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## Light Competition in Maize and Perennial Ground Cover Intercropping: The Shade Avoidance Strategy

### INTRODUCTION

Intercropping offers many potential benefits, however in many cases the growth of both plants suffers because of competition, and these competition dynamics between plants in intercropping systems are not well understood (Moore et al., 2019; Schlautman et al., 2018). Competition for light involves sophisticated plant responses, including shade avoidance mechanisms, to maximize light interception and minimize shading effects (Moore et al., 2019). Understanding these mechanisms is crucial for optimizing crop productivity in intercropping systems.

### OBJECTIVE and HYPOTHESIS

- The objective of this study is to analyze the effect on light quality (Red/Far-Red) of a Perennial Ground Cover (PGC) growing in the maize inter-row during different timings.
- HYPOTHESIS:** Light competition and its consequent shade avoidance response are responsible for changes in maize phenotyping and yield reduction.

### METODOLOGY

- Randomized complete block design with two commercial maize hybrids: P1185Q and P1197.
- Treatments:

- T1: CONTROL (no PGC)
- T2: PGC ALL TIME
- T3: PGC UNTIL V4
- T4: PGC UNTIL V8
- T5: PGC UNTIL V6
- T6: SPRAYED PGC
- T7: T1 + FAR-RED LIGHT

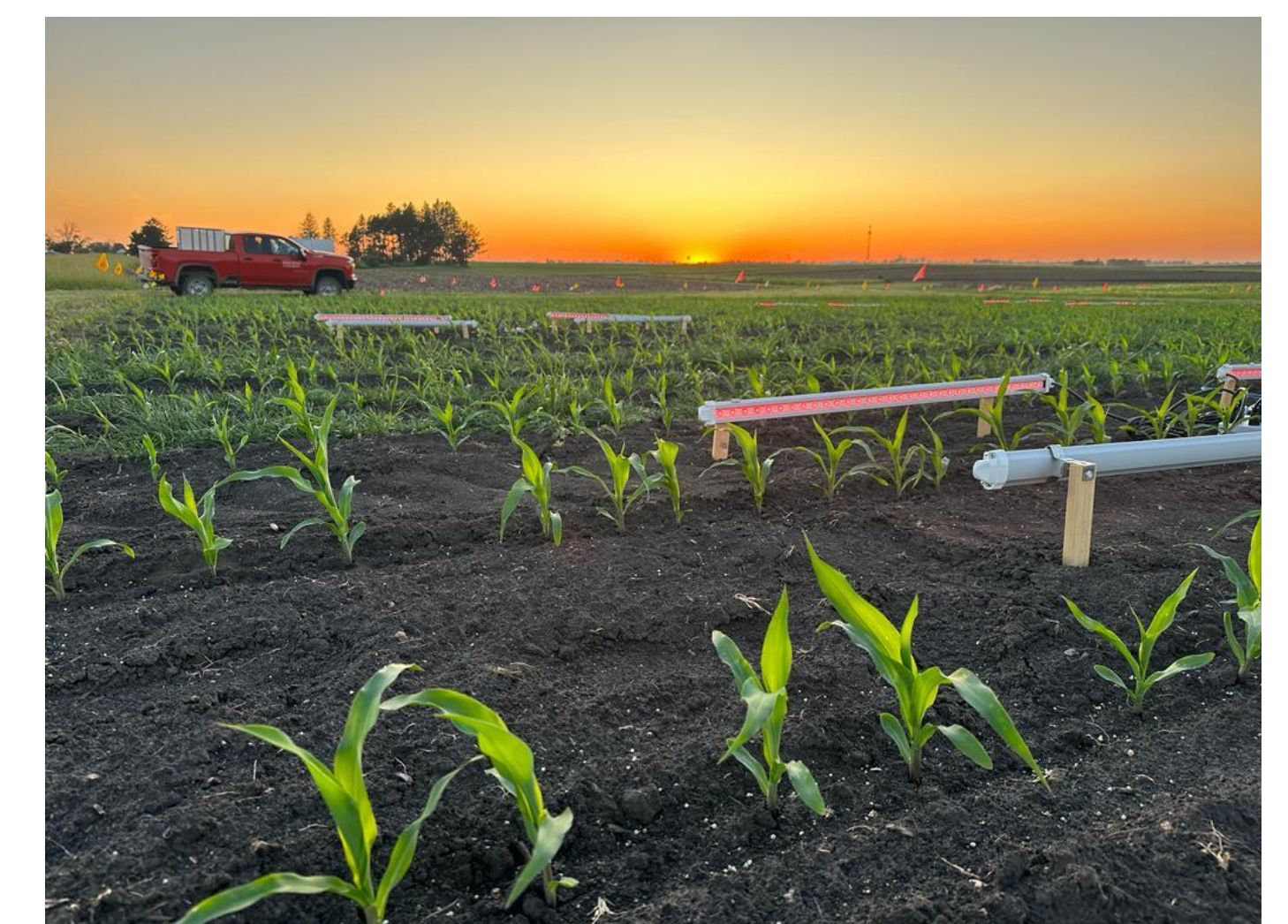
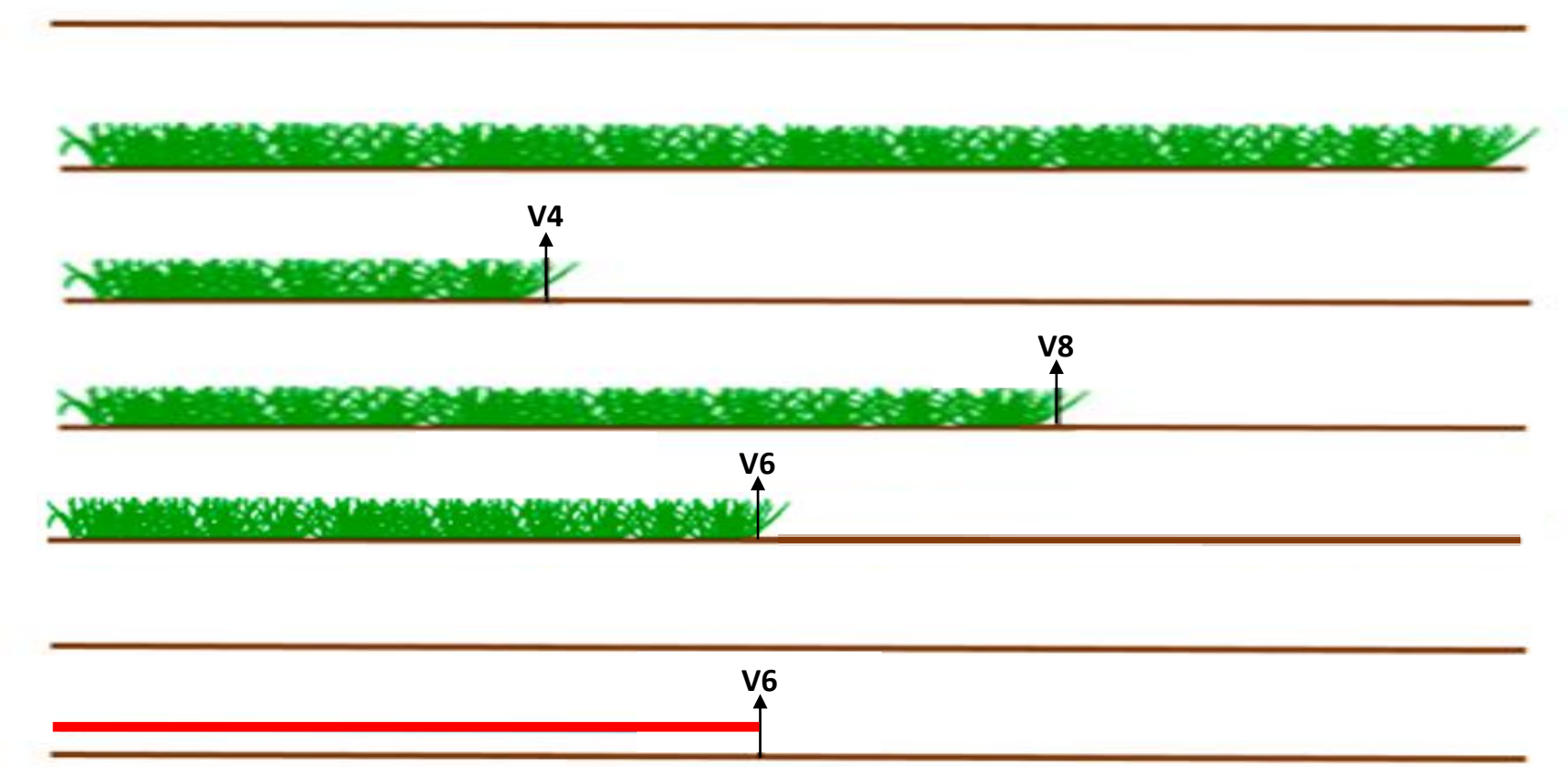


