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MACRO AND ULTRA-MICRO SCALE CHANGES OF RAPESEED SEEDLINGS GERMINATED FROM SEEDS EXPOSED TO UVA-VIS RADIATIONS

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Abstract

Our researches have focused primarily on variations of different biophysical and biochemical effects on vegetal and animal material at macro, micro, and ultra-micro scale resulted from changes in environmental condition. Growth and spectral parameters of rapeseed seedlings from seeds exposed to UVA-VIS radiation with a high pressure lamp which emits incoherent continuously radiation for different time periods were examined 14 days after germination. These studied parameters correspond at macro, respectively ultra-micro scale. Thus, the physiological parameters, allometric exponent associated with statistical analysis were analyzed. The responses of the functional groups, mainly related with lipid structure which occurred on a molecular level during the radiation process, were investigated with Fourier Transform Infrared (FTIR) spectroscopy. Another objective of our study was the behavior of indicators of the functional pigments and light adaptation of the photosynthetic apparatus analyzed by UV-VIS spectroscopy. The highest germination percentage of rapeseed seedlings, 84.37 %, was recorded for seeds exposed for 135 minutes and it is greater than the control sample with 6.6 %, and the lowest (69.79%) was calculated for seeds exposed for 65 minutes. Variations of allometric exponent as growth parameter resulting from relationship between different organ parts as consequence of UVA-VIS irradiation were found. The results show that the value of negative allometric exponent computed from power regression shape decreases from 7/8 to approximately 4/8 when the irradiation dose increases. Power regression describes all variations between stem and root length from a strong to a weak link with variations for R^2 from 0.902 for control sample to 0.395 for the most irradiated sample. Values of the partial eta squared χ^2 indicate that the irradiation impact is more pronounced in steam case. Enhanced UVA-VIS irradiation specifically affects conformational changes of the hydrocarbon chain by increasing the ratio between gauche and trans isomers, simultaneously with the decreasing of the degree of fatty acid components saturation. Early indicator of senescence decreased and the greenness of seedlings increased with increasing of the exposure time of rape seeds.

Key words: allometry, ANOVA, molecular index, photosynthetic index, physiological parameters, UVA-VIS irradiation

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