

Mode of Action Classification

IRAC

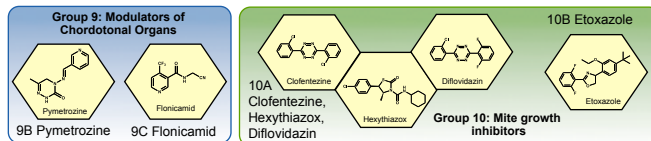
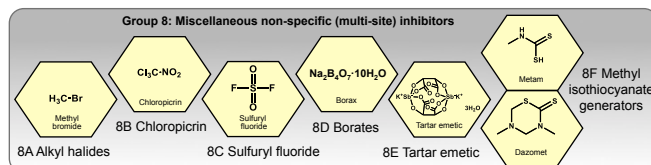
Insecticide Resistance Action Committee

The Key to Resistance Management

➤ Successive generations of a pest should not be treated with compounds from the same MoA Group.

➤ Not all of the current groupings are based on knowledge of a shared target protein. For further information, please refer to the IRAC Mode of Action Classification document.

➤ The color scheme used here associates modes of action into broad categories based on the physiological functions affected, as an aid to understanding symptomatology, speed of action and other properties of the insecticides, and not for any resistance management purpose. Rotations for resistance management should be based only on the numbered mode of action groups.



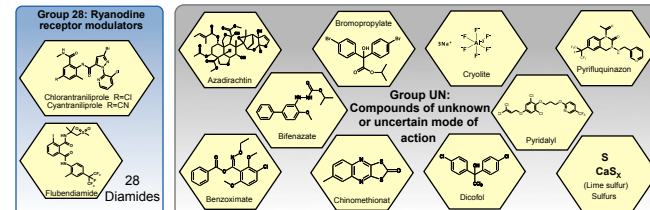
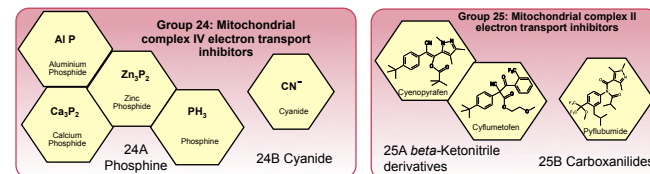
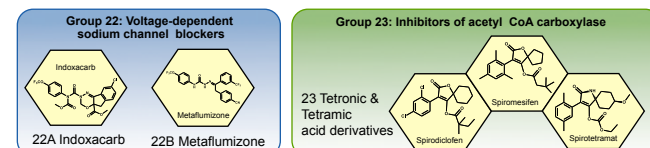
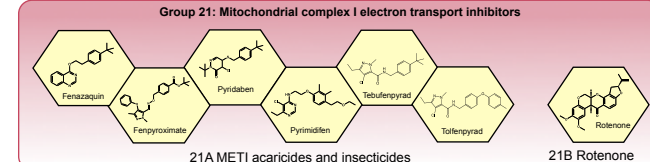
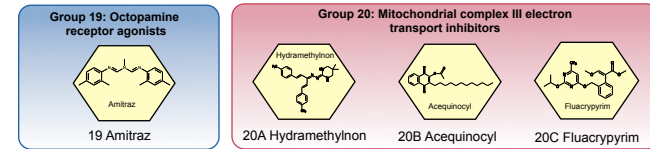
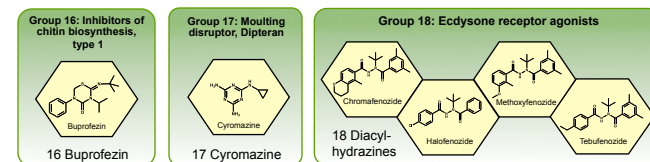
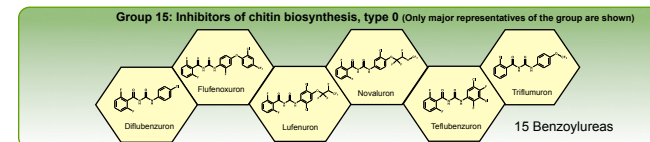
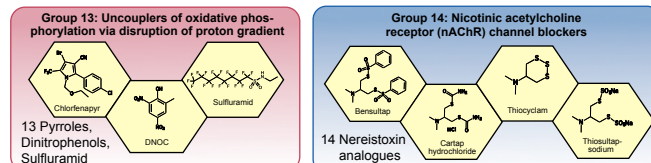
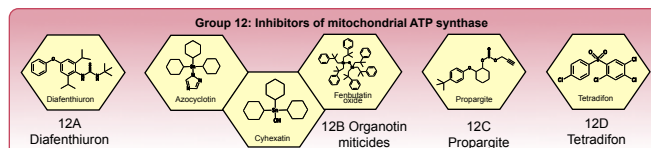
Group 11: Microbial disruptors of insect midgut

Includes transgenic crops expressing *Bacillus thuringiensis* toxins (however, specific guidance for resistance management of transgenic crops is not based on rotation of modes of action)

Different B.t. products that target different insect orders may be used together without compromising their resistance management. Rotation between certain specific B.t. microbial products may provide resistance management benefits for some pests. Consult product specific recommendations.

* Where there are differences among the specific receptors within the midguts of target insects, transgenic crops containing certain combinations of these proteins provide resistance management benefits.

11A *Bacillus thuringiensis* 11B *Bacillus sphaericus*



Targeted Physiology

- Nerve & Muscle
- Growth & Development
- Respiration
- Midgut
- Unknown or Non-specific

Use of Groups and Sub-Groups:

- Alternations, sequences or rotations of compounds between MoA groups reduces selection for target site resistance.
- Applications are arranged into MoA spray windows defined by crop growth stage and pest biology.
- Several sprays of a compound may be possible within each spray window, but successive generations of a pest should not be treated with compounds from the same MoA group.
- Local expert advice should always be followed with regard to spray windows and timing.
- Actives in groups 8 (Miscellaneous non-specific multi-site inhibitors), 13 (Uncouplers) and 14 are thought not to share a common target site and therefore may be freely rotated with each other unless there is reason to expect cross-resistance.
- Sub-groups represent distinct structural classes believed to have the same mode of action.

Sub-groups provide differentiation between compounds that may bind at the same target site but are structurally different enough that risk of metabolic cross-resistance is lower than for close chemical analogs.

Cross-resistance potential between sub-groups is higher than between groups, so rotation between sub-groups should be considered only when there are no alternatives, and only if cross-resistance does not exist, following consultation with local expert advice. These exceptions are not sustainable, and alternative options should be sought.

Sub-group 3B: DDT is no longer used in agriculture and therefore this is only applicable for the control of insect vectors of human disease, such as mosquitoes, because of a lack of alternatives.

Sub-group 10A - Hexythiazox is grouped with clofentezine because they exhibit cross-resistance even though they are structurally distinct, and the target site for these compounds is unknown. Diflovidazin has been added to this group because it is a close analogue of clofentezine and is expected to have the same mode of action.

Poster Notes:

- Groups 26 and 27 are unassigned.
- The poster is for educational purposes only. Information presented is accurate to the best of our knowledge at the time of publication, but IRAC or its member companies cannot accept responsibility for how this information is used or interpreted. Advice should always be sought from local experts or advisors, and health and safety recommendations followed.
- Representative compounds are shown. Please visit www.irc-online.org for the complete IRAC classification.

CropLife

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