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"Gheorghe Asachi" Technical University of Iasi, Romania

EVALUATION OF GROWTH PARAMETERS AND SPECTROSCOPIC INDEXES OF CANOLA FROM SEEDS SUBJECTED TO NON- IONIZING RADIATION STRESS

Iuliana Mihaela Lazar[1*], Irina Loredana Ifrim[1], Daniela Nicuta[2], Marius Stamate[3]

[1] "Vasile Alecsandri" University of Bacău, Department of Chemical and Food Engineering, 157 Calea Mărăşeşti, 600115 Bacău, Romania
[2] "Vasile Alecsandri" University of Bacău, Department of Biology, Ecology and Environmental Protection, 157 Calea Mărăşeşti, 600115 Bacău, Romania
[3] "Vasile Alecsandri" University of Bacău, Department of Mechanical and Environmental Engineering, 157 Calea Mărăşeşti, 600115 Bacău, Romania

Abstract

This study reports the effect of UV-VIS rays on the spectroscopic indexes and the growth parameters of canola cotyledon. Canola seeds were exposed to incoherent continuously radiation with wavelengths between 300 and 750 nm emitted by a high pressure lamp, for different exposure times. An untreated sample is used for comparison purposes. Seed germination and allometric scaling were related to irradiance treatments. The unsaturation and carbonyl spectroscopic indexes changes in the canola cotyledon stems from irradiated seeds were evaluated by Fourier Transform Infrared FTIR spectrophotometric methods. FTIR spectra suggest that the processes of irradiation do not affect the chemical fingerprints (ca. 900–1200 cm^{-1}) and had no significant effect ($p > 0.05$) to the molecular spectrum in lipid related functional groups. On the other side, the results of non parametric Kruskal-Wallis Test confirm that all investigated samples are independent. The main significant effect was obtained at root level to the sample irradiated for 160 minutes ($\chi^2 = 11.358$, $df = 3$, $p = 0.010$). The growth of the organ parts was characterized by a negative allometric factor for control, 280 minutes and 460 minutes irradiated samples. However, for 160 minutes irradiation time, an isometric scaling ($a = 1.013$) was obtained. The results show that 177 kJ/m2 ultraviolet dose was not strong enough to induce changes in lipid conformation. Significant changes in terms of growth parameters of canola cotyledon can be observed mainly caused by continuously emission lines at 365 nm, 436 nm and 620 nm. In the cases of irradiated seeds the proportion of germinating seeds decreased compared with the control sample. The largest decrease occurs at 160 minutes irradiation time. In this case a strong absorption of the orange radiation on 620 nm is probable. It may be assumed that the canola seeds are negatively photoblastic, in most cases. This study will prospectively justify the response investigation of molecular structure and growth parameters to various external stresses induced on the canola seeds differentiated by the age of plant and by selected wavelengths.

Key words: allometric scaling, canola, germination yield, lipid molecular structure, non-ionizing radiation, univariate statistics

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* Author to whom all correspondence should be addressed: e-mail: ilazar@ub.ro