

The Fungicide Resistance Action Committee (FRAC):

members, structure, objectives,
key activities, and publications

Studiedag Fungicidenresistentie, 28.09.2017, Lelystad



Purpose of FRAC



FRAC is a Specialist Technical Group
of CropLife International



FRAC is an inter-company committee dedicated to prolonging the effectiveness of fungicides, liable to encounter resistance issues and to limit crop damage during the emergence of resistance. Since 1982!

- ⇒ Main goal of **FRAC** is to provide resistance management advice and guidelines and thereby sustain the effectiveness of “at risk” fungicides.
Key activity of MoA working groups (WG) and Expert Fora (EF)
- ⇒ **FRAC** represents a center of knowledge and expertise across the involved industry. It seeks to actively promote effective resistance management via networking with independent bodies
- ⇒ **FRAC** offers a range of services (publications, FRAC code lists, methods, training) to assist researchers, advisors and growers.
Main route for communication is the FRAC website: www.frac.info

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FRAC works proactively



- ⇒ Seeking scientific knowledge
- ⇒ Carrying out science in field of fungicide resistance; in the member companies, with universities, extension scientists, governments, FAO, EPPO, etc.
- ⇒ Constantly monitoring pathogen populations, sharing knowledge, refining recommendations
- ⇒ Working with other experts to give best advice on disease management and fungicide resistance management strategies

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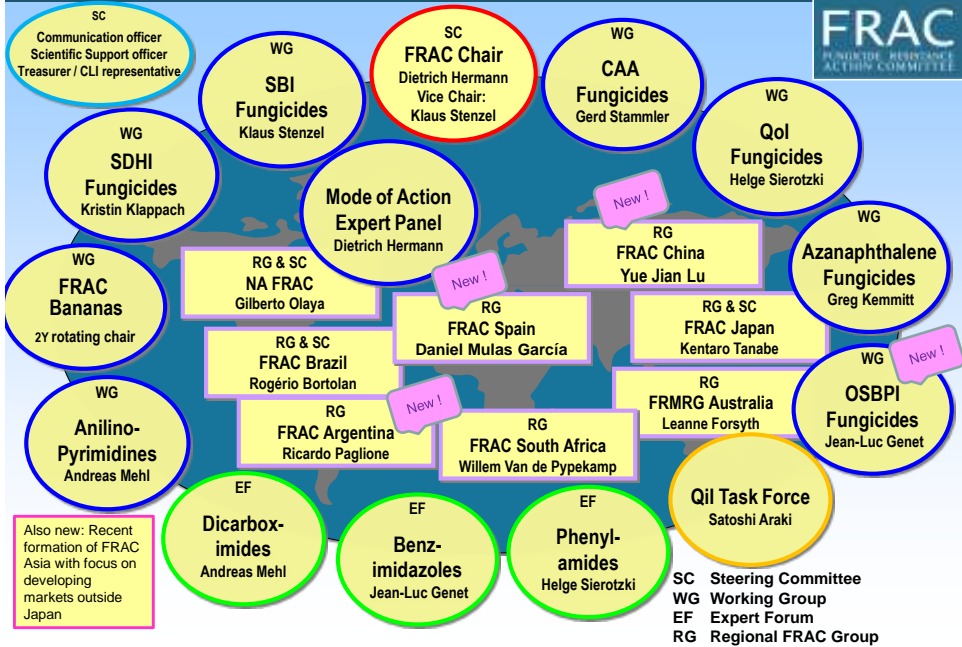
FRAC structure and groups



- ⇒ Managed by the FRAC steering committee. Supported by the scientific support officer and a communication officer. Financial aspects managed with CLI.
- ⇒ The FRAC constitution defines role, structure, membership and gives operating guidelines to the involved groups
- ⇒ FRAC Working Groups (WG) and Expert Fora (EF) are responsible for technical reviews of monitoring data and studies, determination of resistance management strategies and publication of use recommendations
- ⇒ The FRAC Mode of Action Expert Panel evaluates in collaboration with suppliers the inclusion of new active principles to the mode of action code list and poster
- ⇒ Network of local FRAC's, established in connection to Crop Life regional organizations
- ⇒ Connections through company experts to independent local Fungicide Resistance Action Groups (FRAG)

