



In collaboration with  United Kingdom

PhD Studentship plus: Determination of the key parameters influencing dislodgeable foliar pesticide residues.

Qualification type:	PhD + industry experience
Location:	UK – Bracknell, Berks & Hatfield / Bayfordbury, Herts
Funding for:	No restriction
Stipend:	Starts at £14,777
Start date:	Negotiable - Autumn 2018
Time period / hours:	4 years full time
Application deadline	5pm 31st August 2018

Background:

Every day the world's population is increasing by 200,000 people and more farmland is lost due to increasing urban sprawl, expansion of infrastructure and damaging environmental processes such as erosion. Pesticides are a vital tool in helping farmers meet the challenge of feeding this fast-growing world population. However, it is also vital that pesticides are used sustainably and in a way which does not compromise the safety of humans or the environment. To this end, rigorous assessment of the risks involved is carried out to satisfy the demands of consumers, manufacturers and regulatory authorities.

Risk assessment for humans considers dietary and non-dietary exposure scenarios. Non-dietary scenarios include exposure to workers and members of the public when entering treated crops. Exposure assessment for this scenario takes into account, amongst other factors, the amount of residue which can be transferred from the foliage to the skin or clothes ('dislodgeable foliar residue', or DFR). In the absence of specific information, defaults are assigned to in DFR. Where preliminary assessments identify a potential concern, it is often necessary to conduct specific field studies to take real measurements of DFR. As the default values for DFR and other parameters in the risk assessment become more precautionary in the developing regulatory landscape, the requirements for specific studies are increasing. DFR studies can be costly, time consuming and constrained by the seasonality of the crops and the elements.

The factors which are thought to influence DFR include application rate and efficiency, physico-chemical properties of the pesticide and its formulation environment, meteorology, crop architecture and leaf shape/surface texture. However, in truth, apart from an expected correlation with application rate, little is known about the degree of influence exerted by the other factors and, as a result, regulatory authorities allow little extrapolation between crops and formulations. Where a pesticide has multiple formulations and is used on many crops, the number of studies is potentially unmanageable and a better understanding of the factors which determine DFR could have a significant positive impact.

Industrial placement background:

This is a four year contract whereby the first year is spent undertaking an industrial knowledge exchange placement with Syngenta Plc and years 2 to 4 undertaking a funded PhD studentship at the University of Hertfordshire.

During the placement year, it is the intention that the successful student would have the option of being involved in various areas of research which will contribute to answering the questions described above. In the first instance, there are existing DFR data available from studies which have been carried out on a range of pesticides and crops. An in depth statistical analysis will be necessary which will aim to identify parameters which have an impact on DFR. In addition to this DFR dataset, there is a very large database of crop residue data collected for the purpose of dietary risk assessment. It will be possible to look for correlations between DFR and whole plant or commodity residues, particularly in terms of the dissipation of residues with time, which is an important factor where the pesticide is applied sequentially or where it is necessary to calculate re-entry restriction periods (the time between application and the point where handling the crop is acceptable).

Having identified factors of interest, a subsequent activity which the student could be involved in would be to work with experts from the industrial sponsoring partner, Syngenta, on developing a novel, rapid methodology to measure DFR in the laboratory and test the hypotheses developed during statistical analysis. The student will have the flexibility to develop their project in different directions depending on their interests, with extensive support, guidance and training from experts from a wide range of disciplines. We fully recognise that this study needs a range of different skills so training and support for the successful candidate will be made available.

The placement year will be spent at Jealott's Hill International Research Station, the largest research and development site operated by the collaborating industrial partner, Syngenta, where over 800 people are employed in key activities including research into discovery of new active ingredients, new formulation technologies, product safety, technical support of the product range and seeds research. The site houses a number of centres of scientific excellence, both chemical and biological, that support worldwide R&D activities. It is also a key centre for R&D collaborations, partnering with the UK and global research base in world-class science. During this placement, the student will be involved in activities which are primarily related to the PhD, but the aim is for the student to leave with a broad experience of the pesticide industry, as well as a formulated plan for the research work which will be required for the ensuing 3 year research programme.

As the collaboration will be with the Product Safety function at Jealott's Hill, the successful candidate will spend the majority of their placement in the Operator and Consumer Safety (OCS) platform, with the option of gaining an all-round experience of risk assessment and regulatory affairs for pesticides and an appreciation of the use of experimental data in carrying out these risk assessments, which are required to support active ingredient and product registration, where DFR is a key input parameter.

During the industrial placement, the student may carry out relevant literature searches; Syngenta has established systems to facilitate this and the University of Hertfordshire also has exceptional facilities with instant access to literature databases and many journals. Additionally, OCS has a team of field study experts who are increasingly involved in DFR trials and so there will also be the possibility to find out more about the conduct of DFR studies and, if any studies are carried out during the placement, to make a field visit as an observer.

