Food and Agriculture Organization of the United Nations

Salt-affected soils: threats and potentials

Crop modelling to assess the performance of quinoa under saline conditions in various management scenarios

SALAD
Saline Agriculture for ADaptation

ILVO
Instituut voor Landbouw-, Visserij- en Voedingsonderzoek

Joint meeting of INSAS and SUSTAIN

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International Network of Salt-Affected Soils

Funded by the European Union

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SUSTAIN
Sustainable use of salt-affected lands

VNIVERSITAT DE VALÈNCIA

International Union of Soil Sciences

Valencia, Spain
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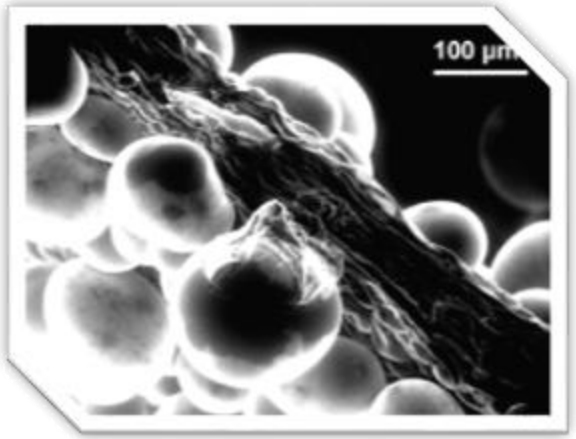
GLOBAL SOIL PARTNERSHIP

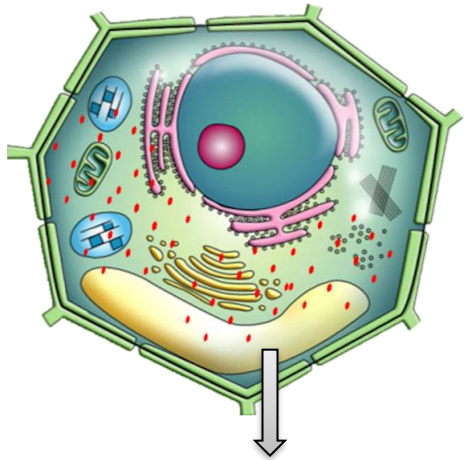
Quinoa is a promising crop to cope with soil salinization

