

Fungicide Resistance Action Group-UK

FRAG - UK



FRAG-UK 45th Meeting
10:30, Wednesday 20th March 2019
Corteva, CIPC, Fulbourn, Cambridge, CB21 5XE

Minutes

Present	
Chairman	Prof F Burnett (SRUC)
Secretary	Mr P Ashby (HSE/CRD)
Members	Mr M Ashworth (Corteva) Dr K Maguire (Bayer CropScience) Mr B McKeown (BASF) Mr B Clark (NIAB -TAG) Mr M Thompson (AICC) Mr A Bailey (Adama) Dr B Fraaije (Rothamsted) Mr R Dyason (Nu Farm) Dr N Paveley (ADAS) Mr E Bingham (Belchim) Dr J Turner (FERA) Dr J Tatnell (Syngenta)
Guests	Catherine Garman (AHDB) standing in for Paul Gosling Laurence Powers (Certis) standing in for Alan Horgan Dr J O'Leary Quinn (HSE) observer
Apologies	Dr P Gosling (AHDB) Dr S Kildea (Teagasc) Dr G Kemmitt (FRAC) Dr L Cooke (Specialist/QUB) Dr D Ellerton (Hutchinsons) Dr T Fleming (AFBI) Mr J Sellars (Dow) Mr D Pendergrast (Arysta)

A copy of the current FRAC anti-trust guidelines was circulated during the meeting. BASIS qualified members were invited to sign the circulated attendance sheet if they wished to claim the available points.

1 MEMBERSHIP

Sec announced that John Clarkson (JC) (Warwick Crop Centre) had agreed to join the group as the independent Horticulture specialist. Laurence Powers (LP) is seeking to replace Alan Horgan and agreed to provide a statement outlining his relevant experience and reaffirming the Certis commitment to sharing information with the group. Ed Bingham (Belchim) announced that due to a change in responsibilities he would step down from the group and he requested that his colleague Adrian Sisson (AS) should replace him. Sec requested that AS sends him and the Chair a short statement supporting statement together with a reaffirmation of Belchim's intention to share information with the group.

ACTION: LP to provide supporting statement to the Chair and Sec. AS to provide supporting statement to the Chair and Sec.

2. CONFIRMATION OF PREVIOUS MINUTES

Barry requested a minor amendment to the minutes of the 43rd meeting and agreed to email proposed changes to Sec. Sec confirmed that he had received the comments previously submitted by Kerry and would include these in a revised version. (Done, revised final version circulated (Tues 26 March))

Sec confirmed that the revised draft minutes of the 44th meeting included comments received from Louise and Jason. Further amendments were proposed by Bart. Sec agreed to amend and circulate final version (Done, revised final version circulated Tues 26 March).

3. ACTIONS FROM PREVIOUS MEETING

5.1 Done. BCS strawberry mildew sensitivity data included in revised draft minutes of 43rd meeting

5.2 Done. BCS and Dupont cereal sensitivity data included in revised draft minutes of 44th meeting

5.3 Addressed under Membership. John Clarkson confirmed as new independent Hort. specialist

5.4 Sec has reminded GK to send FRAC SC short minutes to Chair and Sec. Done, Sec circulated to all members on Tues 26th March. .

5.5 Sec confirmed that MOA labelling in line with Crop Life International proposals could be implemented initially on voluntary basis. HSE will be issuing amendment notices to all authorisation holders outlining that the changes must be made by 2023 (date to be finalised).

5.6 Sec to remind GK to send revised FRAC definitions to Chair. Done

5.7 to 5.10 (Revision of FRAG General Leaflet) Taken as Item 5.2

5.11 Members to provide comments on the new Soft Fruit Recommendation. Taken as Item 5.1

5.12 Manufacturers and AHDB to agree Potato blight sensitivity message ahead of AHDB Agronomy conference. Done

5.13 Manufacturer representatives to send expressions of interest in joining the ADAS potato blight resistance project to Neil Paveley. Done

5.14 AHDB to circulate Fungicide Futures statements. Done

5.15 Kerry to provide an update on BCS loose smut sensitivity testing. **Ongoing**

4. FRAC Update (GK)

GK was unable to attend the meeting.

