CropLife Australia Insecticide Resistance Management Review Group
Mode of Action Classification for Insecticides – Valid as at 22 June 2018

Main Mode of Action Group and Primary Site of Action	Chemical Sub-group or Exemplifying Active Constituent	Active Constituents[1]
1* **Acetylcholinesterase inhibitors** Nerve action	**1A** Carbamates*	Bendiocarb Carbaryl Carbofuran Carbosulfan Methiocarb Methomyl Oxamyl Pirimicarb Propoxur Thiodicarb
** all members of this class may not be cross resistant*	**1B** Organophosphates*	Acephate Azamethiphos Azinphos methyl Cadusafos Chlorfenvinphos Chlorpyrifos Chlorpyrifos-methyl Diazinon Dichlorvos Dimethoate Ethion Fenamiphos Fenitrothion Fenthion Maldison (malathion) Methidathion Mevinphos Omethoate Phorate Phosmet Pirimiphos-methyl Profenofos Prothiofos Temephos Terbufos Trichlorfon
2 **GABA-gated chloride channel blockers** Nerve action	**2A** Cyclodiene organochlorines	No registered actives
	2B Phenylpyrazoles (Fiproles)	Fipronil

[1] *Refer APVMA website (www.apvma.gov.au) to obtain complete list of registered products from the PUBCRIS database*

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3 **Sodium channel modulators** Nerve action	**3A** Pyrethroids Pyrethrins	Allethrin Alpha-cypermethrin Beta-cyfluthrin Bifenthrin Bioallethrin Bioresmethrin Cyfluthrin Cypermethrin Cyphenothrin Deltamethrin Esbiothrin Esfenvalerate Fenvalerate Flumethrin Gamma-cyhalothrin Imiprothrin Lambda-cyhalothrin Permethrin Prallethrin Pyrethrins Tau-fluvalinate Tetramethrin Transfluthrin Zeta-cypermethrin
	3B *No registered actives in Australia*	*No registered actives in Australia*
4 **Nicotinic acetylcholine receptor (nAChR) competitive modulators** Nerve action	**4A** Neonicotinoids	Acetamiprid Clothianidin Dinotefuran Imidacloprid Thiacloprid Thiamethoxam
	4B *Nicotine*	*No registered actives in Australia*
	4C Sulfoximine	Sulfoxaflor
5 **Nicotinic Acetylcholine receptor allosteric modulators (nAChR)** Nerve action	Spinosyns	Spinosad Spinetoram
6 **Glutamate-gated Chloride (GluCl) channel allosteric modulators** Nerve action	Avermectins Milbemycins	Abamectin, Emamectin benzoate Milbemectin
7 **Juvenile hormone mimics** Growth regulation	**7A** Juvenile hormone analogues	Methoprene
	7B Fenoxycarb	Fenoxycarb
	7C Pyriproxyfen	Pyriproxyfen

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8 **Miscellaneous non-specific (multi-site) inhibitors-**	**8A** Alkyl halides	Methyl bromide
	8B Chloropicrin	Chloropicrin
	8C Fluorides	Sulfuryl fluoride
9 **Chordotonal organ TRPV channel modulators** Nerve Action	**9B** Pyridine azomethine derivatives	Pymetrozine
	9D **Pyropenes**	Afidopyropen
10 **Mite growth inhibitors** Growth regulation	**10A** Clofentezine Hexythiazox	Clofentezine Hexythiazox
	10B Etoxazole	Etoxazole
11 **Microbial disrupters of insect midgut membranes** (includes transgenic crops expressing *Bacillus thuringiensis* toxins)	***11A*** *Bacillus thuringiensis* and the insecticidal proteins they produce.	*Bacillus thuringiensis* subsp. *israelensis* *B. thuringiensis* subsp. *aizawai* *B. thuringiensis* subsp. *kurstaki* B. thuringiensis *subsp*. tenebrionis B.t. crop proteins: Cry1Ac Cry2Ab Cry1F Vip3A
	11B *B. sphaericus* and the insecticidal proteins they produce	*Bacillus sphaericus*
12 **Inhibitors of mitochondrial ATP synthase** Energy metabolism	**12A** Diafenthiuron	Diafenthiuron
	12B Organotin miticides	Fenbutatin oxide
	12C Propargite	Propargite
	12D Tetradifon	Tetradifon
13 **Uncoupler of oxidative phosphorylation via disruption of the proton gradient** Energy metabolism	Chlorfenapyr	Chlorfenapyr
14 **Nicotinic acetylcholine receptor channel blockers** Nerve action	Nereistoxin analogues	*No registered actives in Australia*

Main Mode of Action Group and Primary Site of Action	**Chemical Sub-group or Exemplifying Active Constituent**	**Active Constituents**[1]
15 **Inhibitors of chitin biosynthesis, type 0,** Growth regulation	Benzoylureas	Bistrifluron Chlorfluazuron Diflubenzuron Flufenoxuron Hexaflumuron Lufenuron Novaluron Triflumuron
16 **Inhibitors of chitin biosynthesis, type 1** Growth regulation	Buprofezin	Buprofezin
17 **Moulting disruptor, Dipteran** Growth regulation	Cyromazine	Cyromazine
18 **Ecdysone receptor agonists** Growth regulation	Diacylhydrazines	Methoxyfenozide Tebufenozide
19 **Octopamine receptor agonists** Nerve action	Amitraz	Amitraz
20 **Mitchondrial complex III electron transport inhibitors** Energy metabolism	**20A** Hydramethylnon	Hydramethylnon
	20B *No registered actives in Australia*	*No registered actives in Australia*
	20C *No registered actives in Australia*	*No registered actives in Australia*
	20D Bifenazate	Bifenazate
21 **Mitchondrial complex I electron transport inhibitors** Energy metabolism	**21A** METI acaricides and insecticides	Fenpyroximate Pyridaben Tebufenpyrad
	21B Rotenone	Rotenone (Derris)
22 **Voltage-dependent sodium channel blockers** Nerve action	**22A** Oxadiazines	Indoxacarb
	22B Semicarbazones	metaflumizone
23 **Inhibitors of acetyl CoA carboxylase** Lipid synthesis, growth regulation	Tetronic and Tetramic acid derivatives	Spirotetramat