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Organization of FRAC



FRAC Steering Committee 2017

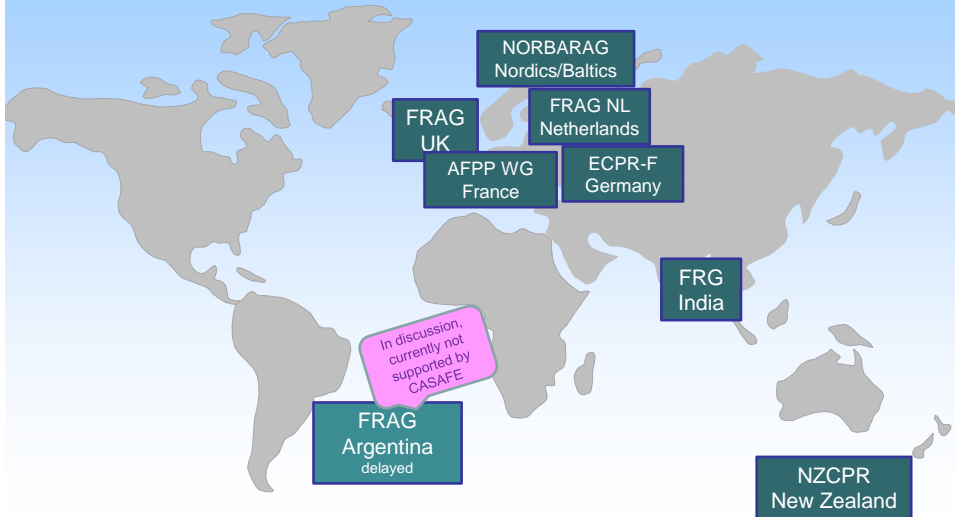
The FRAC SC meets 2x annually for a full day meeting
 Ad hoc approvals by E-mail
 Monthly calls between Chair and Vice Chair

| | | |
|------------------|-------------------|--|
| Dr. D. Hermann | Syngenta | Chairman FRAC, Chairman MoA Expert Panel |
| Dr. K. Stenzel | Bayer | Vice Chairman, Chairman SBI Fungicides WG |
| Mr. D. McKenzie | | Scientific Support Officer |
| Dr. J. Derpmann | Bayer | Communication and Website Officer |
| Dr. G. Kemmitt | Dow Agrosciences | Chairman Azanaphthalene WG; FRAC-MoA Poster |
| Dr. A. Mehl | Bayer | Chairman Anilinopyrimidines WG & Banana WG Dicarboximide Expert Forum |
| Dr. G. Stammler | BASF | Chairman CAA Fungicides WG |
| Dr. K. Klappach | BASF | Chairwoman SDHI Fungicides WG |
| Dr. H. Sierotzki | Syngenta | Chairman Qol-WG & Phenylamides Expert Forum |
| Mr. J.-L. Genet | DuPont | Chairman OSBPI-WG & Benzimidazoles Expert Forum |
| Dr. K. Tanabe | Nippon Soda Japan | Representative Japan FRAC, Qil Task Force |
| Dr. G. Olaya | Syngenta USA | Representative North America FRAC |
| Mr. R. Bortolan | Bayer Brazil | Representative Brazil FRAC |

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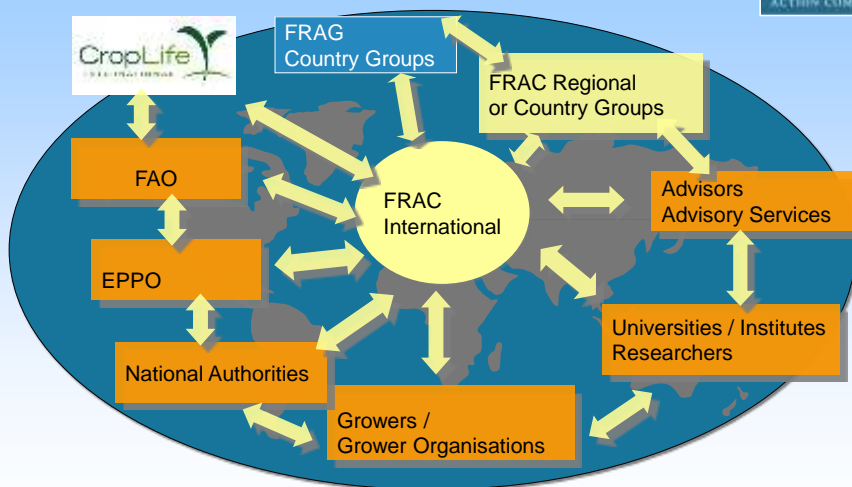
Outreach to other national groups

National fungicide resistance action groups are led by representatives of national institutes and regulatory authorities, with industry representation.



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FRAC - Outreach, Influence and Politics



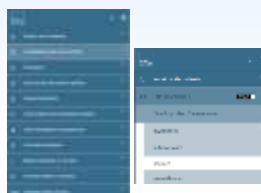
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FRAC WEBSITE - www.FRAC.info

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Overview of publications and offers

- Recommended, approved monitoring methods (bioassays, molecular tests) by the member companies are on website - focus on robustness, reliability, costs, suitability for a range of users
- Guidance for resistance risk evaluation to support registration dossiers (Monographs)
- By mode of action:
 - Minutes of annual reviews of resistance monitoring results by WGs
 - Regularly updated recommendations for resistance management strategies
- Annually updated list of AI's by mode of action, FRAC MoA Poster
- Lists of fungicide common names, pathogen risk list, recorded cases of fungicide resistant pathogens, mixture recommendations ...
- In preparation/planned:
 - FRAC MoA mobile-phone APP
 - Database for mutation information



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FRAC WEBSITE - Monitoring methods

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Monitoring Methods

Monitoring Methods

Introduction

To establish a baseline using disease parameters, a reliable technique must be developed. The technique must also be able to be used in subsequent monitoring operations investigating possible development of resistance. If and when resistance develops, the same method may be used to identify resistant isolates, but it is possible that more specific methods will have been developed in that time.

