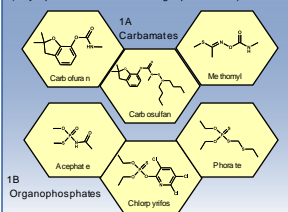


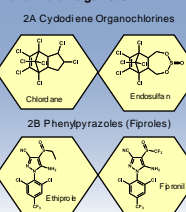
Key to Targeted Physiology

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

Group 1: Acetylcholinesterase (AChE) inhibitors

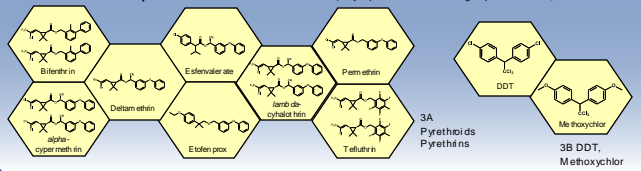


Group 2: GABA-gated chloride channel antagonists

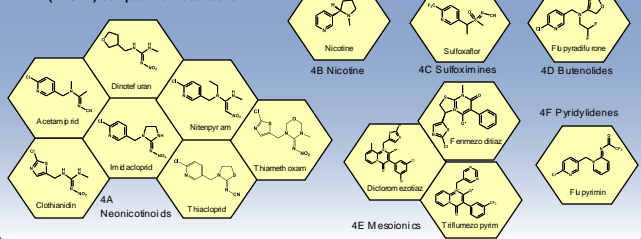


Group 3: Sodium channel modulators

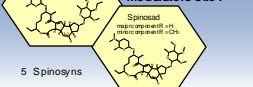
(Only representative actives of group 3A are shown)



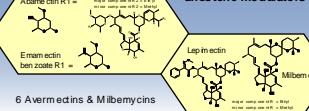
Group 4: Nicotinic acetylcholine receptor (nAChR) competitive modulators



Group 5: Nicotinic acetylcholine receptor (nAChR) allosteric modulators site I



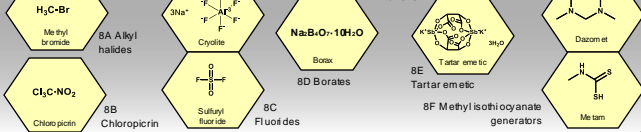
Group 6: Glutamate-gated chloride channel (GluCl) allosteric modulators



Group 7: Juvenile hormone receptor modulators



Group 8: Miscellaneous non-specific (multi-site) inhibitors



Use of Groups:

- Alternations, sequences or rotations of compounds between MoA groups reduce 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 on spray windows and timings should always be followed.
- Groups in the classification whose members do not act at a common target site are exempt from the prescription against rotation within the group (Group 8, 13 and all UN groups: UN, UNE, UNB, UNF, UNM, UNP & UNV).

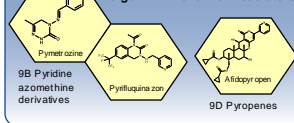
Use of Sub-Groups:

- Sub-groups represent distinct structural classes which are 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 analogues.
- 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 rotation advice. These exceptions are not sustainable, and alternative options should be sought.

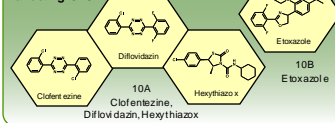
IRAC

Insecticide Resistance Action Committee Mode of Action Classification

Group 9: Chordotonal organ TRPV channel modulators



Group 10: Mite growth inhibitors affecting CHS1



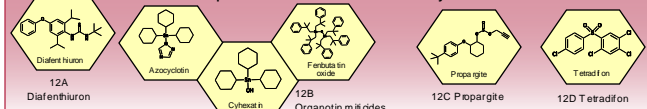
Group 11: Microbial disruptors of insect midgut membranes

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)

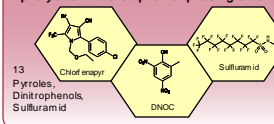
Rotation between certain specific *B.t.* microbial products may provide resistance management benefits for some pests. Consult product-specific recommendations.



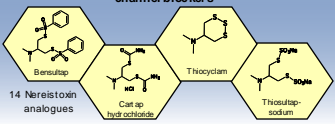
Group 12: Inhibitors of mitochondrial ATP synthase



Group 13: Uncouplers of oxidative phosphorylation via disruption of proton gradient

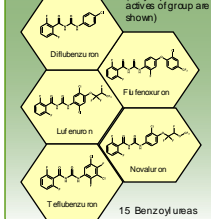


Group 14: Nicotinic acetylcholine receptor (nAChR) channel blockers

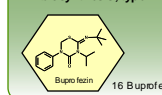


Group 15: Inhibitors of chitin biosynthesis affecting CHS1

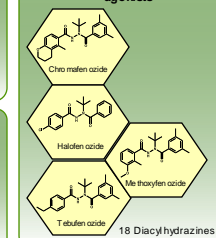
(Only representative actives of group are shown)