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24 **Mitochondrial complex IV electron transport inhibitors** Energy metabolism	**24A** Phosphides	Phosphine Aluminium phosphide Magnesium phosphide
	24B *Cyanides*	*No registered actives in Australia*
25 **Mitochondrial complex II electron transport inhibitors** Energy metabolism	**25A** Beta-ketonitrile derivatives	*No registered actives in Australia*
	25B Carboxanilides	*No registered actives in Australia*
28 **Ryanodine receptor modulators** Nerve and muscle action	Diamides	Chlorantraniliprole Cyantraniliprole Flubendiamide
29 **Chordotonal organ modulators – undefined target site** Nerve action	Flonicamid	Flonicamid
UN Compounds of unknown or uncertain mode of action[2]	Azadirachtin	Azadirachtin
	Dicofol	Dicofol
	Lime sulphur	Lime sulphur
	Sulphur	Sulphur

[2] *A compound with an unknown or controversial mode of action or an unknown mode of toxicity will be held in group 'un' until evidence becomes available to enable that compound to be assigned to a more appropriate mode of action group.*

Active Constituent	Current Group	Active Constituent	Current Group
Abamectin	**6**	Fipronil	**2B**
Acephate	**1B**	Flonicamid	**29**
Acetamiprid	**4A**	Flubendiamide	**28**
Afidopyropen	**9D**	Flufenoxuron	**15**
Allethrin	**3A**	Flumethrin	**3A**
Alpha-cypermethrin	**3A**	Gamma-cyhalothrin	**3A**
Aluminium phosphide	**24A**	Hexaflumuron	**15**
Amitraz	**19**	Hexythiazox	**10A**
Azadirachtin	**UN**	Hydramethylnon	**20A**
Azamethiphos	**1B**	Imidacloprid	**4A**
Azinphos methyl	**1B**	Imiprothrin	**3A**
Bacillus thuringiensis aizawai	**11**	Indoxacarb	**22A**
Bacillus thuringiensis israelensis	**11**	Lambda-cyhalothrin	**3A**
Bacillus thuringiensis kurstaki	**11**	Lufenuron	**15**
Bacillus sphaericus	**11**	Magnesium phosphide	**24A**
Bacillus thuringiensis tenebrionis	**11**	Maldison (malathion)	**1B**
Bendiocarb	**1A**	Metaflumizone	**22B**
Beta-cyfluthrin	**3A**	Methidathion	**1B**
Bifenazate	**20**	Methiocarb	**1A**
Bifenthrin	**3A**	Methomyl	**1A**
Bioallethrin	**3A**	Methoprene	**7A**
Bioresmethrin	**3A**	Methoxyfenozide	**18**
Bistrifluron	**15**	Methyl bromide	**8A**
Buprofezin	**16**	Mevinphos	**1B**
Cadusafos	**1B**	Milbemectin	**6**
Carbaryl	**1A**	Oxamyl	**1A**
Carbofuran	**1A**	Omethoate	**1B**
Carbosulfan	**1A**	Permethrin	**3A**
Chlorantraniliprole	**28**	Phorate	**1B**
Chlorfenvinphos	**1B**	Phosmet	**1B**
Chlorfluazuron	**15**	Phosphine	**24A**
Chlorfenapyr	**13**	Pirimicarb	**1A**
Chloropicrin	**8B**	Pirimiphos-methyl	**1B**
Chlorpyrifos	**1B**	Prallethrin	**3A**
Chlorpyrifos-methyl	**1B**	Profenofos	**1B**
Clofentezine	**10A**	Propargite	**12C**
Clothianidin	**4A**	Propoxur	**1A**
Cyantraniliprole	**28**	Prothiofos	**1B**
Cyfluthrin	**3A**	Pymetrozine	**9B**
Cypermethrin	**3A**	Pyrethrins	**3A**
Cyromazine	**17**	Pyridaben	**21A**
Deltamethrin	**3A**	Pyriproxyfen	**7C**
Diafenthiuron	**12A**	Spinosad	**5**
Diazinon	**1B**	Spinetoram	**5**
Dichlorvos	**1B**	Spirotetramat	**23**
Dicofol	**UN**	Sulfoxaflor	**4C**
Diflubenzuron	**15**	Tau-fluvalinate	**3A**
Dimethoate	**1B**	Tebufenozide	**18**
Dinotefuran	**4A**	Tebufenpyrad	**21A**
Emamectin benzoate	**6**	Temephos	**1B**
Esbiothrin	**3A**	Terbufos	**1B**
Ethion	**1B**	Tetradifon	**12D**
Etoxazole	**10B**	Tetramethrin	**3A**

Esfenvalerate	**3A**	Thiacloprid	**4A**
Fenamiphos	**1B**	Thiamethoxam	**4A**
Fenbutatin oxide	**12B**	Thiodicarb	**1A**
Fenitrothion	**1B**	Transfluthrin	**3A**
Fenoxycarb	**7B**	Trichlorfon	**1B**
Fenpyroximate	**21A**	Triflumuron	**15**
Fenthion	**1B**		
Fenvalerate	**3A**	Zeta-cypermethrin	**3A**