Minutes of the FRAC OSBPI Working Group Meeting

3 April 2023 – 11:00 to 17:00

Syngenta Office, Basel

Participants

Corteva	Jean-Luc Genet (Chair)
	Olivier Couery
	Mamadou Mboup
Syngenta	Helge Sierotzki
	Stefano Torriani
	Santiago Valdes
	David Ranner
	Daniela Pfeifer (excused)
Bayer	Jürgen Derpmann
	Andreas Mehl
	Christian Zupanc

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Introduction

A FRAC OSBPI Working Group was formed in 2015 to generate common resistance management recommendations for the fungicides oxathiapiprolin and fluoxapiprolin. OSBP fungicides are active against oomycete fungi and used for the control of Phytophthora and downy mildews of numerous crops. OSBPIs inhibit an oxysterol binding protein (OSBP) homologue. Oxysterol binding proteins are implicated in the movement of lipids between membranes, among other processes. Inhibiting OSBP may disrupt other processes in the fungal cell, such as signaling, maintaining cell membranes, and the formation of more complex lipids that are essential for the cell to survive.

Oxathiapiprolin and fluoxapiprolin are cross-resistant.
OSBPIs have been classified under the FRAC Code 49. The resistance risk is medium to high.

FRAC Code	Target site and code	Group name	Chemical group	Common name	Comments
49	F9 lipid homeostasis and transfer/ storage	OSBPI oxysterol binding protein homologue inhibition	piperidinyl-thiazole-isoxazolines	Oxathiapiprolin Fluoxapiprolin	Resistance risk assumed to be medium to high (single site inhibitor). Resistance management required. .

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

OSBPI Minutes of the 2023 discussions

Review of sensitivity monitoring 2022

Grape downy mildew (*Plasmopara viticola*)

Data presented by Bayer, Corteva and Syngenta

In 2022, sensitivity data have been generated for samples originating from Austria, Croatia, France, Germany, Greece, Hungary, Italy, Portugal, Romania, Spain and Turkey.

Most 2022 samples in monitored areas were sensitive.

In France, less sensitive populations were detected in commercial vineyards of Armagnac. A single isolate with reduced sensitivity was also found in one trial site in Midi-Pyrénées.

In Italy, several less sensitive populations/isolates were detected in Veneto and Emilia Romagna and more frequently in Friuli-Venezia-Giulia.

Single cases of reduced sensitivity were also found in a small number of trial sites in Austria (Steinmarkt), Croatia and Spain (Galicia).

Data generated in 2021 was also presented for grape downy mildew populations from Brazil which were all characterized as sensitive.

Molecular characterization of less sensitive isolates collected in 2022 revealed the presence of target site mutations N752I and I792F (homolog to N837I, and I877F based on *P. infestans* homology numbering).

In previous years, a few isolates with reduced sensitivity have been found in a small number of trial sites located in Austria, France, Italy, Germany, Portugal and Spain where OSBPI fungicides have been used intensively during several years. The frequency of these isolates was however low. In some of these isolates, target site mutations have been identified at positions 685, 752 and 778 (homolog to 770, 837 and 863 based on *P. infestans* homology numbering).

Potato/tomato late blight (*Phytophthora infestans*)

Data presented by Bayer, Corteva and Syngenta

In 2022, sensitivity data have been generated for samples originating from potato and tomato crops in Belgium, Chile, Croatia, Denmark, France, Germany, Hungary, Indonesia, Ireland, Israel, Italy, Latvia, Netherlands, Norway, Poland, Portugal, Slovenia, South Africa, Spain, Sweden and United Kingdom.

Most 2022 samples from Europe were sensitive. Reduced sensitivity was identified only in one commercial potato field in the Netherlands where FRAC recommendations had not been strictly followed as well as in one tomato field in Italy (Puglia).

All 2022 samples from potato crops in Chile and South Africa were fully sensitive.

While the majority of 2022 potato late blight samples from Israel were characterized as sensitive, reduced sensitivity was detected in 2 locations. Mutation I877F was identified in a single isolate from 2021.

Molecular characterization of samples from tomato crops in Vietnam indicated the presence of target site mutation N837I in 3 regions.

Molecular studies conducted in 2022 revealed the presence of target site mutations in samples from Indonesia (East and Central Java). Mutation G770V was found in samples from both potato and tomato. Mutation N837F/L was identified in samples

from potato fields whereas tomato late blight samples were found to bear mutation N837I.

Data generated in 2021 was also presented:

Brazil: All potato late blight populations from Brazil were characterized as sensitive.

