To fight or to flourish: Do plants decide in the heat of the moment? Understanding the coordination of growth and immunity

Supervisory team:
Main supervisor: Dr Vinod Kumar (University of Exeter)
Second supervisor: Prof Nicholas Smirnoff (University of Exeter)

Host institution: University of Exeter (Streatham)

Project description:
How do plants sense and respond to changes in ambient temperature? How are multiple environmental signals integrated to mount ecologically meaningful responses? These are long-standing, fundamental questions in plant biology. While modulation of plant development in response to temperature is to harmonise the plant's life cycle to the external environment, elevated temperature-induced disease susceptibility is underlain by the trade-off between growth and defense. With the predicted increase in severity and extended geographical ranges of crop diseases, leading to severe crop losses, with rise in global temperatures, this is extremely relevant to food security. The mechanism underlying the integration of environmental signals and the coordination of growth and immunity is currently not well-understood. This project will investigate the above questions by studying the integration of temperature and defence signalling with the objective of defining the molecular mechanisms underlying temperature-induced suppression of immunity.

Using a combination of genetic and molecular approaches, we have recently identified key molecules in the coordination of growth and immunity in response to temperature. These novel thermosensory components offer an unprecedented opportunity to dissect the molecular mechanisms underlying defence suppression at higher temperatures. This project will investigate the molecular mechanisms by which these signalling molecules control growth and immunity in response to temperature. This is a multidisciplinary project employing genetics, molecular biology and chromatin biochemistry, which will integrate mathematical and experimental approaches to define the thermosensory framework at the interface of development and defence signalling. Understanding the molecular mechanism could lead to the development of climate resilient crops.

Student training opportunities: In this multidisciplinary project the student will have the opportunity to develop a wide range of scientific and technical skills. These include molecular biology, genetics, plant phenotyping, mass spectrometry, next generation sequencing, bioinformatics. The student will be given full training in all technical and analytical aspects of the project. The project can be tailored according to the scientific interests of the student. In addition to the above project specific elements, the student will receive generic training in Exeter, and discipline-specific training via training events developed by the DTP and by the University. We are seeking a highly motivated and enthusiastic candidate with a strong interest in fundamental biology. A background in environmental biology and/or molecular biology and bioinformatics would be desirable. Training will be provided in all techniques required for the project, but some practical experience in these techniques will be an advantage.