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Effect of Artificial Light Spectrum on Plant Vigour of Tissue Culture *Anubias hastifolia* Plant

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Background: *Anubias hastifolia* is a popular ornamental aquatic plant with significant commercial potential. However, its naturally slow growth limits conventional propagation methods, creating a need for efficient in vitro multiplication. Although light quality is a critical factor influencing plant development, studies focusing on the optimization of artificial light spectra for in vitro culture of aquatic plants remain limited.

Objective: This study aimed to evaluate the effects of artificial light spectra on the in vitro growth and morphology of *A. hastifolia*, with the goal of establishing commercially viable tissue culture protocols.

Methods: Plants were grown under seven distinct light treatments using LED: red, blue, white, and red-blue combinations, and fluorescent light control. Growth parameters measured included leaf number, length, width, surface area, and fresh and dry biomass. Data were analyzed using one-way ANOVA and Tukey's test at a significance level of 5%.

Results: Leaf number showed no significant differences across treatments ($p > 0.05$). However, leaf morphology and biomass accumulation were highly significant ($p < 0.001$) by light quality. Red LED treatment produced the longest leaves (1.94 ± 0.20 cm), widest blades (0.97 ± 0.27 cm), and largest leaf surface area (1.43 ± 0.45 cm²), suggesting enhanced cell elongation and leaf expansion. Fresh biomass was highest under red-blue (1:1) combination (0.58 ± 0.24 g), followed by Blue LED (0.56 ± 0.21 g), indicating a possible synergistic effect of combined spectra. Dry biomass was highest in both white fluorescent and blue LED treatments, both reaching 0.13 ± 0.07 g, highlighting their role in tissue density and structural development.

Conclusion: The study concludes that specific light spectra, particularly red and red-blue combinations, significantly enhance the growth and morphology of *A. hastifolia*. Further studies investigating the interaction of light intensity, photoperiod, temperature, and nutrient availability with the light quality are recommended to optimize commercial propagation protocols.

Keywords: *Anubias hastifolia*, LED light spectrum, Aquatic plants, Tissue culture