Effect of clonal integration on drought and waterlogging response in *Urochloa humidicola*

Mildred Mayorga, Juan Andrés Cardoso Arango.
International Center for Tropical Agriculture, Tropical Forages Program.
Contact: m.mayorga@cgiar.org

INTRODUCTION

- Clonal integration allows for the sharing of resources such as water, nutrients, and photosynthates among individual subunits of clonal plants, promoting adaptation to diverse environmental and ecological conditions (Xu et al., 2010).
- In livestock production systems, a key aspect in adapting to climate change is the use of forage materials tolerant to abiotic stresses such as water deficit and waterlogging.
- The accession of *Urochloa humidicola* CIAT 679 (cv. Tully) is a promising forage due to its good adaptation to acidic soils with low fertility, drought, and waterlogging. Additionally, it has a high capacity for biological nitrification inhibition and efficient propagation through stolons (Bastidas et al., 2023), a reproductive system that allows for the maintenance of clonal integration among shoots of different generations.

OBJECTIVE

Evaluate whether clonal integration is one of the strategies that confers tolerance to drought and waterlogging in *Urochloa humidicola* CIAT 679 (cv. Tully)

METHODOLOGY

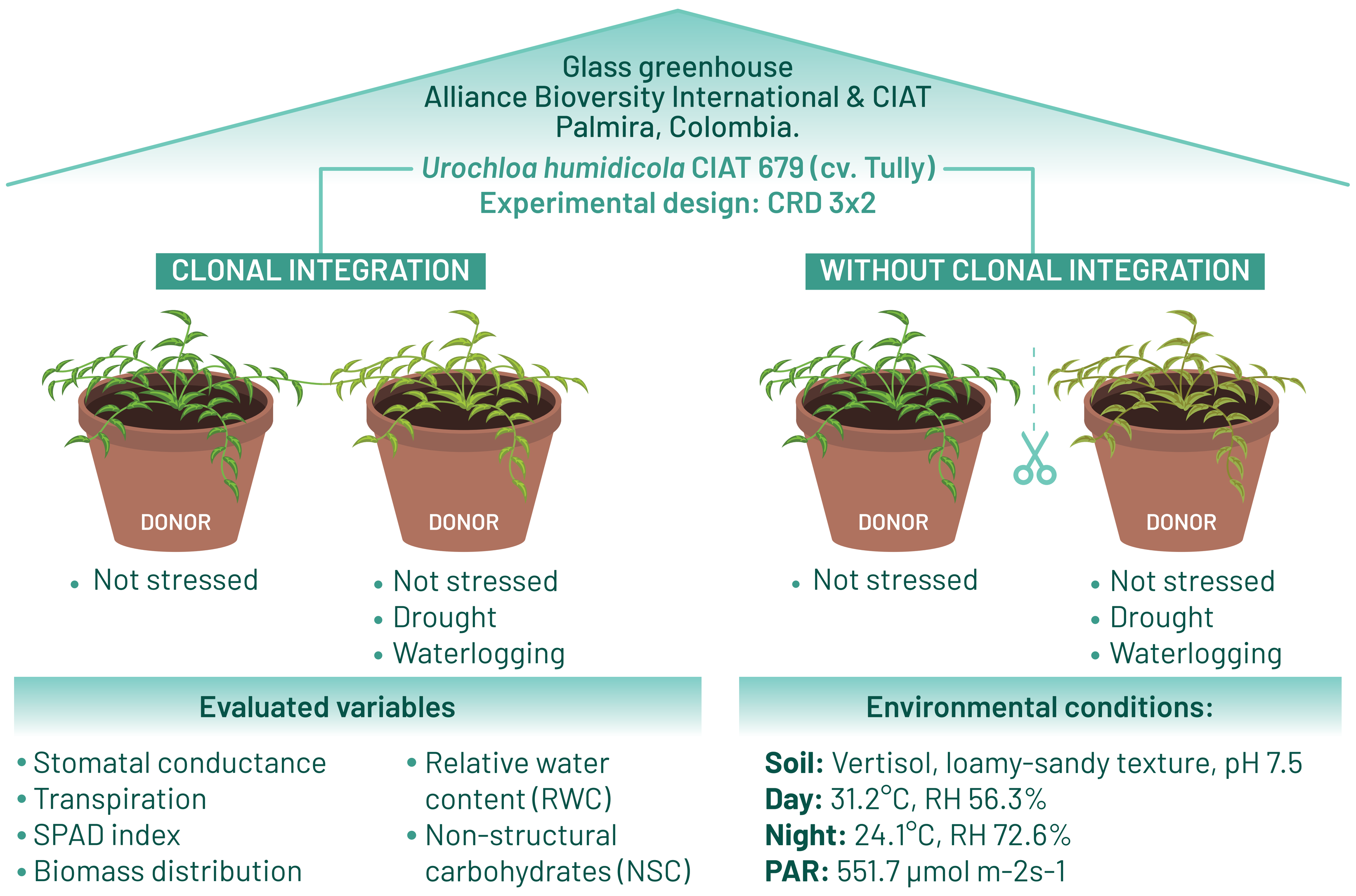
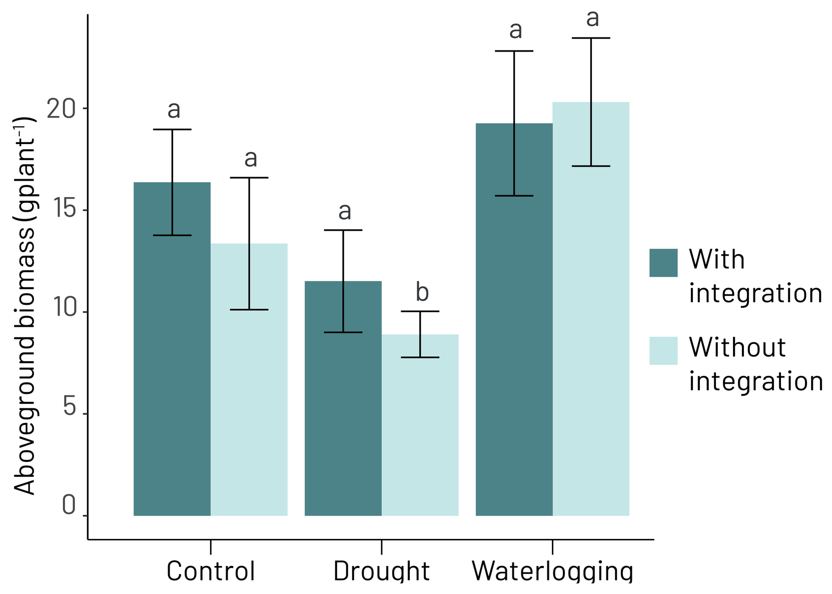


