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

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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 (510bp) 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*) & 214-216, aspartic acid-26 to serine (*M2-usp-2*) & 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 *W-usp-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.

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