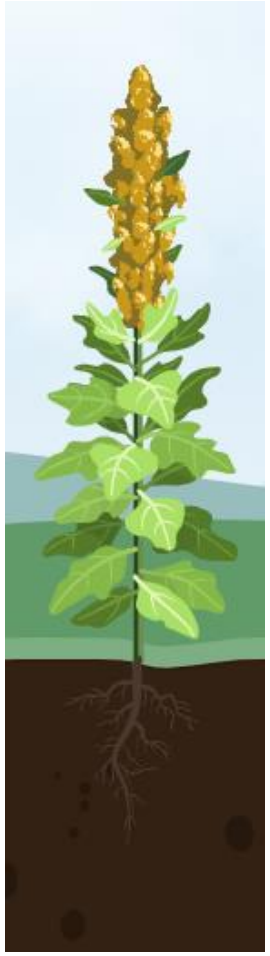
"Salt glands" on leaf surface



https://doi.org/10.1016/j.envexpbot.2012.07.004

Salt ions sequestration into vacuoles ensure vital cellular metabolisms

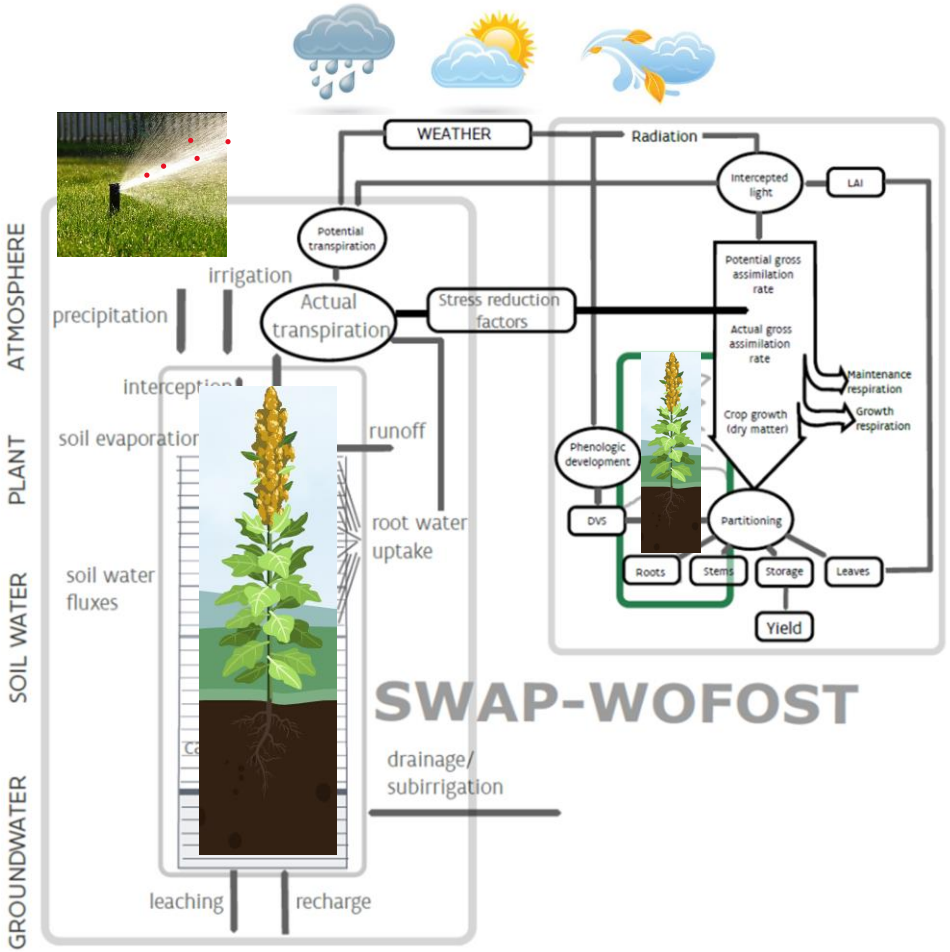




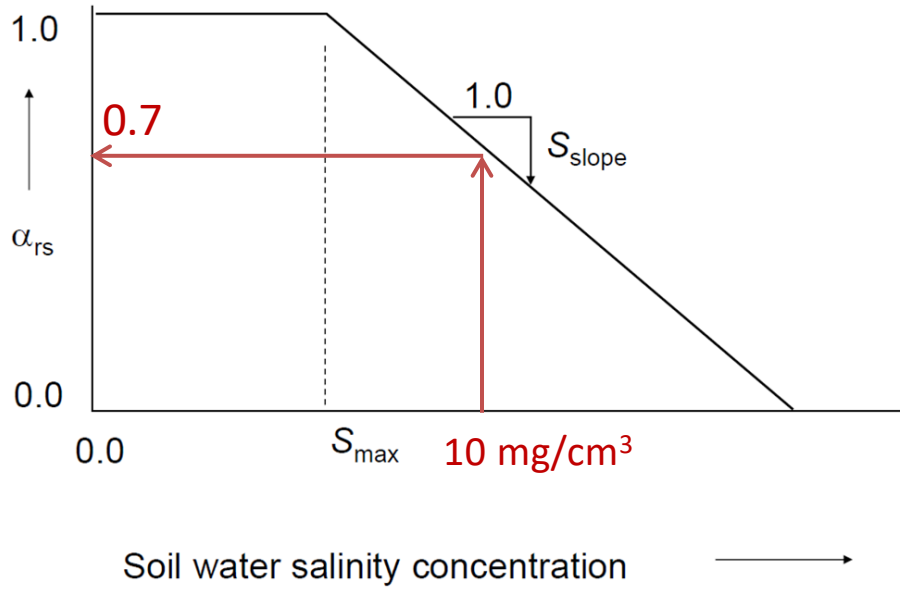
How to improve our understanding of salinity stress tolerance mechanisms?

