Speed breeding in *Urochloa humidicola*: changes in photoperiod accelerate flowering and increase seed yield

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Introduction

- *Urochloa humidicola* is an economically important tropical forage grass that is being improved through hybridization techniques to produce genotypes with spittlebug (Hemiptera: Cercopidae) tolerance, high nutritional quality and superior agronomic characteristics.
- Empiric observations suggest that changes in photoperiod and vernalization induce natural flowering in *U. humidicola* and, consequently, seed production.
- Under tropical sunlight conditions, a flowering, and therefore a crossing season, occurs every 12 to 16 months. As a result, breeding cycles are long and genetic gain is reduced.

Objective

To study the effect of photoperiod changes on flowering induction and seed yield in *U. humidicola* genotypes.

Results

1st trial:

- All treatments induced flowering on Genotype 1, indicated by the increased number of spike/m² (Tukey HSD, α = 0.05, Fig 3).
- We conclude that the best treatments correspond to 24 h and 16 h of red light and white light respectively (Figure 3).

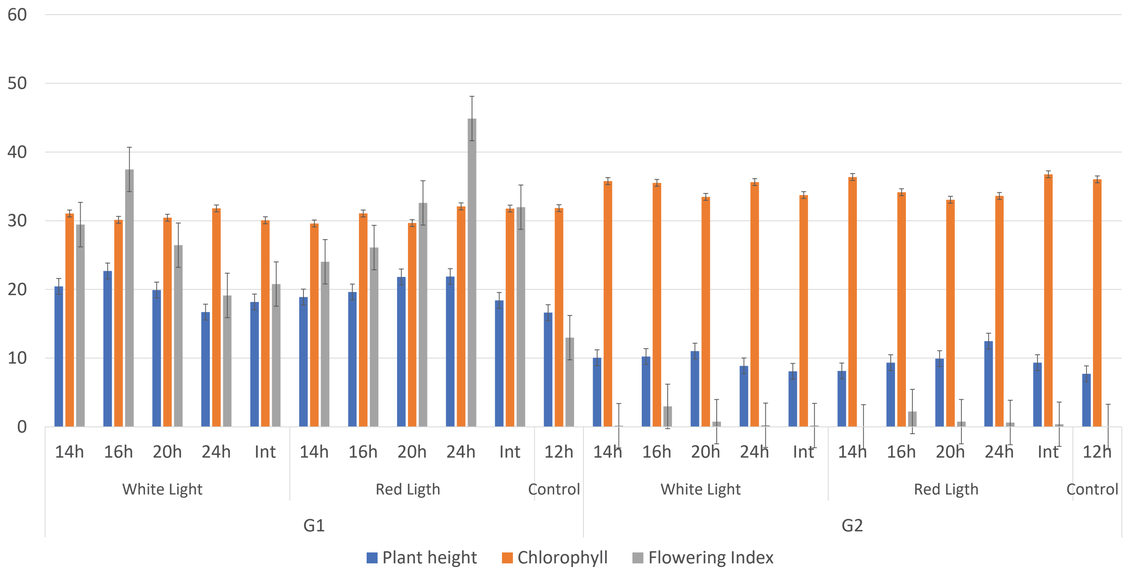

Figure 3. Effects of photoperiod modification on plant height, chlorophyll, and flowering index (spikes/m²) in two genotypes of *U. humidicola*.

