EFFECT OF ARTIFICIAL LIGHT SPECTRUM ON PLANT VIGOR OF TISSUE CULTURE *Anubias hastifolila* PLANT

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ABSTRACT

Anubias hastifolia is a hardy aquatic plant of the family Araceae, widely used in aquascaping and aquarium ornamentation due to its attractive foliage and adaptability. With growing global demand, it presents significant potential for commercial propagation and foreign revenue generation. However, its slow growth and specific environmental requirements make conventional propagation inefficient. Research on optimizing light spectra for aquatic plants in tissue culture remains limited, with most studies focused on terrestrial species. This study aimed to evaluate the effects of artificial light spectra and planting density on the *in vitro* growth and morphology of *A. hastifolia*, with the goal of establishing commercially viable tissue culture protocols. The experiment was conducted at Ruvini Aqua Plants Lanka (Pvt) Ltd., Sri Lanka, using a Completely Randomized Design. Plants were grown under seven light treatments (red, blue, white, and their combinations) and two planting densities (two and four plants per container). Growth parameters, including leaf number, length, width, surface area, and fresh and dry biomass, were recorded over three weeks. ANOVA and Tukey's test were used for statistical analysis. Results showed that leaf number did not significantly differ among treatments ($p > 0.05$), with values ranging from 13.47 to 15.72 leaves per pot in two-plant containers and from 30.06 to 37.78 in four-plant containers. However, treatment effects on leaf morphology and biomass were highly significant ($p < 0.001$). T_1 (Red LED) consistently produced the longest leaves (up to 1.94 ± 0.20 cm), widest blades (up to 0.97 ± 0.27 cm), and largest surface area (up to 1.43 ± 0.45 cm^2). Fresh weight was highest in T_6 (Red: Blue 1:1) at 0.58 ± 0.24 g in four-plant containers, while T_2 (Blue LED) yielded 0.56 ± 0.21 g. Dry weight was highest under T_7 (White fluorescent) and T_2, reaching 0.13 ± 0.07 g. High-density conditions amplified treatment differences across most traits. The study concludes that specific light spectra, particularly red and red-blue combinations, significantly enhance growth and morphology of *A. hastifolia*, with responses varying by planting density. These results support the development of efficient, light-optimized tissue culture protocols. Future studies should investigate the effects of environmental variables, including light spectrum, intensity, photoperiod, temperature, and nutrient availability, as well as their

interactions, on plant growth, physiological mechanisms, and commercial-scale validation to enhance applicability and scalability.

Keywords: *Anubias hastifolia*, aquatic plant tissue culture, *in vitro*, LED light spectra, plant density

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