UNIVERSITY OF HOHENHEIM

Institute of Agricultural Sciences in the Tropics (Hans- Ruthenberg-Institute) Water stress Management (490g)

Genotypic morphological traits affecting ion partitioning and tuber formation in salt stressed sweet potato

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Introduction

Sweet potato (*Ipomoea batatas* L.) is an important food and climate-resilient root crop, but increasing soil salinity poses a major constraint to its growth and tuber productivity. Salt stress induces ionic imbalance, particularly excessive accumulation of Na, which disrupts physiological processes and adversely affects tuber formation.

Genotypes differ in regulating ion uptake, partitioning, and morphological adaptation under saline conditions. Understanding the relationship between genotypic morphological traits, ion partitioning, and tuber formation may therefore be essential for identifying salt-tolerant genotypes and developing sweet potato cultivars suitable for salt-affected environments.

Conclusions

- **CIP 188002.1 showed the strongest vegetative performance under non-saline and saline conditions.**
- **Salt tolerance and tuber formation are not determined by vegetative growth alone. The good performance of CIP 188002.1 and BARI SP 12 may be related to better Na^+ partitioning, K^+ retention, and source-sink balance under salt stress.**
- **Ion distribution differed among organs and genotypes. Under salinity, petioles stored more Na^+ and lost more K^+, helping regulate ion transport.**

Results and Discussion

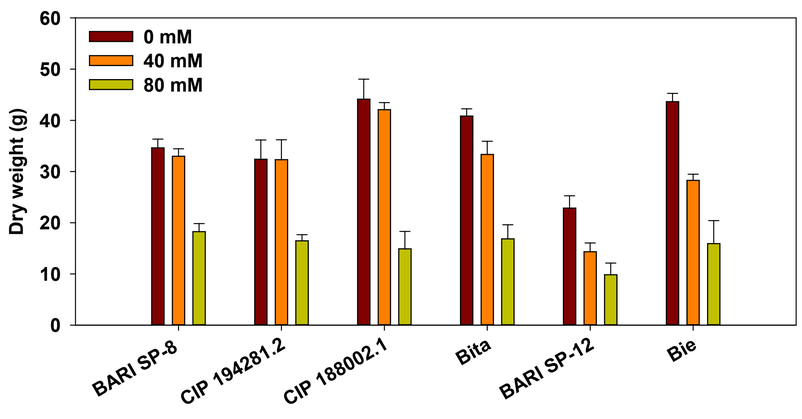

Fig. 1: Mean dry weight (g) under different treatments

- Genotypes differed in growth and ion regulation under salinity. CIP 188002.1 maintained high biomass but failed to tuberize, suggesting a genotype-specific sink limitation rather than a salinity effect.
- BARI SP-12 maintained tuber yield even at 80 mM NaCl, through effective Na^+ compartmentation in petioles and K^+ retention in sink-related tissues.
- The organ-wise Na^+ and K^+ distribution indicate that ion partitioning and K^+ homeostasis are central mechanisms driving salinity tolerance and yield stability.

