A COMPARATIVE STUDY ON THE PHOTOCHEMICAL EFFICIENCY OF PHOTOSYSTEM II COMPLEX DURING LOW-TEMPERATURE PHOTOINHIBITION IN PLANTS WITH DIFFERENT CHILLING SENSITIVITY

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Chilling tolerance of plants are closely related with the degree of fatty acid unsaturation of chloroplast membrane lipids. To examine the chilling tolerance of photosynthetic machinery in relation to membrane lipids, we compared the chilling susceptibility of photosystem II of wild type tobacco plants with that of transgenic tobacco plants, in which the sensitivity to chilling had been enhanced by genetic modification of fatty acid unsaturation of chloroplast membrane lipids. The transgenic tobacco plants were found to contain reduced levels of unsaturated membrane fatty acids by being transformed with cDNA for glycerol-3-phosphate acyltransferase from squash [1]. We previously found that photosynthesis of the transgenic tobacco plans were more unstable than the wild-type plants when exposed to low-temperature photoinhibition [2].

For the purpose of studying on the functional integrity of photosystem II during low-temperature photoinhibition, the photochemical efficiency was measured at room temperature as the ratio of the variable to the maximun fluorescence of chlorophyll (Fv/Fm)of photosystem II. In parallel with an investigation on the transgeinc plants, susceptibility of chilling-resistant species, such as spinach and pea, and of chilling-sensitive ones, such as squash and sweet potato, to low-temperature photoinhibition was also compared in terms of room-temperature induction of chlorophyll fluorescence from photosystem II. When leaf disks from the two genotypes of tobacco plants were exposed to light at 5°C, the transgenic plants showed more rapid decline in photochemical