2020 FRAC Update

EPPO Resistance Panel

17 September 2020

Organization of FRAC 2020 – What's New?

FRAC
FUNGICIDE RESISTANCE ACTION COMMITTEE

2020 Changes

WG
SBI Fungicides
Andreas Goertz

SC member
Ippei Uemura
Henry Ngugi

SC
FRAC Chair
Dietrich Hermann
Vice Chair:
J-L. Genet

WG
CAA Fungicides
Gerd Stammler

WG
Qol Fungicides
Helge Sierotzki

WG
SDHI Fungicides
Kristin Klappach

Mode of Action Expert Panel
Dietrich Hermann

SC
Communication officer:
Juergen Derpmann,
deputy Henry Ngugi
Scientific Support officer:
Duncan McKenzie
Treasurer: Martin Semar
CLI representative:
Andrew Ward

RG & SC
Asia-FRAC
Susan Knight

RG
FRAC China
Yue Jian Lu

WG
Azanaphthalene Fungicides
Greg Kemmitt

WG
FRAC Bananas
2Y rotating chair

RG & SC
NA FRAC
Gilberto Olaya

RG & SC
FRAC Brazil
Luis Demant

RG & SC
FRAC Japan
Kentaro Tanabe

RG
FRAC Spain
Elena Robles

RG
FRMRG Australia
Leanne Forsyth

WG
OSBPI Fungicides
Jean-Luc Genet

WG
Anilino-Pyrimidines
Andreas Mehl

RG
FRAC Argentina
Julio Muriel

RG
FRAC South Africa
Willem Van de Pypekamp

EF
Dicarbox-imides
Andreas Mehl

EF
Benz-imidazoles
Jean-Luc Genet

EF
Phenyl-amides
Helge Sierotzki

Qil Task Force
Satoshi Araki

FRAC website in future will consider resistance management for compounds outside WGs/EF: Template available!

SC Steering Committee
WG Working Group
EF Expert Forum
RG Regional FRAC Group

New FRAC video

https://www.frac.info/home/news

06.29.2020

The FRAC video now available in additional languages

The FRAC video, which explains fungicide resistance and how it can be managed, is now available beside English in following languages: Arabic, Bahasa Indonesia, French, Hindi, Korean, Mandarin, Portuguese, Russian, Spanish, Vietnamese

Please use the follwoing link: FRAC Videos

Swahili and Thai will follow soon.

Fungicide resistance managment video available in 11 languages

Language
Arabic
Bahasa ID
English
French
Hindi
Korean
Mandarin
Portuguese
Russian
Spanish
Thai

Available on YouTube

https://www.youtube.com/watch?v=Fw8VXz2SUGs&feature=youtu.be

New FRAC Poster

https://www.frac.info/home/news

06.29.2020

An update of the FRAC MOA Poster© 2020 and the FRAC Code List© 2020 is now available for download

An update of the 2020-version of the FRAC MOA Poster is now available including the fungicide metyltetraprole. This PDF is suitable for printing up to a wall-sized poster print. Copies may be printed freely for educational purposes only.

Also, the updated version of the FRAC Code List© is now available for download in PDF- and Excel-format.

Both publication can be downloaded using following link: www.frac.info/knowledge-database/downloads

FRAC Fungicide classification by cross resistance and mode of action: Poster 2020 (www.frac.info)

