

RD 2.1.4: Plant Pest Epidemiology

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Aim:

To improve plant disease risk management and control through understanding and manipulating key epidemiological parameters

These parameters underpin epidemiological models that can be used to predict the effect of management strategies, including crop protection and host resistance.

This work aims to define the parameters for problematic and economically important diseases of crops of particular importance in Scotland, to deliver practical disease control solutions.

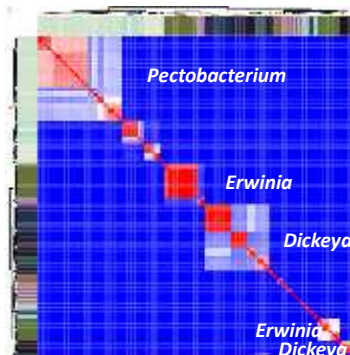
Research Objectives

- Develop an epidemiological modelling framework to determine disease risk and identify critical knowledge gaps
- Determine the importance of pathogen and phylloplane microbial inoculum in epidemic development
- Develop durable control methods by understanding the response of pest and pathogen populations to environmental change and management practices

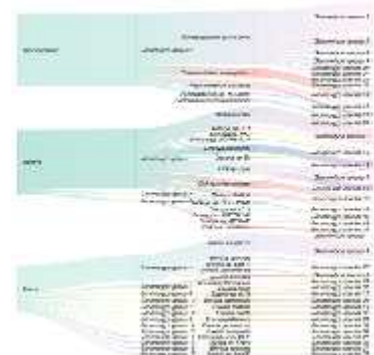


Bacterial whole genome reclassification

- Binomial taxonomic nomenclature of bacteria (*Genus species*, e.g. *Escherichia coli*) is not fit for purpose
- Bacterial identities are being revisited using genomic relatedness. This subdivides bacteria into groupings based on properties of their complete genomes and provides a basis for universal indexing of bacteria
- Modern sequencers can rapidly generate complete bacterial genome data. We have developed the software pyani (>14,000 installations in 2017), to precisely identify plant pathogens



Identity plot for 127 enterobacterial plant pathogen genomes. Red squares indicate that bacterial genomes share >95% nucleotide identity = same species.



River diagram showing proposed reclassifications of enterobacteria.

Acknowledgements

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Impacts

- Provision of the accurate classification crucial for the development of policies and border controls that aim to reduce disease risks
- To meet policy goals with modern, accurate and rapid diagnostic tools
- Precise identification of plant pathogens on-site