Post minute note GK circulated the short minutes of the last FRAC Steering Committee meeting (Jan 2109). These were subsequently circulated to all FRAG members by Sec.

5. FRAG-UK Guideline

5.1. Soft Fruit

Members thanked AHDB for their efforts in producing a first draft. Sec confirmed that Barry had sent him some additional comments which he would forward to AHDB. The version circulated for discussion included comments received from John Clarkson (JC). Picking up on a point made by JC members agreed that for this sector it would be important to include some additional guidance on the use of the biological control agents. Sec indicated that the products labels contained some information but he also suggested that FRAG members ask colleagues with specialist knowledge. Bill had received some comments from Angela Berrie (East Malling Research) and agreed to forward these to AHDB. There were some formatting issues to be resolved and Bill agreed to send AHDB a template. Bill also agreed to see if EMR could provide suitable photos. Members agreed it would be helpful if the document could be finalised before the summer. AHDB have offered to produce an additional shorter version, members preferred to focus on finishing the main document first.

ACTION: Members to send any additional comments to PG asap. Bill to forward Angela's comments, a template and possibly photos to PG. (Post minute note: Bill has sent template and Angela's comments). PG to update and circulate revised version asap.

5.2. General Fungicide Resistance Leaflet

Sec had circulated a revised document containing his proposals for updating the pathogen list and additional changes to the introduction section made by Fiona. Bill commented that the document still needed extensive revision, including the glossary. Judith stated that due to a change in the Liaison platform FERA were no longer able to update the pesticide information in Table 4. Members agreed that the document should be restructured and contain a list of resistant pathogens, with the old actives greyed out and the list of non UK cases restricted to those most relevant to the UK. Fiona agreed to update the list of reported UK cases and then share with Neil. Sec explained that an agreed updated list of known UK cases could be used to populate the proposed EPPO resistance database and that it would therefore be extremely helpful to have this available at the next meeting of the EPPO Resistance Panel (September).

ACTIONS: Fiona to update list of resistant pathogens asap and liaise with Neil.

5.3 Cereal Recommendations

Bill did not see any reason to update the current version but agreed to reconsider whether it was necessary. Sec suggested the *R collo-cygni* wording may need updating. Mike Thompson noted that a revision next year may be more appropriate when hopefully there will be some new chemistry available.

ACTION: Members to send proposed amendments to Bill by the end of March. Bill to consider the need to revise the Cereal recommendations and liaise with AHDB regarding hard copies.

6. Fungicide Futures

CG handed out hard copy versions of the current wheat and barley statements.

7. Research Updates

7.1. BF presented a brief summary of the early season 2019 sensitivity testing of *Zymoseptoria tritici* (*Mycosphaerella graminicola*) isolates from a single untreated field at Rothamsted.

In vitro azole (prochloraz, tebuconazole, epoxiconazole and prothio-desthio) sensitivity was similar to that reported in the previous year.

The SDHIs isolates collected early season at Rothamsted showed a further decrease in sensitivity in 2019 compared with 2018. Bart reported an increase in the number of shifted intermediate resistant isolates (bixafen EC₅₀ > 0.3 ppm) from 24/50 to 35/49 and highly resistant isolates (bixafen EC₅₀ > 5.0 ppm) from 1/50 to with 3/49. This is possibly due to an increase in the number of mutations although the sequencing is needed to confirm this. The results over the last few years fit a pattern of variants with decreased sensitivity and a population that does not return to the same level of sensitivity as the previous year.

7.2. NP presented results of research looking into the optimum dose and cost of fungicide application in a changing resistance situation.

Neil defined the economic cost of disease control as fungicide cost+yield loss cost. He referenced a paper published last year (van den Bosch et al. 2018. *Plant Pathology*) which included a model for examining how changes in sensitivity affect the dose response curve and therefore the optimum dose. The team had examined dose response curves from Fungicide Performance trials and compared these to the PUS data to assess whether the rates of azole and SDHIs were optimised. Citing the PUS data for 2016 Neil considered that the reported 3.0 applications of azole per crop (1.9 total dose) was higher than justified economically for *Z. tritici* control when used for use in mixture with CTL (or other similarly effective mixture partner). The mixture partner reduces losses and optimum dose of the azole or SDHI. It was noted that azoles are also used to control rust and fusarium ear blight.

