

Plasticity in the Morphology of Growing Bamboo: Exogenous Treatment Effects on Plant Height, Internode Length, and Internode Numbers



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國際竹藤中心

1 INTRODUCTION

- Bamboos (Poaceae family) represent one of the most crucial forest resources globally, holding significant ecological and economic value.
- Woody bamboos, valued for their materials and shoots, possess a higher economic worth compared to herbaceous bamboos.
- Woody bamboos distributed in tropical and subtropical regions, they are extensively cultivated due to their significant ecological and economic benefits.
- During the growth of woody bamboos, the culm height is a critical biological characteristic, directly influencing its commercial and ecological value.
- This study aims to investigate the effects of exogenous treatments with Sucrose (Suc) and Gibberellin (GA) on the height, internode length, and internode number of Moso bamboo (*Phyllostachys edulis*).

2 METHODS

Location

Guangde City
(Anhui Province)
Yanling County
(Hunan Province)
Xianning City
(Hubei Province)

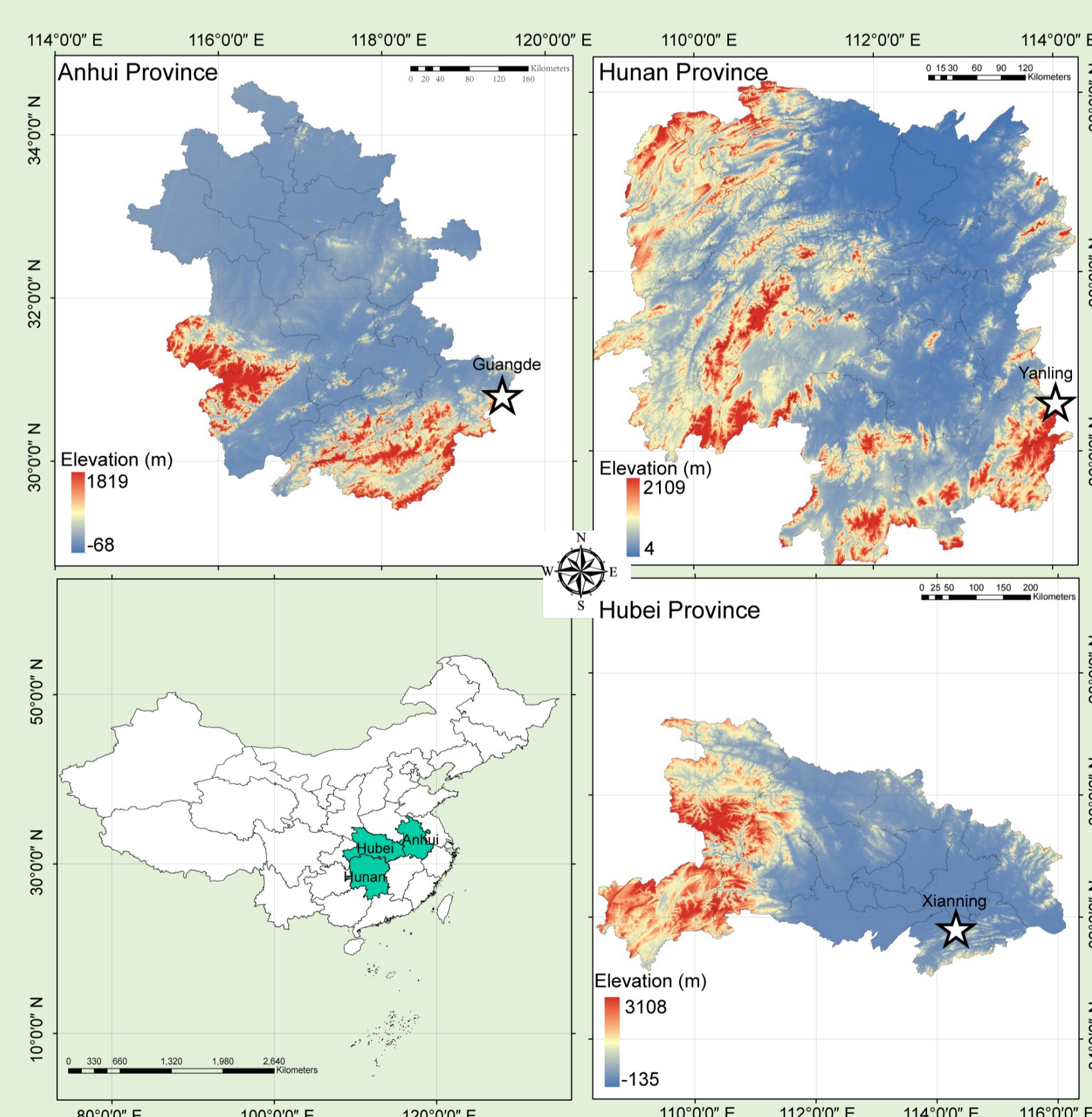


Figure 1. Study area.

