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

Overexpression of the activated form of the *AtAREB1* gene (*AtAREB1ΔQT*) improves soybean responses to water deficit

J.P. Leite[1], E.G.G. Barbosa[2], S.R.R. Marin[2], J.P. Marinho[3], J.F.C. Carvalho[5], R.F. Pagliarini[2], A.S. Cruz[2], M.C.N. Oliveira[4], J.R.B. Farias[5], N. Neumaier[5], F.C.M. Guimarães[2], T. Yoshida[6,7], N. Kanamori[6], Y. Fujita[6], K. Nakashima[6], K.Y. Shinozaki[6,7], J.A. Desidério[1] and A.L. Nepomuceno[2]

[1]Departamento de Biologia Aplicada à Agricultura, Faculdade de Ciências Agrárias e Veterinárias, Universidade Estadual Paulista, Jaboticabal, SP, Brasil
[2]Laboratório de Biotecnologia Vegetal, Embrapa Soja, Londrina, PR, Brasil
[3]Departmento de Biologia Geral, Universidade Estadual de Londrina, Londrina, PR, Brasil
[4]Departmento de Biometria, Embrapa Soja, Londrina, PR, Brasil
[5]Laboratório de Ecofisiologia Vegetal, Embrapa Soja, Londrina, Brasil
[6]Biological Resources and Post-Harvest Division, Japan International Research Center for Agricultural Sciences, Tsukuba, Ibaraki, Japan
[7]Laboratory of Plant Molecular Physiology, University of Tokyo, Bunkyo-Ku, Tokyo, Japan

Corresponding author: A.L. Nepomuceno
E-mail: alexandre.nepomuceno@embrapa.br

Genet. Mol. Res. 13 (3): 6272-6286 (2014)
Received November 11, 2013
Accepted February 3, 2014
Published August 15, 2014
DOI http://dx.doi.org/10.4238/2014.August.15.10

ABSTRACT. Abscisic acid-responsive element binding protein (AREB1) is a basic domain/leucine zipper transcription factor that binds to the abscisic acid (ABA)-responsive element motif in the promoter

region of ABA-inducible genes. Because AREB1 is not sufficient to direct the expression of downstream genes under non-stress conditions, an activated form of AREB1 (AREB1ΔQT) was created. Several reports claim that plants overexpressing AREB1 or AREB1ΔQT show improved drought tolerance. In our studies, soybean plants overexpressing AREB1ΔQT were characterized molecularly, and the phenotype and drought response of three lines were accessed under greenhouse conditions. Under conditions of water deficit, the transformed plants presented a higher survival rate (100%) than those of their isoline, cultivar BR 16 (40%). Moreover, the transformed plants displayed better water use efficiency and had a higher number of leaves than their isoline. Because the transgenic plants had higher stomatal conductance than its isoline under well-watered conditions, it was suggested that the enhanced drought response of AREB1ΔQT soybean plants might not be associated with altered transpiration rates mediated by ABA-dependent stomatal closure. However, it is possible that the smaller leaf area of the transgenic plants reduced their transpiration and water use, causing delayed stress onset. The difference in the degree of wilting and percentage of survival between the 35S-AREB1ΔQT and wildtype plants may also be related to the regulation of genes that protect against dehydration because metabolic impairment of photosynthesis, deduced by an increasing internal CO_2 concentration, was not observed in the transgenic plants.

Key words: *AtAREB1*ΔQT; Biolistics; Drought tolerance; Soybean; Transcription factor; Water use efficiency