For current effective azoles:

Optimum dose has increased slightly as resistance has developed, but has now peaked and is predicted to decline if sensitivity shifts continue on the current trend.

For SDHIs

Optimum dose is flat/increasing slightly. Optimum dose will fall if highly resistant strains increase in frequency. Mike A asked what the effect of using a different multi-site would be. Neil replied that it could be modelled as it was primarily determined by its effectiveness.

The group discussed whether insurance spraying was expensive in terms of storing up future yield losses. Based on 5 years of research using a range of varietal susceptibilities/fungicide programmes Bill was of the view that it was better to be slightly over the optimum dose because the yield losses in the likely 1:5 year epidemic scenario could be high. Bill also commented that the varietal story is changing and farmers/advisors are now much more interested in this than fungicide performance *per se*, in part this has been driven by the higher yielding potential of the newer more resistant varieties. Ed Bingham agreed that it would be important to consider dose response and economics for the newer varieties. Bill considered that the FRAG message moving forward would be tricky as it is not just about the loss of the multi-sites. Future strategy will depend upon the use of mixtures of lower doses and the anticipated introduction of newer chemistries. Fiona and Neil commented that the group should not give up on the other multi-sites as they still have an important role to play in resistance management.

Discussion on the benefit on adding the multisite: Bill commented that from an efficacy point of view the case for adding a multi-site to an effective programme was questionable. Neil noted that work done in Ireland with Teagasc using epoxiconazole and folpet indicated that there was a benefit to resistance management of adding folpet.

Neil confirmed that the project on concurrent resistance, reported previously to FRAG, would be presented at Reinhardtsbrunn and he will report back to FRAG at the next meeting.

7.3. BF presented an update on understanding the sources and spread of Azole resistance in environmental *Aspergillus fumigatus* populations.

Reporting on work sponsored by Crop Life International Bart noted that published reports have highlighted a high mortality rate in immuno-compromised patients exposed to azole resistant *A fumigatus*. Bart highlighted some of the complexities around identifying possible sources of azole resistance given their widespread use in medicines, cosmetics, veterinary medicines and material preservation. Several reports have linked this to the farm use of azoles. The focus of this work was to see if there was a link between resistant strains and agricultural use of azoles. A number of potential high risk sources were sampled

In soil samples from Broadbalk, which has a long history of azole usage, only a small number of soil samples contained detectable *A fumigatus* spores. Only 2 out of 210 strains contained CYP51A mutations (F46Y/M172V/E427K) and these showed a low level of azole resistance. Additional soil samples from wheat fields provided by industry from locations in Europe were also tested, only 2 strains out of 419 tested showed high levels of insensitivity to itraconazole.

Straw incorporation field experiments samples at Rothamsted and Woburn showed no selection for azole resistance in Af populations.

In flower bulbs high numbers of colonies in bulb outer parts have been observed. High frequencies of TR34/L98H and TR45/Y121F/T289A strains were reported in 2015 in Dutch bulb samples (6) with no or low frequencies of these strains in UK samples (5). Resistance to tebuconazole and imazalil was confirmed in the TR34 and TR46 strains. In 2017 no resistant Af isolates were detected in Dutch tulip bulbs (2) and the UK daffodil bulb samples (3).

Other work published by Dutch research groups has found 'hot spots' of azole resistant strains in compost and tulip peel waste heaps (high temperatures suit *A fumigatus*; presence of fungicide residues)

Based on microsatellite markers, Bart suggested a clonal spread of particular azole resistant genotypes around the world.

Bart drew the following conclusions:

Azole resistance in *A fumigatus* is still evolving because new CYP51A variants are emerging
The risk from the use of azole fungicides on wheat is low ('cold spot')
Crop Life International are expected to publish the findings from this work soon.

