

**ROLE OF SIGNAL TRANSDUCTION IN  
REGULATION OF GENE EXPRESSION  
OF DROUGHT TOLERANCE  
IN WHEAT**

By

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B.Sc. Agric. Sc. (Biotechnology, English section), Cairo University, 2007

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## ABSTRACT

**Sarah Adel Abdullah Abd El-Bein: Role of signal transduction in regulation of gene expression of drought tolerance in wheat, Unpublished Master Thesis, Department of Genetics, Faculty of Agriculture, Ain Shams University, 2017.**

A Differential Display Polymerase Chain Reaction (**DD-PCR**) technique was applied for gene expression profiling to detect the up and down regulation of gene expression in shoots and roots of the two cultivars **Sahel 1**(tolerant) and **Gammeiza 7** (sensitive) in response to drought in bread wheat (*Triticum aestivum* L.). Twenty differentially expressed ESTs fragments were obtained from shoots and roots. The sequences of ESTs were identified by using bioinformatics analysis. Seven of which were from shoots and 13 from roots. The results of fragments showed a significant homology to some predicted proteins such as: *TaAP2* which has important roles in directing changes in gene expression during stress, glycosyltransferases (*GTs*) which catalyzes the transfer of sugar moieties to a wide range of acceptor molecules, nelumbo nucifera protein NEN-4 which plays a role in cellular protection, restoration of plant functions under stress and exhibits protein-repair activity after heating to 100°C, fructan 1-exohydrolase which is important for regrowth of leaf tissue after defoliation, ageratina adenophora *ICE1* protein that activates many downstream genes that confer chilling and freezing tolerance to plants. RNA polymerase II gene which regulates transcription, the synthesis of RNA from a DNA template, is one of the most important steps in control of cell growth and differentiation. Serine/threonine-protein kinase maintains unperturbed photosynthesis inducing an oxidative stress response and plays a role in salt stress signaling, *NRC-1* which is highly responsive to its environment and provided insights into some of the specific responses at the level of gene expression and prolamine genes stable proteins which is accumulated at

massive levels due to the high expression level from extensively duplicated genes in endoreduplicated cells. Elucidation of the functions of these genes can understand the signal transduction of response mechanism for drought in the two cultivars which can be used to improve the quality and productivity of Egyptian wheat in future investigations.

**Key words:**

*Triticum aestivum*, ESTs, Differential display, drought  
and signal transduction.

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## LIST OF ABBREVIATIONS

<b>ABA</b>	Abscisic acid
<b>AP</b>	Arbitrary primers
<b>APS</b>	Ammonium persulfate
<b>ATI</b>	Abiotic tolerance index
<b>AWC</b>	Available water content
<b>BAC</b>	Bacterial artificial chromosome
<b>Blast</b>	Basic local alignment search tool
<b>Blastn</b>	Basic local alignment search tool nucleotide
<b>Blastp</b>	Basic local alignment search tool protein
<b>Blastx</b>	Basic local alignment search tool nucleotide to protein
<b>bZIP</b>	Basic Leucine Zipper Domain
<b>cDNA</b>	Complementary DNA
<b>CDNA-AFLP</b>	Complementary DNA amplified fragment length polymorphism
<b>COR</b>	Cold-stress-responsive
<b>CVG</b>	Germination and coefficient of velocity
<b>DD</b>	Differential display
<b>DI</b>	Drought resistance index
<b>DREB</b>	DRE binding proteins
<b>DRI</b>	Drought response index
<b>EDTA</b>	Ethylenediaminetetraacetic acid
<b>EST</b>	Expressed sequence tag
<b>EtBr</b>	Ethidium bromide
<b>E-value</b>	Expected value
<b>FEH</b>	Fructan 1- exohydrolase
<b>G7</b>	Gemmeiza 7
<b>GAD</b>	Glutamic Acid Decarboxylase
<b>Glu/Gli</b>	The glutenin-to-gliadin ratio
<b>GMP</b>	Geometric mean productivity
<b>GST</b>	Glutathione-s-transferase
<b>GT</b>	Glycosyltransferase
<b>HEG</b>	High K utilization efficiency cotton genotype
<b>HSPs</b>	Heat shock proteins
<b>ICE1</b>	Inducer of CBF expression 1
<b>KUE</b>	Potassium utilization efficiency