Experiment design

- 50 mL of 20 μ M Suc and GA3 solutions were injected into 60 shoots each, with another 60 receiving pure water as a control.
- The injections were made at the fifth internode from the bottom, every three days, five times in total.
- Measurements were taken in August 2021 for plant heights and internode lengths after felling 124 bamboo shoots.
- Generalized Linear Mixed Model (GLMM) using Bayesian Markov chain Monte Carlo (MCMC) method.

3 RESULTS

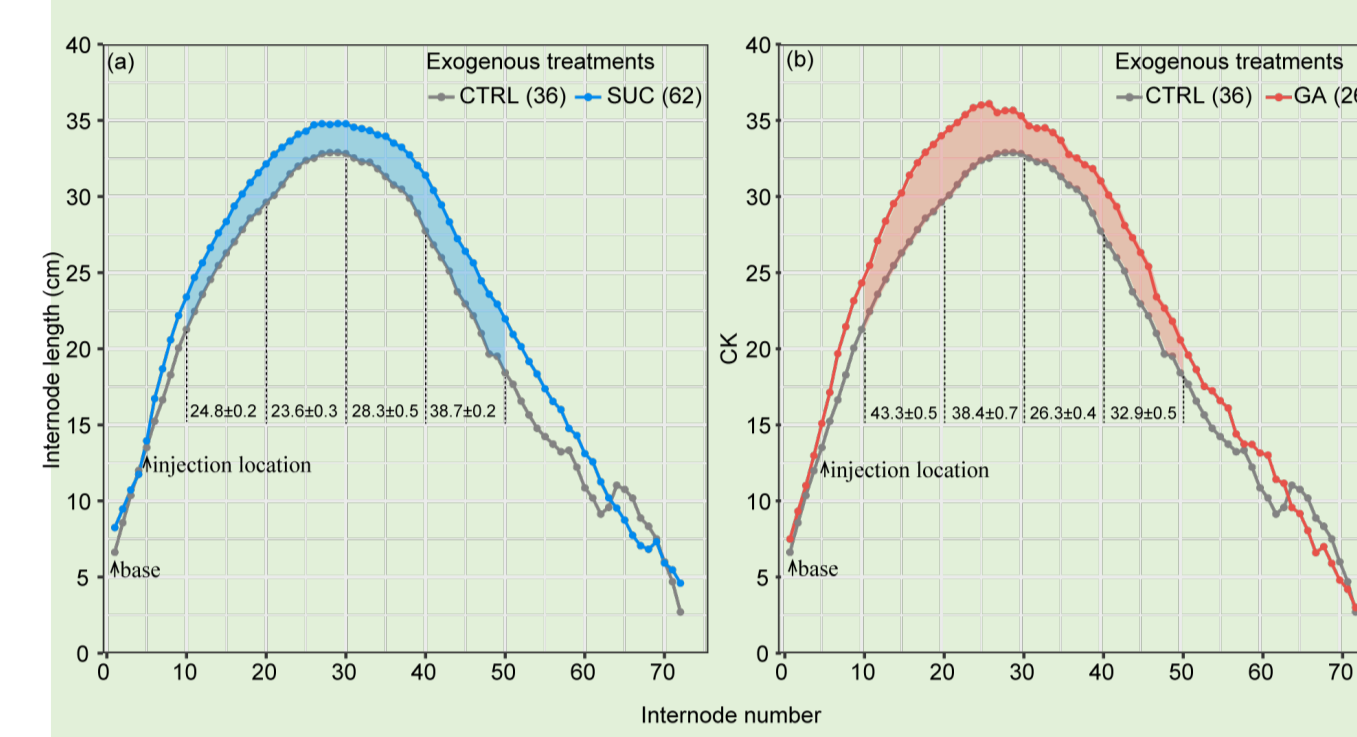


Figure 2. The internode lengths at different internodes under Suc (a) and GA (b) treatments compared with CTRL.

