

Monitoring sensitivity to fungicide active ingredients in the UK population of *Phytophthora infestans*.

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The James
Hutton
Institute



National
Potato
Innovation
Centre



EuroBlight
A potato late blight network for Europe



Euroblight Workshop 18-21 May 2026

Introduction

- Monitoring the efficacy of available fungicides against the *P. infestans* genotypes present in the UK is essential for effective late blight control and integrated pest management (IPM).
- Each year since 2018, representative isolates of dominant and newly emerging genotypes of *P. infestans* were sampled from UK crops through the Fight Against Blight campaign and tested for sensitivity to a range of commonly used fungicide active ingredients.



Sample Collection

- In order to do these genotypic and phenotypic studies we need living isolate samples, and DNA samples (FTA cards).
- We have been able to do this thanks to the fantastic network of scouts and others that collect samples as part of the Fight Against Blight, and Euroblight campaign

FIGHT AGAINST BLIGHT

Outbreak code ↓	Severity	Source	Status	Host	Reported on	Sample received on
FAB25_050765	Scattered through field	Conventional crop	Confirmed	Potato	8/1/2025	8/14/2025
FAB25_050764	Scattered through field	Conventional crop	Confirmed	Potato	7/30/2025	8/4/2025
FAB25_050763	Scattered through field	Organic crop	Confirmed	Potato	7/30/2025	8/1/2025
FAB25_050762	Single plant	Garden/Allotment	Negative	Potato	7/28/2025	8/4/2025
FAB25_050761	Scattered through field	Conventional crop	Confirmed	Potato	7/28/2025	7/29/2025
FAB25_050760	Patch	Volunteer	Confirmed	Potato	7/28/2025	7/30/2025
FAB25_050759	Scattered through field	Conventional crop	Confirmed	Potato	7/26/2025	7/29/2025



Detached Leaf Assays – Active Selection



Plant Pathology An International Journal edited by
the British Society for Plant Pathology 

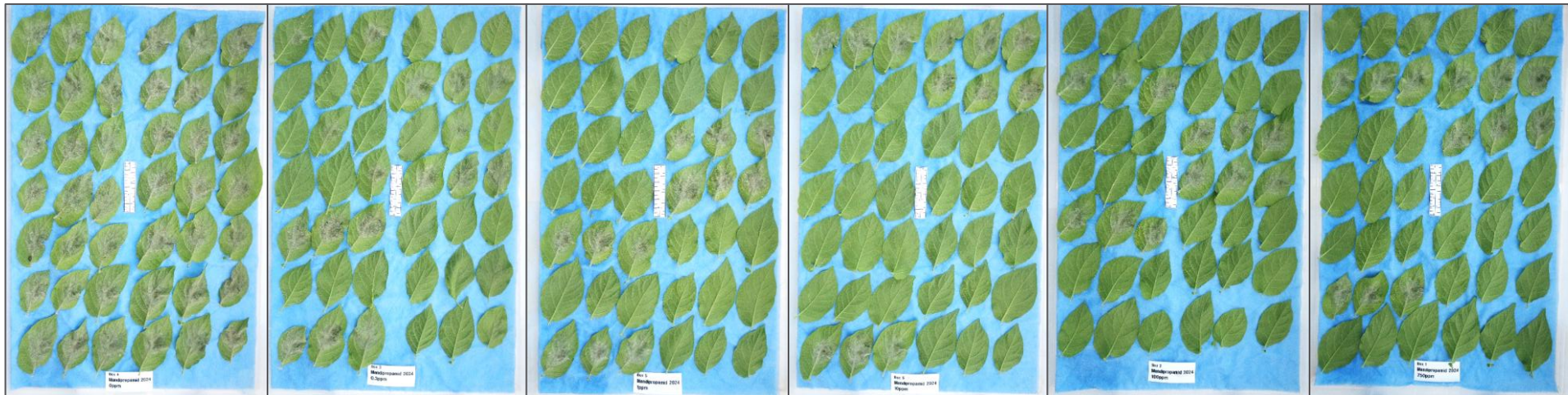
ORIGINAL ARTICLE |  **Open Access** |  

Sensitivity of dominant UK *Phytophthora infestans* genotypes to a range of fungicide active ingredients

