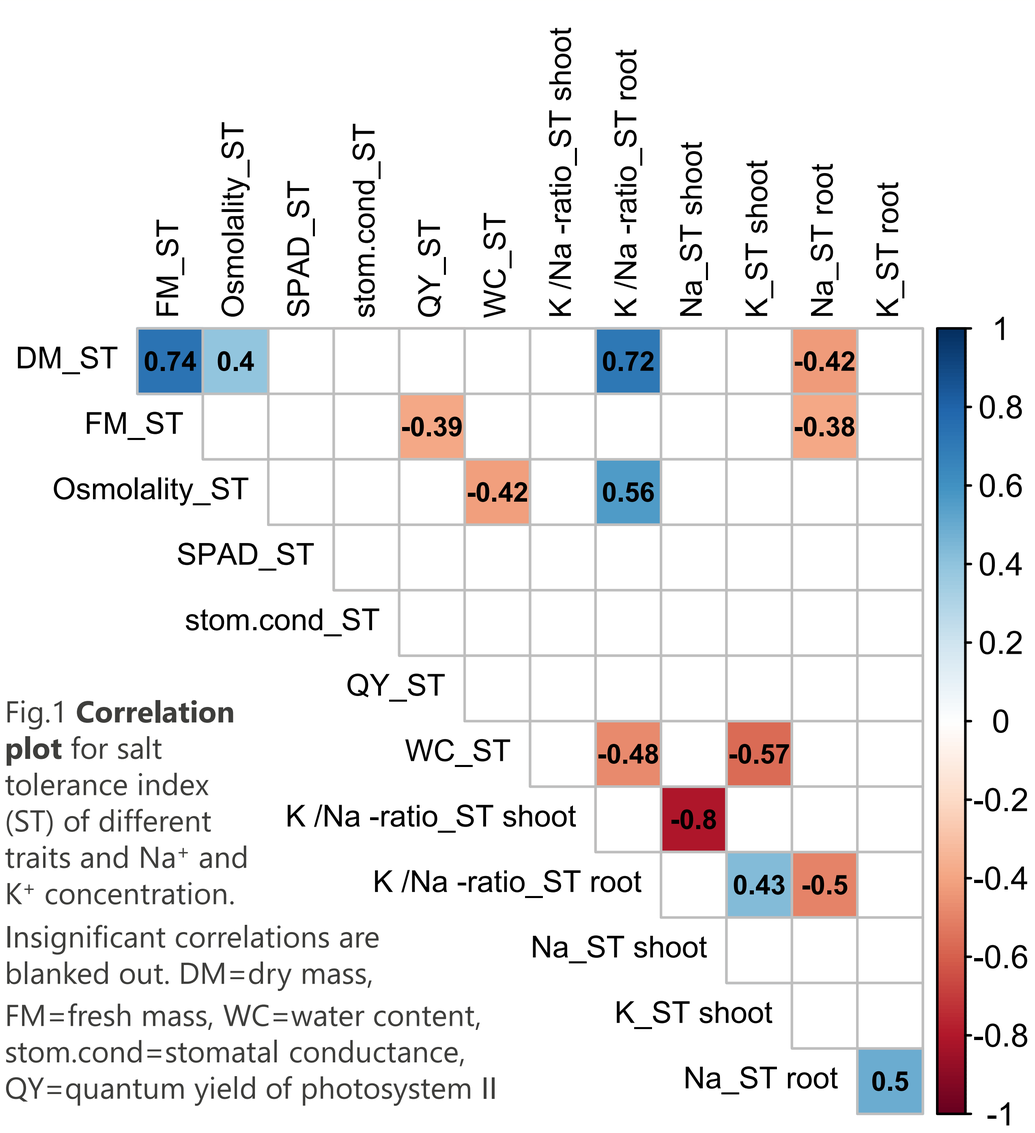
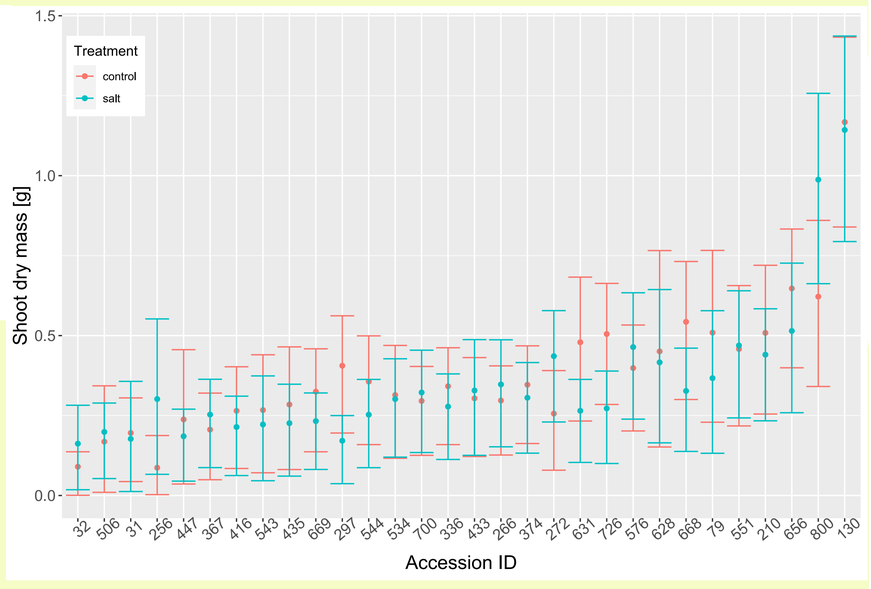


