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Heterologous expression of uncharacterized wild type and mutated Universal Stress Protein-2 (USP-2) gene from *Gossypium arboreum*-FDH-171 confers osmotic and salt resistance to *Pichia pastoris* and *Escherichia coli*

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Cotton is a cash crop of Pakistan and *Gossypium arboreum* is a locally cultivated variety, which has considerable resistance against various biotic and abiotic stresses. This variety of cotton is considered as good reservoir of stress tolerance genes, while based on EST data mostly of its genes are uncharacterized. *Universal stress protein*-2 (USP-2) gene was identified in 15 days drought stressed leaves of *G.arboreum*-FDH-171. Full length of this gene was mutated at three different (M_1usp-2, M2usp-2, *M_3usp-2*) positions (fig: 1) in three separate clones in E. coli-uspABC-mutant and Pichia pastoris-gs115 strains for its functional validation under various abiotic stress treatments (NaCl 800 mM, PEG 8%, Heat 37-450C, Cold 40C). The expression of 1st mutant (M_1usp-2) was noted as 8.3fold under NaCl stress and 9.7fold under PEG stress treatments, recombinant cells showed higher growth up to 10-5 dilution in spot assay as compared to control and other genes. The 2nd mutant form of USP-2 was expressed on induction but it was failed to initiate stress tolerant mechanism in both organisms. No significant difference was noted in between 3rd mutant form and wild type USP-2. However, all mutant forms showed little tolerance against heat and cold stresses. The results of this study showed that activity of USP-2 was enhanced in M_1usp-2 by enhancing its ATP binding capacity at 2X but wipe out in M_2usp-2 with zero ATP-binding ability and 4X enhanced CMP capacity has no effect on activity of M_3-usp-2. In silico analysis showed that 1st and 3rd mutant forms of USP-2 may directly involve in stress adaptive mechanism or it might be function as a signaling molecule to initiate stress mechanism.

Biography

Nadeem Hafeez is serving at an esteemed position in Molecular Biology (CEMB), Pakistan . He is the recipient of numerous awards for hir expert research works in related fields. His research interests reflect in his wide range of publications in various national and international journals.

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