1. List of major research findings of the Department in past five years

- **Prof. Deepak Pental and Prof. A. K. Pradhan**'s lab has developed several genomic resources – 8 different bi-parental mapping populations (RILs/DH) for genome and gene mapping in mustard. They have also constructed high-density molecular map (consisting of > 3500 markers) in mustard, and developed the SNP-maps in *B. rapa* and *B. juncea* through the use of NGS-based RNA data. Further, the use of SNP markers for saturation mapping of several genomic regions harbouring genes related to yield and quality in mustard and the identification of candidate gene(s) for some important traits in mustard was also done.

- **Prof. Sheela Srivastava**'s lab has demonstrated the genetic basis of heavy-metal tolerance in bacteria and characterized the bacteriocin in bacteria. They have also used the metagenomic analysis to identify a novel antimicrobial function.

- **Prof. M. V. Rajam**'s lab has developed several novel strategies, based on RNAi and artificial microRNA, for the control of viral and fungal pathogens, and insect pests in crops. They have demonstrated that engineered polyamine accumulation can confer abiotic stress tolerance in plants and that the polyamines are important determinants of plant regeneration and transformation. They have also developed improved regeneration and *Agrobacterium*-mediated transformation protocols for important crops and *Chlamydomonas* (first report), and generated a battery of transgenic crops for stress tolerance, delayed ripening and other agronomic traits.

- **Prof. B. K. Thelma**'s lab has discovered new genes for mental retardation, Rheumatoid arthritis and Ulcerative colitis by genome-wide analysis of Indian populations; identified genetic determinants underlying differential drug response in Rheumatoid arthritis using genetic and computational tools and novel variants conferring risk in Celiac disease. They have demonstrated the potential application of ‘Ayurgenomics’ as a novel approach of combining Ayurveda with Genomics to address the clinical heterogeneity in common complex disorders such as Rheumatoid arthritis. Functional characterization of variants in the dopaminergic pathway genes with implications for lead molecule development/translational medicine has been achieved.

- **Dr. P. K. Burma**'s lab has developed strategies to optimize transgene expression in plants by targeting transcriptional as well as post-transcriptional processes. They have identified and synthesized novel promoters for both constitutive and tissue specific expression. They have also demonstrated that accumulation of high levels of Cry1Ac protein was detrimental to plant regeneration and development.

- **Dr. Surajit Sarkar**'s lab has demonstrated for the first time that targeted over-expression of *dMyc* (a homologue of human *cMyc* proto-oncogene) could potentially suppresses human poly(Q) induced neurodegeneration and cellular toxicity in *Drosophila* disease models. It was further established that *dMyc* mediated suppression of human poly(Q) toxicity is achieved by alleviating the cellular level of CREB-Binding Proteins (CBP) and improved histone acetylation, resulting restoration of transcriptional machinery which are otherwise abbreviated due to poly(Q) disease conditions. These novel finding could potentially help in...
designing novel therapeutic approach to suppress some fatal human neurodegenerative disorders.

- **Dr. Jagreet Kaur’s** lab is working on understanding the molecular mechanism underlying plant resistance/susceptibility to necrotrophic fungal pathogens. In collaboration with Dr. Pravindra Kumar from IIT Roorkee and Dr. S Kundu (Dept. of Biochemistry) they have reported the first crystal structure of Arabidopsis non-symbiotic globin 1 (AHb1) and are attempting to address its role in disease resistance *in planta*.

- **Dr. Aruna Naorem’s** lab is involved in elucidating the role of bZIP transcription factors and other proteins involved in differential expression of genes accompanying morphogenesis and cell differentiation in a model organism, *Dictyostelium discoideum*.

- **Dr. Tapasya Srivastava’s** lab has been working on molecular and cellular changes which occur in the hypoxic tumor microenvironment. They are establishing that the potency of small molecule inhibitors and plant-derived potential chemotherapeutic agents effective in the hypoxic microenvironment, hold tremendous potential in assisting the standard treatment of solid tumors.

- **Dr. Kaustav’s** lab involved in deciphering the role of a novel class of GTPases that are involved in mitochondrial ribosome biogenesis in a model organism, *Saccharomyces cerevisiae*.

### 2. Any patents, products, findings or other notable achievements of the Department

**Patents**

- DNA construct for obtaining improved fertility restorer lines in crop plants for hybrid seed production Indian patent No. 238973 (2003).

**Tangible products developed**

- Release of first ever CMS-based hybrid, DMH-1, in mustard giving >20% higher yield than best Indian varieties
- Hybrid, DMH-11, based on transgenic technologies (*barnase-barstar* system) is undergoing biosafety analysis.
- Hybrid, DMH-4, with similar yield potential as DMH-1 having bolder seed and higher yield content has been nominated to All India Co-ordinated trial of ICAR.

**Notable achievements**

- Prof. B. K. Thelma’s lab has undertaken a major public health initiative for screening 200,000 newborns in Delhi state for Inborn errors of metabolism
Some of the Best Publications