Figure 1: Field Experiment emphasizing treatment with Far-Red lights.

### RESULTS

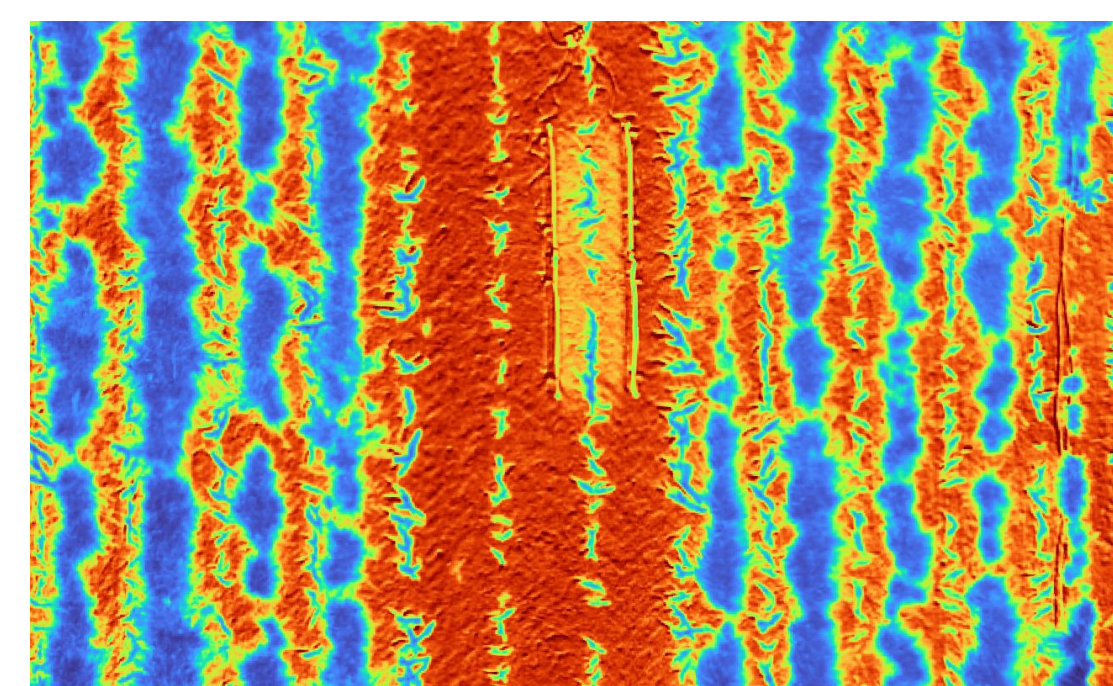
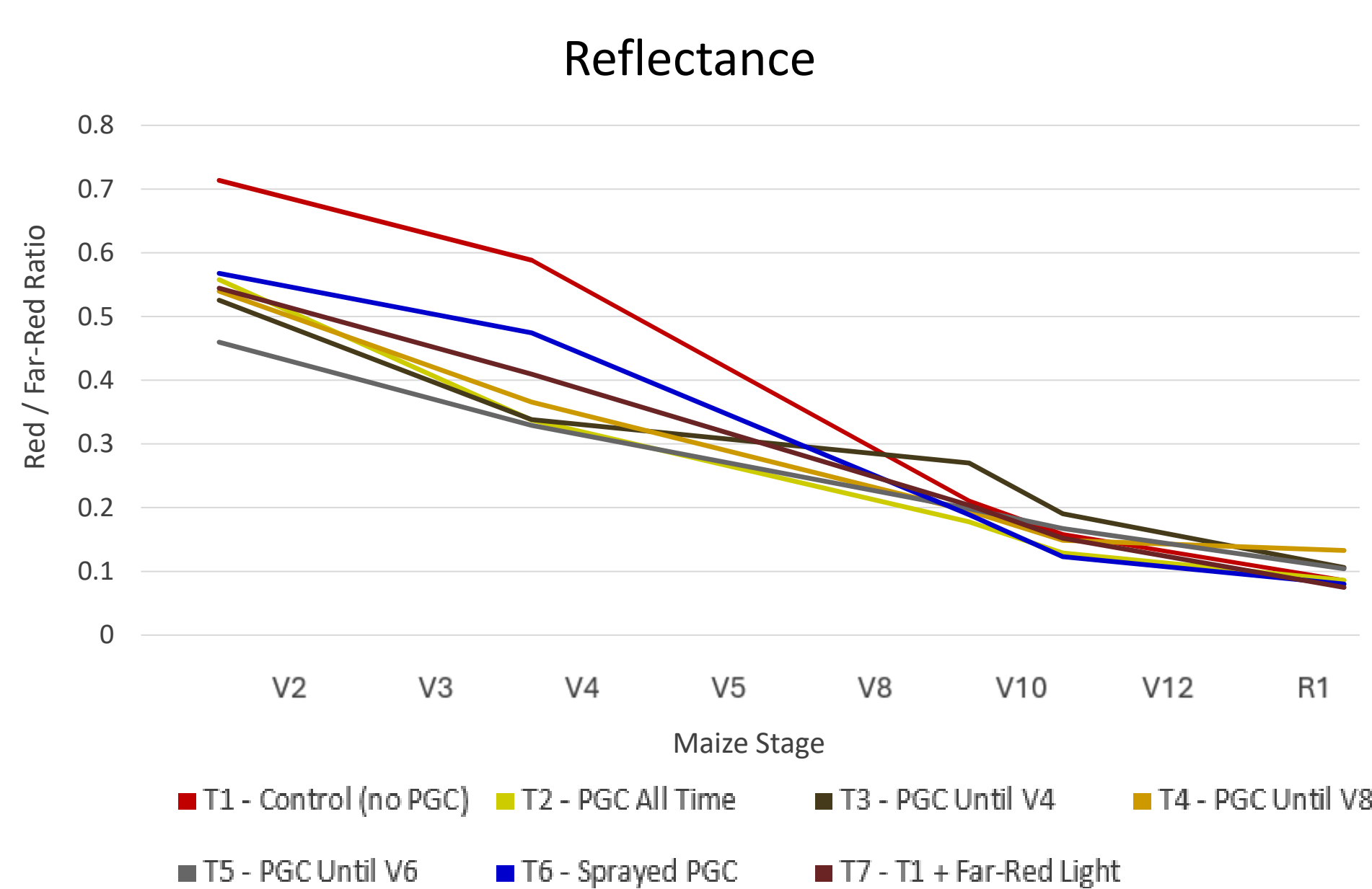
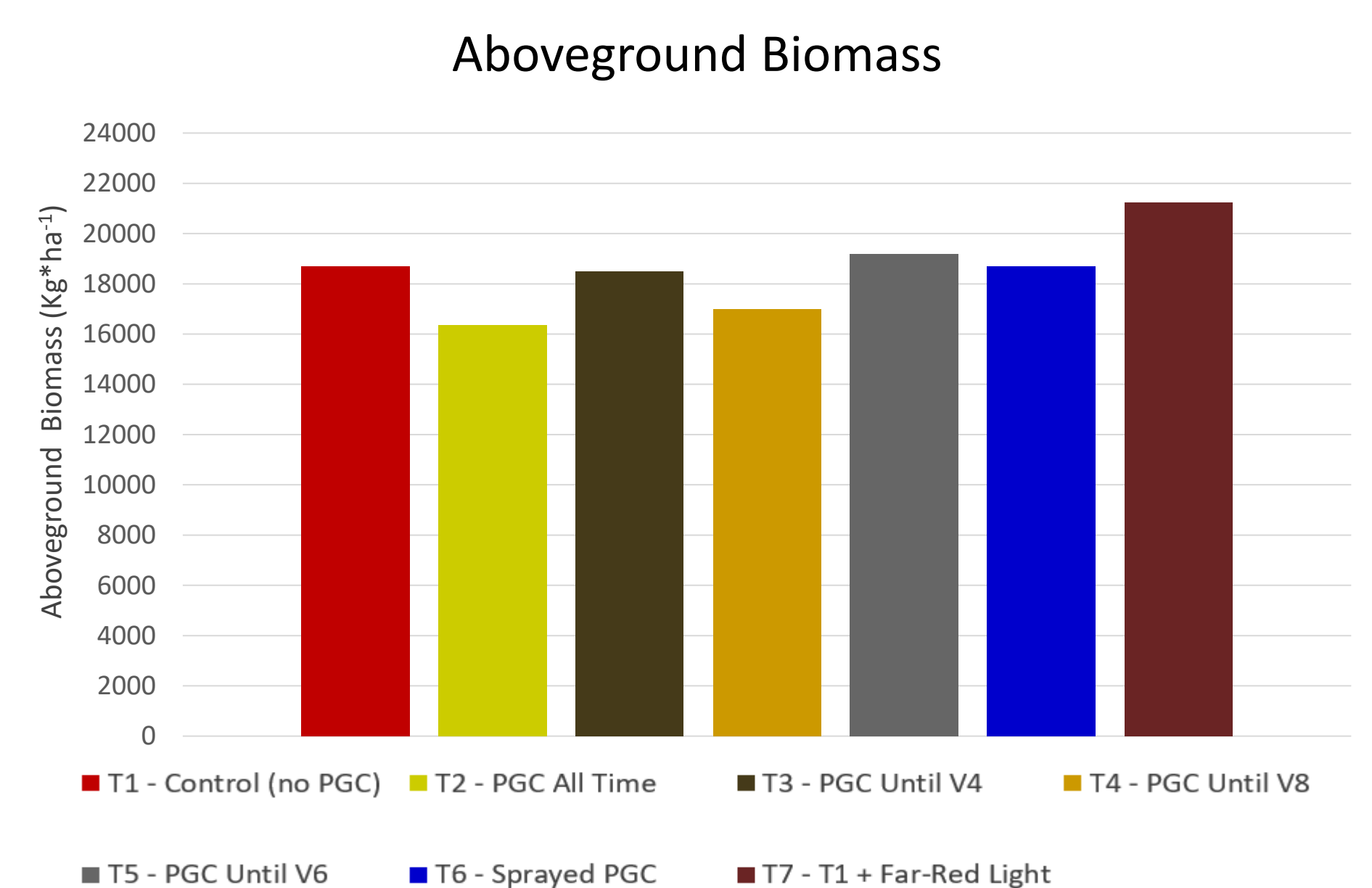
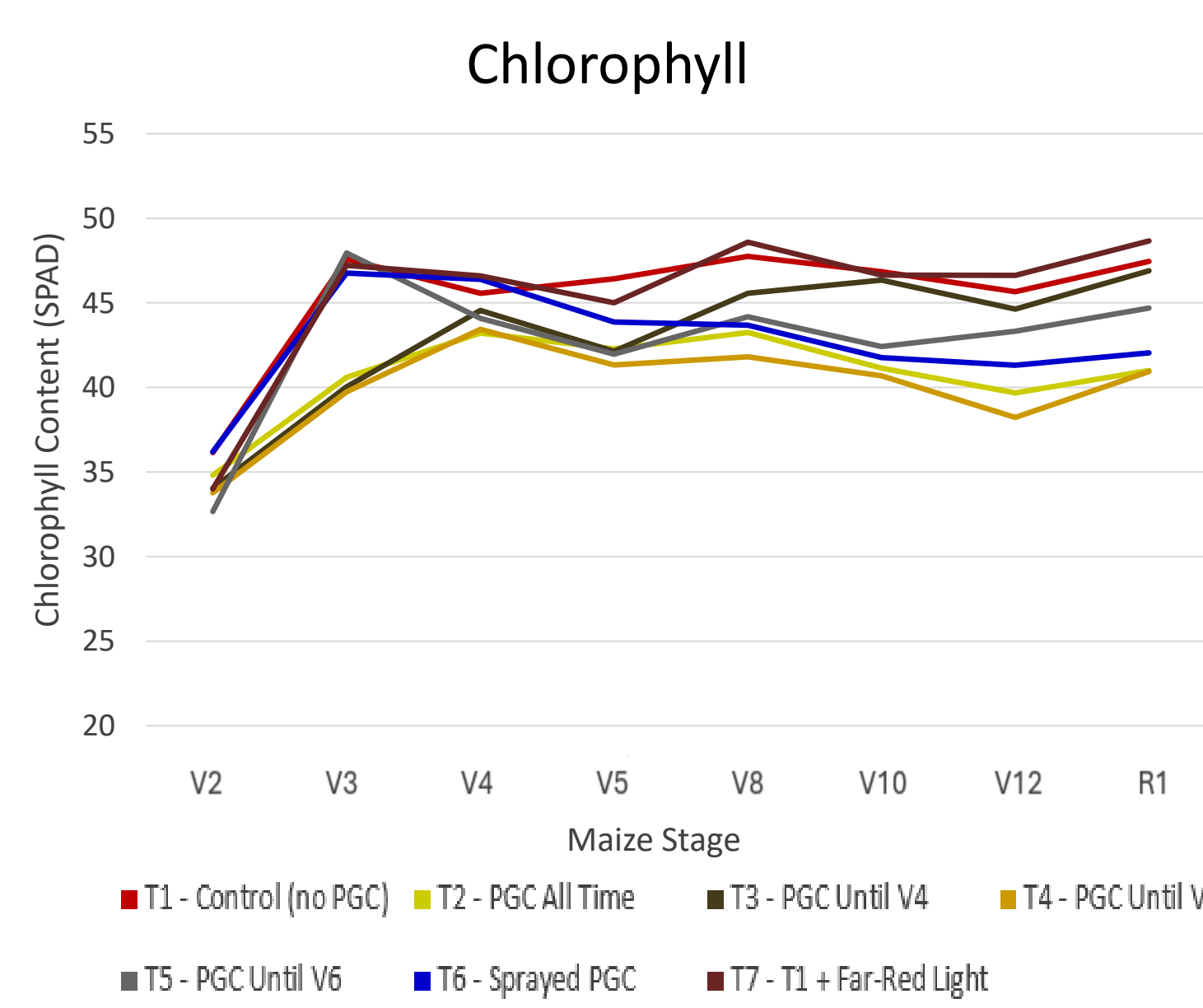
