Mode of Action Classification for Insecticides

Main Mode of Action Group Primary Site of Action	**Chemical sub-group of Exemplifying Active Constituent**	**Active Constituents**
1* **Acetylcholinesterase inhibitors** Nerve action	**1A** Carbamates*	Bendiocarb Carbaryl Carbofuran Carbosulfan Methiocarb Methomyl Oxamyl Pirimicarb Propoxur Thiodicarb
	1B Organophosphates*	Acephate Azamethiphos Azinphos methyl Cadusafos Chlorfenvinphos Chlorpyrifos Chlorpyrifos-methyl Diazinon Dichlorvos Dimethoate Ethion Fenamiphos Fenitrothion Fenthion Maldison (malathion) Methidathion Mevinphos Omethoate

cont. **1*** **Acetylcholinesterase inhibitors** Nerve action	cont. **1B** Organophosphates*	Phorate Phosmet Pirimiphos-methyl Profenofos Prothiofos Temephos Terbufos Trichlorfon
2 **GABA-gated chloride channel blockers** Nerve action	**2A** Cyclodiene organochlorines	*No registered active constituents*
	2B Phenylpyrazoles (Fiproles)	Fipronil
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 active constituents in Australia*

4 **Nicotinic acetylcholine receptor (nAChR) competitive modulators** Nerve action	**4A** Neonicotinoids	Acetamiprid Clothianidin Dinotefuran Imidacloprid Thiacloprid Thiamethoxam
	4B Nicotine	*No registered active constituents in Australia*
	4C Sulfoximine	Sulfoxaflor
	4D Butenolides	Flupyradifurone
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

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. thuringiensis* crop proteins: Cry1Ac Cry2Ab Cry1F Vip3A
	11B *Bacillus 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 active constituents in Australia*
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 **Mitochondrial complex III electron transport inhibitors** Energy metabolism	**20A** Hydramethylnon	Hydramethylnon
	20B Acequinocyl	*Acequinocyl*
	20C	*No registered active constituents in Australia*
	20D Bifenazate	Bifenazate
21 **Mitochondrial 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 Tetramic acid derivatives	Spirotetramat
24 **Mitochondrial complex IV electron transport inhibitors** Energy metabolism	**24A** Phosphides	Phosphine Aluminium phosphide Magnesium phosphide
	24B Cyanides	*No registered active constituents in Australia*
25 **Mitochondrial complex II electron transport**	**25A** Beta-ketonitrile derivatives	*Cyflumetofen*
	25B	*No registered active constituents in*

inhibitors Energy metabolism	Carboxanilides	*Australia*
28 **Ryanodine receptor modulators** Nerve and muscle action	Diamides	Chlorantraniliprole Cyantraniliprole Cyclaniliprole Flubendiamide Tetraniliprole
29 **Chordotonal organ modulators – undefined target site** Nerve action	Flonicamid	Flonicamid
30 **GABA-gated chloride channel allosteric modulators** Nerve action	Meta-diamides Isoxazolines	Broflanilide Isocycloseram
31 **Baculoviruses** Host-specific occluded pathogenic viruses (Midgut epithelial columnar cell membrane target site – undefined)	Granuloviruses (GVs)	*Cydia pomonella* granulosis virus strain V22
	Nucleopolyhedroviruses (NPVs)	Polyhedral occlusion bodies of the NPV of *Helicoverpa zea or H. armigera*
32 Nicotinic acetylcholine receptor (NACHR) allosteric modulators Site II	GS-omega/kappa HXTX-Hv1a peptid	*No registered active constituents in Australia*
33 Calcium-activated potassium channel (KCA2) modulators	Acynonapyr	*No registered active constituents in Australia*