Depending on the students developing interests, there will be additional opportunities to gain training and experience in other areas of pesticides science relevant to human risk assessment, which may include mammalian toxicology, pesticide application technology and pesticide formulation

development. Syngenta has an application technology laboratory on site where it will be possible to see spraying systems in action and begin to discuss with the technical experts the factors which may influence the level of deposition and ultimately DFR. Formulation technology could also be a critical factor and Syngenta has a team of acknowledged industry leading experts in this field who have previously contributed greatly to science collaborations. Whilst at Jealott's Hill, the student will be able to establish which pesticide compounds are of interest and can be involved in the technical and governance aspects of making these compounds available.

They will also be able to spend time in the Product Metabolism and Analytical Sciences platform to learn about the analysis of DFR samples; space and materials will be available to conduct any lab work required for the PhD programme. It is hoped that this work will allow the student to develop a clear picture of the data they will be working with and to formulate a structured plan of action for their PhD to help them focus on the key areas to gain an increased understanding of the contributory factors and maximise the usability of any data generated.

It is stressed that the activities which the student will be involved in can be tailored to their individual interests and there is a good degree of flexibility. We do not expect the successful candidate to have all the skills required – enthusiasm and an enquiring mind are the most important attributes

These activities, undertaken with a world leading research and development company, will give the student excellent experience of the development and registration of pesticides and can significantly improve their employability in a range of sectors of academia, industry or government whilst providing them with invaluable knowledge and skills to take forward into the PhD project.

During this first year the student will spend 1 day a week at the University of Hertfordshire undertaking various research training activities organised by the UH Doctoral College. The Research Degree support programme includes training in generic activities such as generic research skills, literature reviews, report writing. It can also provide more bespoke training that students might need such as statistics and information technology.

Whilst at Jealott's Hill, which has a unique rural campus atmosphere, the student will enjoy great facilities, including an on-site restaurant and coffee shop, sports clubs, other extracurricular activities and a healthy community of students at all levels.

The overall aim of this placement is for the student to gain a sound understanding of pesticide science, particularly that relating to DFRs, and of the underpinning regulatory risk assessment processes. In addition the student will prepare their PhD study plan.

Three-year PhD:

During years 2 to 4 the student will move base and spend most of their time at the University of Hertfordshire undertaking their PhD work plan. It is envisaged that experimental and field work will be undertaken at the University's Bayfordbury field station but some may also be conducted at Jealott's Hill.

Supervision from the University will be from within the Agriculture and Environment Research Unit (AERU) who undertake many different research projects related to agriculture and the environment including those on pesticide science. AERU also run and manage the world class online pesticide properties database (PPDB) which may also be valuable to the student. During the PhD the student will work closely with their supervisors at both the University and at Syngenta. They will also have the

support of the UH Doctorial College which will also introduce them to the University's vibrant, productive research community which seeks to nurture new research talent.

The student will receive training in all the necessary skills and techniques including experimental design, statistical analyses, sampling protocols, laboratory and field work and health and safety. Some of this will be undertaken in year 1 but training in the more specialist topics may be in subsequent years. The University of Hertfordshire has a comprehensive training programme for postgraduate students to gain transferrable skills, such as scientific writing and presentation skills. The principal supervisors will be (i) at the University of Hertfordshire: Professor Kathy Lewis and Dr Doug Warner, (ii) at Syngenta: Dr Neil Morgan and Rob Mason. Other experts will be available as required.

The student will be expected to present their work at various internal (e.g. UH & Syngenta) and external fora (e.g. conferences, workshops, seminars) and be encouraged to produce articles for publication in collaboration with their supervisors.

There is little doubt that this is an exceptional opportunity for a student with interest in agriculture and crop protection however it requires an exceptional, high calibre student to undertake the research successfully. We are looking in particular for:

- Enthusiasm and an enquiring mind;
- Honours degree at 2:1 level or equivalent in a plant science/agriculture/statistics related discipline as a minimum. A relevant MSc or work experience would be beneficial but not essential;
- Strong, proven data analytical skills including statistical analysis;
- Ideally willing and able to undertake laboratory work under own initiative; training and mentoring can be provided;
- Effective and proven communication skills including a high level of written and spoken fluency in English;
- Computer literacy.

In addition the student would benefit from having a UK valid driving licence and a good working knowledge of European crop protection.

Points to consider:

- Transport between Syngenta and the University is at the student's expense, but an additional £1500 may be made available to help with this for the first year when the student will need to travel more frequently between sites. Ideally personal transport would make this easier as although public transport is available it will be time consuming and expensive.