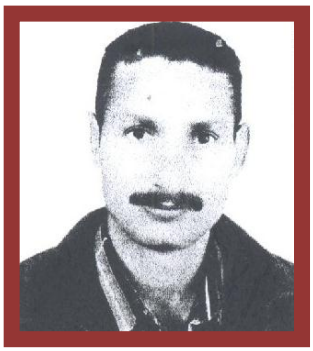
Plant Cell Rep (2013) 32:663–674,ISSN:0721-7714

IMPACT FACTOR=2.509



TOLERANCE TO DROUGHT AND SALT STRESSES IN TRANSGENIC FABA BEAN (VICIA FABA L.) PLANTS BY HETEROLOGOUS EXPRESSION OF THE PR10A GENE FROM POTATO

Moemen S. Hanafy • **Antar El-Banna •**
Heinz Martin Schumacher • Hans-Jorg Jacobsen •Fathi S. Hassan
Faculty of Agriculture, Department of Genetics, Kafr El-Sheikh University, 33516 Kafr El-Sheikh, Egypt

ABSTRACT

Key message We report for the first time that expression of potato PR10a gene in faba bean causes enhanced tolerance to drought and salinity. Abstract Grain legumes such as soybean (Glycine max L. Merrill), pea (Pisum sativum L.) and faba bean (Vicia faba L.) are staple sources of protein for human and animal nutrition. Among grain legumes, faba bean is particularly sensitive to abiotic stress (in particular osmotic stress due to lack of water or enhanced soil salinity) and often suffers from severe yield losses. Many stress responsive genes have been reported with an effect on improving stress tolerance in model plants. Pathogenesis-related proteins are expressed by all plants in response to pathogen infection and, in many cases, in response to abiotic stresses as well. The PR10a gene isolated from the potato cultivar Desiree was selected for this study due to its role in enhancing salt and/or drought tolerance in potato, and transferred into faba bean cultivar Tattoo by Agrobacterium tumefaciens-mediated transformation system based upon direct shoot regeneration after transformation of meristematic cells derived from embryo axes. The transgene was under the control of the constitutive mannopine synthase promoter (p-MAS) in a dicistronic binary vector, which also contained luciferase (Luc) gene as scorable marker linked by internal ribosome entry site elements. Fertile transgenic faba bean plants were recovered. Inheritance and expression of the foreign genes were demonstrated by PCR, RTPCR, Southern blot and monitoring of Luciferase activity. Under drought condition, after withholding water for 3 weeks, the leaves of transgenic plants were still green, while non-transgenic plants (WT) wilted and turned brown. Twenty-four hours after re-watering, the leaves of transgenic plants remained green, while WT plants did not recover. Moreover, the transgenic lines displayed higher tolerance to NaCl stress. Our results suggested that introducing a novel PR10a gene into faba bean could be a promising approach to improve its drought and salt tolerance ability, and that MAS promoter is not only constitutive, but also wound-, auxin/cytokinin- as well as stressinducible.