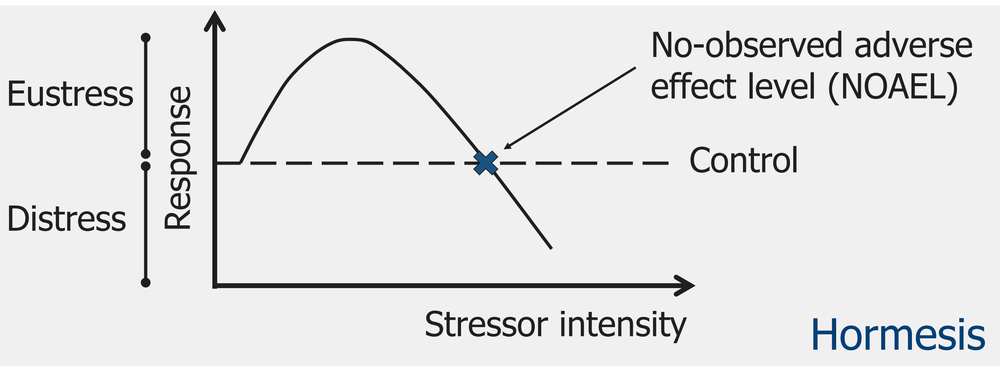
Commissioned by the German Federal Ministry for Economic Cooperation and Development (BMZ) and carried out by ATSAF e.V. on behalf of the Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH.

Between eustress and distress
Tracing hormesis of salinity in a sweetpotato clonal pool

Johanna Volk[1], Dhruv Patel[1], Jane Cypriyana[1], Maria Isabel Andrade[2], Folkard Asch[1]
[1]University of Hohenheim, Inst. for Agricultural Sciences in the Tropics (Hans-Ruthenberg-Institute), Germany
[2]International Potato Center, Flagship 2- Adapted Productive Varieties and Quality Seed, Mozambique