[James S. Lynott](#), [David E. L. Cooke](#), [Louise Sullivan](#), [Alison K. Lees](#) 

First published: 27 November 2023 | <https://doi.org/10.1111/ppa.13832> |  **VIEW METRICS**

Detached Leaf Assays



Oppm  750ppm

- Detached leaf tests = fungicide active at 6 concentrations, 5 isolates of each genotype, 6 leaves inoculated for each isolates/concentration.
- Fungicide dose response curves were produced from lesion area data collected, this allowed EC50 values to be calculated for each genotype

Detached Leaf Assays - Results

■ EU_37_A2

■ EU_6_A1

■ EU_36_A2

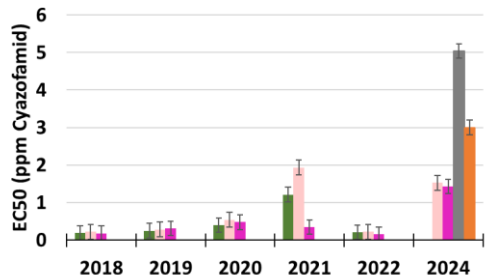
■ EU_41_A2

■ EU_43_A1 (DK)

■ EU_43_A1 (NL)

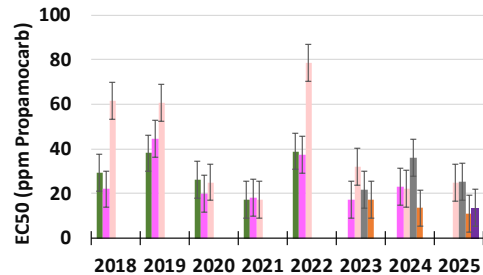
■ EU_46_A1

Cyazofamid



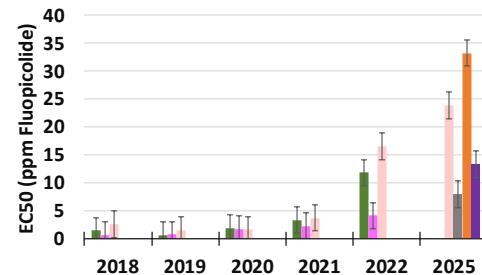
Cyazofamid Field Rate – 400ppm

