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Fungal-plant interaction for crops improvement under changing environment for food security

For crops improvement under stress conditions in changing environment an understanding of the beneficial fungal-plant interactions is important. Since the stresses lead to reduction in agricultural production, therefore, there is an urgent need to develop stress tolerant crops with no yield loss for future food security. Use of beneficial fungus (root endophyte *Piriformospora indica*) through non-transgenic and transgenic approaches could be one of the best ways for crop improvement. Through non-transgenic approach P. *indica* has been found to provide strong growth promoting activity during its symbiosis with a broad spectrum of plants including mustard, pea, tobacco, tomato, rice, lepidium and medicinal plant *Coleus forskohlii*. Despite its positive impact on the host, little is known about the P. *indica* genes that may be involved in stress tolerance. However, for transgenic approach to improve the crop under stress condition, first high salinity tolerant genes from P. *indica* need to be cloned. Recently we have cloned several salinity tolerant genes from P. *indica* fungus by functional screening, based on random overexpression of a *P. indica* cDNA library in *Escherichia coli* grown on medium supplemented with 0.6 M NaCl. Out of these one of the salinity tolerant genes from P. *indica* (cyclophilin; PiCypA) has been functionally validated for its role in salinity tolerance in bacteria and plant. This gene product catalyzes the inter-conversion of peptidyl prolyl imide bonds in peptide and protein substrates and functions as molecular chaperones. This is also known to be involved in pre-mRNA splicing; however, their RNA binding activity has not been well described. We found that this protein contains unique property of RNA binding. It also provides high salinity tolerance in *E. coli*. Here we have also shown that the transgenic tobacco plants over expressing fungal PiCypA provide high salinity tolerance and exhibit normal growth under salinity stress conditions. Overall, we demonstrated for the first time a direct evidence of countering salinity stress tolerance in plant by genetic modification using a fungal gene.

Biography

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