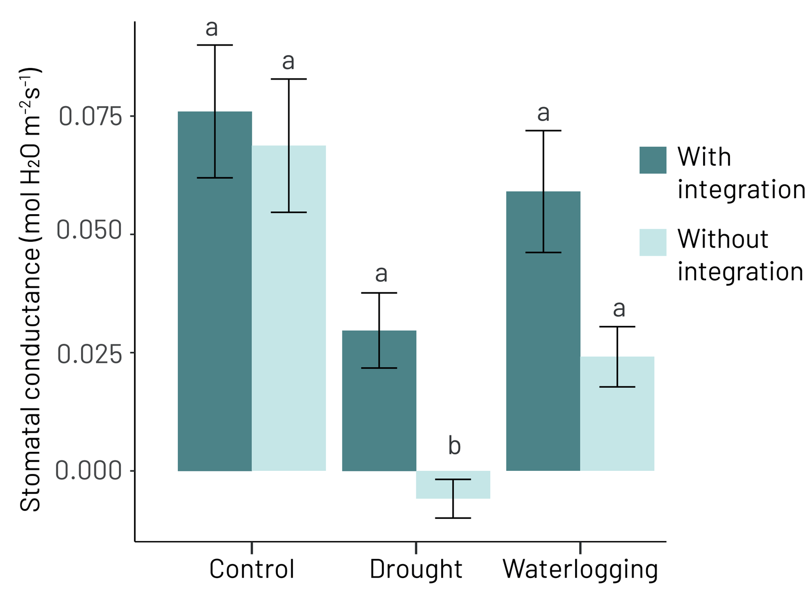
Figure 1. Clonal integration methodology.

RESULTS

Recipient plants under drought without integration exhibited 22.3% less aboveground biomass compared to plants with integration. Aboveground biomass in recipient plants under waterlogging (with and without clonal integration) and drought with integration was not affected by the stress condition (Fig. 2).