Introduction



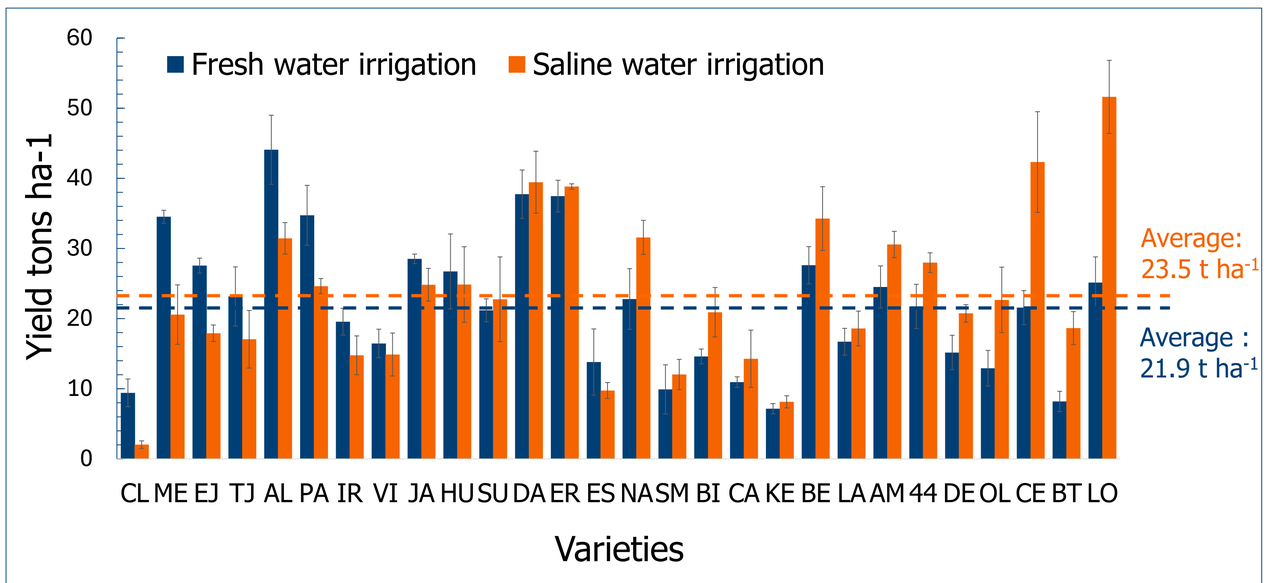
Hormesis

- Promising concept to select varieties for low-stress environments.
- Moderate salinity levels shown to have positive effects in other crops.
- Sweetpotato salinity hormesis not yet described.

Conclusions

- Yield increase for majority of varieties under saline irrigation.
- Number of roots and harvest index are underlying yield changes.
- Dry matter and starch are changing along with yield.
- Positive or no effect on quality parameters.
- If managed carefully, saline irrigation can increase yield.
- Ongoing research into hormesis mechanisms.

Results and Discussion

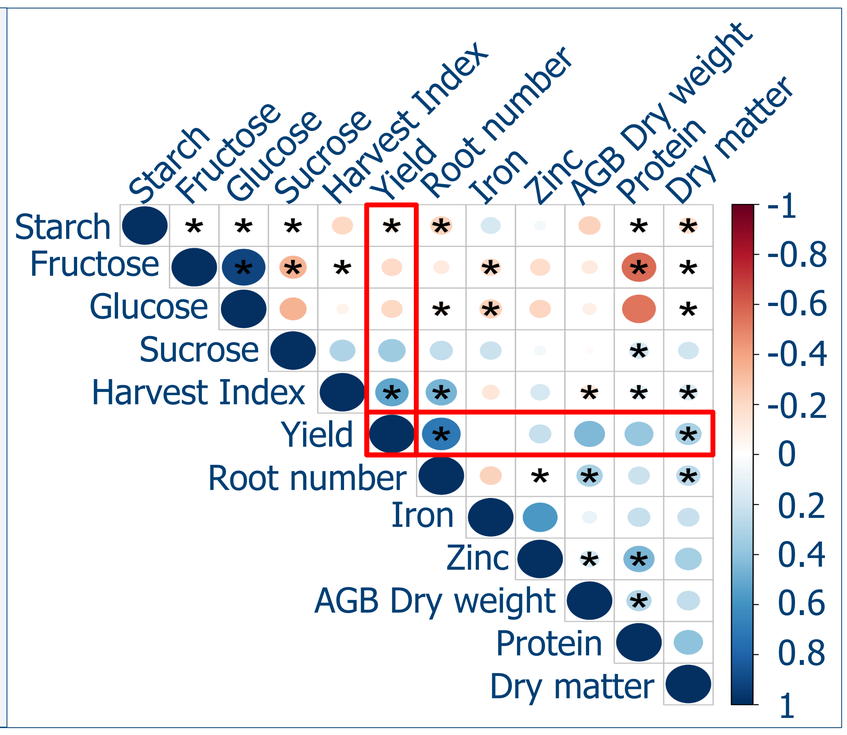


→ Freshwater yield average: 21.9 t ha^{-1}
→ Salinity increased yields by Ø 1.6 t ha^{-1}

