Anilinopyrimidines (AP's) Working Group

Meeting on January 20, 2020, 13:30 am - 17:30 am
Protocol of the discussions and use recommendations of the AP's Working Group of the Fungicide Resistance Action Committee (FRAC)

Participants

BASF	Nadine Riediger Gerd Stammler
Bayer	Andreas Mehl Robert Puhl
K-I Chemical	Akihiro Moriwaki
Syngenta	Stefano Torriani

Venue:

Lindner Main Plaza Hotel, Frankfurt, Germany

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Anti-Trust Guidelines (from FRAC Constitution) were shown before meetings started

1.1 *Botrytis* results

Vineyards
(BASF, Bayer, K-I Chemical, Syngenta)

Extensive monitoring studies in Europe, Chile, and New Zealand have been carried out for more than a decade by Bayer, K-I Chemical, Syngenta, and BASF.

In 2019, sensitivity data from commercial vineyards and trial sites were presented for France, Germany, Austria, Croatia, Italy, Portugal, Czech Republic, Spain, Switzerland, Slovenia, and Hungary.
Data from these studies show that frequencies of resistant strains varied in Europe from zero to moderate and in Chile (2018 data) from zero to high especially at trial sites, with regional variability.
These results still reflect a stable situation and are comparable to the observations made during the last ten years.

Products, applied according to the FRAC-AP guidelines in grape spray programs, maintained good performance in the field.

Strawberries
(BASF, Syngenta)

Sensitivity monitoring was carried out during 2019 in Croatia, France, Germany, Poland, Portugal, Greece, UK, Netherlands, Slovenia, and Spain, from commercial locations and trial sites.

2019 data show that the frequency of resistant isolates is again moderate, fluctuating from field to field, and ranging from zero to high. Compared to data obtained a decade ago, the frequency of resistant isolates in the monitored populations remained stable.

Monitoring studies in 2017 and 2018 with samples originating from 8 Chinese provinces show mostly full sensitive isolates and only single resistant strains.

Products, applied according to the FRAC-AP guidelines in strawberry spray programs, provided good control in commercial situations.

Vegetables
(Syngenta)

In 2016, European sensitivity monitoring in tomato, peas, and beans was carried out in the Netherlands, Belgium, Czech Republic, Italy, Serbia, France, and Poland with a limited number of samples obtained from commercial locations and trial sites.

Overall, the data show a low frequency of resistant isolates in tomato and beans.
In 2017 and 2018, limited sensitivity data for tomato samples collected in Belgium and the Netherlands showed no to moderate frequency of resistant isolates. Limited monitoring was also carried out in beans: one Spanish sample from 2018 showed resistance, while all samples from France were sensitive.
In 2019, limited sensitivity data for tomato samples collected in a single location in Southern Italy indicated presence of resistant isolates.

In 2017, first monitoring studies with limited number of tomato and cucumber samples from China indicated, similar to the situation in strawberries, besides sensitive isolates also presence of resistant ones.
In 2018, samples originating from up to 6 Chinese provinces didn´t show occurrence of resistant isolates in tomato and cucumber.

Evidence from field and laboratory trials has shown that there is a medium resistance risk of *Botrytis* to APs. Good agronomic practices and strict adherence to the FRAC AP use guidelines are crucial to ensure that APs remain effective due to the risk of increasing occurrence of multiple resistant strains and isolates with unspecific, increased efflux activity (often called `multidrug resistant´, MDR), particularly in soft fruits.
For more information on the different AP resistance types see the latest publications on AP related resistance research (Mosbach *et al*., 2017).

1.2. *Venturia* results
(BASF, Syngenta)

2019 samples from Austria, France, Germany, Italy, Belgium, Hungary, Poland, Portugal, Spain, Greece, Bulgaria, Croatia, Ukraine, Latvia, Netherlands, Slovenia, and the UK were analyzed. Based on dose-response to APs using *in vivo* biotests, populations are classified as either sensitive, moderately adapted or resistant.

In 2019, the vast majority of all studied samples was sensitive as already observed in 2018, indicating that current resistance management strategies are efficient.

History:
In 2016 and 2017, the trend for lower resistance frequencies at commercial and trial site locations, as already observed in 2015, was confirmed. This was linked to the detection of more sensitive and less moderately adapted populations in all apple growing areas monitored.

1.3. *Stemphylium vesicarium*
(Syngenta)

Monitoring data has been presented for isolates originating from Portugal, UK, Croatia, Belgium, Germany, Spain, Greece, Italy, Netherlands, and Poland during 2015-2019, sampled in asparagus and pears.

In summary, single resistant isolates were detected in both crops on a comparably low level.

1.4. *Alternaria solani* (potatoes)
(Bayer)

First monitoring data has been generated in 2019 for European isolates originating from Belgium, Germany, Netherlands, Denmark and Sweden.

All isolates showed high sensitivity in a narrow range.

2. AP - Use Recommendations

The purpose of the use guidelines for AP containing products is to maintain the sensitivity in the target pathogens and to prevent crop losses due to resistant pathogen populations.

2.1 AP - Guidelines

For grey mold and apple scab control, specific guidelines have been developed. In general, where different AP-containing products are used in one season, the cumulative number of applications with cyprodinil-, pyrimethanil- or mepanipyrim-containing products must not exceed the maxima as mentioned below.
For sound resistance management, good agricultural practices, including phytosanitary measures and crop protection, should be followed not only in commercial practice, but also in nurseries.

The use recommendations were reviewed during the meeting on January 20th, 2020. The *Botrytis* and *Venturia* guidelines have not been changed.

For all other pathogens and crops, specific guidelines are not yet regarded to be needed. However, the maximum number of applications should be limited and should not exceed more than 50% of all treatments.

2.2 AP - *Botrytis* Guidelines

- Where up to three treatments are made per season, the number of applications of AP-containing products is limited to one.
- In situations where four to six Botrytis treatments are made per crop and season, a maximum of two applications with AP-containing products are recommended.
- In specific situations where seven or more Botrytis treatments are required per crop and season, a maximum of three applications with AP-containing products is recommended and not more than two consecutive applications.

- For specific crops and products, follow use recommendations of individual companies.

2.3 AP - *Venturia* Guidelines

- Apply a maximum of four AP-containing products per season.
- In locations where moderately adapted or resistant populations have been reported, use APs only in mixture with an effective non cross-resistant scab fungicide.
- Individual products should always be used at recommended dose rates and during the period when they are most effective.
- Curative use only in conjunction with reliable scab warning systems.

The next AP FRAC Working Group meeting is scheduled for January, 18th, 2021.

Literature

Mosbach *et al*., 2017: Anilinopyrimidine Resistance in *Botrytis cinerea* is linked to Mitochondrial Function, Front. Microbiol., https://doi.org/10.3389/fmicb.2017.02361