Stomatal conductance decreased in recipient plants under drought and waterlogging compared to control plants. Only the plants under drought without clonal integration showed significant differences (Fig. 3), as this treatment resulted in the death of leaf tissue. Similar results for transpiration, SPAD index, and RWC.





Bars represent the mean ± SE (n=6). Different letters indicate significative differences according to Tukey test ($p \leq 0.05$).

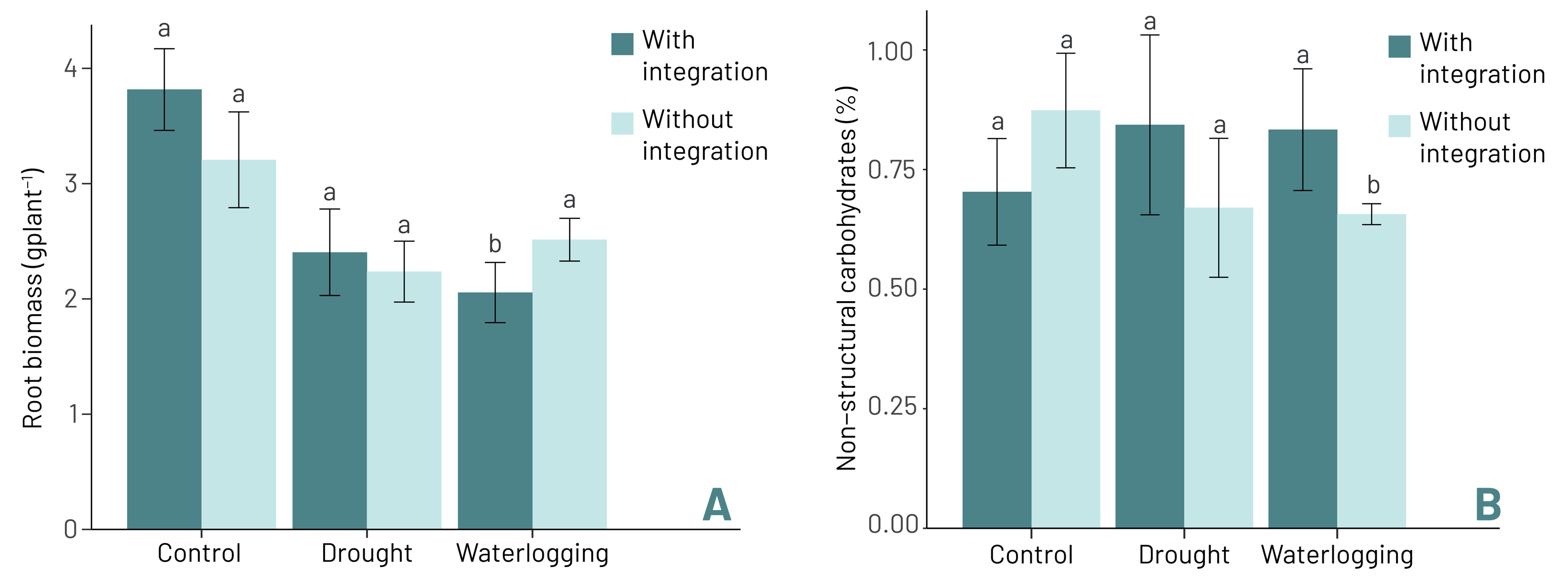
Figure 2. Aboveground biomass of recipient plants under different conditions.

Figure 3. Stomatal conductance of recipient plants under different conditions.

Root biomass was lower in recipient plants under waterlogging with integration (Fig 4A).Non-structural carbohydrates were lower in plants under waterlogging without integration (Fig. 4B).

