# Plant pathogens in insect microbiome - diversity, transmission, and agricultural implications

Insects play a key role in the emergence and spread of plant diseases worldwide – both through direct feeding and by transmitting dangerous pathogens. **A particularly important group is the Hemiptera, sap-feeding insects such as aphids, whiteflies, psyllids, and true hoppers, which are the most significant vectors of economically important plant diseases.** They are responsible for transmitting viruses, fungi, and numerous bacteria, including *Xylella*, *Liberibacter*, and *Phytoplasma*. At the same time, they host diverse communities of symbiotic microorganisms. Some of them are essential for insect survival, while others may influence their adaptation to new environments or ability to spread plant pathogens.

Intriguingly, many bacterial plant pathogens are closely related to bacteria that normally live as symbionts inside insects. This makes it difficult to clearly distinguish between beneficial and pathogenic microorganisms and **raises important questions about the true distribution of plant pathogens across different Hemiptera groups, as well as our current capacity to monitor pathogen and vector spread.** In addition, **the ecological and environmental drivers of pathogen transmission, and the symbiont-mediated mechanisms underlying vector competence remain largely unresolved**, limiting our ability to predict and prevent future outbreaks.

**This project aims to develop the most comprehensive overview to date of bacterial plant pathogens associated with sap-feeding insects.** Using cutting-edge methods, including advanced DNA sequencing, metagenomics, transcriptomics, statistical modelling, advanced microscopy, and controlled laboratory experiments, we will identify which bacteria found in insect microbiomes are true plant pathogens, how frequently they occur, and how they evolve. We will also investigate how insect facultative symbionts influence the ability of different species to transmit plant diseases, and whether modifying an insect's microbiome could alter this capacity.

**The results will uncover hidden pathogen diversity, clarify how microbial partners shape disease spread, and provide a foundation for predicting pathogen emergence and developing innovative strategies to mitigate vector-borne plant diseases.**