Molecular Breeding R.G., BioGreen 21 Program, RDA (Ramada Plaza Jeju, November 2-3, 2005)

과제 일련번호: 22

Transgenic sweetpotato and potato plants with enhanced tolerance to multiple environmental stresses

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Oxidative stress derived from reactive oxygen species (ROS) is one of the major damaging factors in plants exposed to environmental stress. In order to develop transgenic sweetpotato (*Ipomoea batatas* L. Lam cv. Yulmi) and potato (*Solanum tuberosum*L. cv. Atlantic and Superior) plants with enhanced tolerance to multiple stress, the genes of both Cu/Znsuperoxide dismutase and ascorbate peroxidase were expressed in chloroplasts under the control of an oxidative stress-inducible peroxidase (*SWPA2*) promoter (referred to SSA plants). SSA sweetpotato and potato plants showed enhanced tolerance to oxidative stress caused by the application of methyl viologen (MV, paraquat), a ROS-generating non-selective herbicide. SSA sweetpotato plants showed higher tolerance to chilling stress than non-transgenic (NT) plants, whereas SSA potato plants showed higher tolerance to high temperature. SSA sweetpotato plants showed a strong tolerance to the application of sulphur dioxide (500 ppb). NT sweetpotato plants showed more rapid reduction in Fv/Fm indicating maximum photochemical efficiency of PS II compared with SSA plants on the level of detached leaves, indicating that SSA plants are tolerant to water stress. SSA sweetpotato plants showed enhanced tolerance to sulphur dioxide (SO_2) and UV light compared NT plants. SSA sweetpotato and potato plants are under cultivation for the mass propagation in collaboration with Mokpo Experiment Station, National Institute of Crop Science and National Institute of Highland Agriculture, RDA, respectively. Our results strongly suggested that the rational manipulation of antioxidative mechanism in chloroplasts will be applicable to the development of all plant species with enhanced tolerance to multiple environmental stress to contribute in solving the global food and environmental problems in the 21st century.

Acknowledgements: MV and SO_2 tolerant tests using whole plants were done in collaboration with Dr. JS Kim, Bioorganic Science Division, Korea Research Institute of Chemical Technology and Dr. SH Han, Genetic Resources Division, Korea Forest Research Institute, respectively.

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‡ 총연구기간 (년차): 2002년 - 2006년 (4년차)