GMR Genetics and Molecular Research
Online Journal
ISSN:1676-5680

Effects of exogenous 5-aminolevulinic acid on PIP1 and NIP aquaporin gene expression in seedlings of cucumber cultivars subjected to salinity stress

F. Yan*, D. Qu*, Y.Y. Zhao, X.H. Hu, Z.Y. Zhao, Y. Zhang and Z.R. Zou

College of Horticulture, Northwest Agricultural & Forest University, Yangling, Shaanxi, China

*These authors contributed equally to this study.
Corresponding author: Z.R. Zou
E-mail: zouzhirong2005@hotmail.com

Genet. Mol. Res. 13 (2): 2563-2573 (2014)
Received September 18, 2013
Accepted November 12, 2013
Published January 22, 2014
DOI http://dx.doi.org/10.4238/2014.January.22.12

ABSTRACT. Aquaporins play a direct role in plant water relation under salt stress, but the effects of 5-aminolevulinic acid (ALA) on aquaporin gene expression in salt-treated plants remain unknown. This study investigated the potential effects of exogenous ALA (50 mg/dm^3) on aquaporin expression levels under salt stress (75 mM NaCl) in the salt-sensitive (Jinchun No.4) and the relatively salt-tolerant cucumber (Jinyou No.1) seedlings. The expressions of cucumber PIP aquaporin gene (*CsPIP1:1*) and cucumber NIP aquaporin gene (*CsNIP*) were analyzed in 20-day-old seedling leaves at 2, 4, 8, 16, and 24 h after ALA treatment. After treatment with saline alone and ALA alone, *CsPIP1:1* and *CsNIP* gene expression levels in the 2 cucumber cultivars increased to maximum at 2 h. The aquaporin gene expression in salt-treated cucumber seedling leaves was considerably higher than that in leaves subjected to exogenous ALA. Further, the aquaporin expression levels in Jinchun No.4 were higher than those in Jinyou No.1, reaching 5.20-

and 2-fold induction levels, respectively. After treatment with both ALA and NaCl, the *CsNIP* gene expression was downregulated in both the cucumber cultivars, while that of *CsPIP1:1* decreased at 2 h and then increased to 3.8-fold in Jinchun No.4. In Jinyou No.1, *CsPIP1:1* gene expression gradually increased to 2.3-fold at 4 h, followed by a decline in expression. The results indicated that ALA might delay and counteract the upregulated expression of *CsPIP1:1* and *CsNIP* genes in cucumber seedlings under NaCl stress. Thus, salt tolerance of cucumber seedlings might be enhanced by ALA application.

Key words: 5-aminolevunlinic acid; NaCl stress; Aquaporin; Cucumber; Gene expression