34 Mitochondrial Complex III transport inhibitors – QI Site	Flometoquin	*No registered active constituents in Australia*
36 Chordotonal organ modulators – undefined target site	Dimpropyridaz	Dimpropyridaz
UN Compounds of unknown or uncertain mode of action[2]	Azadirachtin	Azadirachtin
	Beauveria bassiana	*Beauveria bassiana*
	Clitoria ternatea extract	*Clitoria ternatea* extract
	Dicofol	Dicofol
	Lime sulphur	Lime sulphur
	Sulphur	Sulphur
UNM Non-specific mechanical and physical disruptors	Diatomaceous earth	Diatomaceous earth

**All members of the class may not be cross resistant.*

[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.*

Mode of Action Classification for Insecticides - Active Constituent List

Active constituent	Current Group	Active constituent	Current Group
Abamectin	6	Fenthion	1B
Acephate	1B	Fenvalerate	3A
Acequinocyl	20B	Fipronil	2B
Acetamiprid	4A	Flonicamid	29
Afidopyropen	9D	Flubendiamide	28
Allethrin	3A	Flufenoxuron	15
Alpha-cypermethrin	3A	Flumethrin	3A
Aluminium phosphide	24A	Gamma-cyhalothrin	3A
Amitraz	19	Hexaflumuron	15
Azadirachtin	UN	Hexythiazox	10A
Azamethiphos	1B	Hydramethylnon	20A
Azinphos methyl	1B	Imidacloprid	4A
Bacillus thuringiensis aizawai	11	Imiprothrin	3A
Bacillus thuringiensis israelensis	11	Indoxacarb	22A
Bacillus thuringiensis kurstaki	11	Isocycloseram	30
Bacillus sphaericus	11	Lambda-cyhalothrin	3A
Bacillus thuringiensis tenebrionis	11	Lufenuron	15
Beauveria bassiana	UN	Magnesium phosphide	24A
Bendiocarb	1A	Maldison (malathion)	1B
Beta-cyfluthrin	3A	Metaflumizone	22B
Bifenazate	20	Methidathion	1B

Bifenthrin	3A	Methiocarb	1A
Bioallethrin	3A	Methomyl	1A
Bioresmethrin	3A	Methoprene	7A
Bistrifluron	15	Methoxyfenozide	18
Broflanilide	30	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	Polyhedral occlusion bodies of the NPV of *Helicoverpa zea or H. armigera*	31
Chloropicrin	8B	Pirimicarb	1A
Chlorpyrifos	1B	Pirimiphos-methyl	1B
Chlorpyrifos-methyl	1B	Prallethrin	3A
Clitoria ternatea extract	UN	Profenofos	1B
Clofentezine	10A	Propargite	12C
Clothianidin	4A	Propoxur	1A
Cyantraniliprole	28	Prothiofos	1B
Cyclaniliprole	28	Pymetrozine	9B
Cydia pomonella granulosis virus strain V22	31	Pyrethrins	3A
Cyflumetofen	25B	Pyridaben	21A

Cyfluthrin	3A	Pyriproxyfen	7C
Cypermethrin	3A	Spinosad	5
Cyromazine	17	Spinetoram	5
Deltamethrin	3A	Spirotetramat	23
Diafenthiuron	12A	Sulfoxaflor	4C
Diazinon	1B	Tau-fluvalinate	3A
Dichlorvos	1B	Tebufenozide	18
Dicofol	UN	Tebufenpyrad	21A
Diflubenzuron	15	Temephos	1B
Dimethoate	1B	Terbufos	1B
Dimpropyridaz	36	Tetradifon	12D
Dinotefuran	4A	Tetramethrin	3A
Emamectin benzoate	6	Thiacloprid	4A
Esbiothrin	3A	Thiamethoxam	4A
Ethion	1B	Thiodicarb	1A
Etoxazole	10B	Transfluthrin	3A
Esfenvalerate	3A	Trichlorfon	1B
Fenamiphos	1B	Triflumuron	15
Fenbutatin oxide	12B	Zeta-cypermethrin	3A
Fenitrothion	1B		
Fenoxycarb	7B		
Fenpyroximate	21A		