O_2^- Activates Leaf Injury, Ethylene and Salicylic Acid Synthesis, and the Expression of O_3-Induced Genes in O_3-Exposed Tobacco

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O_3 is the major component of photochemical oxidants and gives rise to visible injuries on plant leaves. In O_3-exposed plants, O_2^- is produced before the formation of the injury, but the role that O_2^- plays in plant response to O_3 exposure is still unknown. To clarify its role, we observed the behavior of plants during O_3 exposure after pretreatment with tiron, which is an O_2^- scavenger. When tiron-pretreated tobacco cv. Bel W3 was exposed to O_3, leaf damage was attenuated. In O_3-exposed tobacco, tiron inhibited increases in the levels of ethylene and salicylic acid, which promote leaf injury. Tiron pretreatment also suppressed increases in the expression of O_3-induced genes. These results suggest that O_2^- is involved in many plant responses induced by O_3 exposure. Bel B, a tobacco cultivar that is genetically related to Bel W3, is reported to be more resistant to O_3 than Bel W3, but the reason for this difference is unclear. We investigated the differences between the responses of Bel B and tiron-pretreated Bel W3 to O_3 exposure, and we discuss the reasons for the resistance to O_3 by comparing the phenotype of Bel B with that of tiron-pretreated Bel W3.

Key words: Ozone, Superoxide Radical, Tiron