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CLONING AND SEQUENCING OF FIVE LEA2 GENES FROM DATE PALM CV. KHALAS AND FUNCTIONAL CHARACTERIZATION TO HEAT AND SALT STRESS TOLERANCE USING YEAST KNOCKOUT MUTANTS

by

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Date & Venue

12-2pm

Sunday, 15 November 2020

Online through BlackBoard Collaborate Ultra

Link: https://eu.bbcollab.com/guest/0f7b0abe48cc4e92b5c0acd5578c65aa

Abstract

Genomic assets from the plants innate to abiotic stress environments have the prospective to be latent in generating stress tolerant plants. Late embryogenesis abundant (LEA) proteins are decisive phytomolecules, which accumulates mainly in the late stages of seed development and in the vegetative tissues during exogenous stresses as a reaction to stabilize the damaged macromolecules. In spite of substantial research, their mechanism of action to initiate plant tolerance against abiotic stresses remains enigmatic. Here, we report a preliminary study on LEA 2 genes from the *P. dactylifera* cv. khalas, a relatively tolerant plant of arid regions. In this aspect, the current study was undertaken to clone five LEA 2 genes from date palm cv. khalas and characterize their functionality towards heat and salt stress tolerance using yeast knockout mutants. Through the utilization of whole transcriptome sequencing of date palm, it was found that the DpLEA2 genes were highly expressed in roots when the seedlings were challenged with salt stress. A total of 5 DpLEA2 genes were isolated, and analysed using bioinformatic tools, which displayed high sequence similarity and possession of certain specific conserved motifs. To evaluate for their possible functions in stress tolerance, three DpLEA2 genes from the 5 isolated genes were expressed in *Saccharomyces cerevisiae* (AXT3K, W303 and CDC25 strains), a genetically tractable eukaryotic facsimile organism. Heat stress experiments showed that all the 3 DpLEA2 genes significantly enhanced yeast CDC25 strain survival and viability, with an effective protection to the yeast cells. While none of the 3 DpLEA2 genes provided protection to yeast cells (AXT3K and W303 strains) under the salt stress, with no significantly enhanced tolerance observation. In grasp of, our results set forth that DpLEA2 genes may have a remarkable part in amending the tolerance and survival ability of plants or organisms under heat stress, which could account them as promising candidate genes for heat tolerance transgenic plant research and as a forthcoming functional marker for marker-assisted selection in *P. dactylifera* breeding programs for heat tolerance.

Keywords: Late embryogenesis abundant (LEA) protein, *P. dactylidera*, heat stress, salt stress, yeast expression, abiotic stress tolerance