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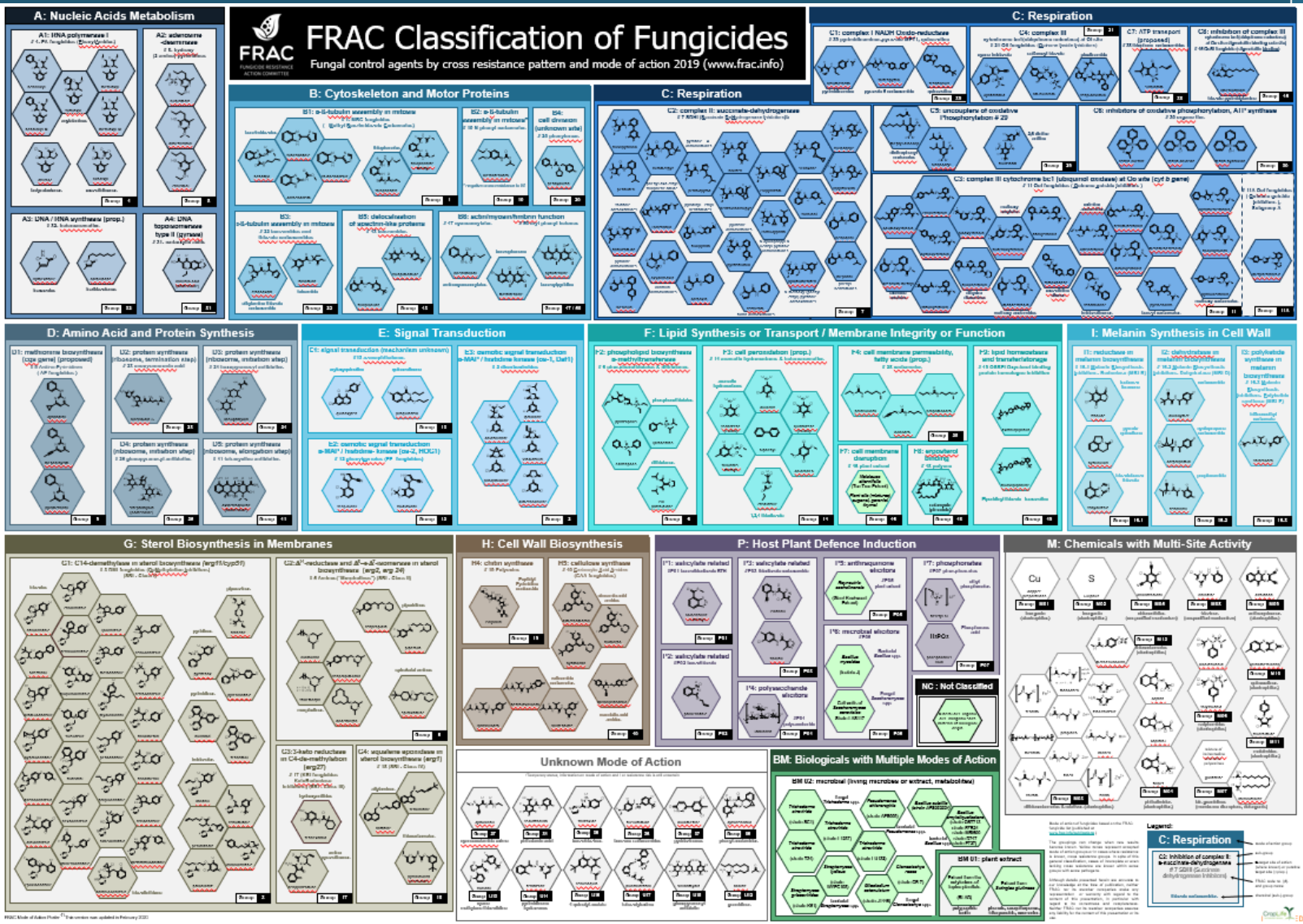


Global FRAC 2020

>230 fungicides, 65 MOA groups

FRAC Code List

02.18.2020

The updated FRAC Code List© 2020 is now available for download

The 2020-version of the FRAC Code List© is now available for download in PDF- as well as Excel-format. Copies may be printed freely for educational purposes only.

Here is an overview of the most important changes:
F9, OSBPI (Code 49) addition of fluoxapiprolin
BM01: Addition of plant extract from Swinglea glutinosa
Bacillus spp. based compositions formerly F6 (code 44) – moved to BM02
BM02: Inclusion of Bacillus spp from F6
BM02: Addition of new microbial compositions based on:
Clonostachys rosea strain CR-07
Bacillus spp. strains F727, AFS032321
Pseudomonas chlororaphis strain AFS009
Streptomyces lydicus strain WYEC108
Remarks for several FRAC codes or active ingredients have been updated regarding resistance situation or to clarify scope of the category - namely B6, I3 (16-3), U13, M01, BM02

The publications can be downloaded using following link: www.frac.info/publications

