# CHAPTER 6

# BOTANY

## Doctoral Theses

046. DUTTA (Ajaswrata)
**Molecular and Abiotic Stress Signal Transduction Studies on TIA Biosynthetic Pathway Genes in Periwinkle.**
Supervisors : Dr. Renu Deswal
Th 15222

*Abstract*

Understands the complex regulation of TIA biosynthetic and related primary pathways in C. roseus under different abiotic stress conditions at in vivo level. An attempt was also undertaken to demonstrate the relationship of cellular differentiation in vitro with TIA accumulation. The screening of high yielding C. roseus genetic resurces, which is usually done by conventional methods till date, has been attempted based on molecular methods. Conventional strategies for screening of high yielding genetic resources include sacrificing the plants and quantification of alkaloids by HPLC method. Thus the present strategy for selection of high yielding genetic resources using expression analysis of TIA biosynthetic pathway genes in C. roseus seemed to be simpler and effective as compared to the conventional one. In addition, studies were carried out to evaluate the probable molecular mechanisms that control abiotic stress response of TIA and related primary biosynthetic pathways specially in relation to salt and low temperature stresses via regulating Sir gene in C. roseus. Finally, the possible role of a novel C-repeat binding factor in C. roseus has been studied in low temperature tolerance.

*Contents*

1. Introduction 2. Review of Literature. 3. Materials and Methods. 4. Results and Discussion. 5. Summary, Discussion. and Bibliography.

047. JAIN (Shalu)
**Molecular and Bichemical Studies in Stress Sensitive vs. Stress Tolerant Cell Lines of Arachis hypogaea (Peanut)**
Supervisors : Dr. Renu Deswal and Prof. Neera Bhalla Sarin
Th 15221

*Abstract*

Plants are adversely affected by various environmental stresses. In response to stress various genes are up-regulated, which can mitigate the effect of stress and lead to adjustment of the cellular processes leading to stress tolerance in plants. In nature, stress does not generally come in isolation and many stresses act together. In response to these stress signals that cross talk with each other, nature has developed diverse pathways for combating and tolerating them. These pathways act in co-operation to allveiate stress conditions. In the present work we developed the cell lines of Arachis hypogaea to study the effects of salt stress and identified proteins/genes which are up-regulated under stress conditions. A combination of proteomics and genomics approach was followed to analyze these cell lines. Interestingly, a pathogenesis related protein of family 10 (PR10) was most abundant in the salt tolerant cell lines. Therefore, this protein was further characterized to study its involvement in multiple stress tolerance through expression studies in salt tolerant cell lines and its transgenic expression in tobacco.

*Contents*

1. Introduction 2. Review of Literature. 3. Materials and Methods. 4. Results. 5.Discussion. 6. Summary, Conclusions and Bibliography.

048. JAISWAL (Sarita)
**Experimental Regulation of Epiphyllous Bud Differentiation and Associated Foliar Senescence in Kalanchoe Pinnata (Lam.) Pers., and an Assessment of Antioxidative Potential of the Leaves.**
Supervisor : Prof. S K Sawhney
Th 15220

*Abstract*

Kalanchoe pinnata, a leaf succulent developing foliar buds in biphasi manner was chosen for conduction to understand the

physiology of regulation of epiphllous bud differentiation and associated foliar sencescence using leaf detachment to trigger the twin leaf based processes. The experimental model was standardized, comprising of small marginal leaf discs, each harbouring a dormant epiphyllous bud competent to develop into a healthy plantlet on unsupplemented medium and showing high sensitivity and responsivenes towards experimental manipulations. An attempt was made to find out the probable correlations among the senescence parameters [chlorophyll contet($Chl_{a+b}$), soluble protein content and memnberane stability index (MSI)] and antioxdative characteristics [ ferric reducing anbility in plasma equivalence (FRAP Eq), phenolic content and memberane protection index (MPI)] of leaf discs showing epiphyllous bud differentiation under contiuous light or dark conditions. The data obtained was statistically analysed using computer software SPSS-10. Intracorrelation analysis of senescence characteristics revealed that $Chl_{a+b}$ and protein content were maximally correlated. In case of antioxidative characteristics FRAP equivalence was found to be maximally correlated with phenolic content. Intercorrelation analysis showed maximal correlation of FRAPEq with several senescence parameters. A signficant correlation of decreasing levels of $Chl_{a+b}$ with variations in antioxidative parameters indicated that with the progressive degradation of secondary metabolites (phenolics in the present case) the overall antioxidative capacity of the leaf disc diminished.

*Contents*

1. Introduction 2. Review of Literature. 3. Materials and Methods. 4. Experimentation and Results. 5. Discussion. 6. Summary and Bibliography.

049. KAPOOR (Priyanka)

**Rhizome Induction and Plant Regeneration Under In Vitro and In Vivo conditions : Some Aspects of Phase Change in Bamboos.**

Supervisor : Prof. I. Usha Rao

Th 15453

*Abstract*

Understands some of the physiological factors for precosious rhizome induction and provide a protocol (through in vitro as well as in vivo means) for mass scale propagation of bamboos for sustainable development and apply the cocept of phase

change to this process. Caryopses of Bambusa bambos var. gigantea were used for in vitro experiments and caryopses of B bambos were used for in vivo experimentation. Effect of cytokinins (BAP, Kinetin and TDZ) was studies on formation of multiple shoots from embryonal axis of B. bambos var. gigantea under the vitro conditions. BAP was mote favourable for initiation of multiple shoots on the embryonal axis than Kinetin.

