

## **Comparative analysis of protein phosphatase 2C involved in the negative regulation of ABA-signaling pathway in *Physcomitrella patens* and *Arabidopsis thaliana***

Kenji Komatsu, Tomohito Otsuka, Miwa Yoshida, Teruaki Taji, Shigeo Tanaka, Yoichi Sakata

Dept. of BioScience, Tokyo Univ. of Agriculture, Tokyo 156-8502, Japan

E-mail: [55050011@nodai.ac.jp](mailto:55050011@nodai.ac.jp), Phone/Fax: 81-3-5477-2762

The phytohormone abscisic acid (ABA) plays an important role in various aspects of plant development, and also mediates response to environmental stresses, such as drought, high osmolarity, and low temperature. The *Arabidopsis thaliana* *ABI1*, which encodes a type-2C Ser/Thr protein phosphatase (PP2C), is a negative regulator of ABA-signaling pathway. The *abil-1* is a dominant mutant allele of *ABI1* that carries an amino acid substitution (Gly to Asp) in the catalytic domain, and strongly blocks ABA signaling in higher plants. Previously we demonstrated that transient expression of *abil-1* also resulted in complete repression of the ABA-inducible *Em* promoter activity in *Physcomitrella patens*, suggesting the PP2Cs are involved in ABA-signaling pathway in *P. patens*.

To analyze the physiological function of ABA signaling regulated by PP2Cs in moss, we took an approach in which the *abil-1* was overexpressed in *P. patens*. The moss *abil-1* overexpressor (OE) lines were less sensitive to ABA, and were also less tolerant against osmotic stress. The protonemal cell sizes and gametophores of *abil-1* OEs were bigger compared to wild-type. Furthermore, development of sporophytes were abnormal in *abil-1* OEs. These results suggest that ABA signaling regulated by PP2Cs is involved not only in stress tolerances but also in development of *P. patens*.

Toward the functional comparison of the PP2Cs in ABA signaling between *A. thaliana* and *P. patens*, we searched moss EST-database (PhyScobase) for *ABI1* homologs. At least five ESTs showed significant similarity to *ABI1*, and the ABA inducibilities were analyzed by QRT-PCR. One gene termed *PpABI1*, was found to be induced by ABA, osmotic stress, and low temperature. *PpABI1* was clustered into the same group with *ABI1* based on amino acid sequence alignment of plant PP2Cs. Moreover, the exon/intron structure between this gene and *ABI1* is well conserved. Transient expression of *PpABI1* in protonemal tissue strongly repressed the activation of *Em* promoter by ABA. This result indicates that *PpABI1* is a negative regulator of ABA-signaling pathway in *P. patens*.