Propamocarb



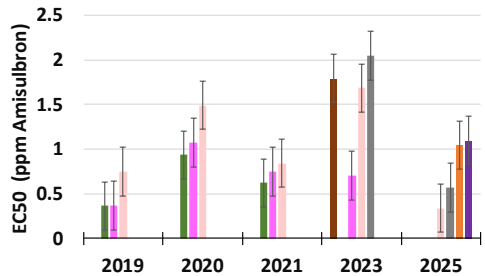
Propamocarb Field Rate – 5000ppm

Fluopicolide



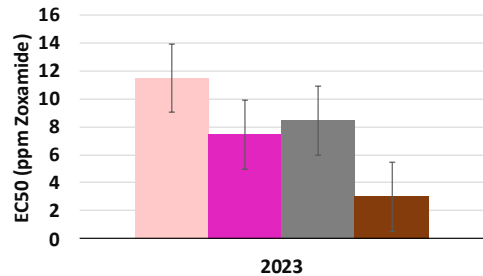
Fluopicolide Field Rate – 500ppm

Amisulbrom



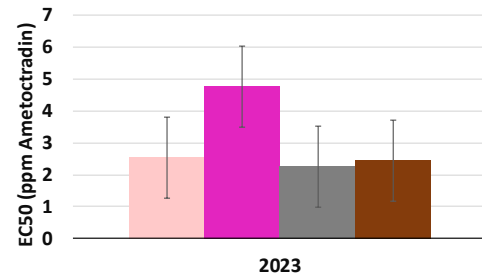
Amisulbrom Field Rate – 500ppm

Zoxamide



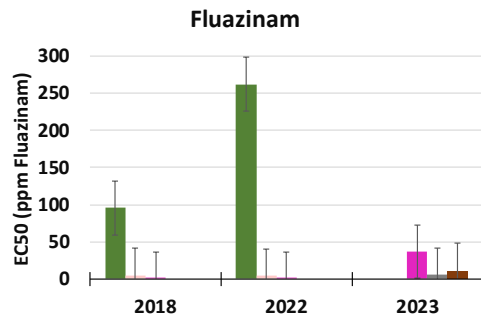
Zoxamide Field Rate – 1660ppm

Ametoctradin

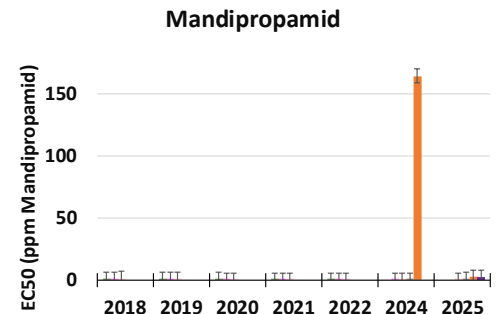


Ametoctradin Field Rate – 1200ppm

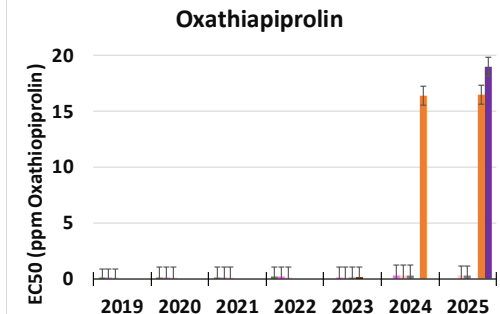
Detached Leaf Assays - Results



Fluazinam Field Rate – 1000ppm



Mandipropamid Field Rate – 750ppm



Oxathiapiprolin Field Rate – 75ppm

■ EU_37_A2

■ EU_6_A1

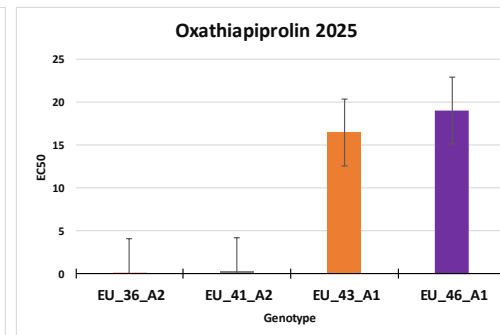
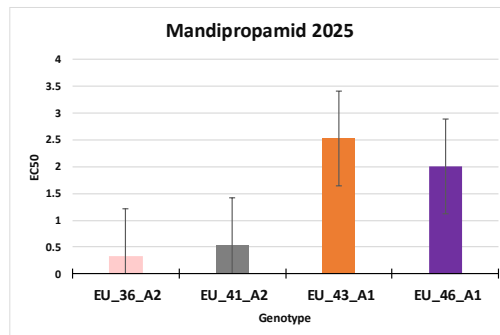
■ EU_36_A2

■ EU_41_A2

■ EU_43_A1 (DK)