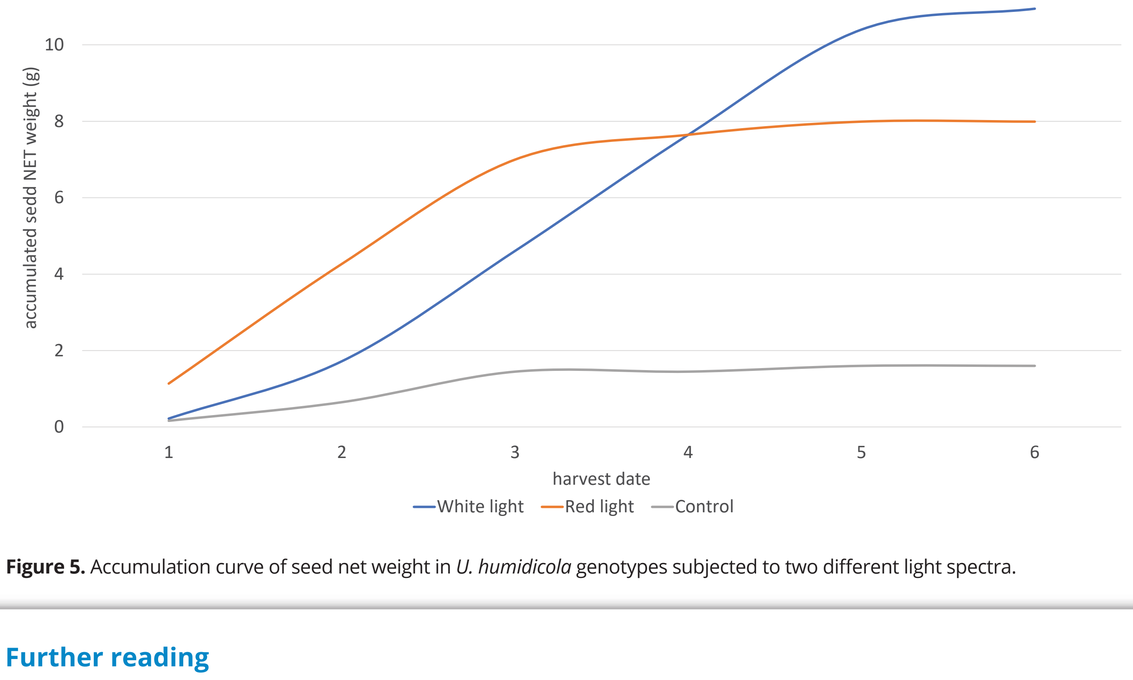

Figure 5. Accumulation curve of seed net weight in *U. humidicola* genotypes subjected to two different light spectra.

Materials and Methods

1st trial: Determine the response of *U. humidicola* genotypes to different photoperiod treatments in a factorial design:

Figure 1. Field distribution of plots in 1st trial.

- *Light spectra*: red, white and natural.
- *Photoperiod length*: 12, 14, 16, 20, 23.5 and 24 light hours.
- *Genotypes*: 2

2nd trial: Corroborate the two best treatments identified on the 1st trial.

Treatments: 16 hs white light and 24 hs red light. *Genotypes:* 5

Figure 2. Effect of light on flowering in *U. humidicola* genotypes with light.

Traits evaluated in both trials:

- Plant height (cm)
- Flowering index (spices/0.25m²)
- Gross Weight (g)
- Net Weight (g)
- Filled seeds (%)

2nd trial

- The results showed that while red light triggers a faster development of flowering, white light allows for an increase in the number of inflorescences and a higher seed yield (Figure 4 and 5).

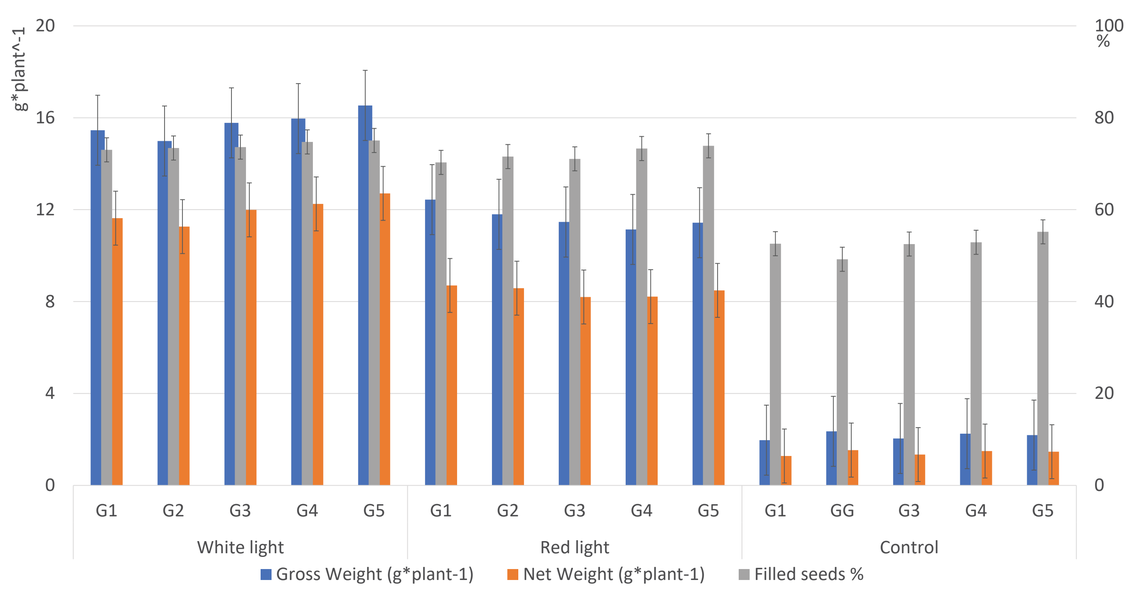

Figure 4. Gross weight, net weight, and filled seeds in five *U. humidicola* genotypes subjected to three photoperiods in 2nd trial.

Conclusions and Perspectives

- Our results suggest that longer photoperiods can be used as a potential speed-breeding tool in *U. humidicola* breeding program under tropical conditions.
- Once established, the optimized methodology will reduce the time between breeding crossing seasons from 12–16 to 6–8 months.
- Corroborate identified methodology over a wide panel of genotypes.

Further reading

Florián D; Hernández LM; Castiblanco V. 2019. Report on identifying a protocol to elicit flowering in Brachiaria humidicola with photoperiod management. International Center for Tropical Agriculture, Cali, CO. 9p.
https://hdl.handle.net/10568/106853

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