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Cloning and transformation of INDUCER of CBF EXPRESSION1 (*ICE1)* in tomato

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ABSTRACT. The tomato plant (*Solanum lycopersicum* Mill.) is sensitive to cold, and low field temperatures can result in shortened growth periods and decreased crop yield. Transcription of CRT/DRE-binding factor (*CBF*) is regulated by INDUCER of CBF EXPRESSION1 (*ICE1*). *CBF* activates many downstream genes that confer cold tolerance on plants. *ICE1* has been used in genetic engineering to improve cold-resistance in several plant species. Here, *ICE1* in a plant expression vector was used to transform a tissue-cultured rhubarb tomato variety using *Agrobacterium tumefaciens*. The transgenic and control plants were compared at 4°C for 0, 24, and 72 h. We measured leaf physiological indicators related to cold resistance, including malondialdehyde (MDA) and proline (Pro) contents, and peroxidase (POD) and catalase (CAT) activities. At 72 h, the MDA content in transgenic plants was significantly lower than in control plants, indicating a lower membrane lipid injury. The Pro contents and the CAT and POD activities in the transgenic plants increased significantly compared with those of the control plants. For Pro, the increase continued over the prolonged stress exposure, while CAT and POD activities reached peak

levels at 24 h. These results are consistent with the roles of Pro, CAT, and POD in defending the integrity of plant cells. Our study not only improves the cold resistance of tomato, but also provides the foundation for further research on the role of *ICE1* as a transcription factor in plant cold resistance.

Key words: Transcription factor; *ICE1* gene; Cold tolerance; Tomato