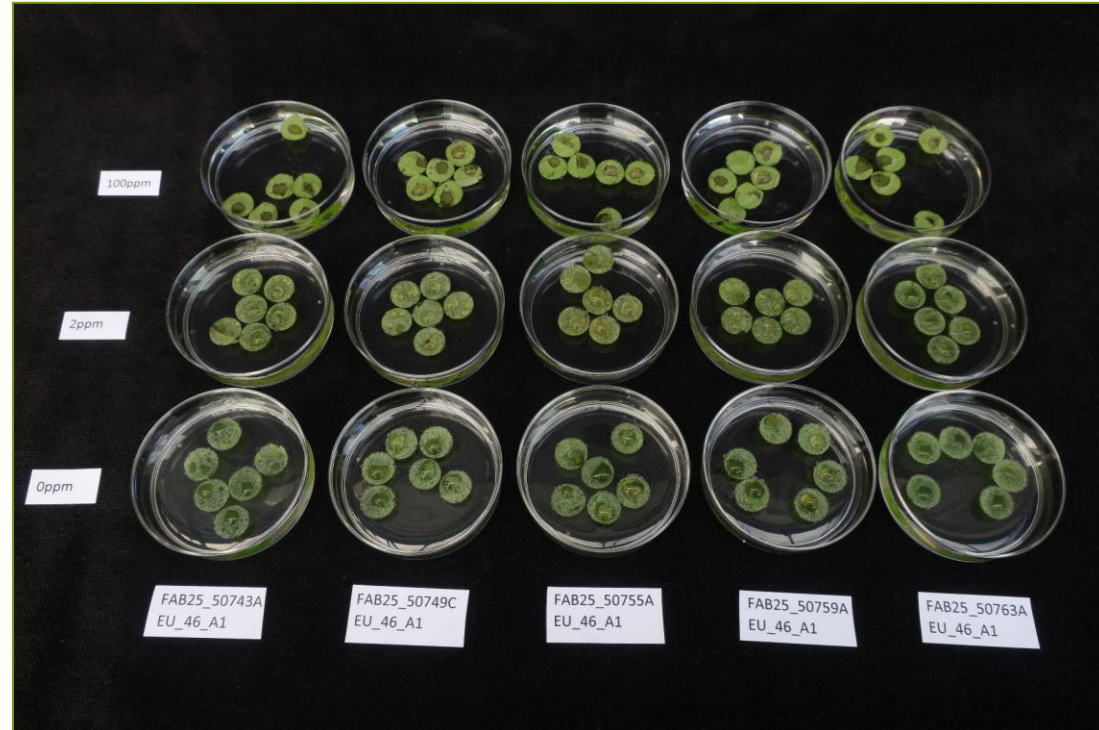
■ EU_43_A1 (NL)

■ EU_46_A1



Metalaxyl Leaf Disc Assays

- Leaf discs floating in solutions containing different concentrations of Metalaxyl
- 0ppm, 2ppm, and 100ppm
- 6 leaf disc replicates for each isolate.
- Lesion incidence recorded 5 and 7 days post inoculation.



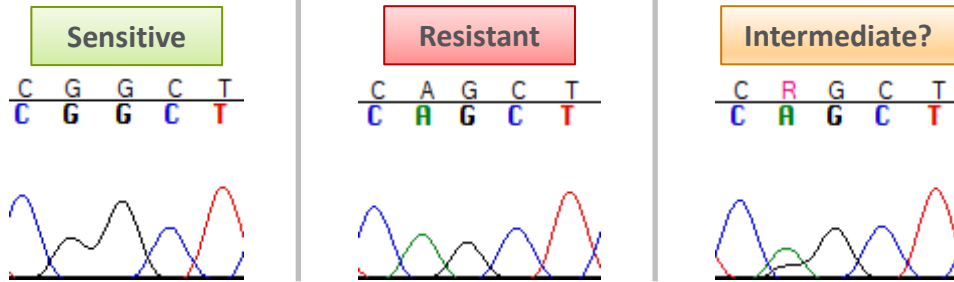
All Actives Summary

	Mandipropamid CAA (40)	Oxathiapiprolin OSBPI (49)	Metalaxyl PhenylAmides (4)	Propamocarb Carbamates (28)	Cyazofamid Qil (21)	Amisulbrom Qil (21)	Fluazinam QoSI (45)	Ametoctradin Benzamides (22)	Zoxamide QoSI (45)	Fluopicolide Benzamides (43)	Mancozeb Dithiocarbamates (M03)
EU36	EU36	EU36	EU36	EU36	EU36	EU36	EU36	EU36	EU36	EU36	EU36
EU6	EU6	EU6	EU6	EU6	EU6	EU37	EU6	EU6	EU6	EU6	EU6
EU13	EU13	-	EU13	EU13	EU13	EU6	EU13	-	-	EU13	-
EU37	EU37	EU37	EU37	EU37	EU37	-	EU37	-	-	EU37	EU37
EU41	EU41 (DK/UK)	EU41 (DK/UK)	EU41 (DK/UK)	EU41 (DK/UK)	EU41 (DK/UK)	EU41 (DK/UK)	EU41 (DK)	EU41 (DK)	EU41 (DK)	EU41 (UK)	-
EU43	EU43 (NL/DK)	EU43 (DK) EU43 (NL)	EU43 (NL/DK)	EU43 (NL/DK)	EU43 (NL)	EU43 (NL/DK)	EU43 (DK)	EU43 (DK)	EU43 (DK)	EU43 (NL)	-
EU46	EU46 (NL/UK)	EU46 (NL/UK)	46_A1 (NL/UK)	EU46 (UK)	-	EU46 (UK)	-	-	-	EU46 (UK)	-
Other	Other (NL)	Other (NL)	-	-	-	-	-	-	-	-	-
	Other (NO)	-	-	-	-	-	-	-	-	-	-

