

**MOLECULAR CLONING AND THE PRIMARY STRUCTURE OF  
THE GENES FOR PSII REACTION CENTER OF *PANAX GINSENG***

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*Panax ginseng*, one of the major Korean natural products of plants, is readily photoinhibited when it is exposed to the high intensity of light. Generally the Photosystem II (PSII) reaction center has been reported to be the major target site of photoinhibition in plants and is also responsible for the energy conversion of the solar energy into the electrochemical potential energy of the cell. The PSII of higher plant consists of D1, D2, and cytochrome *b-559* - and -subunits, which are encoded by the *psbA*, *D*, *E*, and *F* genes, respectively. In order to get insight into the molecular aspects of photoinhibition, the *psbD*, *E*, and *F* genes were cloned and analyzed.

All 249 and 117 nucleotides were obtained for the *psbE* and *psbF* genes, respectively. His-23 in *psbE* and His-18 in *psbF*, which could be acting as ligands for the heme group of the cytochrome *b-559*, were all conserved as in higher plants. Based on the hydrophathy analysis, each of the *psbE* and *psbF* genes has a single hydrophobic domain which could span the thylakoid membrane. The structural gene for D2 was also analyzed. The Northern blot analysis revealed that the *psbE* and *psbF* genes were cotranscribed as a single band and the size of message was approximately 1.3 kb. The *psbD* gene, however, seemed to be transcribed at least three different sizes, implying that the transcriptional regulation is involved in the *psbD* gene expression and the functionality of the PSII reaction center in response to the environmental changes.