PtrbZIP3 transcription factor regulates drought tolerance of *Populus trichocarpa*

Meiqi Zhou[1], Hao Cheng[1], Vincent L. Chiang[1], Wei Li[1], Chuanping Yang[1,*], Chao Wang[1,*]

[1]State Key Laboratory of Tree Genetics and Breeding, Northeast Forestry University, Harbin 150040, China

* Correspondence and requests for materials should be addressed to C.W. (E-mail: wangchao@nefu.edu.cn.) or C. Y. (E-mail: yangcp@nefu.edu.cn.)

Address: No. 26, Hexing Road, Harbin, Heilongjiang 150040, China.

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ABSTRACT

Plant basic leucine zipper (bZIP) proteins participate in plant development and a variety of abiotic stress responses. However, their roles in response to abiotic stress in Populus are still unclear. In this study, we characterized a bZIP protein, *PtrbZIP3,* in *Populus trichocarpa* which belongs to the sub-family A. *PtrbZIP3* expression was highly induced by treatment with NaCl, PEG6000, or abscisic acid (ABA). PtrbZIP3 is a nuclear protein with transcriptional activation activity. Yeast one hybrid and electrophoretic mobility shift analysis showed that PtrbZIP3 can specifically bind to abscisic acid-responsive element (ABRE) to regulate the expression of ABA-dependent genes and increase the amount of ABA in *P. trichocarpa* overexpressing *PtrbZIP3*. Under PEG-simulated drought conditions, overexpression of *PtrbZIP3* increases the activities of antioxidant enzymes, scavenging of reactive oxygen species, maintains cell membrane integrity, reduces stomatal apertures and water loss, and increases proline accumulation. Thus PtrbZIP3 is a transcriptional activator that plays a role in an ABA-dependent pathway to improve osmotic tolerance in *P. trichocarpa*.

Keywords: ABRE-motif; drought tolerance; gene expression regulation; PtrbZIP3.