- **EU41** - Resistance to Metalaxyl seen in UK and DK isolates
- **EU43** – Resistance to MPD and OXTP. Reduced sensitivity to Metalaxyl
- **EU46** – Resistance to OXTP in UK and NL isolates. Reduced sensitivity Metalaxyl and possibly Mandipropamid
- **Other** – Resistance to OXTP and MPD in some (FTA Sanger sequencing).

Fungicide Resistance Mutations

Mandipropamid - G1105S CesA3 gene

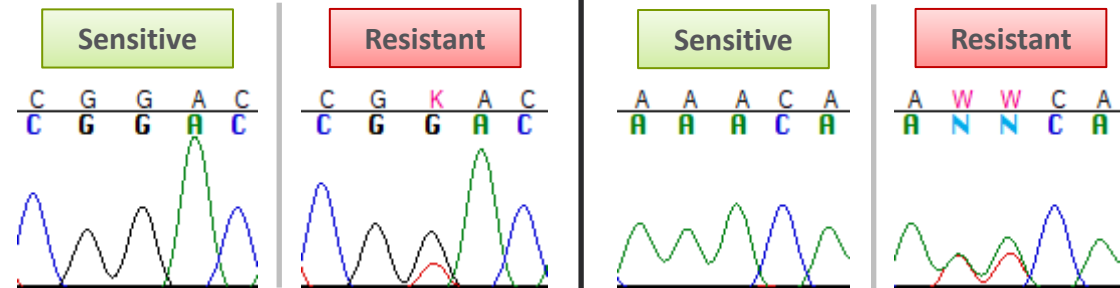


- Known DNA mutations confer resistance to Mandipropamid (CAA), and Oxathiapiprolin (OXTP)