Colombia: Molecular studies revealed a moderate frequency of target site mutations in samples from potato collected in the Antioquia and Cundinamarca regions. Lower frequencies were found in Boyacá.

Guatemala: Molecular studies conducted with samples from potato and tomato fields revealed the presence of several target site mutations. Mutation G770V was found at high frequency and several amino acid substitutions were observed at position N837. The performance of OSBPI fungicides at these sites can be affected.

Cucurbit downy mildew (*Pseudoperonospora cubensis*)

Data presented by Corteva and Syngenta

In 2022, sensitivity data have been generated for samples originating from China, Croatia, Greece, Italy, Romania, Slovenia, Spain and Vietnam.

All samples from Europe were sensitive.

Molecular studies conducted with samples from Vietnam did not reveal any target site mutations.

As in previous years, sensitivity monitoring conducted in China showed a broad sensitivity situation, however populations with higher EC_{50} values were detected in

Henan, Shandong, Liaoning, Hebei, Guangxi and Guandong provinces. Molecular characterization of these populations revealed the presence of OSBPI target site mutations G770V and L863W (based on *P. infestans* homology numbering).

Lettuce downy mildew (*Bremia lactucae*)

No 2022 data was presented.

In 2021, sensitivity data have been generated for samples originating from Belgium, Croatia, Germany and Greece. All the samples analyzed were sensitive.

Onion downy mildew (*Peronospora destructor*)

No 2022 data was presented.

In 2020, populations from Bulgaria, Croatia, Italy, Germany, Spain, Greece, Slovenia, Poland, Lithuania, Netherlands and Hungary were analyzed at Syngenta by sequencing of the OSBP gene. None of the target site mutations known to cause reduced sensitivity to OSBPI fungicides in other pathogens were detected.

Sunflower downy mildew (*Plasmopara halstedii*)

Data presented by Corteva

In 2022, sensitivity data have been generated for samples originating from Bulgaria, Greece and France. All isolates were characterized as sensitive.

No data was reported for 2020 and 2021In 2019, data was presented by Corteva for samples from France, Hungary, Italy and Romania. All isolates were fully sensitive.

Citrus Phytophthora root rot (*Phytophthora palmivora* and *P. nicotianae)*

2020 data presented by Syngenta

In 2020, samples of *Phytophthora palmivora* and *P. nicotianae* from the USA (Florida) were found to be fully sensitive.

Recommendations for 2023

OSBPI – General Use Recommendations

- Fungicide programs must deliver effective disease management. Apply OSBPIs at effective rates and intervals according to manufacturers' recommendations. Effective disease management throughout the season is a critical component to delay the build-up and spread of resistant pathogen populations.

- Apply OSBPIs only preventatively and in mixtures with effective fungicides from different cross-resistance groups.

- The mixture partner should give effective control of the target disease(s) at the rate and interval selected.

- Foliar exposure to OSBPI products should not exceed thirty-three percent (33%) of the total period of protection needed per crop.

The number of foliar applications of OSBPI products within a total disease management program must be limited as follows:

OSBPI – Grapes

- Make no more than two (2) applications per season.

OSBPI – All other crops

- Make no more than four (4) applications or maximum 33% of the total period of protection needed per crop, whichever is more restrictive.

- Where the total number of fungicide applications targeting oomycetes is less than three (3), apply no more than one (1) application of an OSBPI product.

- There should be no more than two (2) foliar applications of any OSBPI product per crop for the control of soil-borne pathogens.

- Applications of OSBPI-containing products are to be made no more than three (3) times in sequence before applying a fungicide with a different mode of action. In areas where the agronomic risk is very high (e.g. continuous potato or cucurbit cropping) and resistance has already been reported, further restrictions to the number of consecutive applications are recommended.

- Applications of OSBPI products can be made in alternation with a fungicide with a different mode of action.

OSBPI – Seed/soil treatments

- No foliar fungicide application of an OSBPI fungicide should be made following a seed/soil treatment* with OSBPI fungicides targeting the same soilborne/seedborne pathogen.

* Directed stem sprays are interpreted as foliar not soil application.

OSBPI – Multiple crops

- In case of non-cucurbit multiple crops, do not make more than six (6) foliar applications of OSBPI product per year on the same acreage or greenhouse, targeting the same pathogen.

- Specifically, in the case of cucurbit crops, do not make more than four (4) applications per year on the same acreage or greenhouse, targeting *P. cubensis*.

OSBPI – Nursery crops

- OSBPI products must not be used in nursery production of transplanted agricultural crops.

Next meeting:

11 April 2024 (Corteva station in Eschbach, Germany)