8th World Biotechnology Congress

October 05, 2021 | Webinar

Identification of a putative master regulator of disease resistance receptor proteins for enhancing broad-spectrum pathogen and pest resistance in soybean

Madan K Bhattacharyya
Iowa State University, USA

Plants are evolved with disease resistance mechanisms to fight innumerable number of pathogens. There are many different types of genetic mechanisms that allow plants to fight successfully against most pathogenic organisms. We observed that expression of four classes of soybean genes are rapidly suppressed following infection of soybean with its fungal pathogen Fusarium virguliforme that causes sudden death syndrome (SDS). We hypothesized that the pathogen suppresses the expression of these genes to overcome the possible immunity mechanisms contributed by these genes. To test this hypothesis, we exchanged the promoters of one member from each of the four classes of genes with two infection inducible strong leaf and root-specific promoters for overexpression in transgenic soybean plants. Three gene members enhanced SDS resistance in transgenic soybean plants. One of the them, GmDR1 enhanced resistance not only against F. virguliforme, but also against soybean cyst nematode, soybean aphids and spider mites. To understand the molecular basis of this broad-spectrum resistance induced by GmDR1, we conducted a transcriptomic study of the soybean leaves treated with chitin, a molecular pattern found in all four pathogen and pests. We identified 10 TIR-NB-LRR, one CC-NB-LRR, two NB-ARC-LRR, five LRR kinase and one WRKY transcription factor genes, transcription of which was significantly induced among the transgenic lines overexpressing GmDR1 as compared to the control plants. A subset of these genes is significantly induced in F. virguliforme infected roots of transgenic soybean plants as compared to that in the nontransgenic control. Our data suggest that GmDR1 is most likely a master switch that regulates the expression of several disease resistance receptor protein genes for enhancing broad-spectrum disease resistance in soybean.

Biography

Madan Bhattacharyya teaches the Plant Genetics course (Agron 527) for graduate students. His main focus of research is soybean sudden death syndrome, though he is also interested in other plant-pathogen interactions.

mbhattac@iastate.edu