

**CropLife Australia Insecticide Resistance Management Review Group
Mode of Action Classification for Insecticides**

(As registered with the APVMA on 24 June 2009 and endorsed by CropLife 15 September 2009)

Main Mode of Action Group and Primary Site of Action	Chemical Sub-group or Exemplifying Active Constituent	Active Constituents
1* Acetylcholinesterase inhibitors Nerve action <i>* all members of this class may not be crossresistant</i>	1A Carbamates*	Aldicarb Bendiocarb Carbaryl Carbofuran Carbosulfan Methiocarb Methomyl Oxamyl Pirimicarb Propoxur Thiodicarb
	1B Organophosphates*	Acephate Azamethiphos Azinphos methyl Cadusafos Chlorfenvinphos Chlorpyrifos Chlorpyrifos-methyl Diazinon Dichlorvos Dimethoate Disulfoton Ethion Fenamiphos Fenitrothion Fenthion Maldison (malathion) Methamidophos Methidathion Mevinphos Omethoate Parathion-methyl Phorate Phosmet Pirimiphos-methyl Profenofos Prothiofos Temephos Terbufos Trichlorfon
2 GABA-gated chloride channel antagonists Nerve action	2A Cyclodiene organochlorines	Endosulfan
	2B Phenylpyrazoles (Fiproles)	Fipronil

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Advice given in this strategy is valid as at 15 September 2009. All previous versions of this strategy are now invalid.

Main Mode of Action Group and Primary Site of Action	Chemical Sub-group or Exemplifying Active Constituent	Active Constituents
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 <i>No registered actives</i>	<i>No registered actives</i>
4 Nicotinic acetylcholine receptor agonists Nerve action	4A Neo-nicotinoids	Acetamiprid Clothianidin Imidacloprid Thiacloprid Thiamethoxam
	4B <i>No registered actives</i>	<i>No registered actives</i>
5 Nicotinic Acetylcholine receptor allosteric activators Nerve action	Spinosyns	Spinosad Spinetoram
6 Chloride channel activators Nerve action	Avermectins Milbemycins	Abamectin, Emamectin benzoate, Milbemycin
7 Juvenile hormone mimics Growth regulation	7A Juvenile hormone analogues	Methoprene
	7B Fenoxycarb	Fenoxycarb
	7C Pyriproxyfen	Pyriproxyfen

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Main Mode of Action Group and Primary Site of Action	Chemical Sub-group or Exemplifying Active Constituent	Active Constituents
8 Miscellaneous non-specific (multi-site) inhibitors-	8A Alkyl halides	Methyl bromide
	8B Chloropicrin	Chloropicrin
	8C Sulfuryl fluoride	Sulfuryl fluoride
9 Selective Homopteran feeding blockers	9A <i>No registered actives</i>	<i>No registered actives</i>
	9B Pymetrozine	Pymetrozine
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 <i>Bacillus thuringiensis</i> toxins)	<i>Bacillus thuringiensis</i> or <i>B. sphaericus</i> and the insecticidal proteins they produce.	<i>Bacillus thuringiensis</i> subsp. <i>israelensis</i> <i>Bacillus sphaericus</i> <i>B. thuringiensis</i> subsp. <i>aizawai</i> * <i>B. thuringiensis</i> subsp. <i>kurstaki</i> <i>B. thuringiensis</i> subsp. <i>tenebrionis</i> B.t. crop proteins: Cry1Ac Cry2Ab
12 Inhibitors of mitochondrial ATP synthase Energy metabolism	12A Diafenthuron	Diafenthuron
	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	<i>No registered actives</i>	<i>No registered actives</i>

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15 Inhibitors of chitin biosynthesis, type 0, Lepidopteran Growth regulation	Benzoylureas	Chlorfluazuron Diflubenzuron Hexaflumuron Lufenuron Triflumuron
16 Inhibitors of chitin biosynthesis, type 1, Homopteran 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 Mitochondrial complex III electron transport inhibitors (coupling site II) Energy metabolism	20A Hydramethylnon	Hydramethylnon
	20B <i>No registered actives</i>	<i>No registered actives</i>
	20C <i>No registered actives</i>	<i>No registered actives</i>
21 Mitochondrial complex I electron transport inhibitors Energy metabolism	21A METI acaricides	Fenpyroximate Pyridaben Tebufenpyrad
	21B Rotenone	Rotenone
22 Voltage-dependent sodium channel blockers Nerve action	22A Indoxacarb	Indoxacarb
	22B <i>No registered actives</i>	<i>No registered actives</i>
23 Inhibitors of acetyl CoA carboxylase Lipid synthesis, growth regulation	<i>No registered actives</i>	<i>No registered actives</i>

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Main Mode of Action Group and Primary Site of Action	Chemical Sub-group or Exemplifying Active Constituent	Active Constituents
24 Mitochondrial complex IV electron transport inhibitors	24A Phosphine	Phosphine Aluminium phosphide Magnesium phosphide
Energy metabolism	24B <i>No registered actives</i>	<i>No registered actives</i>
25 Vacant		
26 Vacant		
27 Vacant		
28 Ryanodine receptor modulators Nerve and muscle action	Diamides	Chlorantranilprole Flubendiamide
UN Compounds of unknown or uncertain mode of action ¹	Azadirachtin	Azadirachtin
	Bifenazate	Bifenazate
	Dicofol	Dicofol

¹ 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.

