

# **A systems approach to identify critical cell networks in order to improve wheat resistance to biotic stress under future climatic conditions.**

*This programme will be based on two integrated subprojects, each with an associated PhD student.*

## **Sub - project 1: Modelling of transcriptome and metabolome responses**

Principal Investigator: Dr Carl Ng (UCD) – carl.ng@ucd.ie

Collaborators: Professor Padraig Cunningham (UCD); Dr Fiona Doohan (UCD); Dr Ewen Mullins (Teagasc)

## **Sub-project 2: Identifying novel genes involved in broad - spectrum stress resistance**

Principal Investigator: Dr Fiona Doohan (UCD) – fiona.doohan@ucd.ie

Collaborators: Professor Padraig Cunningham (UCD); Dr Carl Ng (UCD); Dr Ewen Mullins (Teagasc)

## **Background**

Temperature fluctuations and rising carbon dioxide, in conjunction with the evolving threat of disease/pest occurrence will undoubtedly affect future plant yields and thus threaten food security. Plant adaptation to stress involves key changes at various ‘ - omic’ levels. No study has comprehensively analysed the commonality among the cereal responses to both biotic and abiotic stressors, and few have adopted a systems approach in order to understand plant stress responses. While the value of using a systems approach is real, applicable knowledge relevant to crop cultivation remains scarce. Indeed, many of the genes identified as being associated with stress resistance are of unknown function. Based on predicted future climate conditions, wheat and other cereal crops will be more widely cultivated in Ireland. The goal of this project is to achieve a systems - based, holistic view of wheat responses to environmental stress (elevated temperature and carbon dioxide) and a disease of economic importance in Ireland and worldwide (Fusarium head blight disease). The impacts are that we can thus identify (1) genes as breeding markers, and (2) novel transgenic targets for the enhancement of wheat resistance to biotic stress under future climatic conditions. We will integrate ‘ - omic’ data within a systems - biology/systems - level project, focusing on how wheat genes and metabolites respond to individual and multiple stresses (environment, pathogen).

**Sub-project 1 PhD student:**

**Mandatory requirements**

BSc (2.1 or higher) and MSc that includes a higher level qualification in computational science/bioinformatics from an internationally reputable institution

**Desirable requirements**

Experience in plant science

**Sub-project 2 PhD student:**

**Mandatory requirements**

BSc (2.1 or higher) and MSc that includes a higher level qualification in Plant Science/Molecular Biology/Crop Science/Plant Pathology from an internationally reputable university

**Desirable requirements**

Practical experience in plant biology, monocot research, molecular biology and bioinformatics

**Applications**

Prospective candidates must refer to the UCD Earth Sciences Institute PhD Programme 2011 Prospectus for application guidelines

(<http://www.ucd.ie/t4cms/Strand%204%20Description%20Document%20v5.pdf>).