

Parasite provides clues to evolution of plant diseases

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A new study into the generalist parasite *Albugo candida* (*A. candida*), cause of white rust of brassicas, has revealed key insights into the evolution of plant diseases to aid agriculture and global food security.

How generalist [parasites](#) with wide host ranges evolve is a central question in parasite evolution. Parasites adapt in response to their host organisms' defences and in many cases this adaptation is specific to a particular host species.

A. candida is a plant pathogen could be easily confused with a fungus despite being very distantly related to fungi. The plant parasite can grow on many distantly-related plants of the cabbage family. Some of these plants are common garden weeds that we find here in Norwich in the UK (and across the world) and other vegetable crops such as cauliflowers.

The project ("Albugon") was led by Prof Jonathan Jones at The Sainsbury Lab (TSL), Norwich, who won a five-year Advanced Investigator Grant from the European Research Council to fund the work. A team of scientists at TSL, including Mark McMullan, now of The Genome Analysis Centre (TGAC), set out to use genome sequencing to identify the important differences between *A. candida* races that infect different weeds and crops. The research showed that isolates of the parasite that infect different plants carry distinct gene repertoires, but nevertheless carry shared segments of the genome, indicating recent and continuing gene exchange between races that grow

on different hosts. This suggests parasite races that infect crop species may be regularly receiving infusions of genetic variation from races that infect weeds.

"We were puzzled that distinct races of *Albugo* show evidence of genetic exchange, even though they grow on different host species" said Prof. Jonathan Jones. "However, we then realised that this could be explained by the extraordinary capacity of *Albugo* to shut down host defences. Put simply, we believe *Albugo* suppresses immunity of host plants so that it can have sex".

"Interactions and evolution of plants and microbes is fundamental to agriculture and global food security. Due to the advances in genomics, it is now feasible to look at very many genomes within a wild species," said Dr Mark McMullan, Population & Evolutionary Biologist in the Plant & Microbial Genomics Group at TGAC and first author of the study.

"This has opened the door for scientists to conduct their genome analyses using population genetic techniques, a combination of advanced methods that began development long before the discovery of the structure of DNA. The application of these methods will further advance our understanding of evolution of plant pathogens."

Previously in the Jonathan Jones' group at TSL, Mark McMullan continued his work on the project at TGAC in collaboration with population biologist Cock van Oosterhout at UEA. The scientific paper "Evidence for suppression of immunity as a driver for genomic introgressions and [host](#) range expansion in races of *Albugo candida*, a generalist parasite" is now published in *eLife*.

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