

The effect of field resistance, aggressiveness and inoculum concentration on competitive selection of *Phytophthora infestans* in Northern Ireland

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The late blight pseudofungus *Phytophthora infestans* continues to threaten potato production worldwide. Over the past three decades major population changes have taken place, during which the previously pan-global US-1 clonal lineage has been displaced during multiple migration events (Spielman *et al.*, 1992). It has been suggested that 'new' genotypes are competitively fitter due to increased aggressiveness, both on the foliage and in the tuber (Kato *et al.*, 1997; Lambert and Currier 1997).



The current investigation has used multiple cultivars and *P. infestans* genotypes to study the cultivar x isolate interaction, and thus investigate the potential influence of pathogen aggressiveness and cultivar field resistance on competitive selection of the late blight population. The impact of inoculum concentration was also considered.

Six representative groups of isolates were chosen from N. Ireland based on phenotypic and genotypic differences. Isolates were distinguished by Glucose-6-phosphate isomerase (*Gpi*) allozyme genotyping (Goodwin *et al.*, 1995), mitochondrial haplotype (Griffith and Shaw, 1998) and sensitivity to the fungicide metalaxyl (leaf disc method of Cooke, 1986).

Group	Metalaxyl	Pep genotype	Haplotype
1	R	100/100	Ila
2	S	100/100	Ila
3	R	100/100	Ia
4	S	100/100	Ia
5	R	96/100	Ia
6	R	83/100	Ia

Detached leaflets of four potato cultivars with differing levels of field resistance to foliar late blight were inoculated with a single sporangia/zoospore suspension composed of standardized inoculum from each group. Two concentrations of inoculum were used in the study; 400 sporangia/leaflet and 40 sporangia/leaflet.

Cultivars	NIAB Resistance Ratings ^a
Atlantic	3,3
Sante	7,6
Milagro	8,6 ^b
Stirling	8,7

^a for foliage, tuber blight, (1-9 scale; 9 = maximum resistance)
^b breeder's estimate

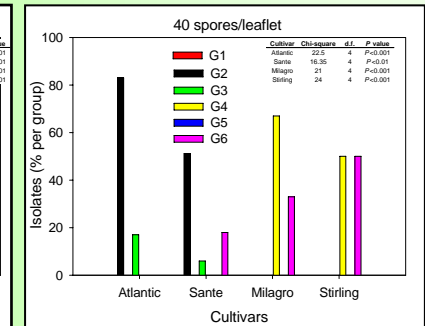
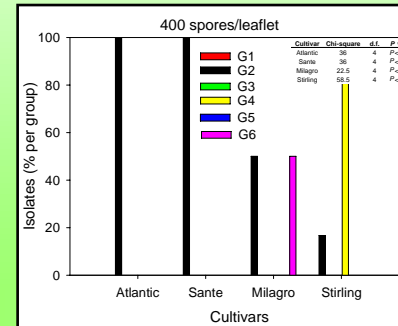
Isolates derived from single zoospores were taken from each lesion at day seven of the infection, characterized and assigned to their respective groupings. Pearson Chi-squared analyses for goodness-of-fit were used to test for the significance of association between the observed and the expected number of isolates from each genotype found on each cultivar.



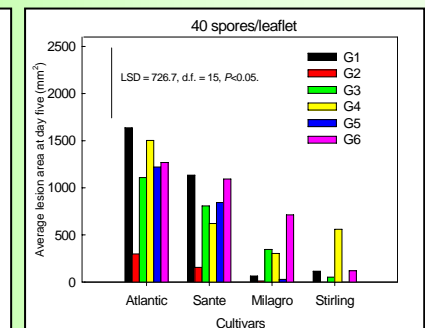
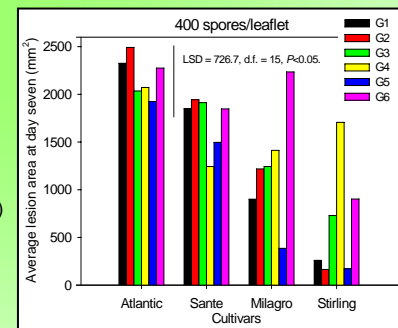
Each group of inoculated isolates was also tested individually for aggressiveness on detached leaflets of all four cultivars at both inoculum concentrations. Parameters used were % infection, latent period and lesion expansion rate at day five and day seven after inoculation.

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Extreme differences were observed in the number of isolates of each group recovered from the different cultivars. On the more susceptible cultivars Atlantic and Sante, Group 2 predominated at both concentrations. On the resistant cultivars Milagro and Stirling, spore concentration had a marked effect. Group 4 isolates were the most competitive on Milagro at the lower concentration, but were absent at the higher. On Stirling Group 6 isolates proved similarly competitive to Group 4 at the lower concentration only.



These trends did not correlate well with any of the aggressiveness parameters tested.



There was a significant effect of both the host and concentration of inoculum on competitive selection, which could not be explained by general aggressiveness of individual genotypes. This study demonstrates how the choice of cultivar and level of inoculum present can substantially impact the make-up of the surrounding late blight populations. Competitive tests may be even more valuable for predictions of fitness than aggressiveness testing on detached leaflets.

References

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