Muhammd Nadeem Hafeez, Adv Crop Sci Tech 2018, Volume 6
DOI: 10.4172/2329-8863-C1-005

Mutated and wild type *Gossypium* Universal Stress Protein-2 (GUSP-2) gene confers resistance to stresses in *Escherichia coli*, *Pichia pastoris* and cotton plant

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Gossypium arboreum is considered to be a rich source of stress responsive genes and EST data base revealed that mostly of its genes are uncharacterized. The full length *Gossypium* universal stress protein-2 (*GUSP-2*) gene (510 bp) was cloned in *E. coli*, *Pichia pastoris* and *Gossypium hirsutum*, characterized and point mutated at three positions separately at 352-354, Lysine-60 to proline (*M1-usp-2*) and 214-216, aspartic acid-26 to serine (*M2-usp-2*) and 145-147, Lysine-3 to proline (*M3-usp-2*) to study its role in abiotic stress tolerance. It was found that heterologous expression of one mutant (*M1-usp-2*) provided enhanced tolerance against salt and osmotic stresses, recombinant cells have higher growth up to 10-5 dilution in spot assay as compared to Wusp-2 (wild type GUSP-2), *M2-usp-2* and M3-usp-2 genes. *M1-usp-2* in Pichia pastoris transcript profiling exhibited significant expression (7.1-fold) to salt and (9.7) and osmotic stresses. *M1-usp-2* gene was also found to enhance drought tolerance and significant expression (8.7) in CIM-496-Gossypium hirsutum transgenic plants. However, little tolerance against heat and cold stresses both in recombinant yeast and bacterial cells was observed. The results from our study concluded that activity of *GUSP-2* was enhanced in *M1-usp-2* but wipe out in M2-usp-2 and M3-usp-2 response remained almost parallel to *W-usp-2*. Further, it was predicted through in silico analysis that *M1-usp-2, W-usp-2* and *M3-usp-2* may be directly involved in stress tolerance or function as signaling molecule to activate the stress adaptive mechanism.

Biography

Muhammd Nadeem Hafeez is currently working as a Researcher at Center for Excellence in Molecular Biology (CEMB), Lahore, Pakistan. He has expertise in gene editing, cloning and plant transformation. He has developed a first triple gene genetically engineered cotton variety of Pakistan, which confers significant resistance against biotic and abiotic stresses.

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