Academy of Romanian Scientists
Annals Series on Biological Sciences

Volume 13, No. 1, 2024, pp. 53-65
Online ISSN 2285 – 4177
ORIGINAL PAPERS

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

Cristina DOBROTA[1,2,3], Alexandru MARIAN[1], Rahela CARPA[1,4], Cristina Lavinia ROSOIU[1], Ferenc L. FORRAY[5]

[1] Faculty of Biology and Geology, Dept. of Molecular Biology and Biotechnology, Babeș-Bolyai University, 1 Kogălniceanu St., Cluj-Napoca, Romania
[2] Babeş-Bolyai University, Scientific Research Center of Excellence in Physical Chemistry, Faculty of Chemistry and Chemical Engineering, 11 Arany Janos St., 400028, Cluj-Napoca, Romania
[3] Academy of Romanian Scientists, 3 Ilfov St., 050044, Bucharest, Romania
[4] Institute for Research-Development-Innovation in Applied Natural Sciences, Babeș-Bolyai University, 30 Fântânele St., 400294 Cluj-Napoca, Romania
[5] Faculty of Biology and Geology, Dept. of Geology, Babeș-Bolyai University, 1 Kogălniceanu St., Cluj-Napoca, Romania

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 $\delta^{13}C$ 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 $\mu mol \cdot m^{-2} \cdot s^{-1}$. Our findings imply that the $\delta^{13}C$ 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, $\delta^{13}C$, photo morphogenetic response.

DOI 10.56082/annalsarscibio.2024.1.53