Research activity

Role of DNA repair in the plant response to abiotic stress. Aim of the research is the molecular characterisazion of genes involved in the response to genotoxic stress (DNA Damage Response-DDR), as useful tools to detect the level of abiotic stress tolerance in crops. The research activity at the Plant Biotechnology Laboratory has led to the isolation and molecular characterisation of novel genes involved in DNA repair processes *in planta*.

Molecular profile of seed quality. Aim of the research is the identification of molecular indicators of seed quality (vigor). DNA repair pathways are activated during the early phase of seed germination (imbibition), when the so-called 'pre-germinative metabolism' is triggered. A working system has been established, using imbibed seeds from model plants (Legumes, *Medicago truncatula*; Solanacee, *Petunia hybrida*; Cereals: *Oryza sativa*) in order to validate the role of novel DNA repair genes during the pre-germinative metabolism.

DNA repair mechanisms induced by ionizing radiations (IR) in plant cells: basic and applied (*in vitro* breeding) aspects. DNA repair pathways and the antioxidant response are investigated in plant cells characterised by natural radio-tolerance (*Petunia hybrida*, *Medicago truncatula, Oryza sativa*) irradiated with gamma-rays LDR (Low Dose Rate) and HDR (High Dose Rate) in order to identify the key molecular players of LD(Low Dose)/LDR response *in planta*.

MicroRNAs in the context of abiotic stress response. An intriguing aspect related to the transcription regulation process involves the activity of microRNAs (miRNAs). Recent studies showed that miRNAs contribute to the modulation of gene expression at the post-transcriptional level, triggering translational repression or gene silencing by binding to complementary sequences on target mRNA transcripts. We investigate the role of miRNAs in plant response to abiotic stresses and in relation to DNA repair.

Genome editing and its applications in plants. An ambitious project was carried out at the International Rice Research Institute (IRRI) aiming to develop a cutting edge platform for rice transformation using TAL Effector Nucleases. Based on the gained expertise, currently the Plant Biotechnology Group is emplyoing the CRISPR/Cas9 aproach to investigate the roles of essential DNA repair genes in plants.

Development of plant cell-based assays for genotoxicity studies. Plants are known to produce a range of secondary metabolites with relevant applications for the Cosmetic and/or Pharmaceutic Industry. These molecoles estracted from plants are then tested on animal/human cells to screen for potential benefits. We aim to employ innovative techniques to test new extracts and develop new screening systems based on plant cell suspensions, instead of animal/human cell lines.

NATIONAL COLLABORATIONS

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