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Cloning and characterization of the *UBC* gene from lotus (*Nelumbo nucifera*)

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ABSTRACT. Protein ubiquitination is extensively involved in the regulation of a considerable number of physiological processes in plant cells. E2 (ubiquitin-conjugating enzyme, UBC), one of the essential enzymes of eukaryotic ubiquitination, catalyzes protein ubiquitination together with E1 and E3. In this study, we cloned four full-length cDNA

NnUBCs of *Nelumbo nucifera*. With the same coding sequence length of 459 bp and coding 153 amino acids, these four genes are highly homologous with the *AtUBC1* and *AtUBC2* of *Arabidopsis thaliana*. Quantitative fluorescence polymerase chain reaction showed that these four genes exhibited different expression patterns in different tissues of *N. nucifera*. Overall, the expression of *NnUBC3* was the highest in all plant tissues. Tests of different stress treatments showed that NnUBC3 plays an important role in response to heat, salt, and drought stresses in *N. nucifera*. Moreover, transgenic *Arabidopsis* plants (*Atubc1-1Atubc2-1* mutant) expressing NnUBC3 presented a wild-type phenotype, indicating that NnUBC3 performs the same function as AtUBC1 and AtUBC2.

Key words: *Nelumbo nucifera*; *UBC* gene; cDNA; Expression; Transformation experiment