New approach for generating transgenic tomato plants expressing the cyanobacterium GRX-2 gene

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ABSTRACT

Tomato, Solanum lycopersicum L., is considered one of the most important vegetable crops in Egypt. Soil salinity, have a huge impact on tomato production and mainly affects arid and semiarid zones. In the present study, simple and rapid transformation system of tomato cv. Castlerock has been developed using in planta transformation for introducing GRX-2 gene from Cyanobacterium Synechocystis sp. PCC 6803. Tomato seeds were used as an explant. Seeds were transformed by using Agrobacterium tumefaciens strain LBA4404 harboring the binary vector pRI 101-ON DNA. The plasmid contains glutaredoxin (GRX-2) and neomycin phosphotransferase (nptII) genes to enhance salinity tolerance. The infected seeds were germinated in seedling trays; the T_0 seedlings were transplanted to maturation and allowed to pollinate naturally for seed setting (T_1 plants) in greenhouse under non-sterile conditions. Molecular analysis using PCR and sequencing proved the presence and integration of the transgenes in the genome of the transgenic plants. RT-PCR detected successfully the expression of GRX-2 gene. The results of the present study can be seen as a step towards development of salinity tolerant transgenic tomato.

Key words: *Agrobacterium mediated transformation, tomato, glutaredoxin, in planta transformation, salinity stress.*

INTRODUCTION

Tomato, *S. lycopersicum* L., is both an economically important crop species, the focus of a large agricultural industry, and a model organism for genetic, developmental, and physiological research. Tomatoes are among the most widely consumed vegetables in the world, and many of the compounds found in tomatoes have received much interest in recent years for their potential health benefits. Tomato plant growth and development are adversely affected by salinity which is a major environmental stress that limits agricultural production. From an agricultural point of view, salinity is the accumulation of dissolved salts in the soil water to an extent that inhibits plant growth (Gorham, 1992). Damage caused by high salinity to plants is observed either as loss of plant productivity or plant death. Recent statistics suggested that 67% of agricultural area has potential for transient salinity, a type of ground water associated salinity (Rengasamy, 2006). The total global area of salt-affected soils including saline and sodic is 831 million hectares (Martinez-Beltran and Manzur, 2005), extending over all the continents including Africa, Asia, Australia and the Americas (Rengasamy, 2006 and Schoups *et al*., 2005). Most commercial cultivars of tomato are moderately sensitive to salinity at all stages of plant development and as a result,