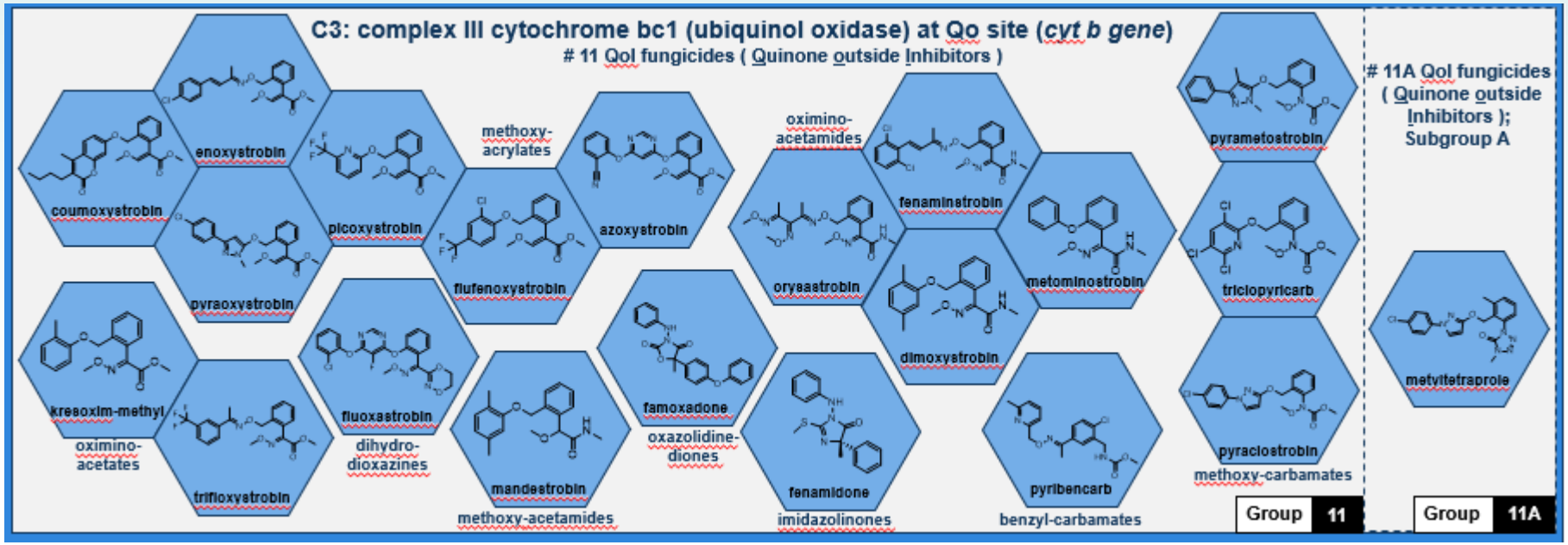
Metyltetraprole Classification

- Creation of a subgroup A within FRAC group 11

QoI-fungicides (Quinone outside Inhibitors) ; Subgroup A	tetrazolinones	metyltetraprole	Resistance not known. Not cross resistant with Code 11 fungicides on G143A High risk **See FRAC QoI Guidelines for resistance management.**	11A

Assigning different sub-group in accordance with sub-code (for easier awareness)

confidential



FRAC Group 11A Recommendations

- Allowing one more QoI application if 11A is included in the spray program, without continuous 11A spraying.
- Mixture of QoI + metyltetraprole is not considered as a valid resistance tactic

Example in Cereals

QoI + QoI + metyltetraprole => OK
QoI + metyltetyraprole + metyltetraprole => OK
Metyltetraprole + metyltetraprole + metyltetraprole => Not allowed
QoI + QoI + QoI => Not allowed
QoI + QoI + metyltetraprole + metyltetraprole => Not allowed

Future additions to the FRAC code list

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- Mitsui: Quinofumelin
- Kumiai: Dichlobentiazox Agr
- Kanesho: Aminopyrifen
- Corteva: Florylpicoxamid
- Sumitomo: Pyridachlometyl
- Nippon-Soda: Ipflufenoquin
- Dongguan Hec: Flubeneteram

Recommendations for molecules with no Working Group

- Purpose is to make recommendations for molecules not covered by a FRAC working group (« Orphan molecules »)
- One-pagers already developed for fluazinam, cymoxanil, cyflufenamid and phenylpyroles to be approved by the FRAC steering committee.
- Other molecules currently under consideration:
  - Tricyclazole
  - Metrafenone
  - Dodine
  - Ametoctradin
- Challenge where multiple manufacturers are involved (e.g. pyriofenone or fluopimomide) & generics

Resistance management recommendations and proposals for Fungicides not included in current working groups