Oxathiapiprolin

G770V OSBP gene

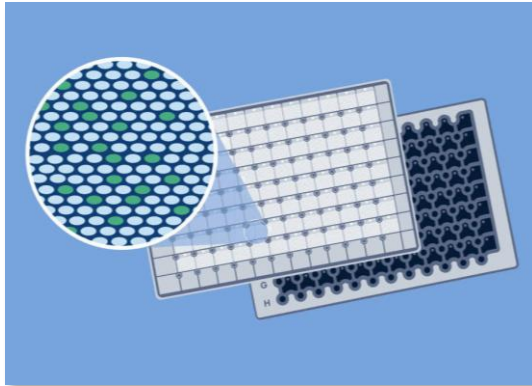
N837F OSBP gene



- Sanger sequencing detection of DNA base changes

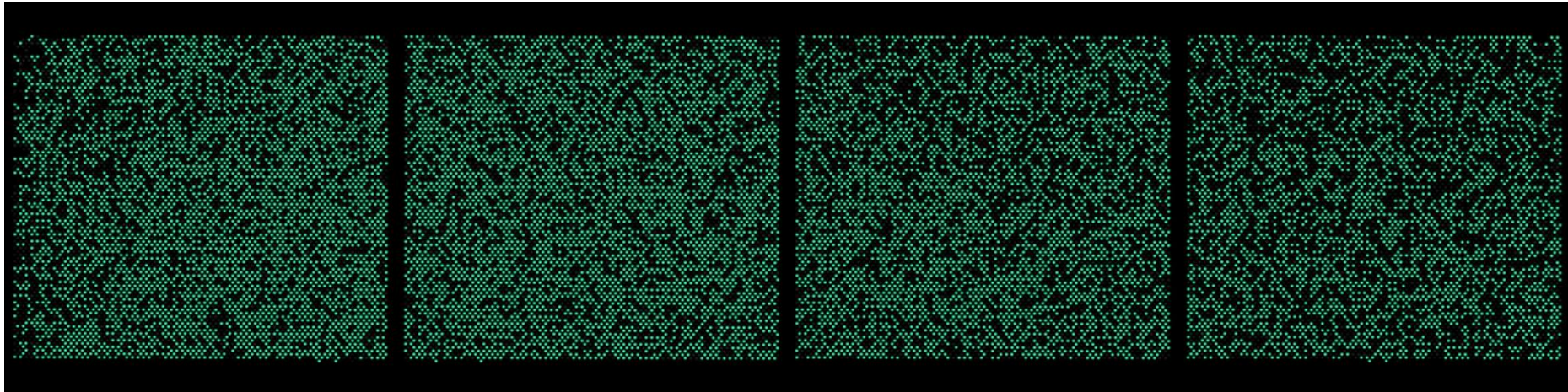
Digital PCR Assays

- Each well 26 thousand separate tiny PCR reactions
- SNP genotyping assays with labelled probes for MT and WT
- Higher throughput than classic PCR and Sanger sequencing
- Works with culture DNA and FTA card DNA



Digital PCR Assays

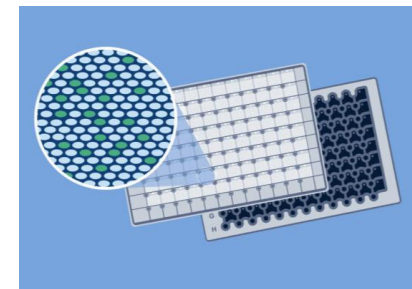
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Digital PCR Assays

■ CAA Digital PCR Assay – Singleplex

Color	Target Name *	Dye	Channel(s) *
■	G1105mt	FAM	● Green
■	G1105wt	VIC	● Yellow

