

CHAPTER 46

PLANT MOLECULAR BIOLOGY

Doctoral Theses

511. BHASKAR (Avantika)
Functional Validation of Rice Genes Encoding Topoisomerase 6 (OsTOP6), Cytokinin Response Regulator (OsRR6), and F-Box Proteins, Involved in Signal Transduction.
Supervisor : Prof. J P Khurana
Th 18171

Abstract

The present study sheds light on to the roles of topoisomerase 6, cytokinin response regulator, OsRR6 and F-box proteins as essential components of different signal transduction pathways involved in cross-talk among light, hormone and stress signalling, and governing plant growth and development.

Contents

1. Functional validation of rice gene encoding topoisomerase 6, OsTOP6. 2. Functional validation of rice gene encoding cytokinin response regulator OsRR6. 3. Functional validation of rice genes encoding F-box proteins. Summary and conclusions.

512. CHECKER (Vibha Gulyani)
Development of Expressed Sequence Tags (Ests) for Comparative Transcriptomics and Generation of Transgenics for Abiotic Stress Tolerance in Mulberry (Morus Indica L.).
Supervisors : Prof. Paramjit Khurana
Th 18264

Abstract

The present investigation is carried out with the generation and functional annotation of Ests generated from roots of M. indica, comparison of Ests generated from roots with mature leaf of mulberry to obtain molecular snapshots of tissue specific transcriptional activities, and in silico identification of SSR

markers to analyze the frequency, type and distribution of SSR motifs in mulberry leaf and root tissues. The transcription collection generated provides a source of gene discovery and functional molecular markers for roots in general and mulberry in particular and contributes new perspectives and avenues.

Contents

1. Introduction. 2. Materials and methods. 3. Results. Discussion. Conclusions.

513. DANSANA (Prasant K)
Evaluation of the Protein Level Interactions of OsiSAP1, OsiSAP11 and OsiRLCK253 and their Potential for Conferring Abiotic Stress Tolerance in Transgenic Rice.

Supervisor : Prof. Akhilesh K Tyagi
 Th 18170

Abstract

The present work attempts to define the biological function of certain stress-associated proteins, OsiSAP1 (*Oryza sativa* subsp *indica* stress-associated protein 1) and its putative protein interactors, OsiSAP11 and Osi RLCK253, in response to abiotic stress in rice. A20/ANI zinc-finger containing stress-associated proteins (SAPs) have been reported from several plant species including rice and found to be involved in abiotic stress response. *OsiSAP1* is induced under multiple stresses including water-deficit, salt and cold stress. Overexpression of *OsiSAP1* in model plants, tobacco and *Arabidopsis*, showed stress tolerance against cold, salt and water-deficit.

Contents

1. Review of previous work. 2. Materials and methods. 3. Results. 4. Discussion. 5. Summary and conclusions.

514. KHURANA (Reema)
Characterization of the Activity of Anther-/Pollen-Specific Promoters and Interacting Regulatory Factors from Rice.

Supervisor : Prof. Akhilesh K Tyagi
 Th 18172

Abstract

Demonstrates that the variable combination of regulatory elements control anther-specific gene expression and such activity is not

always conserved in rice (a monocot) and *Arabidopsis* (a dicot). OSIPA, OSIPP3, OSIPK, OSbHLH and OSFbox promoters can be exploited for biotechnological applications like generating male sterile plants for hybrid seed production or transgene containment. The experimental work has been initiated to investigate the activity of three promoters from anther-specific genes OSIPK, OSbHLH and OSFbox from rice, delineation of minimal regulatory region of OSIPA, OSIPK and OSIPP3 genes in transgenic *Arabidopsis* and identification of transcription factor interacting with anther-/pollen-specific promoter.

Contents

1. Review of previous work on anther/pollen-specific promoters and transcription factors. 2. Materials and methods. 3. Results. 4. Discussion. 5. Summary and conclusions.

515. NIJHAWAN (Aashima)
Comparative Analysis of Flowering Time Genes in Rice and *Arabidopsis*, Analysis of *OsbZIP* Gene Family and Functional Validation of *OsbZIP62* and *OsbZIP47* in Reproductive Development and *OsbZIP45* and *OsbZIP05* in Abiotic Stress Tolerance.

Supervisor : Prof. Jitendra P Khurana
 Th 18168

Abstract

The present study examines the expression patterns of homologous genes in rice and *Arabidopsis* involved in floral transition. Also, an attempt has been made to elucidate the roles of bZIP transcription factor encoding genes in rice, putatively implicated in floral transition/development and abiotic stress response pathway. Also revealed the presence of *FLC* repressors belonging to the vernalization pathway of flowering in the rice genome.

Contents

1. Review of literature on the plant basic leucine zipper family of transcriptional regulators. 2. Materials and methods. 3. Results and discussion. Summary and conclusions.

516. RAHUL KUMAR
Analysis of DNA sequence of a part of chromosome 5, ripening-related transcriptome and delay of fruit ripening by silencing of *LeMADS-RIN* Gene in Tomato.
Supervisor : Prof. Akhilesh K Tyagi and Dr. Arun K Sharma
Th 18169

Abstract

Deals with the sequencing of a part of short arm of chromosome 5, silencing of *LeMADS-RIN* gene for delay of fruit ripening and characterize genes related to fruit ripening by doing transcriptome analysis of the *rin* mutant, impaired in ripening-associated increase in expression of most ripening-related genes. Prior to sequencing of BACs of the genomic BAC libraries, physical mapping is carried out to find positions of these BACs on chromosome 5. Fifteen BACs associated with 5 nucleation points have been sequenced of these, assembled sequences of 11 BACs are submitted to GenBank and SGN databases, Annotation and functional classification of *in silico* predicted gene models belonging to the sequenced BACs are also performed.

Contents

1. Review of literature on tomato genome sequencing and fruit ripening. 2. Materials and methods. 3. Results. 4. Discussion. 5. Summary and conclusions.