CAVITY RING DOWN SPECTROSCOPY AS A TOOL FOR MONOCHROMATIC LIGHT ACTION ON TOMATO PLANTS IN BIO-REGENERATIVE LIFE SUPPORT SYSTEMS

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Abstract. Narrow spectrum LEDs, which regulate diverse photo-morphogenetic responses of plants, can be used to achieve desired plant responses in terms of germination, growth rate, and productivity. Current study examined the effect of blue (465-475 nm), green (515-530 nm), red (620-630 nm), and cool-white light (CCT 6000-6500K) on tomato (Solanum lycopersicum) different cultivars, with determinate and indeterminate growth. Our findings show that monochromatic light had a substantial impact on germination, growth, hydration status, and δ13C values in plantlets grown under experimental conditions. When compared to the other wavelengths, red light stimulates the most and visible light inhibits the most germination in the selected tomato varieties. The lowest elongation was measured in visible light and the greatest elongation was measured in red light, resulting in a drop in the PPFD from 326.1 to 179.4 μmol·m⁻²·s⁻¹. Our findings imply that the δ13C signature in plants detected by Cavity Ring Down Spectroscopy could be a useful proxy for quickly assessing the physiological condition of plantlets in their early stages of development in Bio-Regenerative Life Support Systems.

Keywords: monochromatic light, Bio-Regenerative Life Support Systems, δ13C, photo morphogenetic response.

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