*Contents*

1. Introduction. 2. Materials and methods. 3. Observations and results. 4. Discussion and summary.

050. OTAGHVARI (Arman Mahmoudi)
**Floristic Studies on Aravalli Ranges.**
Supervisor : Prof. S. R. Yadav
Th 15223

*Abstract*

The Aravalli ranges are the abode of certain flora that are particularly endemic to arid regions and are specially adapted biologically to survive in the dry, waterless regions of the hills. The forest vegetation of Aravalli ranges is deciduous and has thorny trees, grasses and shrubs. In spite of oldest mountains with characteristic vegetation, the Aravalli ranges remained botanically little known. Therefore, the present investigation was undertaken with the aims of preparing detailed inventory of flowering plants of aravalli ranges, to update nomenclature and to provide keys for identification.

*Contents*

1. Introduction 2. Previous Work. 3. Materials and Methods. 4. Area of Study. 5. General account of Aravalli ranges. 6. Statistical analysis of the Flora. 7. Results and Discussion. 8. Key to the families. 9. Systematic Treatment. Bibliography.

051. RAZDAN (Anupama)
**Biotechnological Approaches to Improve Phlox Drummondii Hook.**
Supervisor : Prof. S. N. Raina
Th 15454

*Abstract*

Concerns with the application of biotechnological tools to devise for genetic improvement protocols of the universally acclaimed ornmental Phlox drummondii (2n=2x=14). The success has been achieved in : 1) regeneration of plants by nodal segments, 2) induction of haploids by anther culture, 3) triploid production from endosperm culture, 4) somaclonal variant selection from protoplast culture - derived plants, and, 5) variant/mutant strains obtained from genetic engineering technology. These variants /mutant strains can be micropropagated on manifold scale throughout the year under in vitro conditions.

*Contents*

1. Introduction. 2. Materials and methods. 3. Observations and results. 4. Discussion. 5. Summary. 6. References.

052. SEHGAL (Deepmala)
**Assaying Polymorphism at DNASequence Level for New and Novel, Genetic Diversity diagnostics of Safflower (Carthamus Tinctorius L.), and Phylogenetic Reconstruction of the Genus Carthamus**
Supervisor : Prof. S.N. Raina
Th 15224

*Abstract*

Sequencing of genes has served as a remarkable source of data for plant phylogenetic reconstruction. The structural organization of many genes like ribosomal RNA gene (18S-5.8S-26S) clusters originating from nuclear (nr) as well as organelle genomes, genes meant for synthesis of large subunit of rbcL and placed in chloroplast (cp) genome, gene clusters ments for the synthesis of 5S ribosomal RNA, gene meant for synthesis of ATP subunit placed in mitochondrial (mt) genome, maturase K gene placed in chloroplast genome and so on in angiosperms is such that it has led to design of universal primers fordesign of universal primers for their amplification across angiosperm taxa. rDNA gene families (18S-5.8S-26S, 45S, and 5S rRNA) are constituted by conservative, partly conservative and nonconservative regions. The other genes as well exhibit the degree of variation sometimes most suitable for constructing phylogenies. The study utilized DNA markers for comprehensive diagnostics of genetic diversity of the safflower cultivars

and germplasm resources, and for phylogenetic reconstruction of the genus carthamus as such.

*Contents*

1. Introduction 2. Materials and Methods. 3. Male meiosis in the carthamus taxa. 4. Genotyping safflower (Carthamus Tinctorius) cultivars by DNA fingerprints. 5. Assaying polymorphism at DNA sequence level for new and novel genetic diversity diagnostics of the safflower (Carthamus Tinctorius L.) world germplasm Resources. 6. Assaying Polymorphism at nuclear DNA sequence level for new and novel insights in the phylogenetic relationship in the genus carthamus. 7. Assaying Polymorphism at chloroplast and mitochondrial DNA sequence level for added new and novel insights in phylogenetic relationship in the genus carthamus. 8. Summary and Bibliography.

## M.Phil Dissertations

053. CHETRI (Siva Prasad Konwar)
**In Vitro Studies on Tephrosia Purpurea Pers. and its Bioefficacy Against Spodoptera Litura (FABR.), a Polyphagous Pest.**
Supervisor : Dr. Veena Agrawal

054. IFFAT PARVEEN
**Analysis of Tyrosine Phosphatase Activity under Various Abiotic Stress Conditions in Brassica Juncea Seedlings.**
Supervisor : Dr. Renu Deswal

055. PATHAK (Niti)
**Biomarkers for Heavy Metal Stress in Plants : A Perspective & Studies on the Effect of Nickel on Growth Parameters and Antioxidative Enzymes in Jatropha Curcas L. and Cajanus Cajan L.**
Supervisor : Dr. Suman Lakhanpaul

056. SACHIN KUMAR
**Baseline Study of an Abandoned Mine Site and a Natural Forest Site with Respect to Plant Community in Purnapani, Orissa - A Step towards Ecological Restoration.**
Supervisor : Dr. Suman Lakhanpaul

057. SATISH KUMAR
**Effect of Metal Stress on in Vitro Regeneration of Traditional Medicinal Taxon Senna (Cassia Angustifolia Vahl).**
Supervisor : Dr. Veena Agrawal

058. SRIVASTAVA (Priyanka)
**Sex diagnostics in Dioecious Hippophae L. by DNA Markers.**
Supervisor : Prof. S. N. Raina

059. VIBHUTI SINGH
**Inheritance of Some Morphological and RAPD Markers in a Segregating Population of Sesame (Sesamum Indicum L.) Intraspecific Cross : An Attempt Towards the Development of Sesame Genetic Map.**
Supervisor : Dr. Suman Lakhanpaul