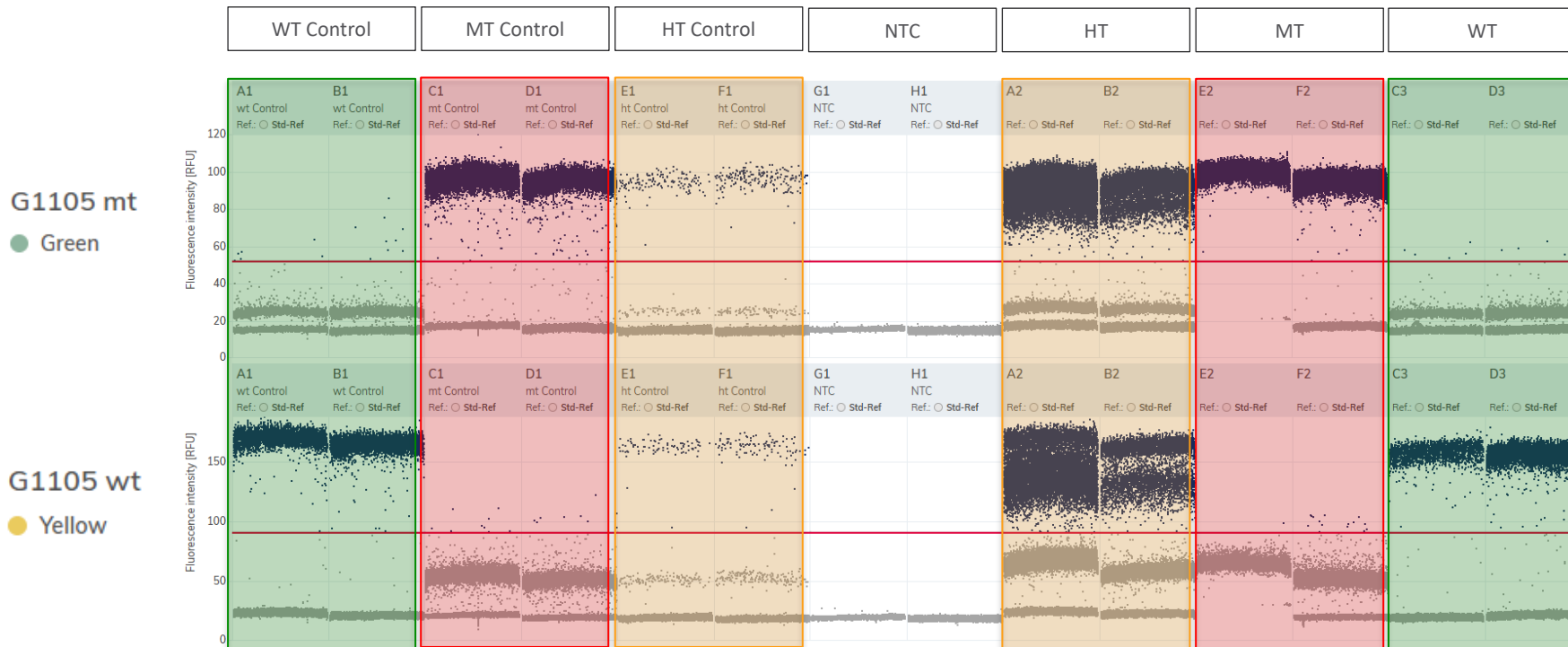


■ OXTP Digital PCR Assay - Multiplex

Color	Target Name *	Dye	Channel(s) *
■	PIOSBP G770 MT	FAM	● Green
■	PIOSBP G770 WT	VIC	● Yellow
■	PIOSBP N837 MT	Texas Red	● Red
■	PIOSBP N837 WT	Cy5	● Crimson



CAA Digital PCR Assay – Singleplex



OXTP Digital PCR Assay – Multiplex

PiOSBP G770 MT

● Green

PiOSBP G770 WT

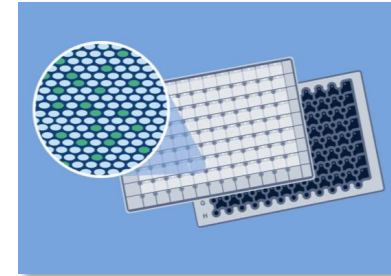
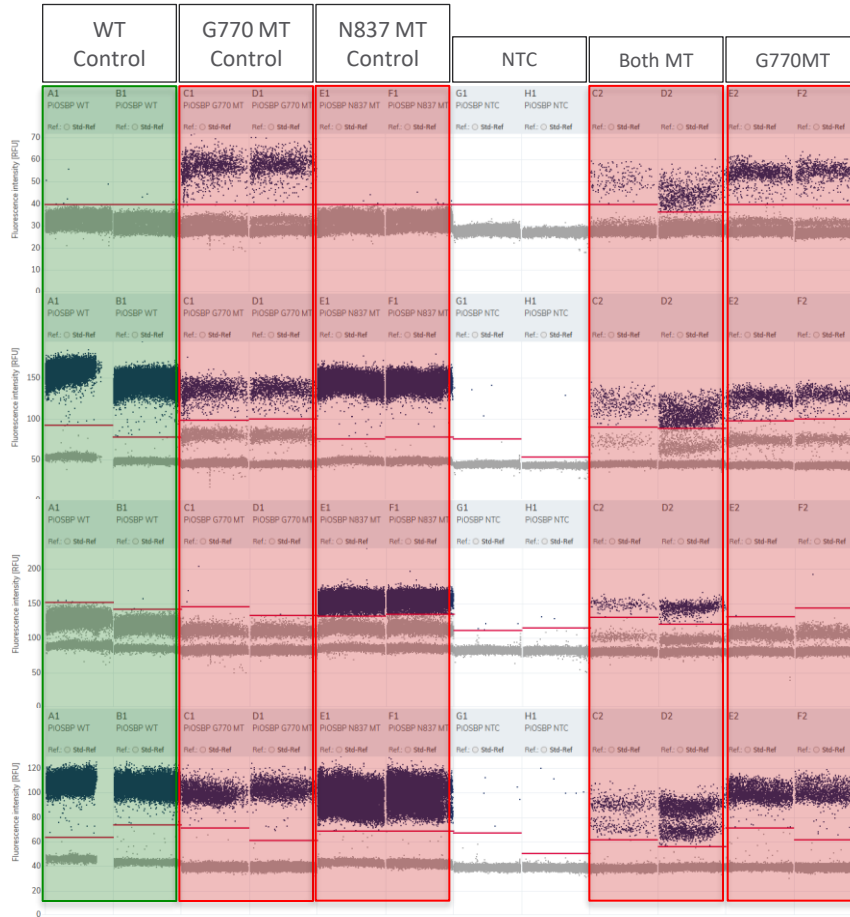
● Yellow