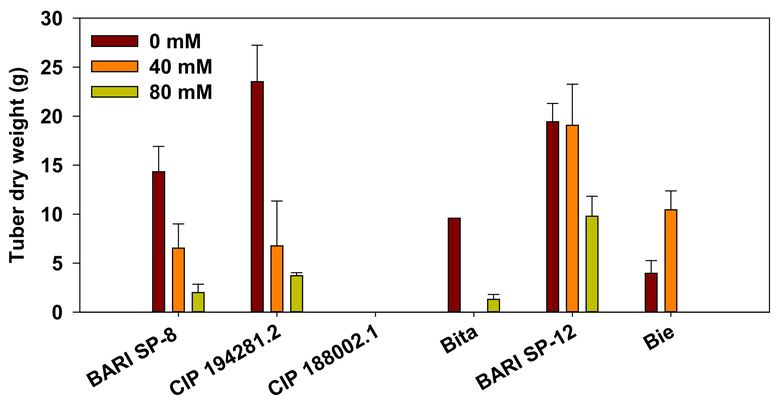

Fig. 2: Mean tuber dry weight (g) under different treatments

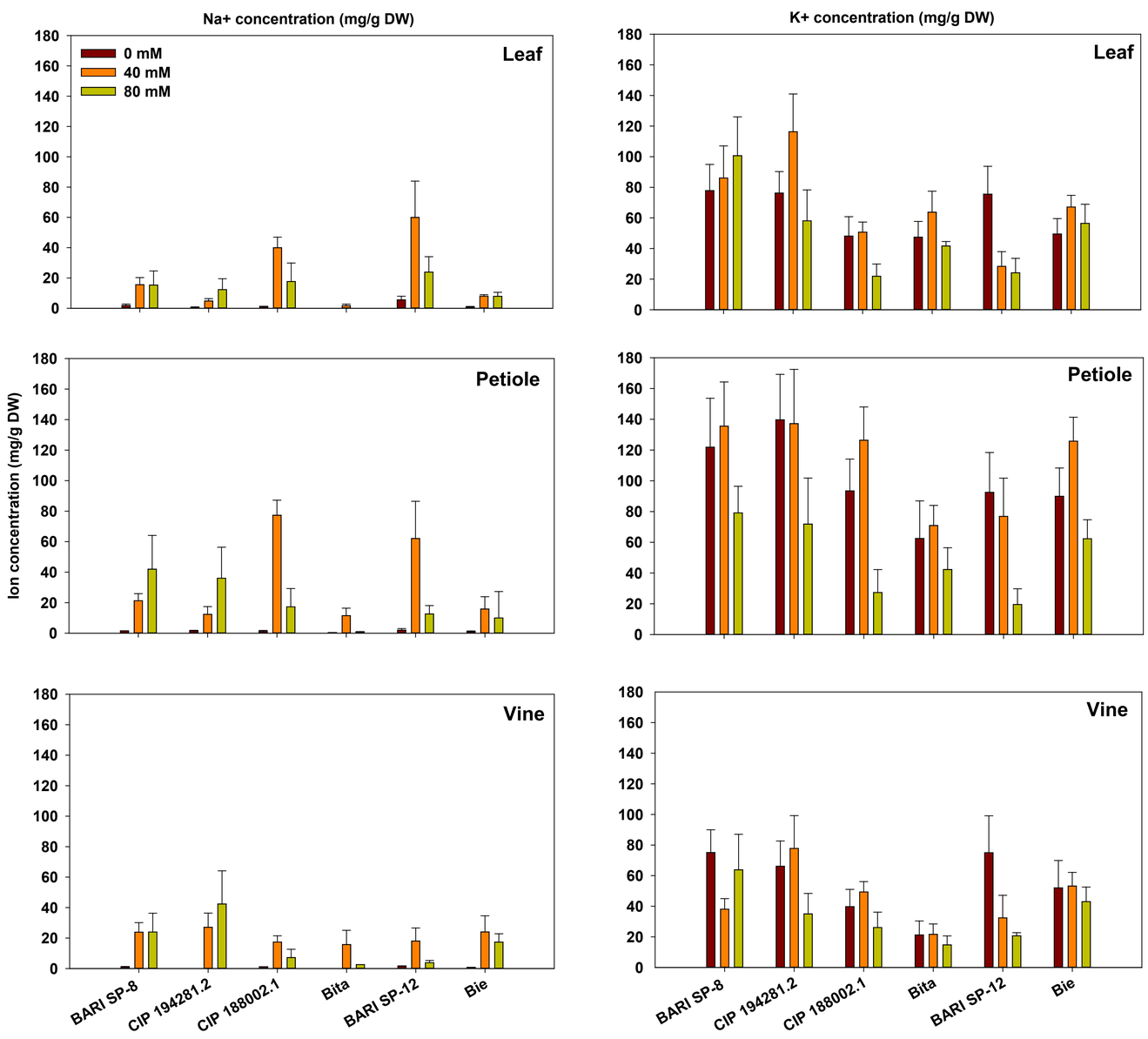

Fig. 3: Na^+ and K^+ ion partioning in different organs of six (6) different genotypes

- Na^+ mainly accumulated in petioles, followed by the leaves and vines.
- K^+ was highest in petioles under control and moderate salinity but decreased sharply under high salinity, indicating disrupted K^+ balance under severe salt stress.

Materials and Methods

A greenhouse experiment was conducted at University of Hohenheim using six genotypes viz., BARI SP 8, CIP 194281.2, CIP 188002.1, Bita, BARI SP 12 and Bie grown in soil-compost substrate and exposed to 0, 40, and 80 mM NaCl for a period of 98 days. The experiment was arranged in a Randomized Complete Block Design with four replications. The six genotypes were subjected to each of the three NaCl treatments, resulting in a factorial combination of genotype and salinity concentration. Morphological traits including vine, leaf, petiole length and biomass, leaf area, biomass portioning and tuber yield were measured to assess physiological responses to salt stress. In addition, Na^+ and K^+ concentrations were determined in the plant tissues to evaluate ion accumulation.

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