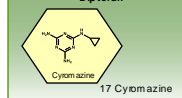
Group 16: Inhibitors of chitin biosynthesis, type 1



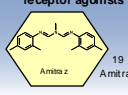
Group 18: Ecdysone receptor agonists



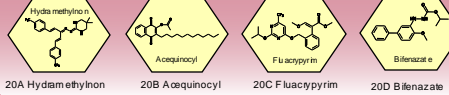
Group 17: Moulting disruptors, Dipiteran



Group 19: Octopamine receptor agonists

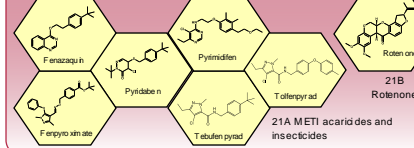


Group 20: Mitochondrial complex II electron transport inhibitors – Qo site

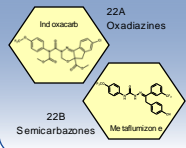


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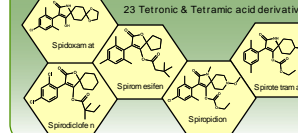
Group 21: Mitochondrial complex I electron transport inhibitors



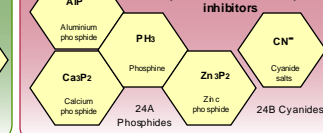
Group 22: Voltage-dependent sodium channel blockers



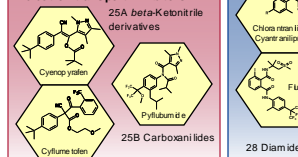
Group 23: Inhibitors of acetyl-CoA carboxylase



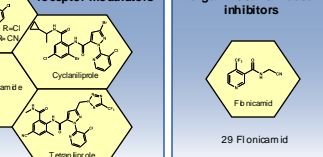
Group 24: Mitochondrial complex IV electron transport inhibitors



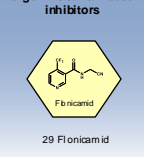
Group 25: Mitochondrial complex II electron transport inhibitors



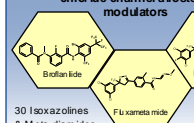
Group 28: Ryanodine receptor modulators



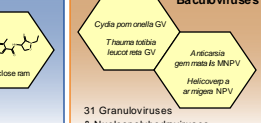
Group 29: Chordotonal organotinamidase inhibitors



Group 30: GABA-gated chloride channel allosteric modulators



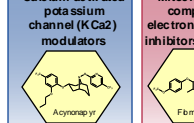
Group 31: Baculoviruses



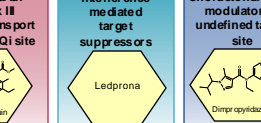
Group 32: Nicotinic acetylcholine receptor (nAChR) allosteric modulators site II



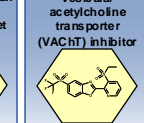
Group 33: Calcium-activated potassium channel (KCa2) modulators



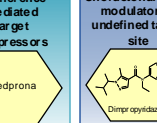
Group 34: Mitochondrial complex II electron transport inhibitors – Qi site



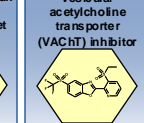
Group 35: RNA interference mediated target suppressors



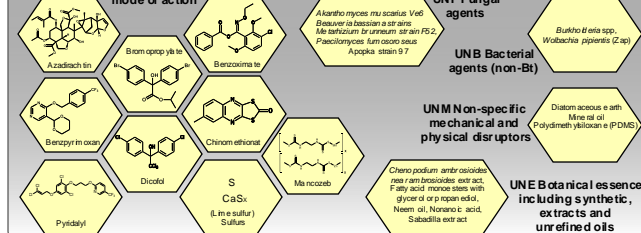
Group 36: Chordotonal organomodulators – undefined target site



Group 37: Nicotinic acetylcholine receptor (VAcHT) inhibitor



UN: Unknown or uncertain mode of action



Poster Notes:

- 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: Hexylthiazox is grouped with Clofentazine because they exhibit cross-resistance even though they are structurally distinct. Diflovidazin has been added to this group because it is a close analogue of Clofentazine and is expected to have the same mode of action.
- Group 20: While there is strong evidence that Bifenazate acts on the Qo site of Mitochondrial Complex II and some Bifenazate resistance mutations confer cross-resistance to Acetquinylol, the sites of action of Fluacrypyrim and Hydramethylnon have not been determined.
- In some cases, only representative actives are shown.
- Because of documented cross-resistance between Difenazate, Bemproflorfen and Abamectin, these active ingredients should not be rotated after each other in an IRM program.

