ARC'14
مؤتمر مؤسسة قطر السنوي للبحوث
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Expression Patterns Of Genes Encoding Antioxidative Enzymes In Date Palm(Phoenix Dactylifera) In Response To Salinity Stress

10.5339/qfarc.2014.EEPP1072

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Abstract

Background
Salinity is one of the major abiotic stresses threatening crop productivity worldwide. Plants exposed to severe salinity suffer ionic toxicities, osmotic stress and oxidative damage that lead to inhibition of active photosynthesis, reduction of growth and cell death. Plants ability to detoxify reactive oxygen species (ROS, free radicals) and avoid oxidative damage is considered as one of the important mechanisms to cope with salinity. Accumulation of ROS causes oxidation of various cellular components, damage to DNA and proteins, and can lead to oxidative destruction of the cell. Detoxification of ROS in plant cells is controlled by a combination of antioxidants such as ascorbate (AsA) and glutathione (GSH), and antioxidative enzymes such as superoxide dismutase (SOD), ascorbate peroxidase (APX) and catalase (CAT). Antioxidative enzymes involved on the regeneration of AsA and GSH such as monodehydroascorbate reductase (MDAR) and glutathione reductase (GR) are essential to maintain active pools of both antioxidants.

Objectives:
The aim of this work was to analyze the expression patterns of the date palm genes encoding antioxidative enzymes under various levels of salt stress.

Material and methods:
Similar plantlets of date palm cultivar (Khalas) were selected for all treatments in MS medium. Plantlets were subjected to various concentrations of NaCl (100mM, 200mM, 300mM and 400 mM) in addition to control. The expression analysis was performed by RT-PCR

Results and Conclusions:
The expression patterns of the date palm genes encoding antioxidative enzymes under various levels of salt stress was analyzed. Results showed that remarkable induction of PdCAT, PdGR, PdMDAR, PdSOD and PdAPX was observed. Highest induction of PdCAT and PdGR was observed at 100 mM NaCl while PdMDAR maintained its highest expression at up to 400 mM NaCl. Following salt exposure time course, all the genes maintained up-regulated expression levels up to 6 days compared to control conditions. Moreover, a high and steady induction of glutathione S-transferase (PdGST) was observed, the enzyme that plays key roles in the detoxification of xenobiotics compounds and oxidative stress mechanism. These results suggest that antioxidative enzymes involved in either ROS detoxification or antioxidants regeneration may play crucial roles in the tolerance of date palm to salt stress.