The changing *Phytophthora infestans* population: implications for Late Blight epidemics and control

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**Introduction**

In recent years there has been a change in the composition of the GB *P. infestans* population, with an increase in the A2 mating type being observed (Fig 1). This increase is largely due to the presence of the 13_A2 genotype, which was first identified in 2005. The proportion of 13_A2 isolates in the population increased from 12% in 2005 to 72%, 78% and 67% in the years 2007-2009 respectively.

The dominance of the 13_A2 genotype of *P. infestans* compared with other genotypes may be due to a combination of increased aggressiveness, virulence and fungicide resistance, all of which are likely to make late blight more difficult to control.

For example, the ability of genotype 13_A2 to overcome host resistance in cultivars resistant to other genotypes of *P. infestans* is illustrated in Fig 2.

If some genotypes are found to have unusual phenotypic characteristics, such as the ability to infect at lower temperatures than previously thought, then this could have implications for disease forecasting and control strategies.

**Project Aims**

Here we introduce a new study that will investigate the reasons why genotype 13_A2 is dominant in the GB *P. infestans* population by:

- Characterising the aggressiveness of isolates of 13_A2 compared with other genotypes.
- Determining whether the temperature range at which in vitro growth, leaf infection and lesion development can take place is affected by genotype and whether there is an interaction with humidity.
- Studying competition between isolates of various genotypes in laboratory and field experiments.

**Ongoing and Future Experiments**

**Isolates** - Fifty eight isolates of *P. infestans* collected between 2006-2008 from a diverse set of cultivars and geographical locations have been selected and characterised for genotype using SSR markers.

**Aggressiveness** - aggressiveness of these 58 isolates will be tested on five cultivars. Preliminary results using 7 isolates belonging to 6 genotypes tested on cultivar Craig’s Royal are shown in Fig 3. This initial experiment shows that there are significant differences between isolates for aggressiveness. Conclusions regarding genotype differences cannot be made until all isolates have been tested.

**Infection Efficiency** - all isolates will be tested for infection efficiency and lesion development on detached leaves at 6°C, 8°C, 10°C, 12°C, 14°C, 16°C and 18°C using a temperature gradient plate incubator with a light/dark cycle of 16/8 hours respectively.

**Comparison Between Genotypes** - isolates belonging to various genotypes will be tested in competition with each other and the 13_A2 genotype in vitro and in vivo to elucidate the mechanisms of competition between genotypes.

**Growth Rate** - in vitro growth rates on Rye A agar plates incubated at 5°C, 10, 15°C, 20°C, 25°C and 30°C under a 16/8 hour light/dark cycle will be assessed. Early results showing differences in growth rates at 5°C are shown in Fig 4. Four of the 54 isolates tested did not show any growth at 5°C after 44 days. Incubation and growth of the remaining isolates was in a range 10-60mm. There does not appear to be a clear relationship between genotype and in vitro growth at 5°C. Results from additional temperatures and infection studies will allow a full analysis of genotype x temperature relationships to be made.