Selection for *P. infestans* genotypes with resistance to fungicides by some cultivars more resistant to foliar blight

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Introduction

Carolan *et al.* (2017) hypothesized that 'the use of cultivar resistance will reduce the rate of selection for fungicide insensitivity, because growth rate limiting host resistance will slow the growth rate of both sensitive and insensitive strains.' This will be true in general but with exceptions.

It was reported that potato cultivars categorized as having medium to high resistance to foliar blight had a high percentage of samples with EU13 (metalaxyl-M resistant) (35.3 to 47.6%) compared with those in the low-resistance group (2% approximately)(Stellingwerf *et al.,* 2018). SRUC's blight trial site contained mixtures of *P. infestans* genotypes for 3 consecutive years. In all 3 years the dominant genotype was EU36 (not fungicide resistant). In the first year EU37 (less sensitive to fluazinam) was also at a significant proportion. In 2023 and 2024 the fungicide-resistant genotype present was EU13. Field experiments were conducted in the three years to investigate the impact of cultivar resistance on the frequency of fungicide-resistant *P. infestans* on leaves.

2024 Plot of King Edward

2024 Plot of Royal

Methods

The two more-resistant cultivars tested were Royal (rated 5 officially) and Innovator (rated 3). This official rating for Innovator did not match its resistance at the trial site. Innovator was more resistant than Royal in 2022 and 2024 and of similar resistance in the middle year. These two cultivars were considerably more resistant than the very susceptible cultivars used; Shepody (rated 2) in 2022 and King Edward (rated 3) in the two subsequent years.

The experiments were naturally infected: in 2022 from artificially inoculated trials in the same field (EU36) plus an external source (EU37), in 2023 from an external source (EU36) plus from artificial inoculation elsewhere in the trial field (EU13) and in the final year from artificial inoculation of other experiments in the trial field (EU36 and EU13). Fluazinam and metalaxyl-M were not used in 2022 and 2023/24 respectively.

Experiments had four replicates in the first 2 years and five in 2024. Leaflets with single lesions were collected towards the end of the growing season. Often the number of lesions on the more-resistant cultivars was very limited. FTA cards were prepared and genotyped at The Hutton.

Results

In four out of five experiments there was significant selection by the more-resistant cultivars for genotypes which happened to be less sensitive to fungicide; metalaxyl-M in three experiments (Fig. 1) and fluazinam in one (Fig. 2). The lack of a statistically significant result from the fifth trial (results not shown) was most likely because of particularly low numbers of Innovator lesions in 2022.

