

Working together to manage fungicide resistance

Fungicide resistance affects all those concerned with crop health; the farmers, growers, advisors and the industry that provides these with the advice and products necessary to ensure a healthy, productive crop.

Without successful resistance management the effectiveness and eventually the number of modern fungicides available to the farmer and grower will diminish rapidly, leading to poor yields and reduced crop quality. Such a scenario could quickly lead to over use of affected fungicides as users strive to get products to work, leading in turn to increased and undesirable loading on the environment.



Plasmopara viticola on grapevine. Resistance management is vital for most fungicides used to control this disease.

Picture courtesy of Bayer CropScience

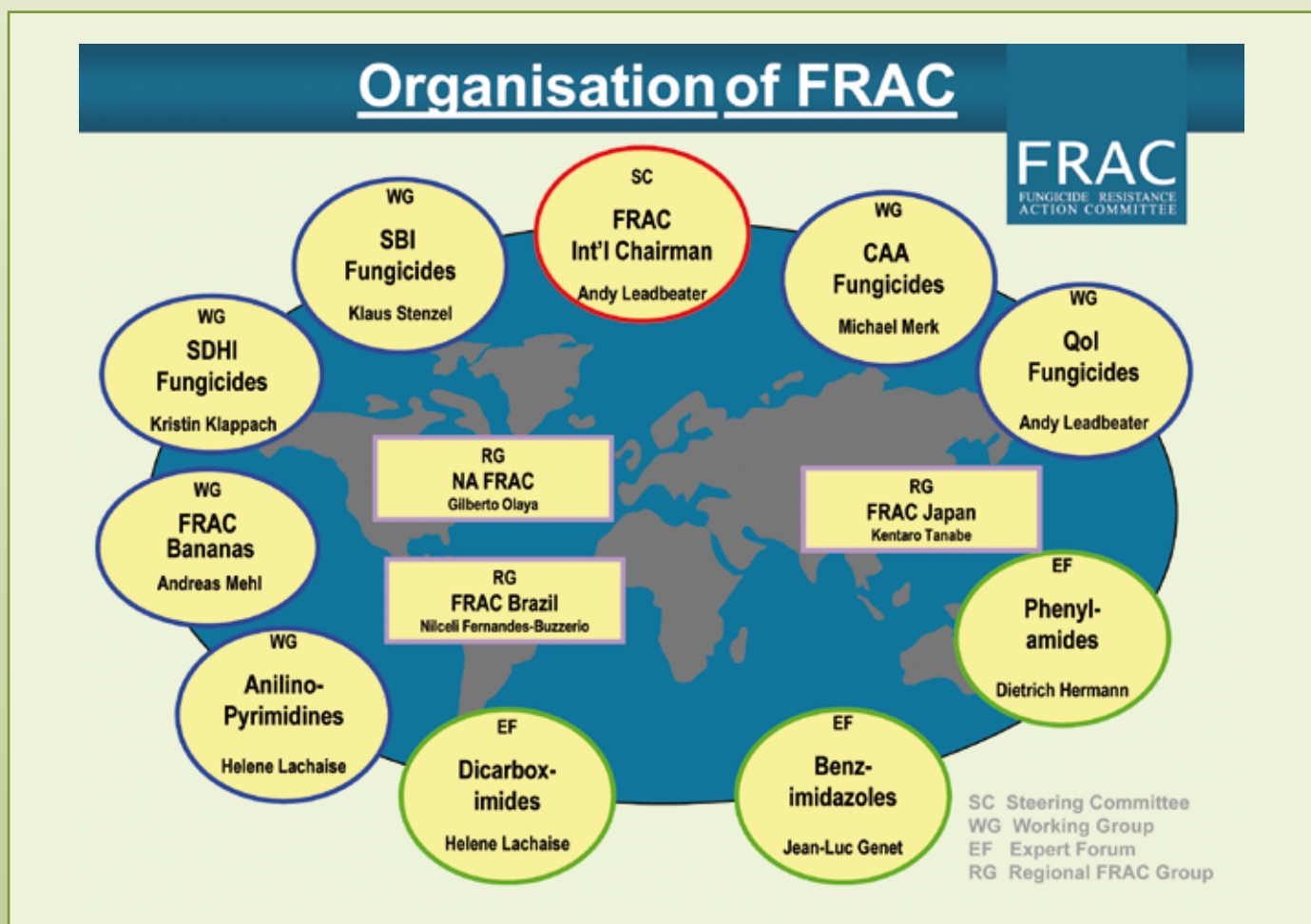


A South African vineyard.

Picture courtesy of Thys Lombaard

FRAC, the Fungicide Resistance Action Committee, was formed in 1981. It is an industry based and financed organisation with key objectives of (1) providing advice to all producers, suppliers and users of fungicides on how best to use fungicides in order to avoid, delay and manage fungicide resistance in crops worldwide and (2) providing educational material to train more people in the science of fungicide resistance and the art of its control. FRAC members are frequent speakers at scientific conferences and symposia.

