# DNA Damage and Repair Mechanism in Duckweed (Spirodela polyrhiza) Under Ultraviolet (UV-B) Radiation Stress

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In living organisms, DNA is a critical macromolecule; its stability and integrity are vital for the normal functioning of cellular processes, such as DNA replication and DNA repair. Sunlight is a significant source of ultraviolet (UV) radiation. Excessive exposure to UV-B (280-315 nm) can cause damage to DNA structure by introducing DNA lesions such as cyclobutane-pyrimidine dimers (CPDs) and 6-4 pyrimidine pyrimidone photoproducts (6-4PPs). These negatively affect the physiological processes of living organisms. In this study, duckweed (Spirodela polyrhiza) plantlets were treated with different UV-B exposure times. After UV-B exposure, plantlets were recovered under normal growth conditions and sampled at 0 h, 12 h, and 24 h for genomic DNA damage analysis. The integrity of the genomic DNA was tested by gel electrophoresis. Genomic DNA was probed on a slot blot for antibodies against the CPDs/6-4PPs to detect the damaged DNA and DNA repair capacity. Our results suggest that duckweed plantlets at 0 h of post-UV-B recovery had the strongest CPDs/6-4PPs signal intensity; thus, in these samples, the DNA repair mechanism (DRM) did not have enough time to repair the damaged DNA. Weaker CPDs/6-4PPs signals were observed in the 12 h and 24 h of post-UV-B treatment. In duckweed, the UV-B stress-induced the expression of genes involved in DRM, as observed in other eukaryotes. In situ visualization by DAB staining revealed higher levels of H2O2 in post-UV-B recovery plantlets. DNA damage, DRM, expression of DRM-related genes, and accumulation of H2O2 in duckweed are UV-B dose-dependent. Our work suggests that duckweed is ideal for studying UV-B-mediated DNA damage as an alternative to the mammalian system to understand the effect of climate change on plant and human health.

**Awards Won:**