Mode of Action Classification

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 symptomology, 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.

Guidance on the use of Sub-Groups:
- 4A, 4B, 4C, 4D: Although these compounds are believed to have the same target site, current evidence indicates that the risk of metabolic cross-resistance between sub-groups is low.
- 13A, 13B, 13C: These analogues of pyrethrins are grouped with pyrethroids because they exhibit cross-resistance even though they are structurally distinct. Rotational use of pyrethroids and Deltamethrin has been added to this group because it is a close analogue of chlorinated hydrocarbons and is assumed to have the same mode of action.
- 13A, 13B, 13C: Although these compounds have the same target site, they have been subgrouped because they are chemically distinct, and current evidence indicates that the risk of metabolic cross-resistance is low. Adverse in group 13B Miteicides non-specific mode of action treated with chemicals from the same MoA Group (at the target site). They should always be rotated to a different target site to control the pest population.
- For further information visit the IRAC website: www.irac-online.org

Targeted Physiology

Inhibitors of Choline Esterase (AChE) inhibitors (only major representatives of the groups are shown)
- Acetylcholinesterase (AChE) inhibitors
- 1A Carbamates
- 1B Organophosphates
- Group 2: GABA-gated chloride channel antagonists
- 2A Cyclicloethernetanes
- 2B Phenoxyphorazides (Furinics)
- Group 3: Sodium channel modulators (only major representatives of group 3A are shown)
- 3A Neonicotinoides
- 3B DDT, Malathionchloror
- Group 4: Nicotinic acetylcholine receptor (nAChR) agonists
- 4A Nicotinic agonists
- 4B Neonicotinoids
- 4D Flupyradifurine
- Group 5: Nicotinic acetylcholine receptor (nAChR) allosteric modulators
- 5 Siphonys
- 6 Avesparcs, MBBamides
- Group 6: Chloride channel activators
- 6B Pyrethroids

Group 7: Juvenile hormone mimics
- 7A Juvenile hormone analogues
- 7B Fenoxycarb
- 7C Pyriproxifen

Group 8: Miscellaneous non-specific (multi-site) inhibitors
- 8A Alkyl halides
- 8B Chloroacetanilides
- 8C Sulfonyl fluorides
- 8D Borates
- 8E Tartrate emetics

Group 9: Modulators of Chondralional Organs
- 9A Organophosphates
- 9B Pyrrolines
- 9C Furanilides
- 9D Pyridines
- 9E Thiazoles
- 9F Thiazolines

Group 10: Mite growth inhibitors
- 10A Chlorothiazoles
- 10B Ethiozate

Group 11: Microbial disruptors
- 11A Bacillus thuringiensis
- 11B Bacillus sphaericus

Group 12: Inhibitors of mitochondrial ATP synthase
- 12A Dafledinbromide
- 12B Organtox micotins
- 12C Propane
- 12D Tadacil

Group 13: Insecticides of oxidative phosphorylation via disruption of proton gradient
- 13A Pyrethroids, Dimethoprop, Sulfururad
- 13B Pyrimidines, Dithiopyr, Simazin

Group 14: Nicotinic acetylcholine receptor (nAChR) channel blockers
- 14 Aminoantin analogues

Group 15: Inhibitors of chitin biosynthesis, type 5 (only major representatives of the groups are shown)
- 15B Rotenone
- 15C Phosphide

Group 16: Inhibitors of chitin biosynthesis, type 1
- 16A Inhibitors of acetyl-CoA carboxylase
- 16B Inhibitors of farnesyl diphosphate synthase

Group 17: Modulating disruptor, Dipherotoxins
- 17 Cyamazine

Group 18: Cyclodinene receptor antagonists
- 18 Dicyphthines

Group 19: Octopamine receptor agonists
- 19 Amidraz

Group 20: Mitochondrial complex I electron transport inhibitors
- 20A Hydroxyurea
- 20B Acepyrine

Group 21: Mitochondrial complex I electron transport inhibitors
- 21A Stearic acid and insecticides
- 21B Rosentine

Group 22: Voltage-dependent sodium channel blockers
- 22A Indoxacarb
- 22B Metgamiflurine

Group 23: Inhibitors of acetyl-CoA carboxylase
- 23 Tetrone & Saracenic acid derivatives

Group 24: Mitochondrial complex IV electron transport inhibitors
- 24A Pulegone
- 24B Pyridazine

Group 25: Mitochondrial complex II electron transport inhibitors
- 25B Beta-Ketoaldehyde derivatives

Group 26: Mitochondrial complex III electron transport inhibitors
- 26A Hydroxycinnamic acid

Group 27: Mitochondrial complex V electron transport inhibitors
- 27B Nucleoside

Group UN: Compounds of unknown or uncertain mode of action
- 28 Diamines

Poster Notes:
- Groups 30 and 27 are unassigned.
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