Nutritious food from salty ground:

The development of an early-detection screening tool for salinity tolerant sweetpotato varieties

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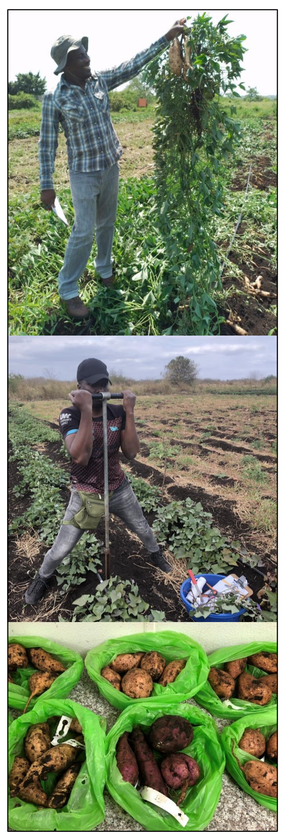
Background and Objectives

- Sweetpotato produces more biomass and nutrients per hectare than any other food crop.
- High vitamin A and iron contents of sweetpotato are reducing micronutrient deficiency in the Global South.
- However, sweetpotato production is affected by rapid soil salinization because plants are often grown on coastal areas and marginal soils.

→ Need for screening indices to effectively select tolerant varieties among the vast genetic diversity.

→ First contribution towards developing a field-based screening tool including yield as the ultimate tolerance trait.



Conclusions and Outlook

- The relationship between aboveground biomass dry weight and storage root yield should be included into assessments of salinity tolerance.
- Defining traits for tolerance needs to take different mechanisms of salt uptake and distribution into account.
- Ongoing field trial in Maputo with higher levels of salinity
- Awaiting quality analysis results for effect of salinity on storage root nutrient content.
- Ion content analysis for a larger set of varieties is under way.

Results

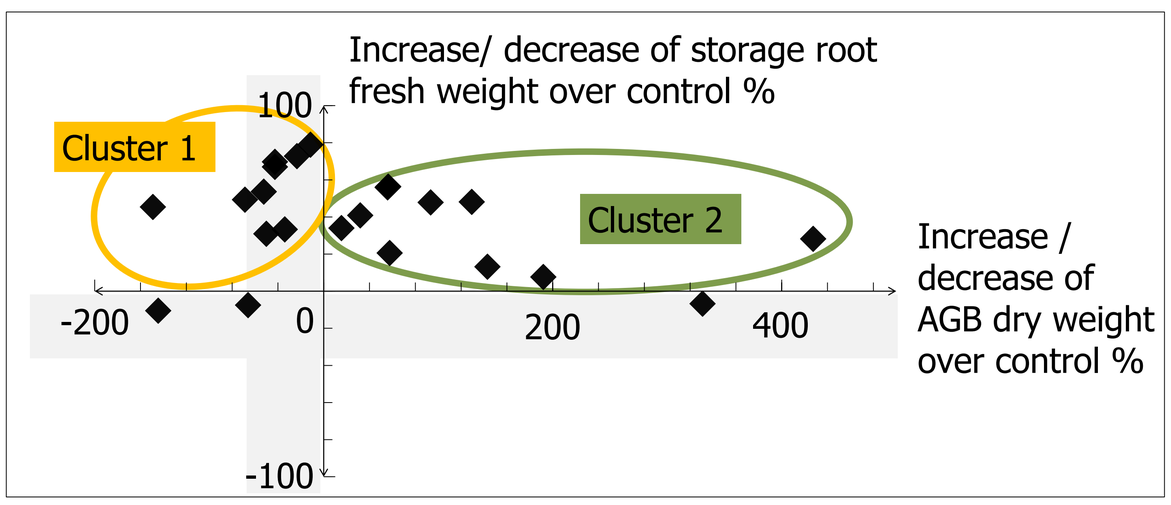


Fig. 1: Effect of saltwater irrigation on aboveground biomass (AGB) dry weight and on yield (fresh weight of storage roots per plant) of 21 sweetpotato varieties; n=3.

→ The storage root yield of some sweetpotato varieties seem more tolerant than indicated by decline of the aboveground biomass dry weight (Fig. 1).