- Suc and GA treatments significantly increased the lengths of internodes.
- The increase in internode length was about 1.2 meters for Suc treatment and 1.4 meters for GA treatment.
- Under Suc treatment, a higher proportion of 30–40 cm internodes was observed, while GA treatment resulted in a greater prevalence of longer internodes (30–40 cm and 40–50 cm) compared to the control group.

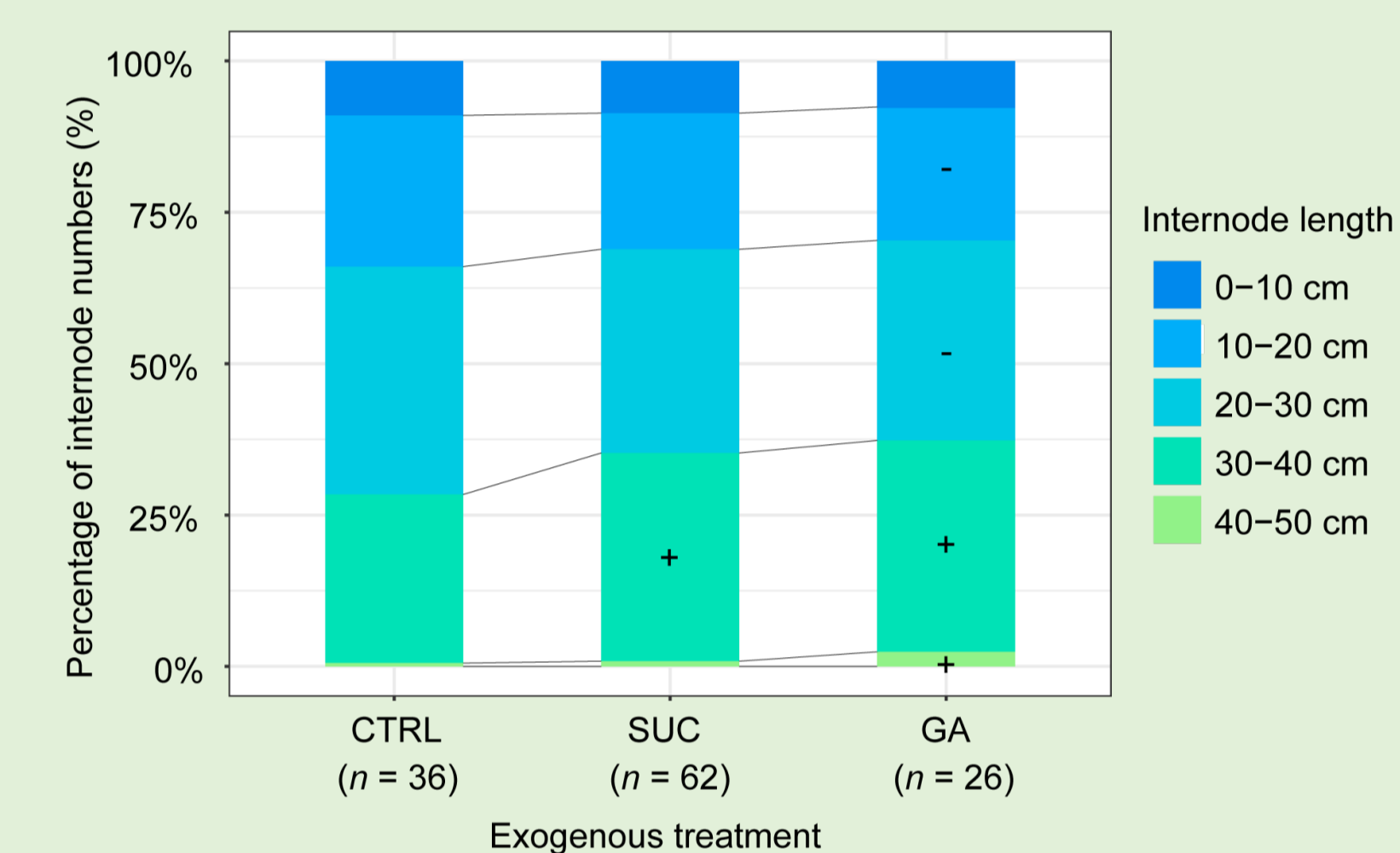


Figure 3. The percentages of internodes with different lengths under different exogenous treatments.