How to use this knowledge to reduce salinity stress?

Crop modelling: SWAP-WOFOST

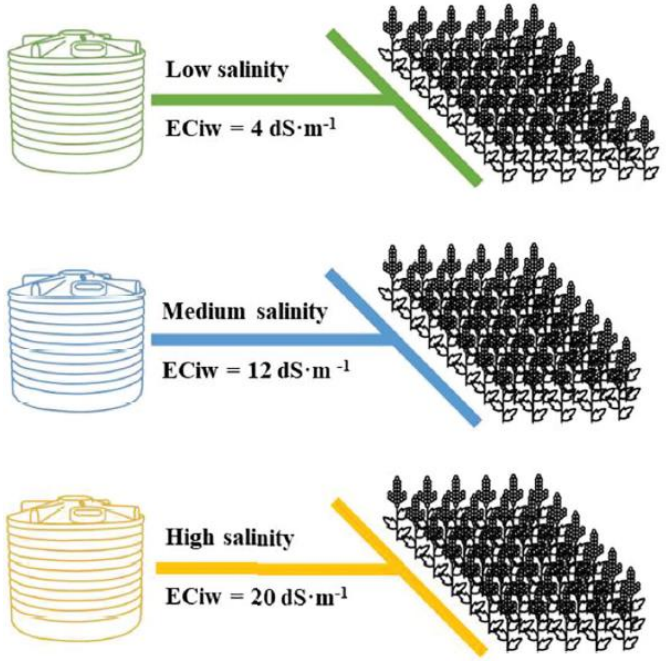


Salinity stress function



Root water uptake -> transpiration -> yield

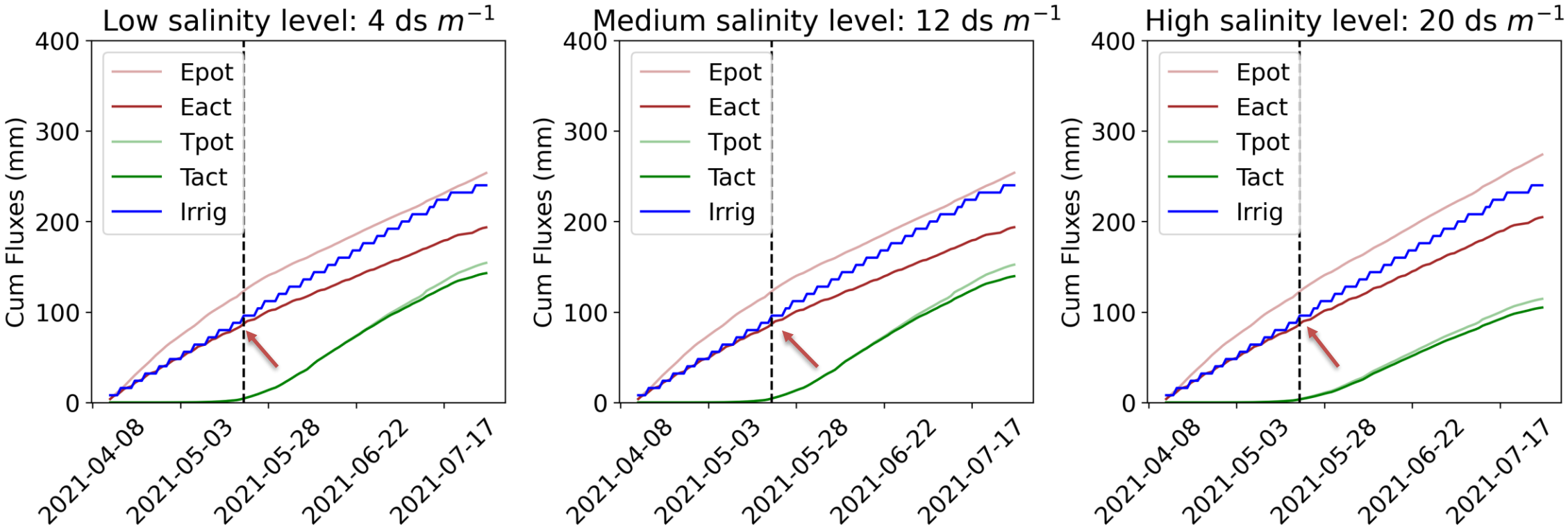
Field experimental data: Laayoune (Morocco)



