

### **Supervisory team**

Professor Mahmut Tor, Professor Yiguo Hong, Dr Tom Wood

### **Director of Studies:**

Professor Mahmut Tor, Molecular Plant and Microbial Biosciences Research Unit, School of Science and the Environment, University of Worcester

### **Supervisors:**

Professor Yiguo Hong, Molecular Plant and Microbial Biosciences Research Unit School of Science and the Environment, University of Worcester  
Dr Tom Wood, (External) National Institute of Agricultural Botany

**Research Group:** [Molecular Plant and Microbial Biosciences Research Unit \(MPMB-RU\)](#)

### **The PhD Opportunity**

Plants are constantly being challenged by microbial pathogens and they have evolved the capacity to detect and defend against these incoming microbes. To do this, plants use surveillance systems that are made up of extracellular and intracellular receptors and a global defence network including signaling cascades, pathogenesis related proteins and non-coding RNAs.

To overcome plant immune systems, bacteria, filamentous fungi and oomycetes secrete effector proteins that are delivered into host cells. Until now, numerous effectors have been characterized, and the current consensus is that effectors can target different cellular structures and compartments, and re-program various cellular machineries for the benefit of pathogens in terms of establishing successful infection.

Gene silencing is a cellular regulatory mechanism, and it also acts as an innate plant immune defense against pathogens. Gene silencing can be triggered by miRNA or siRNA. Gene silencing has also been exploited and used to investig

To overcome this, generally host plants are transformed with the RNAi and the gene in the pathogen that is expected to be silenced, a technique called Host Induced Gene Silencing (HIGS). HIGS may involve bidirectional movement of small RNAs (sRNA), and indeed such bidirectional sRNA movement from pathogen to host or vice versa has been investigated in several pathogen-plant pathosystems, but downy mildews are underrepresented in these studies.

We would like to investigate bidirectional sRNA movement between *Peronospora viciae* f.sp. *pisi* (*PVP*) and pea plant. Reference genome sequences for both the pathogen and the host are available. This will allow a timely investigation into the role of sRNAs in reciprocal signaling between the host and the pathogen.

#### **Our aim and objectives are:**

1. Isolate sRNAs from *PVP* spores, infected and uninfected plant materials.
2. Carry out deep sequencing to reveal sRNAs of plant and pathogen origin.
3. Filter and align the host and pathogen sRNA complements to their respective reference genomes.
4. Determine whether any of *PVP* sRNAs are involved in pathogenicity.
5. Design further experiments to determine systemic spread of *PVP* sRNAs in infected pea plants?
6. Use RNA silencing technology to reveal the role of some of these sRNAs.

Initially, this work will determine whether the sRNAs are involved in the *PVP*-pea interactions. This would lead to; a) understanding the role of reciprocal sRNA signaling in plant-microbe interactions; b) further works to explore sRNAs in manipulating disease development using synthetic biology.

The student will receive research training in: Molecular biology, plant pathology, bioinformatics. The student will have opportunity to work with different groups and laboratories. The supervisors have extensive experience in supervising students and collaborated and published joint papers before. Results obtained from this work will be published in internationally peer-reviewed journals and will be presented at national and international scientific meetings.

#### **Application Process**

To begin the application process please go to <https://www.worcester.ac.uk/courses/plant-biology-mphilphd> and click in the top menu. This PhD could be carried out on a part time or full time basis so please select the relevant application link. On the application form, please make it clear that you are applying for one of our advertised projects so we can direct it straight to the relevant people.

#### **The Interview**

All successful applicants will be offered an interview with the proposed Supervisory Team. You will be contacted by a member of the Research School Team to find a suitable date. Interviews can be conducted in person or over Microsoft Teams.

## Funding your PhD

For more information about Doctoral Loans please visit

<https://www.worc.ac.uk/study/fees-and-finance/doctoral-loans.aspx>

During your PhD you can access the Research Student Support Scheme to support dissemination costs associated with your research, up to £500 a year.

## Research at the University of Worcester

Research

we do. We are committed to delivering excellent research which extends the

in everything that



It provides:

- day-to-day support for our students, both administrative and practical, through our dedicated team
- a Research Student Study Space with both PCs and laptop docking stations
- a comprehensive Researcher Development Programme for students and their supervisors
- a programme of student-led conferences and seminars

## Molecular Plant and Microbial Biosciences Research Unit

