The Fungicide Resistance Action Committee (FRAC):

members, structure, objectives, key activities, and publications

Purpose of FRAC

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
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

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)
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  Bayer  Scientific Support Officer
Dr. J. Derpmann  Bayer  Communication and Website Officer
Dr. G. Kemmitt  Dow Agrosciences  Chairman Anilinopyrimidines 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 QoI-WG & Phenylamides Expert Forum
Mr. J.-L. Genet  DuPont  Chairman OSBPI-WG & Benzimidazoles Expert Forum
Dr. K. Tanabe  Nippon Soda Japan  Representative Japan FRAC, Oil Task Force
Dr. G. Olaya  Syngenta USA  Representative North America FRAC
Mr. R. Bortolan  Bayer Brazil  Representative Brazil FRAC

Studiedag Fungicidenresistentie, 28.09.2017, Lelystad
Outreach to other national groups

National fungicide resistance action groups are led by representatives of national institutes and regulatory authorities, with industry representation.
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
**FRAC WEBSITE - Monitoring methods**

**Resistance Management Strategies**

- **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.
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
- Mixure 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

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

>230 fungicides, 64 MOA groups

fungicides in the same group are cross-resistant
fungicides in different groups are NOT cross-resistant