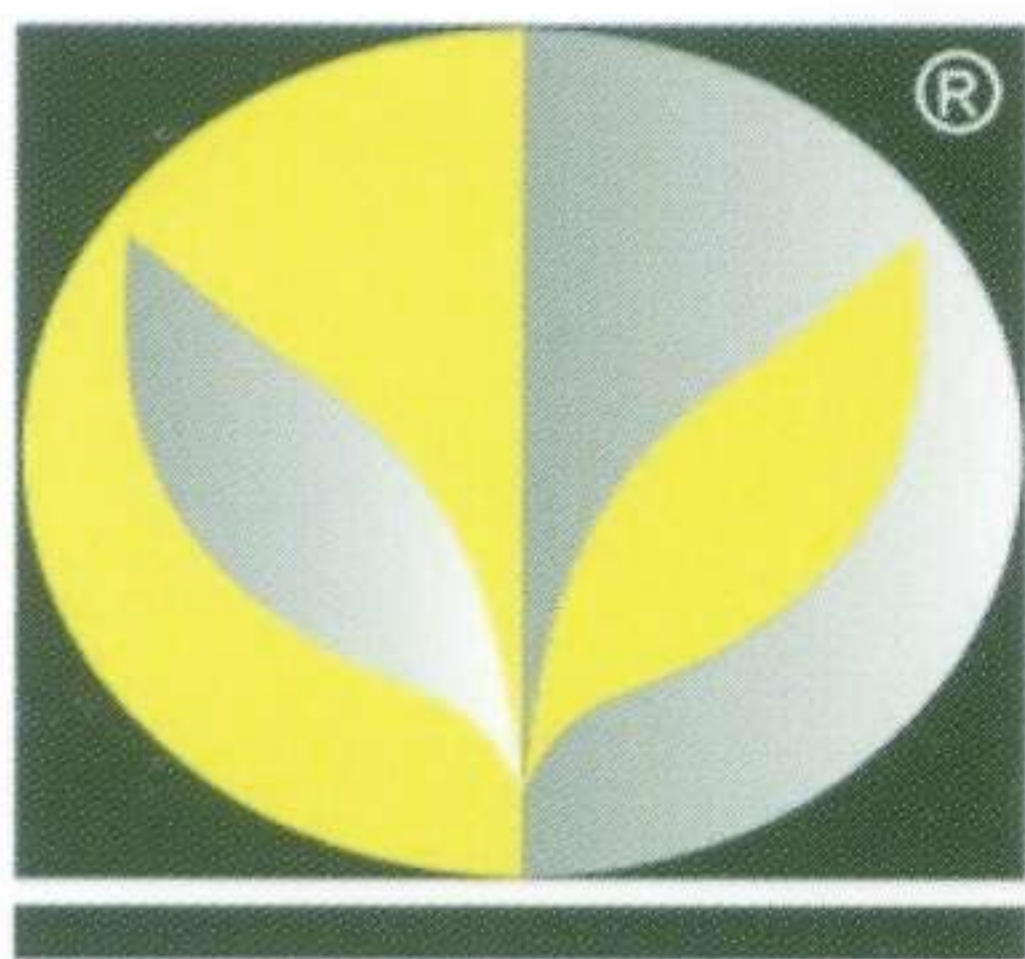




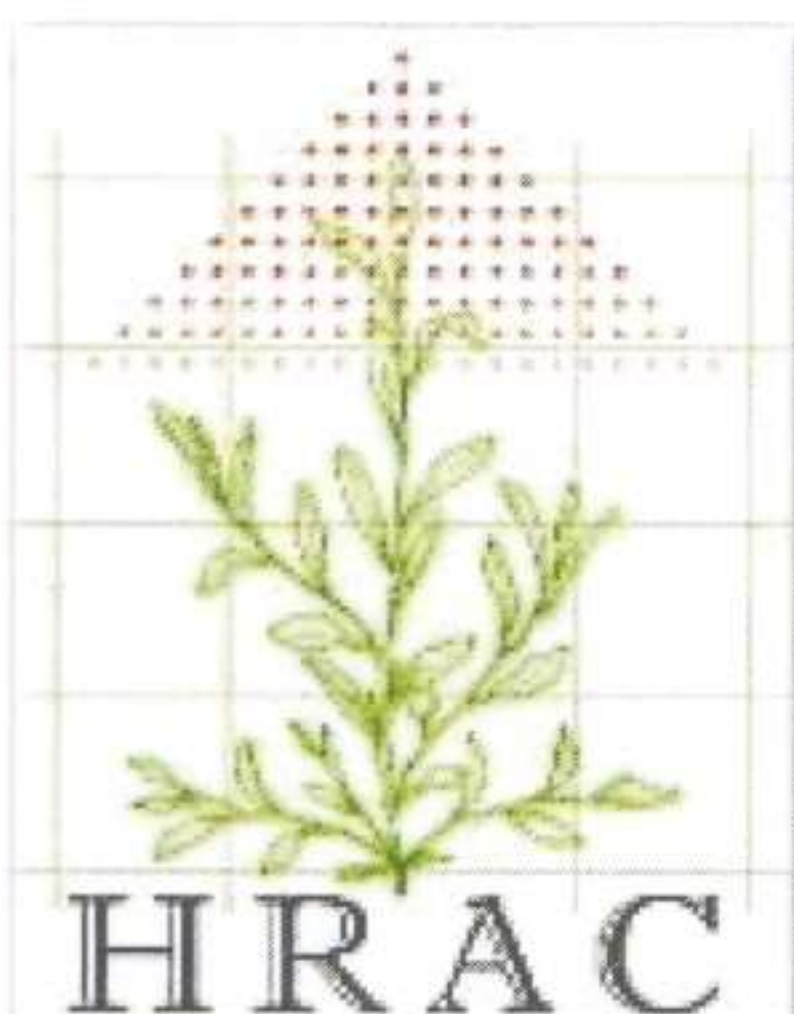
ROTHAMSTED
RESEARCH



Resistance 2015

14th-16th September, 2015

Rothamsted Research, Harpenden,
Hertfordshire, UK



Session 7 Chair: Martin Williamson

Evolution, Selection and Monitoring

- 14.30** Neil Paveley: Translating governing principles of resistance evolution into anti-resistance guidance
- 15.00** Dolores Fernández-Ortuño: Independent emergence of resistance to seven chemical classes of fungicides in *Botrytis cinerea* isolates from commercial strawberry fields in the eastern USA
- 15.20** Christoph Zimmer: The impact of genetic variation in cytochrome P450s on insecticide resistance in the brown planthopper, *Nilaparvata lugens*.
- 15.40** Helena Schmitz: Sensitivity status of current pathogen populations in cereals and relevance of different SDH genotypes
- 16.00** Refreshments and poster viewing

Session 8 Chair: John Lucas

Field Studies and IPM

- 16.30** Deepak Kaundun: Syngenta's contribution to herbicide resistance research
- 17.00** Pablo Bielza: The silver lining of insecticide resistance: resistant natural enemies
- 17.20** Irene Maja Nanni: Efficacy of CAA fungicides on CAA resistant Italian populations of *Plasmopara viticol*
- 17.40** Kevin Bradley: The weed resistance reality in the U.S.: where we've been, where we're headed
- 18.00** End of day
- 18.30** Coach travel from Rothamsted to Luton Hoo Hotel
- 19.00** Pre-dinner drinks at Luton Hoo Hotel
- 20.00** Conference dinner at Luton Hoo Hotel
- 22.00** Coach travel from Luton Hoo Hotel to De Havilland Campus

Translating governing principles of resistance evolution into anti-resistance guidance

Neil Paveley¹ and Frank van den Bosch²

¹ADAS High Mowthorpe, Malton, YO17 8BP, United Kingdom; email: neil.paveley@adas.co.uk

²Rothamsted Research, Harpenden, AL5 2JQ, United Kingdom

E-mail: frank.vandenbosch@rothamsted.ac.uk

A governing principle has been derived which can be used to predict whether a proposed change to a fungicide application program would decrease selection for resistant strains. The principle states that reducing the product of the selection coefficient (defined as the difference between the per capita rate of increase of the sensitive and resistant strains) and the exposure time of the pathogen to the fungicide, reduces the selection for resistance. Validation against experimental and modelling evidence had demonstrated that the governing principle has good predictive power. Strong agreement was found between experimental and modelling evidence and the predicted effect (i.e., that a specific change to a fungicide program increased or decreased selection or was broadly neutral in its effect on selection). We argue, therefore, that the 'selection coefficient and exposure time' principle can guide the development of practical resistance management tactics, in relation to: (i) mixtures of modes of action, (ii) constraining the number of fungicide treatments per crop season, (iii) choice of dose rate per application, (iv) the interaction between number of treatments and dose per treatment, and (v) application timing.

Independent emergence of resistance to seven chemical classes of fungicides in *Botrytis cinerea* isolates from commercial strawberry fields in the eastern USA

Dolores Fernández-Ortuño*, Anja Grabke[#], Xingpeng Li[#], Antonio de Vicente* and Guido Schnabel[#]

*Instituto de Hortofruticultura Subtropical y Mediterránea "La Mayora"-Universidad de Málaga-Consejo Superior de Investigaciones Científicas (IHSM-UMA-CSIC), Dept. de Microbiología, Málaga, Spain.

[#]School of Agricultural, Forest, & Environmental Sciences, Clemson University, Clemson, SC, USA.

Email: dfernandez-ortuno@uma.es

Chemical control of gray mold of strawberry caused by *Botrytis cinerea* Pers. is an important part of IPM to prevent pre- and postharvest fruit decay; however, resistance to multiple chemical classes of fungicides including anilinopyrimidines (APs), dicarboxamides (DCs), hydroxylanilides (HAs), methyl benzimidazole carbamates (MBCs), phenylpyrroles (PPs), quinone outside inhibitors (Qols), or succinate dehydrogenase inhibitors (SDHIs) is a well-described phenomenon in *B. cinerea*. As part of a resistance-monitoring program that investigated 1,890 *B. cinerea* isolates from 189 fields in 10 states of the U.S, we identified 7 isolates in 4 states resistant to all seven chemical classes of registered fungicides for gray mold control in the U.S. Resistance to DCs, HAs, MBCs, Qols, and SDHIs was based on target gene mutations. Isolates were MDR1 or MDR1h dependent on sensitivity to PPs and variations in transcription factor *mrr1*. Expression of ABC transporter *atrB* was highest in MDR1h isolates. None of the isolates had identical nucleotide variations in target genes, indicating their independent emergency. Multifungicide resistance phenotypes did not exhibit significant fitness penalties. The discovery of *B. cinerea* isolates resistant to all registered site-specific fungicides represents an unprecedented milestone of resistance development in *B. cinerea* that signals a failure of current anti-resistance management strategies.