8. Company Resistance Updates

8.1. Syngenta

JT presented results from their 2018 arable fungicide sensitivity tests. In wheat *Z tritici* monitoring was conducted in 20 countries for isopyrazam and now Solatenol. The UK and Ireland have the highest frequency of SDHI resistant isolates but there was no apparent increase compared with 2017 levels. The highest proportion of resistant isolates were associated with the C-H152R mutation and the greatest proportion of these were found in the UK and some parts of France and Germany. C-T79N (moderately resistant) mutations had not increased much but were more prevalent in UK and Ireland. C-N86S has a higher RF value, appears to be dominant in Ireland and less common on the continent. DMI testing showed no significant change a diverse situation and higher EC50 values in Northern continental Europe, UK and Ireland. No change was reported for chlorothalonil or for the wheat rust.

For the DMI's Jason reported that prothioconazole was still working well against *Z tritici* but no sensitivity data were presented.

With regard to the AP fungicides (Cyprodonil) Jason noted that resistance levels in *Z tritici* rise and fall over time even on the same sites. Overall there was no cause for alarm and described the situation as stable with regional variation.

In barley *P terres* testing showed a mixed picture for the SDHI (isopyrazam). No resistance was reported in Ireland and the situation in the UK was generally not as bad as in France and Germany. Jason noted only 1 variety of barley was grown in France last year and that the overall number of samples tested in 2018 was low.

A limited number of *Ramularia collo-cygni* samples were tested due to the weather. Mutations in Sdh C-146R and C 153R were frequent in UK, Ireland and Denmark and this was not good news.

For the DMI's Jason reported 100% resistance in the isolates tested and moderate to high frequencies of these in Denmark, UK, Ireland and Latvia.

Ustilago (wheat and barley) most samples tested were from UK home saved seed. For the DMIs (cyproconazole/triticonazole and tebuconazole) results appear to show a trend to decreased sensitivity although the situation is not yet considered to be resistant. Strong cross resistance between the DMI's was observed. The most shifted isolates were reported in samples from Sweden. Syngenta will monitor more farms this year. Fiona commented that SASA had reported lower levels of loose smut compared to last year.

8.2 Bayer Crop Science

KM provided a brief verbal update confirming that BCS they have not detected and significant changes in *Z tritici*. She noted that *R collo-cyngi* control is now difficult without chlorothalonil.

8.3 Corteva

MA stated that Corteva had stopped commercialising the SDHI's in cereals and would therefore no longer be monitoring sensitivity for this MOA in cereals.

8.4 Certis

Laurence announced that they were awaiting results for powdery mildew testing across a range of actives and would present these at the next meeting.

ACTION: LP to present results of Certis powdery mildew monitoring at the next FRAG-UK meeting.

9. Company updates

None.

10. FRAG-UK website update

CG acknowledged that there were still some issues accessing the FRAG pages on the AHDB website and it was hoped that these could be resolved soon.

11. Liaison with other groups

Fiona reported that she was due to deliver a short presentation to the UK Science Partnership for Animal and Plant Health meeting. The key message would be around the shortage of funding for resistance research and the need to share information.

12. Future events and publicity

CG announced AHDB would be reviewing their publication of FRAG-UK recommendations and that these would need to fit in with AHDB themes. There was discussion around what Fungicide Futures message would be for this season. Fiona agreed to provide PG with some ideas and Mike Thompson noted that he would be seeking clarification on this from PG in due course.

13. AOB

13.1 Biostimulants

On behalf of AHDB Sec asked whether the group needed to consider a position statement on the use of these products as an anti-resistance strategy. It was reported that a platform session at the Crop Protection Southern Britain suggested the yield boosting potential of Biostimulants could be a cost effectively way of reducing fungicide applications. Sec pointed out that any specific disease control claims made by the manufacturer for such a product would render it a PPP and would therefore need to be supported by trials data. Sec also stated that there was as yet no agreed EU definition of a Biostimulant. Laurence Powers felt that clarification was also needed for the Biorationales. The group agreed to return to this topic at the next meeting.

ACTION: Sec to ensure Biostimulants/Biorationales are discussed at the next meeting.

14. Date and Venue of next meeting

Bill offered to host the next meeting. **Date now confirmed as Thursday 5th Dec.** at the NIAB Sophie Taylor Conference Centre.

Catherine Garman agreed to enquire about the possibility of holding a future meeting at AHDB Stoneleigh. (Post meeting note: AHDB have agreed to host on 12th March 2020)