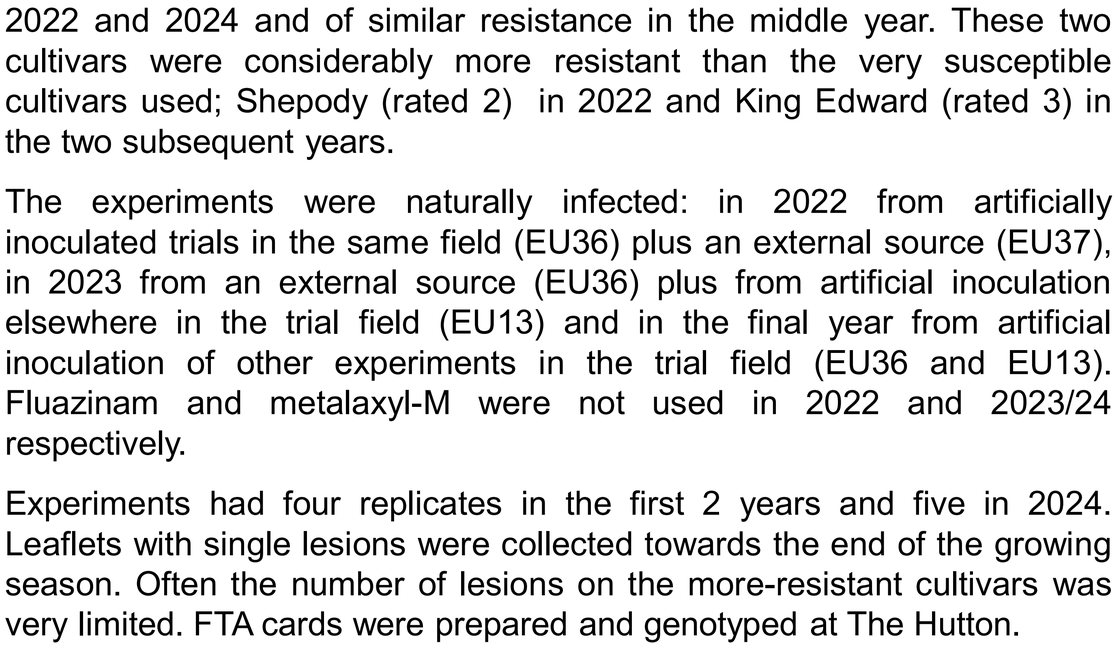

Fig. 1. The impact of cultivar resistance on the relative number of fungicide-sensitive (EU36) and fungicide-resistant (EU13) lesions of P. infestans

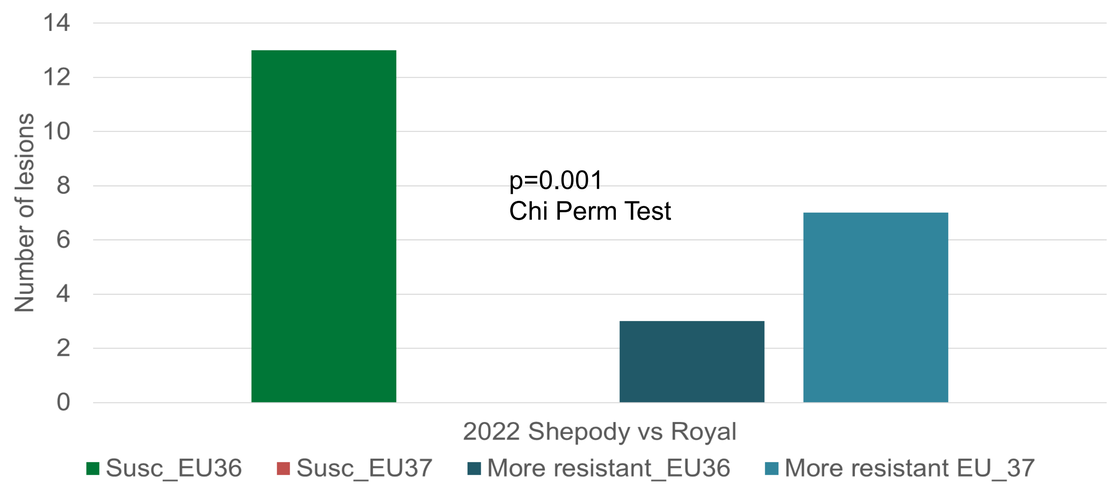

Fig. 2. The relative number of fungicide-sensitive (EU36) and fungicide-resistant (EU37) lesions of P. infestans *in relation to cultivar resistance*

Conclusions/Discussion

- The study by Stellingwerf *et al.* (2018) and the 2022-2024 one suggest that fungicide usage is not the only driver of increased fungicide resistance. For some combinations of cultivar resistance and *P. infestans* phenotype a higher level of host resistance can inadvertently select for fungicide resistance. The frequency of this is not known.
- New genotypes of the late blight pathogen can sometimes combine fungicide resistance with the virulence genes to significantly reduce the resistance rating of cultivars, thereby diminishing the protection by host resistance against selection for fungicide resistance. For example, Lees *et al.* (2012) demonstrated that for 49 cultivars with a resistance rating of 5 or above on the 1 to 9 scale the average resistance rating of 62% of them was reduced by more than 1.9 due to the emergence of EU13.
- The relatively recent trend for resistance to the same FRAC group to appear in a greater number of *P. infestans* genetic backgrounds may also negatively impact the protection against fungicide resistance afforded by some more-resistant cultivars. For example, OSBPI resistance has been found in multiple *P. infestans* genotypes (Anon., 2025).

References

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