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CropLife Australia Insecticide Resistance Management Review Group

Mode of Action Group Classification for Insecticides Active Constituent List – valid as at 15 September 2009

Note: Active constituents shown in red have changed Mode of Action Group or are new since September 2008.

Active Constituent	Old Group	Current Group	Active Constituent	Old Group	Current Group
Abamectin	6A	6	Fenvalerate	3A	3A
Acephate	1B	1B	Fipronil	2C	2B
Acetamiprid	4A	4A	Flubendiamide	28	28
Aldicarb	1A	1A	Flumethrin	3A	3A
Allethrin	3A	3A	Gamma-cyhalothrin	3A	3A
Alpha-cypermethrin	3A	3A	Hexaflumuron	15A	15
Aluminium phosphide	8B	24A	Hexythiazox	10A	10A
Amitraz	19A	19	Hydramethylnon	20A	20A
Azadirachtin	22A	UN	Imidacloprid	4A	4A
Azamethiphos	1B	1B	Imiprothrin	3A	3A
Azinphos methyl	1B	1B	Indoxacarb	22A	22A
<i>Bacillus thuringiensis aizawai</i>	11C	11	Lambda-cyhalothrin	3A	3A
<i>Bacillus thuringiensis israelensis</i>	11B	11	Lufenuron	15A	15
<i>Bacillus thuringiensis kurstaki</i>	11C	11	Magnesium phosphide	8B	24A
<i>Bacillus sphaericus</i>	11D	11	Maldison (malathion)	1B	1B
<i>Bacillus thuringiensis tenebrionis</i>	11A	11	Methamidophos	1B	1B
Bendiocarb	1A	1A	Methidathion	1B	1B
Beta-cyfluthrin	3A	3A	Methiocarb	1A	1A
Bifenazate	2D	UN	Methomyl	1A	1A
Bifenthrin	3A	3A	Methoprene	7A	7A
Bioallethrin	3A	3A	Methoxyfenozide	16A	18
Bioresmethrin	3A	3A	Methyl bromide	8A	8A
Buprofezin	17A	16	Mevinphos	1B	1B
Cadusafos	1B	1B	Milbemycin	6B	6
Carbaryl	1A	1A	Oxamyl	1A	1A
Carbofuran	1A	1A	Omethoate	1B	1B
Carbosulfan	1A	1A	Parathion-methyl	1B	1B
Chlorantraniliprole	28	28	Permethrin	3A	3A
Chlorfenvinphos	1B	1B	Phorate	1B	1B
Chlorfluazuron	15A	15	Phosmet	1B	1B
Chlorfenapyr	13A	13	Phosphine	8B	24A
Chloropicrin	8A	8B	Pirimicarb	1A	1A
Chlorpyrifos	1B	1B	Pirimiphos-methyl	1B	1B
Chlorpyrifos-methyl	1B	1B	Prallethrin	3A	3A
Clofentezine	10A	10A	Profenofos	1B	1B
Clothianidin	4A	4A	Propargite	14A	12C
Cyfluthrin	3A	3A	Propoxur	1A	1A
Cypermethrin	3A	3A	Prothiofos	1B	1B
Cyromazine	18A	17	Pymetrozine	9A	9B
Deltamethrin	3A	3A	Pyrethrins	3A	3A
Diafenthiuron	12B	12A	Pyridaben	21A	21A
Diazinon	1B	1B	Pyriproxyfen	7C	7C
Dichlorvos	1B	1B	Rotenone	21A	21B
Dicofol	2B	UN	Spinosad	5A	5
Diflubenzuron	15A	15	Spinetoram	5A	5
Dimethoate	1B	1B	Tau-fluvalinate	3A	3A
Disulfoton	1B	1B	Tebufenozide	16A	18
Emamectin benzoate	6A	6	Tebufenpyrad	21A	21A
Endosulfan	2A	2A	Temephos	1B	1B
Esbiothrin	3A	3A	Terbufos	1B	1B
Ethion	1B	1B	Tetradifon	2B	12D
Etoxazole	10A	10B	Tetramethrin	3A	3A
Esfenvalerate	3A	3A	Thiacloprid	4A	4A
Fenamiphos	1B	1B	Thiamethoxam	4A	4A
Fenbutatin oxide	12A	12B	Thiodicarb	1A	1A
Fenitrothion	1B	1B	Transfluthrin	3A	3A
Fenoxycarb	7B	7B	Trichlorfon	1B	1B
Fenpyroximate	21A	21A	Triflumuron	15A	15
Fenthion	1B	1B	Zeta-cypermethrin	3A	3A

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