https://doi.org/10.3389/fpls.2023.1143170

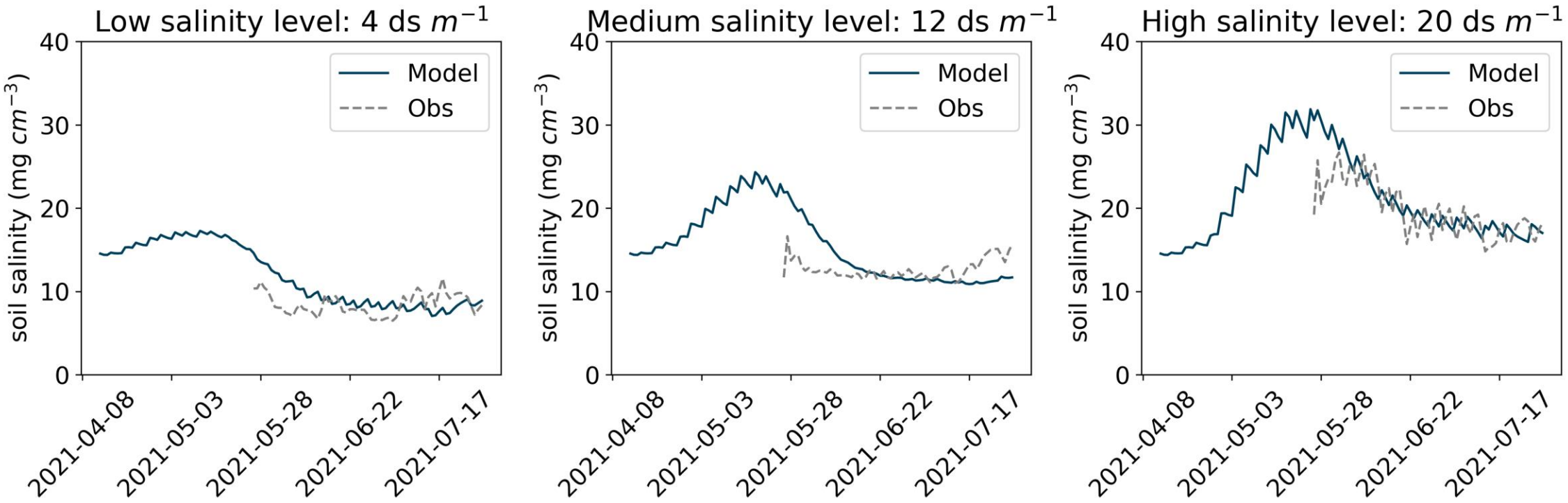
- Variety ICBA-Q5
- Sandy loam soil
- 9 organic amendments