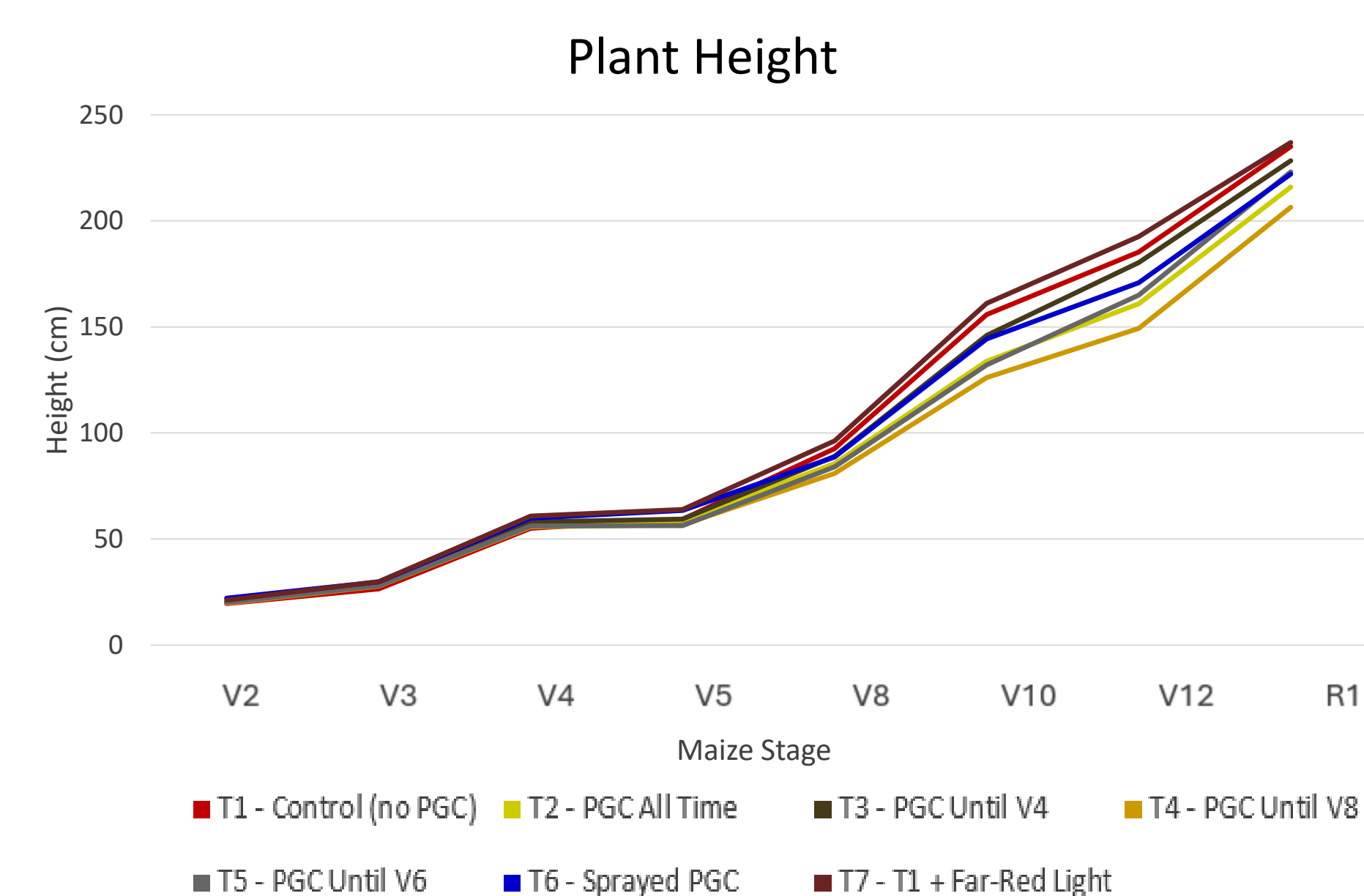
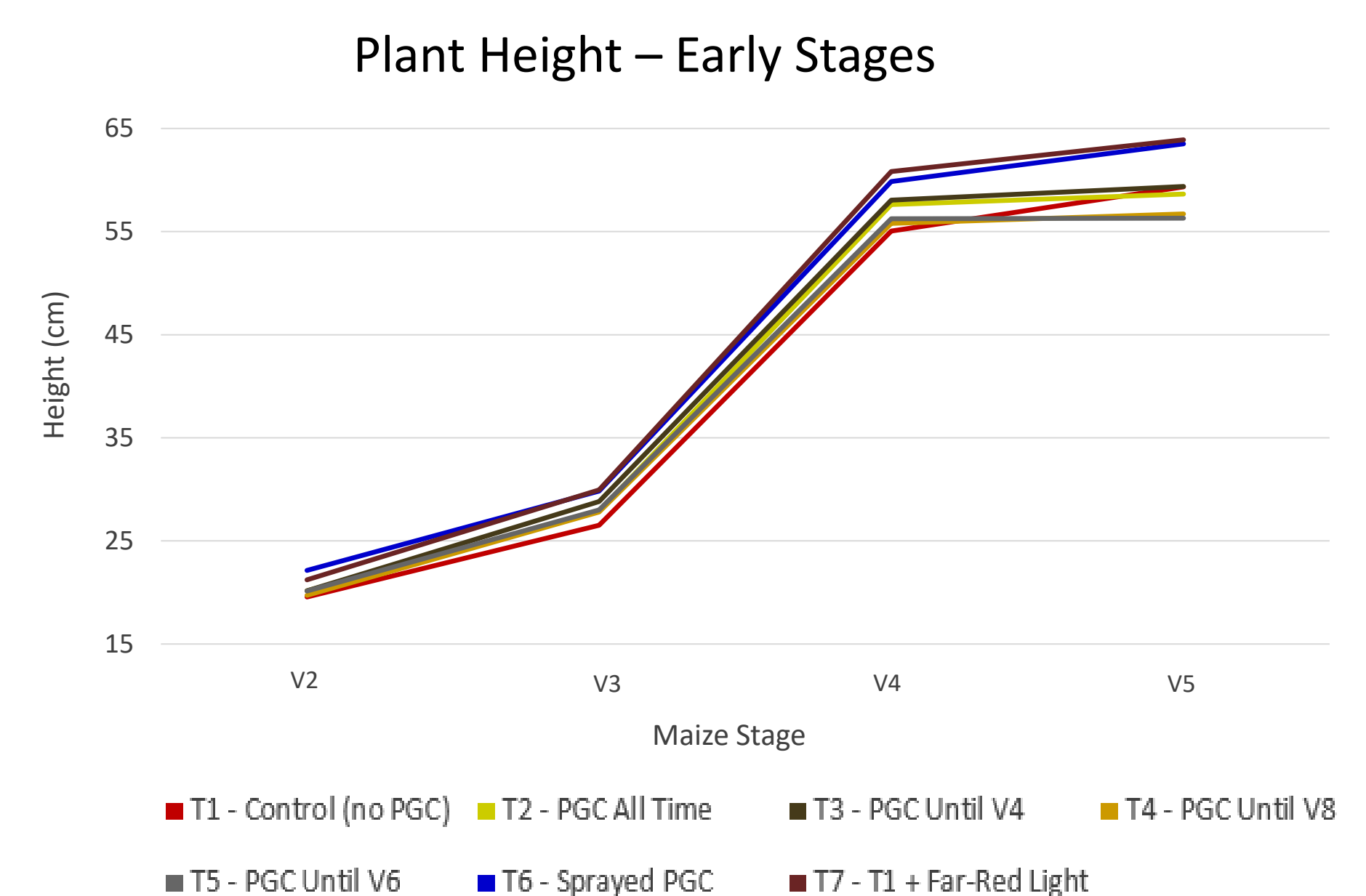


Figure 2: Red/Far-Red ratio collected by Unmanned Aerial Vehicle (UAV).



### CONCLUSIONS

- PGC intercropping system affected the light quality, reducing the Red/Far-Red ratio, leading to the shade avoidance response in maize plants. The most prominent effect is etiolation in the early stages of maize plants.
- The use of UAVs to analyze light quality raises as a potential tool for use in the fields, although more studies are necessary for methodological refinement.
- The chlorophyll levels reduction in the unsuppressed PGC treatments suggests competition for nutrients, an assumption supported by the biomass reduction in these treatments.
- The shade avoidance response did not fully explain the results, making joint analysis of soil nutrients and moisture necessary for future studies.

### References

- Moore, K. J., et al. (2019) Regenerating agricultural landscapes with perennial groundcover for intensive crop production. *Agronomy* 9, 458 <https://doi.org/10.3390/agronomy9080458>
- Schlautman, B., et al. (2018) Perennial grain legume domestication phase I: criteria for candidate species selection. *Sustainability* 10, 730 <https://doi.org/10.3390/su10030730>



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