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Royal Jelly Enhances Recovery from UV-Induced Metabolic and Oxidative Stress in *Candida guilliermondii* NP-4

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ABSTRACT

The biological effects of ultraviolet (UV) radiation vary significantly depending on the wavelength. The peak of UV-induced bactericidal activity occurs at 253.7 nm, which closely aligns with DNA's absorption maximum, indicating that DNA is a primary target. UV exposure can damage the cell wall and promote the formation of reactive oxygen species (ROS), leading to thymine dimer formation that disrupts transcription and replication. This study aimed to investigate the impact of UV irradiation on eukaryotic cell metabolism using *Candida guilliermondii* NP-4 as a model. Yeast cells were irradiated with UV and then cultured in a nutrient medium containing 50μg/mL of Royal jelly (RJ). Total ATPase activity in both homogenates and mitochondria increased during irradiation and subsequent repair, reflecting elevated energy demands for restoring morphological and macromolecular damage. In irradiated yeast, ATP and ADP deamination increased by 35% and 11.5%, respectively, suggesting that catabolic processes are enhanced under UV-induced stress, favoring nucleotide breakdown. During irradiation, metabolic activity slows down, reducing energy needs and promoting nucleotide catabolism over hydrolysis, with deamination as the first step. In the post-irradiation repair phase, catabolism of ATP, ADP, GTP, and GDP decreases, while hydrolysis intensifies, indicating a metabolic shift to energy recovery. GTP is also reintegrated into biosynthetic pathways. UV radiation also accelerates lipid peroxidation, leading to oxidative stress, evidenced by elevated malondialdehyde levels and increased activity of antioxidant enzymes including superoxide dismutase (SOD), catalase, and peroxidase. These stress responses nearly normalize during repair and become more pronounced in the presence of royal jelly, suggesting RJ enhances cellular recovery mechanisms against UV-induced oxidative and metabolic damage.

Keywords: UV radiation, Royal jelly, ATPase activity, nucleotide deamination, oxidative stress

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