Freshwater and saltwater yields

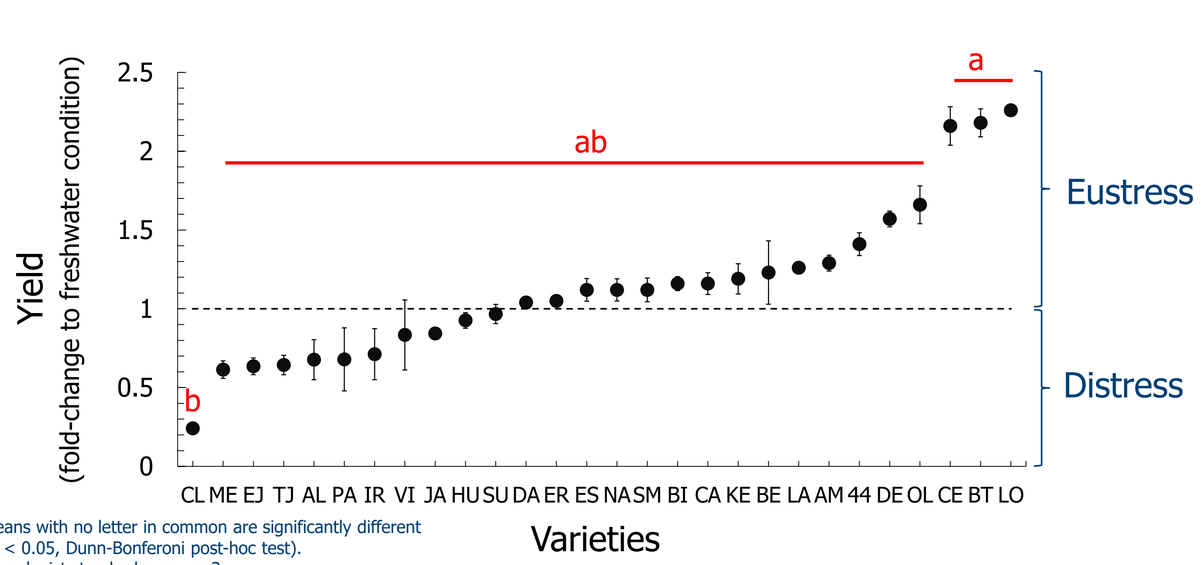
→ Significant positive correlation of yield with root number, harvest index and root dry matter
→ Significant correlation of yield with starch
→ No correlation of yield with iron

Correlations of salinity effects



→ Yield increase for majority of varieties
→ Wide range from distress to eustress

Eustress/distress variety spectrum



Means with no letter in common are significantly different ($p < 0.05$, Dunn-Bonferoni post-hoc test).
Bars depict standard error, n=3.

Salinity effects across varieties

→ Positive effect on yield and biomass
→ Slight negative effect on root number and harvest index
→ No or positive effect on quality
→ Wide effect range across varieties

Salinity effect (factor)

Harvest quantity	Average	Range
Yield	1.1 ± 0.09	0.2 - 2.3
Root number	0.9 ± 0.05	0.5 - 1.5
AGB dry weight	1.4 ± 0.11	0.5 - 3.2
Harvest Index	0.9 ± 0.05	0.3 - 1.8
Harvest quality		
Iron	1.0 ± 0.03	0.8 - 1.3
Zinc	1.1 ± 0.03	0.7 - 1.4
Protein	1.0 ± 0.05	0.6 - 1.7
Starch	1.0 ± 0.01	0.9 - 1.1
Fructose	1.0 ± 0.06	0.5 - 2.1
Glucose	1.0 ± 0.06	0.5 - 1.9
Sucrose	1.1 ± 0.07	0.3 - 1.9
Dry matter	1.0 ± 0.01	0.8 - 1.1

Materials and Methods

Experimental set-up: Strip-Plot designed field trial during dry season of 2023 at the International Potato Centre (CIP) research station in Maputo, Mozambique.
Treatments: Freshwater irrigation (1), saline water irrigation (7.5 dS/m) (onset 25 days after transplanting) (2), 28 sweetpotato varieties (3); n=3; initial soil ECe 1.8 dS/m (non-saline).
Harvest: Storage roots and aboveground biomass (AGB) harvested 145 days after transplanting.
Laboratory analyses: Storage roots analysed for quality parameters using near-infrared spectroscopy (NIRS) after freeze-drying of samples.

This work would not have been possible without the great support of the CIP field and laboratory team in Maputo, the 2023 students from Universidade Pedagógica, Maputo and the 2023 ATSAF JSP/JST stipend holders.