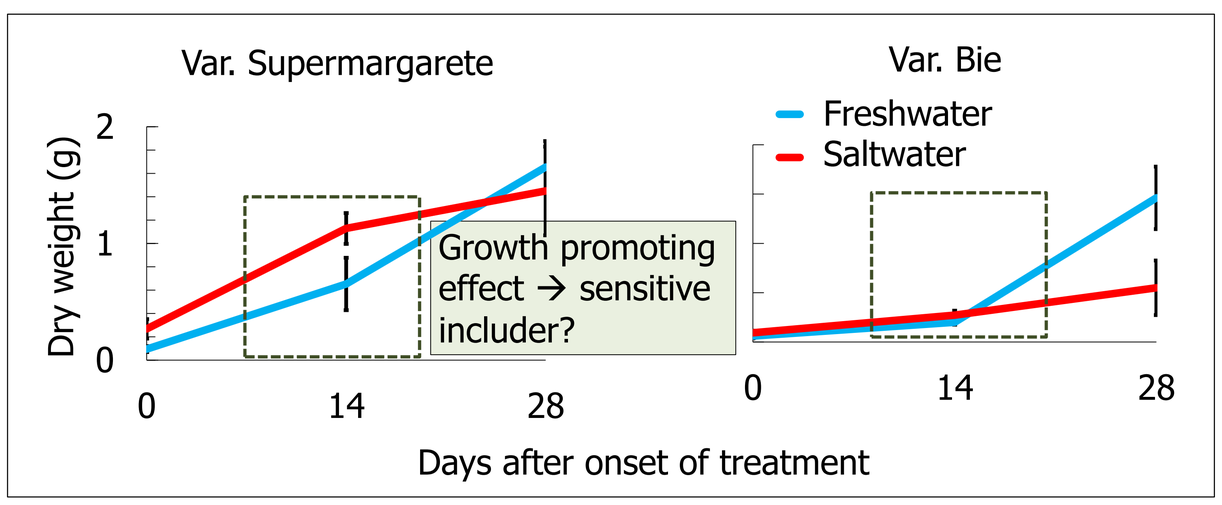


Fig. 2: Dry weight development of aboveground biomass of varieties Supermargarete and Bie in the first 28 day after treatment onset; error bars indicate standard error; n=3.

→ Some varieties sensitive to salinity show a growth promoting effect of saltwater irrigation within the first two weeks after treatment onset (Fig. 2).

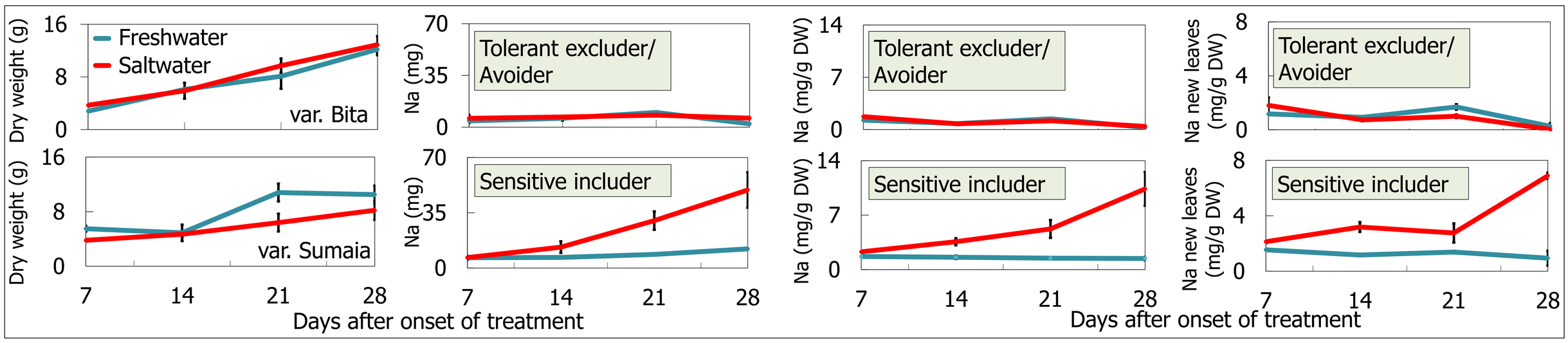


Fig. 3: Parameter development during the first 28 after treatment onset; n=3, bars=std. error.

→ The variety tolerant to salinity is a sodium excluder while the susceptible variety is a sodium includer. This is measurable via the total sodium content, the sodium concentration, and the sodium concentration in the newly grown leaves (Fig. 3).

Material and Methods

The data were collected in the 2022 (Fig. 1) and the 2023 (Fig. 2) field trial in and in the 2022 greenhouse trial in Hohenheim. In the field trial 2022, the maximum salinity level reached by saltwater irrigation was 1.1 dS/m (EC 1:5). 3.8 dS/m (1:5) were reached in the greenhouse trial. 2023 field trial is ongoing. For dry weight determination, samples were dried for 48 hours at 60°C. Soil samples were air-dried, sieved and given into a 1:5 solution with distilled water.

Acknowledgements

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