CHAPTER 46

PLANT MOLECULER BIOLOGY

Doctoral Theses

01. JHA (Saroj Kumar)
Deciphering the Functional role of Calcium and Potassium Transport Elements in Rice and Arabidopsis.
Supervisor : Prof. Girdhar K. Pandey
Th 25314

Abstract
(Verified)

Plants are invariably challenged with the fluctuating environmental condition in the natural habitat. Normal growth and development of plants are greatly influenced by several factors such as light, temperature, water, nutrient status in the soil and pathogen attacks. Plants utilize myriad of strategies for adaptation against these adverse conditions. Ever increasing world population is supposed to grow by at least 25% by 2050. To feed every mouth, there is a need for sustainable food production having enhanced nutritional qualities for better human and ecosystem health. Recent advancement in fields of molecular biology, bioinformatics, physiology, genetics, etc. has strengthened the understanding of plant potential plant membrane transporters and channels. In many instances, conclusions drawn from research work on the channels/transporters have been translated to increase staple crop yield, empower plants to better adapt in low nutrient soil, to enhance nutritional qualities and enhance resistance to frequent stresses such as pathogen attack, nutrient deprivation and other ionic stresses. In the present study, role of novel signaling pathway components responsible for adaptation in low-K^+ nutrient condition, high Mg^{2+} and pathogen attack response has been functionally elucidated. Results suggest that the identified components are crucial players which regulate plant adaptation in adverse environmental conditions. CBL-interacting protein kinase 9, a Ser/Thr kinase has been established to be a critical regulator of low-K^+ response in the model plant Arabidopsis. But knowledge about the downstream components of the pathway is elusive. This study involved identification and functional validation of the downstream components essential to adapt plants in low-K^+ environment. Furthermore, a putative calcium/cation exchanger from Arabidopsis has been identified and characterized in detail for its role in magnesium homeostasis and its crucial role in plant-pathogen interaction. And lastly, a rice calcium/cation exchanger, *OsCCX2* has been worked upon *in planta* for its importance in mitigating abiotic stress episodes.

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02. NARESH (Madhvi)
Comprehensive Study of Begomoviruses Infecting Okra and Genes Modulating RNA Silencing in Rice Tungro Bacilliform Virus.
Supervisor : Prof. IndranilDasgupta
Th25315

Abstract
(Not Verified)

Plant viruses are important components of biotic stresses causing major loss in yield and reduce the quality of the crop. The first important crop studied is okra. Its yield is drastically affected by two diseases namely yellow vein mosaic disease (YVMD) and okra enation leaf curl disease (OELCuD). The second important crop studied is rice which is affected by rice tungro disease (RTD) in Southeast Asia. With the host-pathogen "arms-race", viruses have developed means to counteract or escape this RNAi-based resistance in plants by coding for proteins which suppress host RNAi silencing response.The first objective is "CLONING AND SEQUENCE ANALYSIS OF BEGOMOVIRAL DNAs ASSOCIATED WITH YELLOW VEIN MOSAIC DISEASE OF OKRA". It was undertaken to gather additional information on geminiviruses present in naturally-infected okra plants displaying symptoms of BYVMD and OELCuD. The second objective is "CLONING AND SCREENING GEMINIVIRUSES OF OKRA FOR VIRAL RNAi SUPPRESSORS" examines the okra associated geminiviruses for the silencing suppressors. The third objective is "STUDY OF RNA SILENCING SUPPRESSORS (ORF IV AND PRT) IN *Rice tungro bacilliform virus"* emphasize on the study of two silencing suppressor proteins of RTBV (ORF IV and PRT) for its suppressor activity. The forth objective is "ANALYSIS OF MUTANTS OF RNA SILENCING SUPPRESSORS (ORF IV AND PRT) IN *Rice tungro bacilliform virus"* was to construct deletion mutants (lacking different lengths of the amino acid sequences) of ORF IV and PRT to fine map the modulation of RNAi function seen in the intact proteins. The fifth objective is "INTERACTION OF RNA SILENCING SUPPRESSORS (ORF IV AND PRT) OF RTBV WITH THE PLANT RNA SILENCING-RELATED PROTEINS" was to investigate the interactions of plant silencing suppressor ORF IV and PRT with plant RNAi component genes of Arabidopsis (*SGS3, AGO1* and *RDR6* genes) and potato (*SGS3* gene).

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