

## **Mass spectroscopy imaging of plant - fungi interactions: Understanding symbiosis for sustainable crop production**

### **Supervisory team:**

**Lead supervisors:** Dr Peter Eastmond (Rothamsted Research), Prof William Griffiths (Swansea University)

Dr Richard Haslam (Rothamsted Research), Prof Yuqin Wang (Swansea University)

**Host institutions:** Rothamsted Research (Harpenden), Swansea University

***Please submit applications for this project to Rothamsted Research (this is just for administrative purposes)***

### **Project description:**

A major limitation to plant growth is restricted access to nutrients in the soil. To improve nutrient acquisition, most land plants enter a symbiosis with arbuscular mycorrhizal (AM) fungi. In return for mineral nutrients, the plants provide fixed carbon to the obligate biotrophic fungi. This nutrient exchange takes place through highly branched hyphal structures called 'arbuscules' that form in the inner cortical cells of the root. Until recently, AM fungi were thought to receive carbon from their host plants solely in the form of sugars. However, this paradigm changed when work from Rothamsted Research showed that plants supply AM fungi with most of their carbon in the form of lipids (Luginbuehl *et al.*, [2017] *Science* 356, 1175). The aim of this project is to understand how plants supply lipids to AM fungi, what type of lipids they use and how this process is regulated. To do this we will combine plant molecular genetic approaches with high spatial-resolution mass spectrometry imaging (MSI), using state-of-the-art MSI instrumentation at Swansea University. MSI has not been used previously to study AM symbiosis, but this technique has the power to measure the lipid composition of individual root cells harbouring arbuscules. This work will provide foundation knowledge of nutrient exchange in AM symbiosis that can inform new approaches to achieve more sustainable crop production.