Changes in the water balance due to increasing salinity

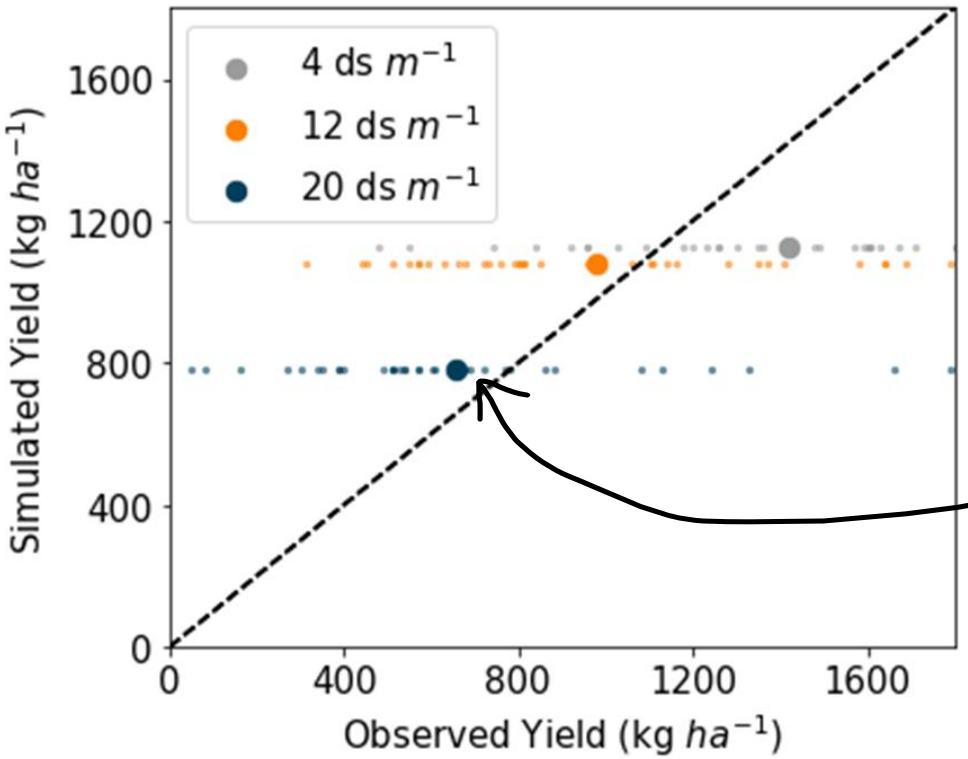


Salt accumulation leading to salinity stress

Quinoa actively takes up salts



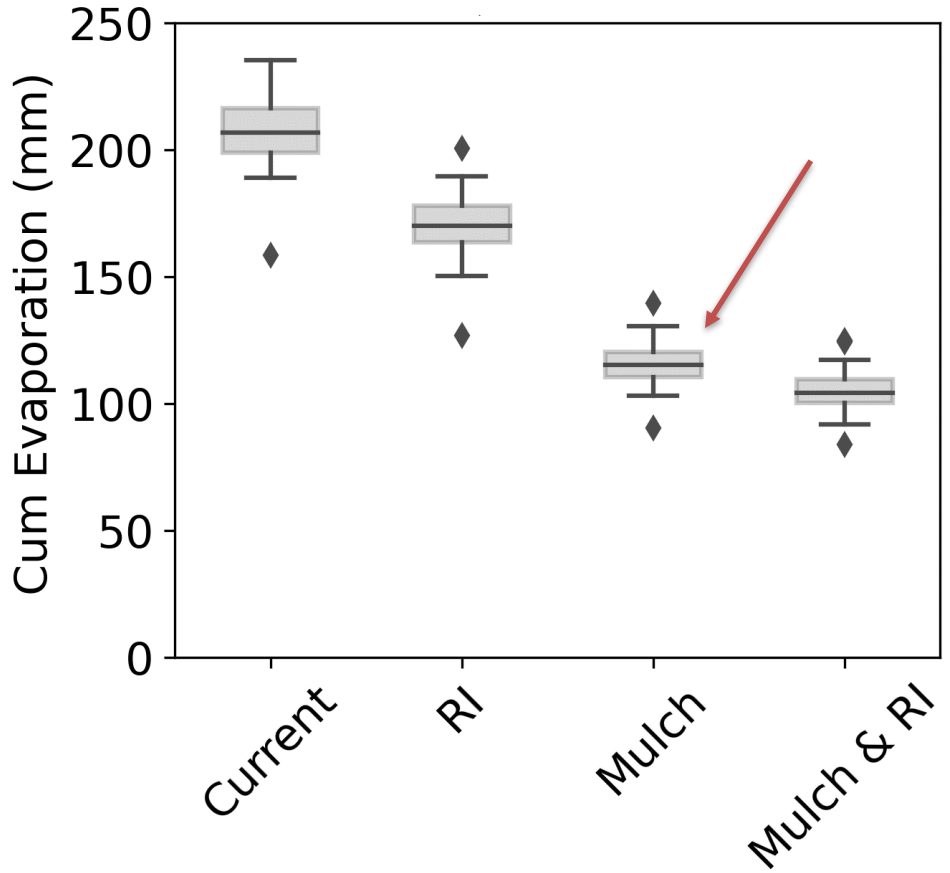
On average, quinoa tolerates medium salinity levels with minor reductions in yield