Compound	Fluazinam
Chemistry	2,6-dinitro-aniline
FRAC MoA Code	29
TAREGT SITE AND CODE	C5: uncouplers of oxidative phosphorylation
Uses	Foliar application: *Phytophthora infestans* on potato and tomato; *Sclerotinia* spp. on potato, beans, peanut, wheat, cotton, soybean, carrots; *Botrytis* spp. on beans, grapes, onion and ornamentals; *Venturia inaequalis* on pome fruit, *Colletrotrichum* spp. on beans, berries, apples & turf; *Clarireedia* spp.; *Rhizoctonia* solani; *Microdochium nivale*; *Drechslera spp.* on turf; Soil application: *Phytophthora infestans* on potato; *Plasmodiophora brassicae* on Brassica crops
Resistance Status	The resistance risk is considered low • Field resistance has been claimed in *Botrytis* in Japan (beans). • Reduced sensitivity of *Phytophthora infestans* has been detected in a clonal lineage (EU: 37) in various European countries.
Resistance Mechanism	• Unknown
Recommendations	**General Recommendations** • The use of fluazinam is recommended in the context of a spray program considering an anti-resistance strategy in which different other fungicide classes are included in the program. • Apply fluazinam preventatively. • Apply fluazinam in rotation or in mixture with fungicides from a different cross-resistance group with satisfactory efficacy against the target pathogens. • When targeting high risk pathogens or areas where reduced sensitivity of target pathogens has been documented: Apply fluazinam in mixture whenever possible. If used solo, strict rotation is required with fungicides from a different cross-resistance group. Limit the number of fluazinam applications to max. 50% of the total applications against the target pathogens in a cropping season. • Soil applications of fluazinam should be considered as part of the total number of allowed applications if it provides activity against foliar pathogens. **Recommendations for potato (late blight)** • Apply fluazinam preventatively. • Maximum of six applications. • In regions with reported resistance it is recommended to limit the number of fluazinam applications to max. 50% of all applications and use mixtures with fungicides belonging to other modes of action that provide satisfactory efficacy against *Phytophthora infestans*. • No more than 3 sequential applications of fluazinam. In regions with resistance or reduced sensitivity apply a maximum of 2 sequential applications if product is used solo. • Refer to manufacturer's recommendations for rates and intervals.
Requested by / date	Helge Sierotzki Stefano Torriani, Ana Dutton, Syngenta Crop Protection, Araki, ISK
FRAC SC approval / date	18th June 2020

FRAC
FUNGICIDE RESISTANCE ACTION COMMITTEE

FRAC MoA Labelling Guidance

FRAC
FUNGICIDE RESISTANCE ACTION COMMITTEE

CropLife INTERNATIONAL

Mode of Action Labelling Guidance

Mode of Action Labelling
The development of resistance is a critical focus for the crop protection industry. The more farmers use a pesticide with the same mode of action (MoA), without another overlapping MoA and/or non-chemical control measures, the more likely it is that pests will develop resistance. Academics and industry experts agree that sequential applications or applying mixtures of products with different effective Moa's are key strategies to delay the onset of pest resistance.

The crop protection industry understands the consequences of the development of resistance and is proactively taking the lead in addressing the problem. CropLife International with the support of the Fungicide, Herbicide and Insecticide Resistance Action Committees (RACs), is advancing the understanding and practice of responsible resistance management. All RACs have communication resources which include websites, training modules, brochures and posters to emphasize the need to increase diversity in pest control, in particular by using several efficient MOAs in sequence or in mixtures.

The inclusion of MoA information on product labels, supported by training and other resources, is critical to ensure growers have the information they need to follow resistance management guidelines. MoA labelling is currently only a regulatory requirement in a small number of countries, however there are strong indications that more countries will make it mandatory in the foreseeable future.

Industry Commitment
To support the widespread adoption of responsible resistance management practices, CropLife International members have voluntarily made a commitment to include MoA icons and groups on all product labels by 2023. The inclusion of MoA information on product labels will ensure growers have simple access to critical information to support implementation of resistance management.

GROUP 5 HERBICIDE

GROUP 1A INSECTICIDE

GROUP 7 FUNGICIDE

GROUP N-3 NEMATICIDE

GROUP 15 27 HERBICIDES

OR

GROUP 15 HERBICIDE
GROUP 27 HERBICIDE

GROUP 1A INSECTICIDE
GROUP 7 FUNGICIDE

Resistance Management

- FRAC initiated a study to better understand the impact of spray programs on resistance development
- Field protocols comparing strict vs block alternation
- Testing models:
  - CAA on grape downy mildew
  - QoI fungicides on grape powdery mildew
- Efficacy assessments
- Phenotyping and genotyping of pathogen populations before the season, mid-season and end-season
- Technically challenging…