Fig.1 **Correlation plot** for salt tolerance index (ST) of different traits and Na^+ and K^+ concentration. Insignificant correlations are blanked out. DM=dry mass, FM=fresh mass, WC=water content, stom.cond=stomatal conductance, QY=quantum yield of photosystem II

- Maintenance or increase of dry biomass in response to salinity is positively correlated with an increase in Osmolality and K^+/Na^+-ratio in roots
- Negative correlation of dry mass ST with increase of root Na^+ concentration

Maintenance of biomass in salt tolerant quinoa

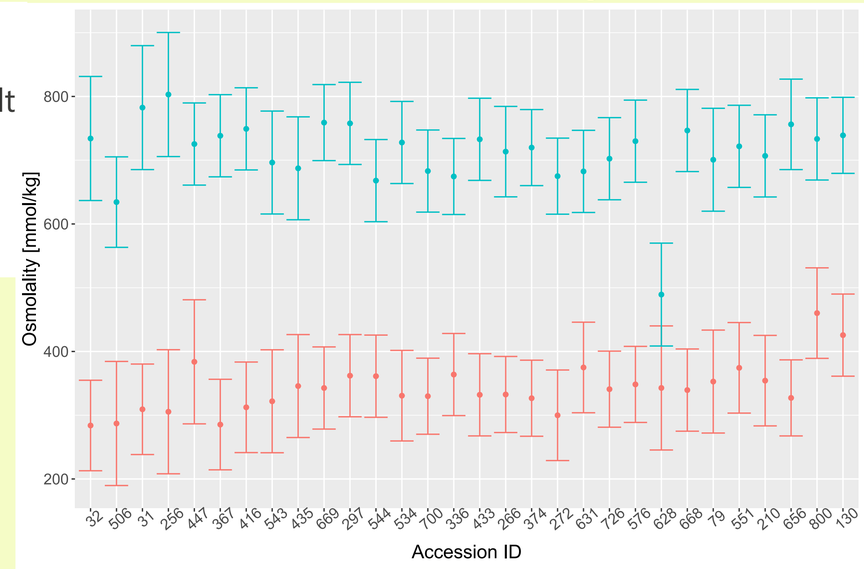
Fig.2 **Shoot dry mass of different quinoa accessions** under salt stress (200 mM) and control treatment. BLUE and 95% confidence interval.



- Most accessions are able to maintain biomass under salt treatment compared to control
- Some accessions show increased biomass under salinity

Salt stress increases osmolality

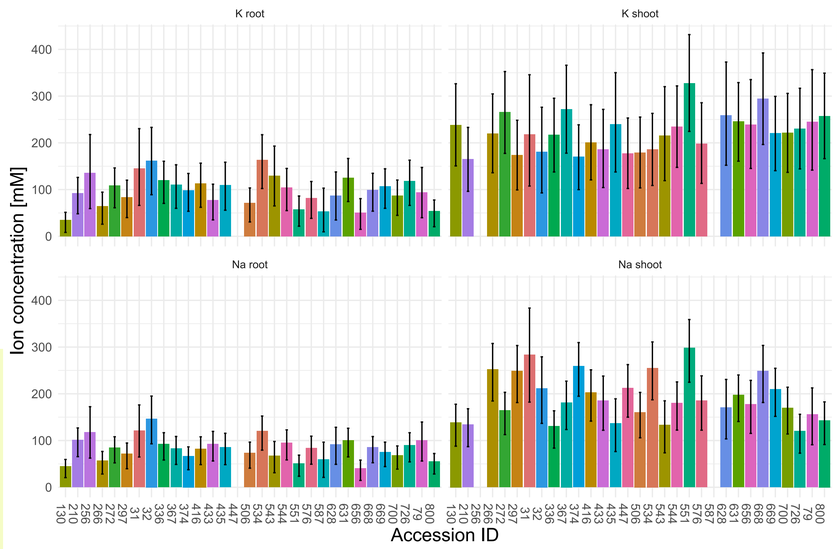
Fig.3 **Osmolality of different quinoa accessions** under salt stress (200 mM) and control treatment. BLUE and 95% confidence interval.



- Magnitude of increase and baseline value differs

Ion accumulation under salt stress

Fig.4 **K^+ and Na^+ concentration in roots and shoots of different quinoa accessions** under salt stress (200 mM) and control treatment. BLUE and 95% confidence interval.



- Shoots accumulate more ions than roots
- K^+/Na^+-ratio differs between accessions

CONCLUSIONS AND OUTLOOK

- Accessions which exhibit more increased osmolality and are able to maintain Na^+/K^+-ratio in the roots appear to maintain higher biomass under salt stress
- A stress treatment of 200 mM for a period of 7 days does not result in strong damage in the tested accessions

→ Investigate contribution of osmolality and ion accumulation to stress response after prolonged salt stress

→ Compare stress response in hydroponic systems to stress response in soil based systems (pot trial / field)

ACKNOWLEDGEMENTS

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