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# Water uptake does not drive sodium and chlorine uptake in sweet potato genotypes exposed to salt stress

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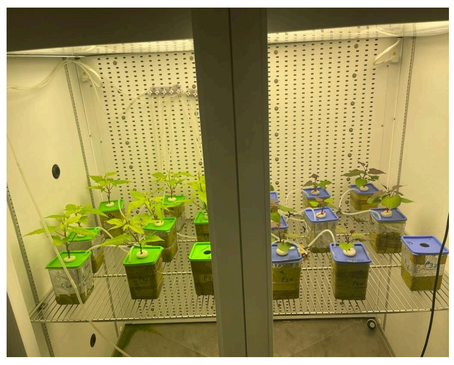
## Introduction

Salinity leads to increased sodium and chlorine concentrations in the root zone solution. Plants transpire root zone-borne water via their leaf surfaces, this way taking up sodium and chlorine to the transpiring surface and thus into the leaf tissue.

It can be expected that the salt load of individual leaves and the transpirational water loss from the same leaves are highly correlated.

Potassium is instrumental in stomatal control. Therefore, plants able to maintain high tissue K and control transpiration under salt stress, should be more resistant to salinity.



## Conclusion

- **rH strongly affects transpiration.**
- **rH does not affect uptake of Na, K, and Cl but strongly affects distribution with in the plant.**
- **Genotypic differences manifest themselves for K under high rH and for Na under low rH.**
- **Na distribution pattern by active ion transport could be suggested for further study.**

## Results and Discussion

**Cumulative transpirational water loss and Na, K, Cl uptake in two contrasting clones of sweet potatoes subjected to 2 levels of root zones salinity. Error = SE, n=4.**

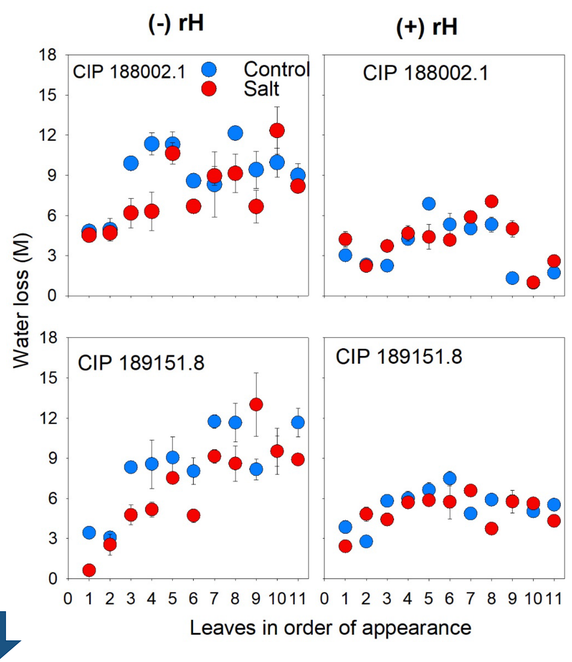
| VAR | TR, mM | %, rH | Na, µmol | K, µmol | Cl, µmol | WL, mM | WL/LA |
|---|---|---|---|---|---|---|---|
| CIP 188002.1 | 0 | 40 | 631 ± 50 | 2172 ± 98 | 2563 ± 104 | 118 | 21.74 |
| CIP 188002.1 | 50 | 40 | 5985 ± 281 | 1493 ± 99 | 4435 ± 265 | 131 | 28.60 |
| CIP 189151.8 | 0 | 40 | 551 ± 64 | 2632 ± 82 | 2461 ± 221 | 123 | 37.80 |
| CIP 189151.8 | 50 | 40 | 5001 ± 454 | 1092 ± 249 | 4625 ± 384 | 108 | 30.43 |
| CIP 188002.1 | 0 | 80 | 537 ± 50 | 2994 ± 247 | 2798 ± 329 | 81 | 13.19 |
| CIP 188002.1 | 50 | 80 | 6452 ± 552 | 1881 ± 190 | 5720 ± 429 | 80 | 12.63 |
| CIP 189151.8 | 0 | 80 | 428 ± 42 | 2279 ± 135 | 2064 ± 202 | 87 | 26.02 |
| CIP 189151.8 | 50 | 80 | 3371 ± 357 | 1052 ± 121 | 2756 ± 112 | 21 | 8.25 |

