**Supervisory team**
Professor Mahmut Tör, Professor Yiguo Hong, Dr Tom Wood

**Director of Studies**:
Professor Mahmut Tör, Molecular Plant and Microbial Biosciences Research Unit (MPMB-RU) School of Science and the Environment, University of Worcester

**Supervisors**:
Professor Yiguo Hong, Molecular Plant and Microbial Biosciences Research Unit (MPMB-RU) School of Science and the Environment, University of Worcester

**Research Group:Molecular Plant and Microbial Biosciences Research Unit (MPMB-RU)**

**The PhD Opportunity**
Demand for food production is increasing due to growing global population, reduced land availability for agriculture, concern over the effects of the environment on agriculture, and decreasing yield reliability because of climate change. We need to rise to this challenge and provide solutions to grow enough food in a sustainable way. Legumes including peas and broad beans and other protein crops have gone through a revival and demand has been increasing steadily.

However, these pulse crops suffer heavily from the downy mildew pathogen *Peronospora viciae* f.sp. *pisi* (*PVP*). Next Generation Sequencing (NGS) approaches on soil and phyllosphere microbes have led to an explosion of information regarding plant associated microbiomes. Although this type of work has been predominantly sequence-based and often descriptive in nature, increasingly it is moving towards microbiome functionality. The synthetic microbial communities (SynCom) approach is an emerging technique that involves co-culturing multiple taxa under well-defined conditions to mimic the structure and function of a microbiome.

**Our aim and objectives are:**
We aim to reduce downy mildew disease with artificially constructed beneficial microbial communities. Specifically, we will identify microbial communities on the phyllosphere part of pea plants, determine if the microbial community enhances yield

1. Identify microbiomes in phyllosphere of pea and investigate how *PVP* interacts with the microbial community using shotgun 16 s and ITS metagenomics/whole genome sequencing approaches.
2. Determine whether phyllosphere microbiomes enhance crop performance in terms of differences in disease symptomsin the absence and presence of infective pathogen.
3. Examine the interaction between synthetic fungicide and addition of 'beneficial microorganism' to phyllosphere and *PVP*.
4. Develop a pea specific novel beneficial microbial mixture.

We anticipate through this work, microbial communities on pea plants will be identified before and after pesticide application; interaction between *PVP* and other microbial community identified; effect of fungicides on pathogenic, commensal and beneficiary microbes determined; role and performance of microbiomes in phyllosphere of pea determined; and a method that will help to identify crop specific mixture of beneficial microbes established.

Student will have research training in: Molecular biology, plant pathology, bioinformatics. Student will have opportunity to work with different groups and laboratories. Supervisors have extensive experience in supervising students and collaborated and

## Research at the University of Worcester

Research is central to the University's mission to make a difference in everything that we do. We are committed to delivering excellent research which extends the boundaries of human knowledge but which also improves people's lives by enabling better health outcomes, improving food security, developing environmentally sustainable solutions for crop production and socially sustainable solutions to our ageing population, enhancing public knowledge and understanding of the past and present.

The University hence focuses its research around five high-level challenges facing society, locally, nationally and globally:

- **Human Health and Wellbeing**
- **Sustainable Futures**
- **Digital Innovation**
- **Culture, Identity and Social Exclusion**
- **Professional Education**

The success of our research is reflected in our continuous improvement in external

**Molecular Plant and Microbial Biosciences Research Unit**

We carry out both fundamental and translational research in the field of plant and microbial biosciences. We are interested in answering the following fundamental questions; how do obligate pathogens such as downy mildews coordinate their attack to overcome the plants' defence? What is the basis of their host specificity? Do they synchronize their physiological and metabolic activity with their hosts? Can we carry out reverse genetics to reveal the role of pathogenicity and developmental genes?

We aim to take the information gained to develop a potential disease control strategy against downy mildews on crop plants. Our further translational research includes genomic assisted plant breeding and genome editing for crop improvements.

**Widening Participation**

As part of its mission statement the University is committed to widening participation for its higher degrees. Although most candidates will have an undergraduate and- 1 200fuT/F.311t