In a joint effort to create standardized methods, members of different FRAC Working Groups have reviewed and collected detailed, ready-to-use laboratory techniques to monitor fungal pathogens of economic importance.

The following requirements were considered while establishing these techniques:

- The method must be robust, reliable and repeatable
- It must be as simple as possible to operate in terms of technology and user skills
- It should be as cheap to operate as possible and capable of a high throughput in a short time
- The data obtained must be able to be related to sensitivity responses in the field

In a joint effort to create standardized methods, members of different FRAC Working Groups have reviewed and collected detailed, ready-to-use laboratory techniques to monitor fungal pathogens of economic importance.

List of approved methods

Here is the list of FRAC approved methods. The assays are sorted by pathogen and assay type. Pathogens are listed by their approved CPPO code.

[List of Monitoring Methods \(Status Jan. 2012\)](#)

[Approved Methods](#)

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Resistance Management Strategies

-
- FRAC
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- **Use of good plant protection practice**
 - resistant crop cultivars, non-chemical control, husbandry systems, crop rotations, tillage systems, efficient application.
 - **Application of Plant Protection Products**
 - limit the number of applications of a chemical class (mode of action = MOA) to reduce selection pressure*.
 - restrict application timing to the optimum for pest control.
 - respect the recommended use rate.
 - **Use of Mixtures and Alternations**
 - * limiting number of application is most effective when used in combination with mixtures / alternations of different MOAs.
 - mixture / alternation partners must be a different MOA and effective.
 - mixtures / alternations reduce the selection pressure and provide more robust disease control
 - resistance risk declines as number / area of applications with the product declines.
 - relies upon a diversity of modes of action being available for a target disease.

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FRAC Guidance on mixtures



- Mixtures (tank-mix or co-formulations) are supported by FRAC, as are alternations
- No clear data that alternation or mixture is better than the other
- Mixture is easier to "ensure" and therefore better "stewardship"
- Appropriate mixtures can:
 - give broader spectrum disease control,
 - ensure more effective control
 - avoid disease control failure,
 - manage the occurrence and impact of resistance
- Mixtures are the better alternative if only few sprays/season are applied
- Mixtures particularly valuable where resistance declines between seasons

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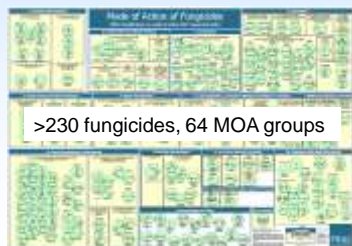
FRAC MOA Poster and Code List (www.frac.info)



- the 'FRAC Poster' and 'MoA Code List' provide a classification of active ingredients of disease control agents according to Mode of Action (MoA), based on scientific evidence
- the code list gives a statement on resistance risk for the MoA and cross-resistance pattern between different fungicides
- the FRAC code for AI's can be used on product labels

The documents however do not give

- information on specific products or disease control efficacy
- an "approval" for a product for its value in resistance management



| MoA | Resistance Risk | Resistance Pattern | Comments |
|-----|-----------------|--------------------|--------------------------------------|
| 1 | High | High | Highly resistant to cross-resistance |
| 2 | High | High | Highly resistant to cross-resistance |
| 3 | High | High | Highly resistant to cross-resistance |
| 4 | High | High | Highly resistant to cross-resistance |
| 5 | High | High | Highly resistant to cross-resistance |
| 6 | High | High | Highly resistant to cross-resistance |
| 7 | High | High | Highly resistant to cross-resistance |
| 8 | High | High | Highly resistant to cross-resistance |
| 9 | High | High | Highly resistant to cross-resistance |
| 10 | High | High | Highly resistant to cross-resistance |
| 11 | High | High | Highly resistant to cross-resistance |
| 12 | High | High | Highly resistant to cross-resistance |
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| 60 | High | High | Highly resistant to cross-resistance |
| 61 | High | High | Highly resistant to cross-resistance |
| 62 | High | High | Highly resistant to cross-resistance |
| 63 | High | High | Highly resistant to cross-resistance |
| 64 | High | High | Highly resistant to cross-resistance |

fungicides in the same group are cross-resistant

fungicides in different groups are NOT cross-resistant

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