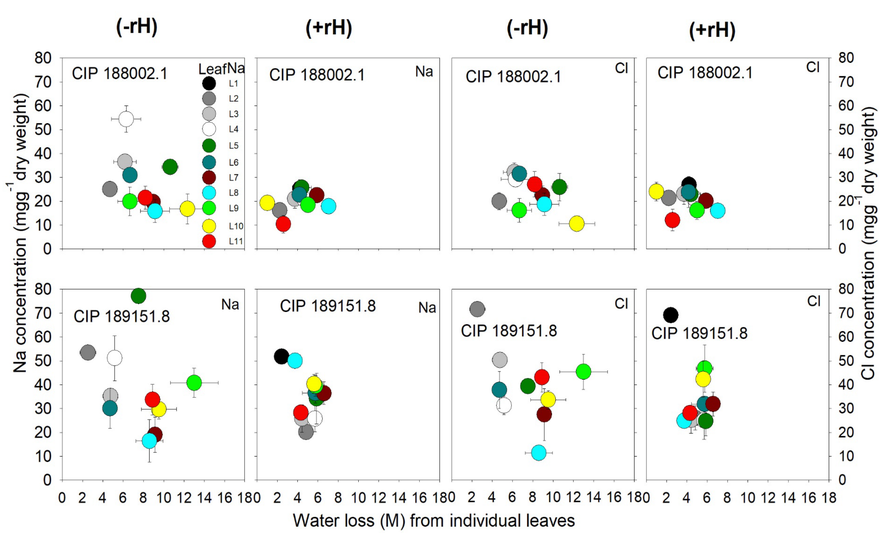
*VAR = Variety: CIP 188002.1 =tolerant and CIP 189151.8 =sensitive. rH=Humidity: 40% and 80%: Air humidity at the artificial VPD chambers. TR= Treatment. LA=Leaf Area; M=Mole, mM=millimole and WL=Water loss.*

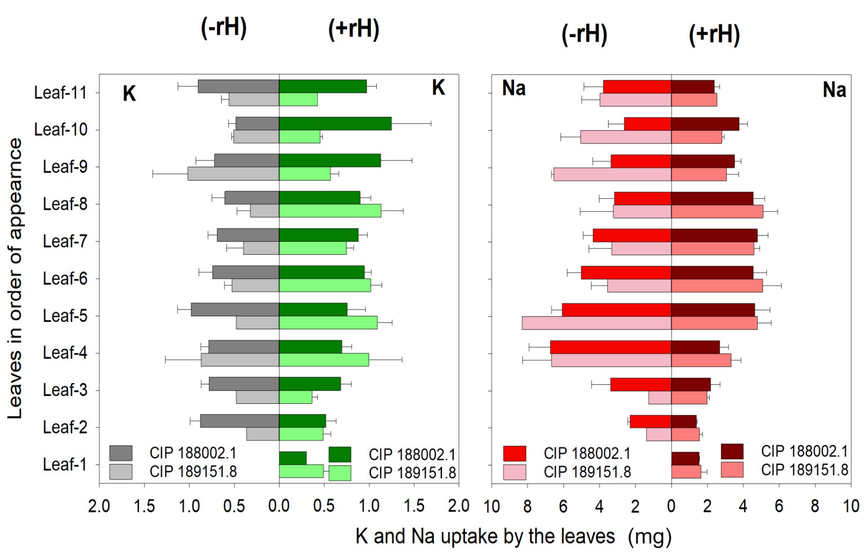
- Transpiration (WL/LA) doubled in low rH.
- Cumultative transpiration significantly in the sensitive genotype under salinity.
- rH did not affect Na accumulation.

► Na uptake is not linked to transpiration.

► Is there a role for Na/H+ antiporter coding genes in Na transport in sweet potato.




- Water loss from individual leaves was significantly reduced at 80% rH and older leaves transpired less water.
- Transpiration was not affected by 50 mM salt stress.

► Air humidity strongly influences transpirational volume flow independent of genotype and salinity

- Transpirational water loss of individual leaves is not linked to their Na nor Cl concentration.

► Since salt is transported with the transpiration stream, compartimentation mechanisms seem to protect highly transpiring tissues.

- Strong effects of rH on K and Na distribution.
- High rH increased K, low rH increased Na
- Under high rH, the tolerant genotype maintained twice the amount K in young leaves.

► Flux control of Na and high tissue K could be a tolerance trait in sweet potato.

## Notes on Materials and Methods

Plants were grown in hydroponics in the climate chambers of the Hans-Ruthenberg Institute for Tropical Agricultural Sciences, University of Hohenheim, Germany. Two contrasting varieties, CIP 188002.1 (tolerant) and CIP 189151.8 (sensitive) were studied at two levels of relative air humidity (rH 40% and 80%). Salt stress (50 mM NaCl) was applied 18 days after planting. Daily water loss from the pot was recorded and transpiration of individual leaves was measured with an LCI porometer and adjusted to rH and leaf age effects. Na, K and Cl were measured after the final harvest (21 days after salt application) in individual leaves by the flame photometer and auto analyzer, respectively.