Omics amalgamated with bioinformatics leads to new gene discovery for abiotic stress tolerance

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Availability of high throughput technologies and innovative ideas can do wonders in field of science. Omics technologies can be used for new gene discovery tools. A coordinated expression of genes is essential for their functional relevance at the trait level. The primary interest of the present study was to establish the gene interaction networks (GINs) under experimental conditions of salinity and drought, and to understand the network(s) of genes commonly regulated for both the stress conditions. For this we did whole genome transcriptome profiling of tolerant and sensitive cultivars of rice under normal and salt and drought stress conditions to observe coordinated differential expression of genes. Gene interaction networks were generated for up and down regulated genes separately under salt and drought stress conditions. The study established that both salt tolerant and salt sensitive varieties comprised of 3 and 2 up-regulated GINs respectively while, 2 GINs those expressed under drought stress conditions were associated with both up and down regulated activity of the tolerant and sensitive variety type. Two smaller GINs (25 upregulated genes) were found to be common to both tolerant and sensitive varieties, while 2 GINs were identified as down regulated genes also common to tolerant and sensitive varieties. A single dense GIN composed of 39 genes were common to both drought and salt stresses. Transcription factors totaling 57 were identified for the 39 genes among which MYBCORE was associated with the maximum number of 19 promoters. Motif analysis was done to identify transcription factors and cis-acting regulatory elements. This study suggests that under drought and salt stress conditions, genes are induced or repressed in tolerant and sensitive cultivars and both gene sets present differential behavioral patterns in their interactions respectively. There also exist ‘hubs’ of gene networks connected to a number of other genes and are co-regulated.

Biography

Vandana Rai received her Ph. D from Banaras Hindu University, Post doc from Meijo University, Nagoya, Japan, published papers in Proc National Acad Sciences, MGG etc. Working on Omics for gene discovery for salt and drought tolerance in staple crop rice and pigeon pea.