But it is affected at high salinity levels

Excessive soil evaporation can be improved by using mulching or reducing irrigation

Scenario	Irrigation/mulching
Current	8 mm, 2x week
RI	2 mm during the first month, 2x week.
Mulch	Mulching + current irrigation
Mulch & RI	Mulching + reduced irrigation



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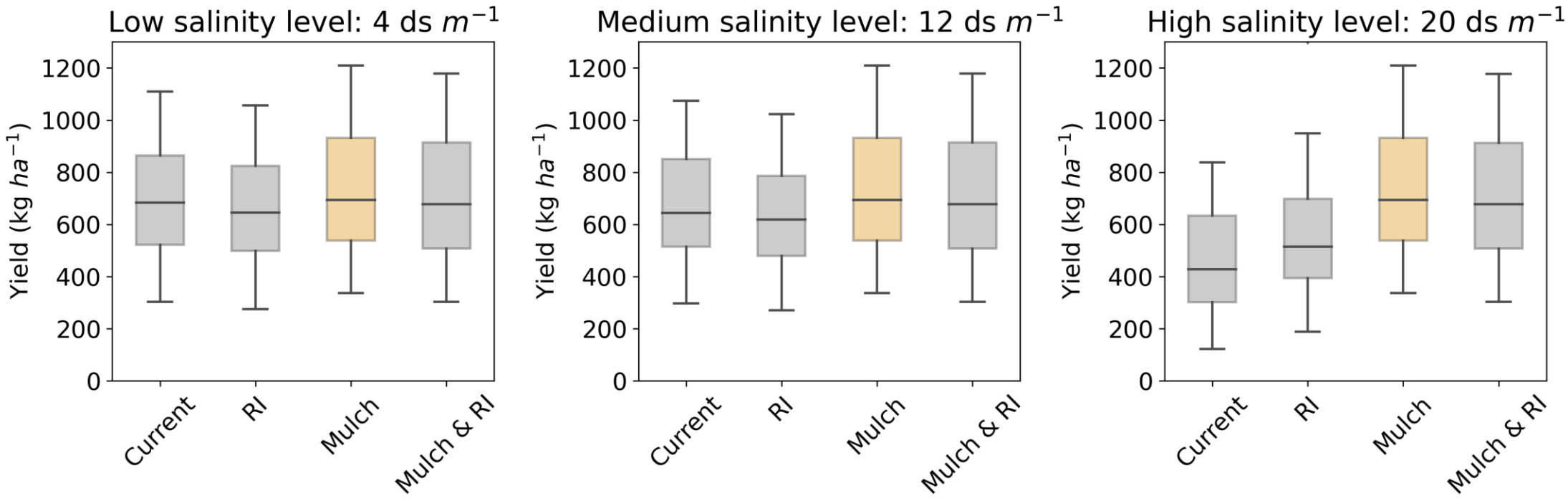

Conclusions

- The salinity stress function can integrate crucial stress tolerance mechanisms inherent to quinoa.
- In the experiment, salinity stress is partially caused by overirrigation during the initial growing stage.
- Reducing irrigation and/or mulching can potentially decrease excessive soil evaporation and improve yield.

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Thank you

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Scan here to read the full report

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