

Research activity

Role of DNA repair in the plant response to abiotic stress. Aim of the research is the molecular characterization 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 characterization of novel genes involved in DNA repair processes *in planta*.

MicroRNAs in the context of DDR. 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 the plant response to abiotic stresses and in relation to DNA damage response (DDR). A novel line of research deals with the potential of plant miRNAs to be transferred through diet to phylogenetically distant species.

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 employing the CRISPR/Cas9 approach to investigate the roles of essential DNA repair genes in plants.

Molecular profile of seed quality. Aim of the research is the identification of molecular indicators of seed quality (vigour). 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*; Solanaceae, *Petunia hybrida*; Cereals: *Oryza sativa*) in order to validate the role of novel DNA repair genes during the pre-germinative metabolism.

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