PiOSBP N837 MT

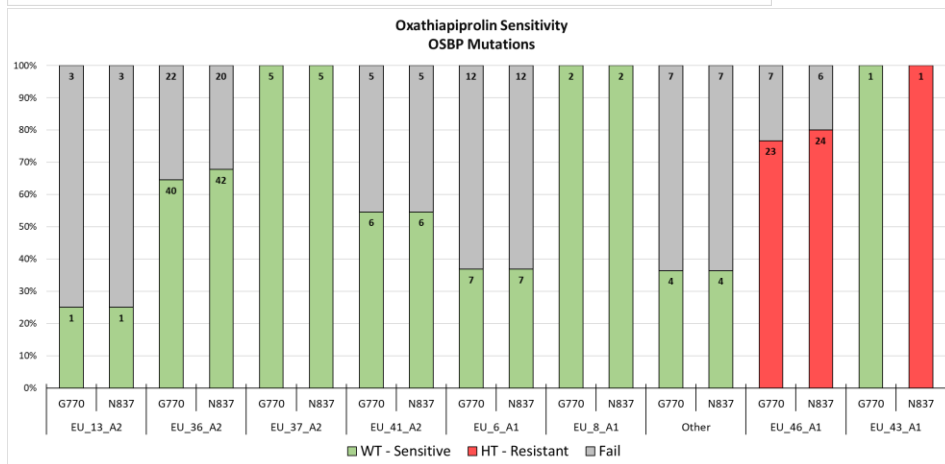
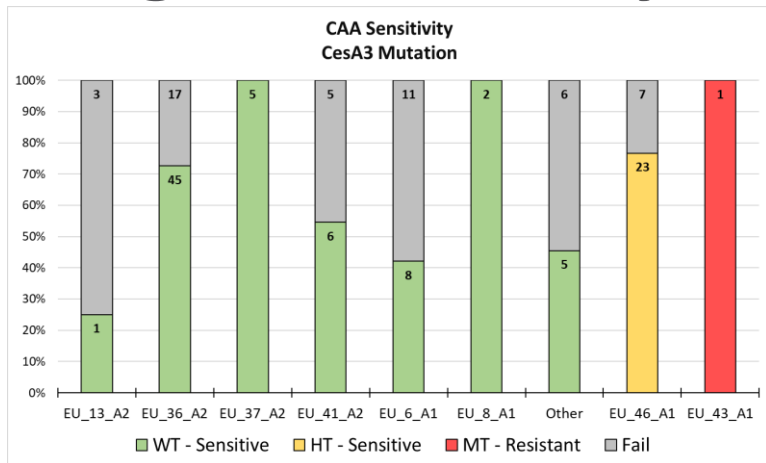
● Red

PiOSBP N837 WT

● Crimson



Digital PCR Assays - Results



- 145 FAB Samples from total of 73 outbreaks tested
- mostly 2 FTA samples from each outbreak in 2025, some have more to check EU46
- Presence of mutations in EU46 and EU43 samples match previously recorded observations



Summary

- Knowledge of efficacy of available fungicides against the evolving *P. infestans* population is important.
- As yet no resistance found in genotypes dominant in UK.
- Molecular methods will allow for rapid detection of mutations associated with fungicide resistance.
- Collaboration and input from industry is vital in the Fight Against Blight.

Acknowledgements



RESAS

Rural & Environment Science
and Analytical Services



Scottish Government
Riaghaltas na h-Alba

Alison Lees
David Cooke
Beatrix Keillor
Prisca Hill

Isaac Kwesi Abuley
Geert Kessel
Trudy van den Bosch

FAB Scouts

