Disruption of the AtREV3 gene causes hypersensitivity to ultraviolet B light and γ-rays in Arabidopsis: Implication of the presence of a translesion synthesis mechanism in plants

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Abstract: To investigate UV light response mechanisms in higher plants, we isolated a UV light-sensitive mutant, rev3-1, in Arabidopsis. The root growth of rev3-1 was inhibited after UV-B irradiation under both light and dark conditions. We found that chromosome 1 of rev3-1 was broken at a minimum of three points, causing chromosome inversion and translocation. A gene disrupted by this rearrangement encoded the catalytic subunit of DNA polymerase ζ (AtREV3), which is thought to be involved in translesion synthesis. The rev3-1 seedlings also were sensitive to γ-rays and mitomycin C, which are known to inhibit DNA replication. Incorporation of bromodeoxyuridine after UV-B irradiation was less in rev3-1 than in the wild type. These results indicate that UV light-damaged DNA interrupted DNA replication in the rev3-1 mutant, leading to the inhibition of cell division and root elongation.
Index Keywords: Catalysis; DNA; Enzymes; Plants (botany); Ultraviolet radiation; Mutants; Cells; Amino Acid Sequence; Arabidopsis; Arabidopsis Proteins; Catalytic Domain; Chromosome Aberrations; Darkness; DNA Damage; DNA Repair; DNA-Directed DNA Polymerase; Gamma Rays; Light; Mitomycin; Molecular Sequence Data; Mutation; Phenotype; Plant Roots; Sequence Homology, Amino Acid; Ultraviolet Rays; Arabidopsis; Embryophyta

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