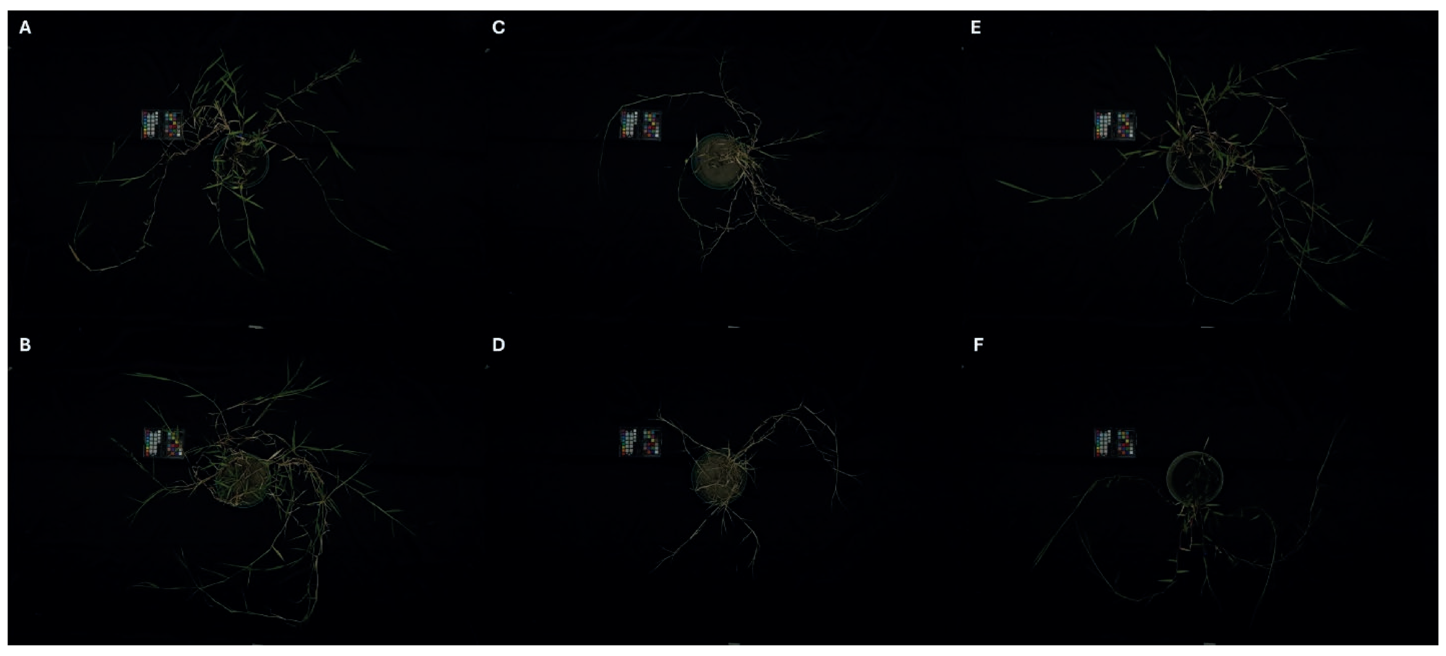
Clonal integration under waterlogging conditions: translocation of photoassimilates from the donor plant to the recipient plant, used in the aerial parts rather than in the roots.

Waterlogging conditions without clonal integration: plants likely allocate their resources towards root growth to mitigate stress.



Bars represent the mean ± SE (n=6). Different letters indicate significative differences according to Tukey test ($p \leq 0.05$).

Figure 4. Root biomass (A) and non-structural carbohydrates (B) of recipient plants under different conditions.



Control with integration (A), control without integration (B), drought with integration (C), drought without integration (D) waterlogging with integration (E) and waterlogging without integration (F).

Figure 5. Visual symptomatology of recipient plants after 21 days under different water conditions and clonal integration conditions with donor plant.

CONCLUSIONS

- The results suggest that clonal integration helps to mitigate waterlogging and drought stress in *Urochloa humidicola* CIAT 679 (cv. Tully) plants, possibly through the translocation of photosynthates and water mobilization, with drought stress having the most significant impact on the development of this material.

REFERENCES

Xu, C. Y., Schooler, S. S., & Van Klinken, R. D. (2010). Effects of clonal integration and light availability on the growth and physiology of two invasive herbs. Journal of Ecology, 98(4), 833-844.

Bastidas, M., Ospina, L., Rao, I. M., Montoya, A., Sotelo, M., Villegas, D. M., ... & Aguiar, A. (2023). Sistemas innovadores de siembra de Urochloa humidicola mediante estolones: Un caso exitoso en la altillanura colombiana.

ACKNOWLEDGEMENTS

This work was conducted as part of the CGIAR Initiatives on Livestock and Climate (L&C). We thank all donors who globally support our work through their contributions to the CGIAR System.

Alianza Bioversity & CIAT

CGIAR INITIATIVE ON Livestock and Climate

POSTER PREPARED FOR
Tropentag 2024
September 11-13, 2024
Vienna (Austria)