FRAC Structure and working environment



The FRAC Steering Committee

The Steering Committee is the management team for all FRAC administration. Under the leadership of Andy Leadbeater (Syngenta) it consists of the Chairpersons of all the Working Groups, Expert Fora and Regional FRAC Groups plus:

- Phil Russell** (Consultant) Secretary/Treasurer
- Randall Gold** (BASF) Communications and Website Manager
- Greg Kemmitt** (Dow AgroSciences) Ordinary member

All members of the Steering Committee have a wide experience of fungicide resistance and its management, theory and practice, worldwide.

The Steering Committee ensures all FRAC activities are conducted according to strict anti-trust guidelines.

FRAC Working Groups

Each Group consists of representatives from the manufacturers and/or distributors of products based on the Group mode of action. Each company in a Working Group plays an active role in providing monitoring and other data relevant to the efficient running of the Group. The Working Groups recommend resistance management Guidelines for all crops and fungicides for their mode of action or area of chemistry. Guidelines must be unanimously agreed by all members before adoption. Guidelines are published on the FRAC web pages and reviewed regularly.

The FRAC Banana Group is the only crop based Working Group and deals with all modes of action used to control banana diseases. The Group includes representatives of the major banana producers.

Expert Fora

Each of the Expert Fora started as a Working Group. As resistance management practices for the chemistry involved in each Group is now well established and there is little or no current monitoring being done by the manufacturers, the maintenance of a full Working Group was considered unnecessary. However, as interest in resistance and its management for these areas of chemistry still remains, a smaller 'Expert Forum' was formed to act as a source of information and advice. Each member of a Forum has expert knowledge of the chemistry and all matters concerning resistance and its management.

Regional Groups

The FRAC Steering Committee and its Working Groups deal with resistance issues worldwide. The Fungicide Use Guidelines formulated by the Working Groups are designed to be effective for all the crops concerned.

The dissemination and implementation of advice within individual countries is, however, more successful when carried out by a country specific organisation. The FRAC Regional Groups perform this function. They each have their own management structure and frequently manage their own resistance monitoring campaigns. Resistance management guidelines may at times differ slightly from the FRAC WG ones, but in such cases are more strict and dictated by local circumstances.

The Regional FRAC Groups work very closely with the FRAC Working Groups and the Steering Committee.

FRAC liaison activities

FRAC is an inter-industry organisation. In several countries Resistance Action Groups (RAGs) have been established consisting of representatives from the government services, research institutes and industry in order to advise on national resistance issues. Such organisations exist in the UK (UK-FRAG), The Netherlands

(FRAG-NL), Australia (FRPMG) and the Nordic and Baltic regions (NORBARAG).

FRAC has excellent communication with such groups and information is passed freely between them and FRAC.

FRAC members sit on many international committees e.g. EPPO Resistance Panel, and have direct contact with such organisations as ECPA.



Puccinia recondita on wheat. Resistance is not a problem at present. Picture courtesy of BASF

FRAC Research activities

FRAC, either as the Steering Committee or the Working Groups, generally does not commission or sponsor research studies. Such activity is usually performed by the individual companies who then report the information back to FRAC. This includes all the industrial resistance monitoring campaigns and the associated studies on cross-resistance and mode of action at the biochemical and physiological levels. FRAC frequently sponsors scientific conferences and symposia based on fungicide resistance.

Local FRAC groups may commission research studies with third party co-operators.

FRAC Communication and Education Activities

The key communication route for all FRAC information is the website: **www.frac.info**

It is strongly recommended that all those with an interest in fungicide resistance should visit the site. It contains information relevant to the advisor, researcher and student. Selected parts of the site will be described here:

WG Pages and Expert Fora pages

Each Working Group has its own dedicated area. Here you will find the latest Guidelines on fungicide use for the crops concerned and much information on the fungicides and resistance phenomena relevant to that mode of action.

The Expert Forum pages contain a wealth of information relevant to the specific areas of chemistry.

FRAC Methods folders

The use of the correct methodology is crucial when conducting a resistance monitoring campaign and establishing the sensitivity of fungal isolates to a particular mode of action. These 'Methods' pages provide detailed information on approved methods for use with each area of chemistry covered by the Working Groups.

Publications pages

The Publications pages are the key information and educational pages provided by FRAC.

FRAC Code List®

The FRAC Code List includes the internationally accepted designations of commercial fungicides according to their mode of action, chemical grouping and resistance risk. This page is the most popular with visitors to the website and is updated on a regular basis.

FRAC Mode of Action Poster®

There is a link on the FRAC website to download a poster chart showing the molecular structures and respective codes of all fungicides included in the FRAC Code List.

The FRAC Monographs

Three monographs are currently available in the FRAC collection, each written by recognised experts.

Monograph 1:

Fungicide resistance in crop pathogens: How can it be managed? K J Brent and D W Hollomon

Monograph 2:

Fungicide Resistance: The assessment of risk. K J Brent and D W Hollomon

Monograph 3:

Sensitivity baselines in fungicide resistance research and management. P E Russell

The monographs are available as pdf downloads from the site. A CD containing all three monographs and hardcopies of monographs 1 and 2 are available from the FRAC Secretary, free of charge.

FRAC list of plant pathogenic organisms resistant to disease control agents

FRAC maintains a list of confirmed cases of resistant plant pathogens plus the key references concerned. Additions to the list are always welcome; please write to the Secretary.



Resistance management is vital for *Phytophthora infestans* on potato.

Picture courtesy of BASF

FRAC is a specialist
technical group of

