DOI: 10.46991/JISEES.2025.SI1.083

The Effect of Ionizing and Non-ionizing Radiation on the Quantitative Change of Proline in *C. guilliermondii* NP-4 Yeasts

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ABSTRACT

The increase in the number of reactive oxygen species under the influence of external negative factors, including ionizing and non-ionizing radiation, is the basis for the development of oxidative stress in cells, which implies the activation of multi-level defense mechanisms. However, the mechanisms of mutual regulation between the components of the defense system have not been fully elucidated to date. The study aims to study the patterns of quantitative changes in proline, which has numerous protective functions, after irradiation of yeast cells with X-rays and millimeter electromagnetic waves and post-irradiation recovery. Under the influence of radiation, profound biochemical changes develop in yeast cells associated with the activation of stress-adaptive responses, in particular, an increase in the level of proline, and changes in the activity of enzymes involved in proline biosynthesis and oxidation. It has been shown that under the influence of X-rays, the amount of free proline in *C. guilliermondii* NP-4 yeast increases by 75% compared to non-irradiated cells, and by 40% in the case of millimeter waves. At the same time, proline biosynthesis is also stimulated, and proline oxidation processes are also activated in post-irradiated restored cells. It can be concluded that proline acts as an effective stress-adaptive molecule, the nature of its accumulation and metabolic changes is significantly determined by the type of radiation, showing more intense reactions under the influence of ionizing radiation. Under irradiation conditions, proline metabolism has a dual significance: protection and energy. Cells not only accumulate proline as an antioxidant and osmoprotective compound but also oxidize it to obtain energy. The data obtained may serve as a basis for the development of new anti-stress therapies or radioprotective drugs.

Keywords: proline, proline biosynthesis enzymes, X-rays, millimeter electromagnetic waves

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