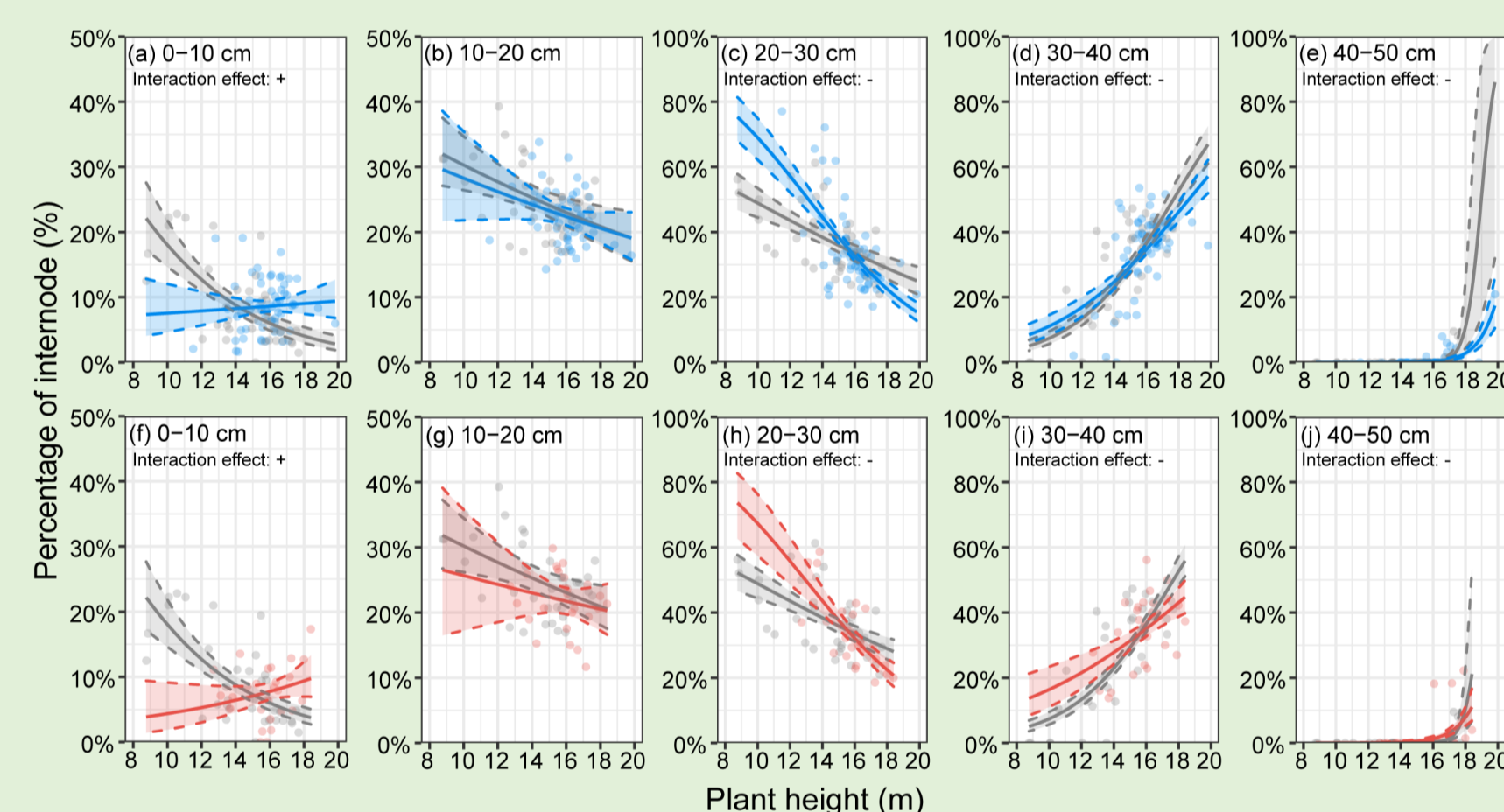


Figure 4 The effect of the interaction between exogenous treatments and plant height on the percentage of internodes with different lengths (a, f: 0–10 cm; b, g: 10–20 cm; c, h: 20–30 cm; d, i: 30–40 cm; e, j: 40–50 cm).

- The proportion of longer internodes (>20 cm) decreased with increasing plant height, especially around 15–16 meters, under both Suc and GA treatments

- Both biomass and carbon storage were significantly higher under Suc and GA treatments.
- The increase in biomass and carbon storage was approximately 1.2-fold under Suc and about 1.4-fold under GA treatment.

