Insecticide and miticide mode-of-action classification (v. 3.3, October 2003) developed by the Insecticide Resistance Action Committee (IRAC)

Group	Primary Target Site of Action	Chemical Sub-group or Exemplifying Active Ingredient	Active Ingredients
1A	Acetylcholine esterase inhibitors	Carbamates	Aldicarb, Alanycarb, Aminocarb, Bendiocarb, Benfuracarb, Butocarboxim, Butoxycarboxim, Carbaryl, Carbofuran, Carbosulfan, Ethiofencarb, Fenobucarb, Formetanate, Furathiocarb, Isoprocarb, Methiocarb, Methomyl, Metolcarb, Oxamyl, Pirimicarb, Propoxur, Thiodicarb, Thiofanox, Trimethacarb, XMC, Xylylcarb
		Triazamate	Triazamate
1B		Organophosphates	Acephate, Azamethiphos, Azinphos-ethyl, Azinphos-methyl, Cadusafos, Chlorethoxyfos, Chlorfenvinphos, Chlormephos, Chlorpyrifos, Chlorpyrifos-methyl, Coumaphos, Cyanophos, Demeton-S-methyl, Diazinon, Dichlorvos/ DDVP, Dicrotophos, Dimethoate, Dimethylvinphos, Disulfoton, EPN, Ethion, Ethoprophos, Famphur, Fenitrothion, Fensulfothion, Fenthion, Fonofos, Fosthiazate, Heptenophos, Isofenphos, Isopropyl O-(methoxyaminothio=phosphoryl)salicylate, Isoxathion, Malathion, Mecarbam, Methamidophos, Methidathion, Mevinphos, Monocrotophos, Naled, Omethoate, Oxydemeton-methyl, Parathion, Parathion-methyl, Phenthoate, Phorate, Phosalone, Phosmet, Phosphamidon, Phoxim, Pirimiphos-methyl, Profenofos, Propaphos, Propetamphos, Prothiofos, Pyraclofos, Pyridaphenthion, Quinalphos, Sulfotep, Sulprofos, Tebupirimfos, Temephos, Terbufos, Tetrachlorvinphos, Thiometon, Triazophos, Trichlorfon, Vamidothion
2A	GABA-gated chloride channel antagonists	Cyclodiene organochlorines	Chlordane, Endosulfan, gamma-HCH, Heptachlor, Lindane, Methoxychlor
2B		Fipronil	Fipronil
3	Sodium channel modulators	Pyrethroids	Acrinathrin, Allethrin, d-cis-trans Allethrin, d-trans Allethrin, Bifenthrin, Bioallethrin, Bioallethrin S-cylclopentenyl, Bioresmethrin, Cycloprothrin, Cyfluthrin, beta-Cyfluthrin, Cyhalothrin, lambda-cyhalothrin, gamma-cyhalothrin, Cypermethrin, alpha-Cypermethrin, beta-Cypermethrin, theta-Cypermethrin, zeta-Cypermethrin, Cyphenothrin [(1R)-trans-isomers], Deltamethrin, Empethrin [(EZ)- (1R)- isomers], Esfenvalerate, Etofenprox, Fenpropathrin, Fenvalerate, Flucythrinate, Flumethrin, tau-Fluvalinate, Halfenprox, Imiprothrin, Permethrin, Prallethrin, Phenothrin [(1R)-trans- isomer], Resmethrin, RU 15525, Silafluofen, Tefluthrin, Tetramethrin, Tetramethrin [(1R)- isomers], Tralomethrin, Transfluthrin, ZXI 8901
		Pyrethrins	Pyrethrins (pyrethrum)
		DDT	DDT
4A	Nicotinic Acetylcholine receptor agonists/ antagonists	Neonicotinoids	Acetamiprid, Clothianidin, Dinotefuran, Imidacloprid, Nitenpyram, Thiacloprid, Thiamethoxam
4B		Nicotine	Nicotine
4C		Bensultap	Bensultap
		Cartap	Cartap
5	Nicotinic Acetylcholine receptor agonists (not group 4)	Spinosyns	Spinosad
6	Chloride channel activators	Avermectins, Milbemycins	Abamectin, Emamectin benzoate, Milbemectin
7A	Juvenile hormone mimics	Juvenile hormone analogues	Hydroprene, Kinoprene, Methoprene
7B		Fenoxycarb	Fenoxycarb
7C		Pyriproxyfen	Pyriproxyfen
8A	Compounds of unknown or non-specific mode of action (fumigants)	Methyl bromide	Methyl bromide
8B		Aluminium phosphide	Aluminium phosphide
8C		Sulfuryl fluoride	Sulfuryl fluoride
9A	Compounds of unknown or non-specific mode of action (selective feeding blockers)	Cryolite	Cryolite
9B		Pymetrozine	Pymetrozine
9C		Flonicamid	Flonicamid

Continued...

Group	Primary Target Site of Action	Chemical Sub-group or Exemplifying Active Ingredient	Active Ingredients
10A	Compounds of unknown or non-specific mode of action (mite growth inhibitors)	Clofentezine	Clofentezine
		Hexythiazox	Hexythiazox
10B		Etoxazole	Etoxazole
11A1	Microbial disruptors of insect midgut membranes (includes transgenic crops expressing *Bacillus thuringiensis* toxins)	*B.t.* var. *israelensis*	*B.t.* var. *israelensis*
11A2		*B.t.* var. *sphaericus*	*B.t.* var. *sphaericus*
11B1		*B.t.* var. *aizawai*	*B.t.* var. *aizawai*
11B2		*B.t.* var. *kurstaki*	*B.t.* var. *kurstaki*
11C		*B.t.* var. *tenebrionensis*	*B.t.* var. *tenebrionensis*
12A	Inhibitors of oxidative phosphorylation, disruptors of ATP formation	Diafenthiuron	Diafenthiuron
12B		Organotin miticides	Azocyclotin, Cyhexatin
13	Uncoupler of oxidative phosphorylation via disruption of H proton gradient	Chlorfenapyr	Chlorfenapyr
		DNOC	DNOC
14	Inhibition of magnesium-stimulated ATPase	Propargite	Propargite
15	Inhibitors of chitin biosynthesis, type 0, Lepidopteran	Benzoylureas	Chlofluazuron, Diflubenzuron, Fluazuron, Flucycloxuron, Flufenoxuron, Hexaflumuron, Lufenuron, Novaluron, Teflubenzuron, Triflumuron
16	Inhibitors of chitin biosynthesis, type 1, Homopteran	Buprofezin	Buprofezin
17	Inhibitors of chitin biosynthesis, type 2, Dipteran	Cyromazine	Cyromazine
18	Ecdysone agonist / disruptor	Diacylhydrazines	Chromafenozide, Halofenozide, Methoxyfenozide, Tebufenozide
19	Octopaminergic agonist	Amitraz	Amitraz
20	Site II electron transport inhibitors	Dicofol, Hydramethylnon	Dicofol, Hydramethylnon
21	Site I electron transport inhibitors	METI acaricides, Rotenone	Fenazaquin, Fenpyroximate, Pyrimidifen, Pyridaben, Tebufenpyrad, Tolfenpyrad, Rotenone
22	Voltage-dependent sodium channel blocker	Indoxacarb	Indoxacarb
23	Inhibitors of lipid synthesis	Tetronic acid derivatives	Spirodiclofen, Spiromesifen
24	Site III electron transport inhibitors	Acequinocyl	Acequinocyl
		Fluacrypyrim	Fluacrypyrim
25	Neuroactive (unknown mode of action)	Bifenazate	Bifenazate
26	Unknown mode of action	Azadirachtin	Azadirachtin