E217

Effects of Overexpressed Manganese Superoxide Dismutase on Oxidative Stress Tolerance

김영조*, 이우성
성균관대학교 이과대학 생물학과

Activated oxygen species, such as superoxide, hydrogen peroxide and hydroxyl radicals, are associated with a number of physiological disorders in plant. Upon exposure of plant to diverse environmental stresses such as chilling, drought, freezing and air pollutants, the activated oxygen species are actively produced. Plants have evolved defensive system to remove the active oxygens. One of the enzymes involved in the defense is superoxide dismutase (SOD, EC 1.15.1.1) which converts superoxide into hydrogen peroxide. To test the role of SOD in the defense system, we have produced transgenic plants that overexpress the Mn SOD of pea (*Pisum sativum* L.) in chloroplasts of tobacco (*Nicotiana tabacum*). Using Sourthern hybridization and SOD activity gel staining, it was confirmed that these transgenic plants overexpressed the introduced gene. Isolated chloroplasts from the transgenic plants are being studied to see if the transgenic plants are resistant to high light and low temperature growth condition.

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E218

Hydrogen Peroxide Stimulates Mitochondrial Phospholipase D in Castor Bean Endosperm

권현자* 이우성, 신성호[1]
성균관대학교 이과대학 생물학과,[1]국방과학 연구소

Hydrogen peroxide has been shown to be generated in plants as the result of a variety of enviornmental stress and it has been suggested that hydrogen peroxide may act as a second messenger. The effect of hydrogen peroxide was examined in highly purified mitochondria from germinating castor bean (*Ricinus communis* L.) endosperm. Exposure of mitochondria to hydrogen peroxide stimulates deterioratin of mitochondrial membrane. The membrane deterioration was due to the extensive loss of total phospholipid. Among the mitochondrial phospholipids, a remarkable decrease was observed in phosphatidylethanolamine (PtdEtn), while other phospholipids were not significantly decreased. The breakdown of PtdEtn was not accompanied by the formation of lysophosphatidylethanolamine indicating that a phospholipase A-type or phospholipase C-type enzyme was not involved. The degradation product of PtdEtn was water-soluble ethanolamine, indicating that PtdEtn hydrolysis was catalyzed by a phospholipase D-type enzyme. From these data we demonstrate that the presence of mitochondrial form of phospholipase D and the activity of this enzyme was induced by hydrogen peroxide.