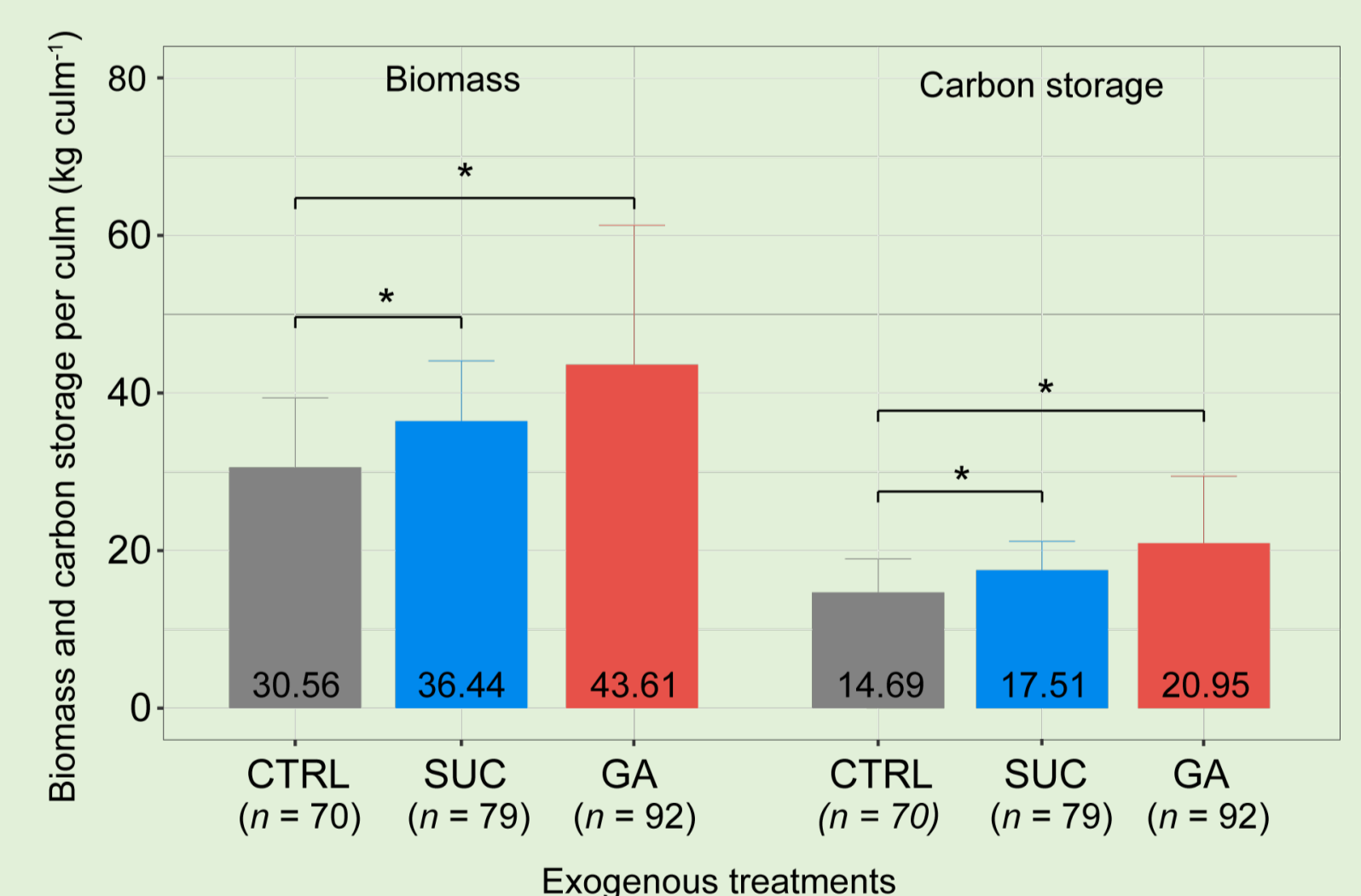


Figure 5. Comparison of estimated biomass and carbon storage under different exogenous treatments.

4 DISCUSSION and CONCLUSION

- The study have developed a low-cost method to promote the elongation of internodes in Moso bamboo.
- Exogenous GA increases internode length.
- Exogenous Suc increases internode length and number.
- Co-elongation internode leads to increase culm height.
- Suc and GA treatments are more effective for bamboo under 16 m.