UF UNIVERSITY of FLORIDA
IFAS Extension

ENY-419

Insecticides Currently Used on Vegetables[1]

S. E. Webb and P. A. Stansly[2]

The following table lists many of the common insecticides currently labeled for use on vegetables in Florida. A number of new materials have been registered in the past few years or have had additional crops added to their labels. Some older organophosphate insecticides are now restricted to just a few crops, a result of recent rulings related to the Food Quality Protection Act. Changes continue, thus this listing may not be totally accurate at the time of printing.

No attempt has been made to list all available formulations. Some are listed under "Signal Word," when different formulations differ in toxicity. Many of the listed insecticides are limited to specific vegetables. Specific crop recommendations and pesticide labels should be consulted for more detailed information.

Insects can become resistant to any insecticide if it is used repeatedly. This also applies to alternating insecticides with similar modes of action, for example following a soil application of Admire with foliar applications of Actara or Assail (all neonicotinoids, MOA 4). To complicate matters, some products, such as Voliam Flexi, come premixed with two different modes of action. In general, pesticides with the same mode of action should be used no more than twice in any crop cycle if residual activity is short, and only once if residual activity is long. It is important that successive generations of a pest not be exposed to the same pesticide mode of action. To aid in developing a spray program, we have included a column with a code number for the mode of action of each insecticide. A footnote lists the mode of action associated with the code. In addition to alternating insecticides with different modes of action, integrating other non-chemical control measures in a pest management program should help to delay resistance.

1. This document is ENY-419 (IG018), one of a series of the Entomology and Nematology Department, Florida Cooperative Extension Service, Institute of Food and Agricultural Sciences, University of Florida. First published June 2000. Revised April 2012. Please visit the EDIS Website at http://edis.ifas.ufl.edu.

2. S. E. Webb, associate professor/Extension entomologist, Entomology and Nematology Department, Cooperative Extension Service, Institute of Food and Agricultural Sciences, University of Florida, Gainesville, FL 32611, and P. A. Stansly, professor, Entomology and Nematology Department, Southwest Florida Research and Education Center, University of Florida, Immokalee, FL 34142.

Table 1. Insecticides for Use on Vegetables

Insecticide	General Characteristics	Signal Word	MOA[1]	Typical Target Pests
Carbamates				
*Lannate (methomyl)	very short residual	Danger—Poison	1A	caterpillars, leafhoppers
Larvin (thiodicarb)	larvicide & ovicide	Warning	1A	caterpillars
Sevin (carbaryl)	use can result in aphid and mite outbreaks	Caution—4F, XLR, Bait; Warning—80S	1A	beetles, leafhoppers, caterpillars
*Vydate (oxamyl)	contact action; systemic if applied to soil	Danger—Poison	1A	aphids, thrips, some beetles
Organophosphates				
*Counter (terbufos)	systemic action; insecticide/nematicide	Danger—Poison	1B	soil pests
*Diazinon	soil application	Caution	1B	cutworms, mole crickets, wireworms
Dibrom 8E (naled)	some short residual fumigant action	Danger	1B	caterpillars
Dimethoate 4EC	local systemic	Warning	1B	aphids, leafhoppers
*Di-Syston 8 (disulfoton)	systemic action	Danger—Poison	1B	aphids
Imidan 70W (phosmet)		Warning	1B	caterpillars, sweetpotato weevil
Lorsban (chlorpyrifos)	long residual	Caution—15G Warning—75WG, *Advanced	1B	caterpillars, soil pests
Malathion	short residual	Warning – 57EC Caution – 8F	1B	broad spectrum
*MSR Spray Concentrate (oxydemetonmethyl)	systemic; contact & stomach action	Danger—Poison	1B	aphids, thrips & other sucking insects
*Mocap (ethoprop)	contact action	Danger—Poison	1B	aphids, caterpillars
*Monitor (methamidophos)	insecticide/nematicide; long residual	Danger—Poison	1B	caterpillars & other pests
Orthene 97 (acephate)	10–15 day residual systemic activity	Caution	1B	aphids, beetles, caterpillars, thrips
*Penncap-M (methyl parathion)	contact & fumigant action; slow-release formulation	Warning	1B	caterpillars, thrips
*Thimet 20G (phorate)	systemic action	Danger—Poison	1B	soil pests, thrips
Organochlorines				
*Endosulfan (endosulfan)	fairly long residual	Danger—Poison	2A	aphids, beetles, caterpillars, whiteflies
Pyrethroids				
*Ambush 25W (permethrin)	rapid knockdown; repellent; broad spectrum	Warning	3	beetles, caterpillars, leafhoppers, thrips
*Asana XL (esfenvalerate)	rapid knockdown; repellent; broad spectrum	Warning	3	beetles, caterpillars, leafhoppers
*Baythroid XL (beta-cyfluthrin)	rapid knockdown; repellent; broad spectrum	Warning	3	beetles, caterpillars, leafhoppers, thrips
*Brigade 2EC (bifenthrin)	rapid knockdown; repellent; broad spectrum	Warning	3	beetles, caterpillars, leafhoppers, thrips, whiteflies

Insecticide	General Characteristics	Signal Word	MOA[1]	Typical Target Pests
*Danitol 2.4 EC (fenpropathrin)	rapid knockdown; repellent; broad spectrum	Warning	3	caterpillars, leafhoppers, whiteflies
*Force (tefluthrin)	broad spectrum	Caution	3	soil pests
*Mustang Max (zeta-cypermethrin)	rapid knockdown, repellent, broad spectrum	Warning	3	beetles, caterpillars, leafhoppers, thrips
*Pounce (permethrin)	rapid knockdown; repellent; broad spectrum	Caution—1.5G Warning—25WP	3	beetles, caterpillars, leafhoppers, thrips
*Proaxis (gamma-cyhalothrin)	rapid knockdown; repellent; broad spectrum	Caution	3	beetles, caterpillars, leafhoppers, plant bugs, stink bugs
Pyganic 5.0 (Pyrethrins)	contact, stomach, & fumigant action; extract from chrysanthemums	Caution	3	broad spectrum
*Warrior II (lambda-cyhalothrin)	rapid knockdown; repellent; broad spectrum	Warning	3	beetles, caterpillars, leafhoppers, thrips
Neonicotinyls				
Actara (thiamethoxam)	local systemic	Caution	4A	aphids, potato leafhopper, some beetles, stinkbugs, whiteflies
Admire Pro, generics (imidacloprid)	systemic or locally systemic, depending on application method; long residual	Caution	4A	aphids, leafhoppers, some beetles, whiteflies
Assail 30SG (acetamiprid)	local systemic; ovicidal effects	Caution	4A	aphids, Colorado potato beetle, whiteflies
Belay (clothianidin)	systemic; long residual	Caution	4A	Colorado potato beetle, aphids, leafhoppers
Platinum 75SG (thiamethoxam)	systemic; soil application; long residual	Caution	4A	aphids, potato leafhopper, some beetles, stinkbugs, whiteflies
Venom Scorpion (dinotefuran)	systemic or locally systemic, depending on application method; long residual	Caution	4A	aphids, Colorado potato beetle, leafhoppers, leafminers, thrips, whiteflies
Other insect nerve poisons				
*Agri-Mek SC (abamectin)	active once ingested; some contact action; mostly stomach poison	Warning	6	leafminers, mites, some beetles, tomato pinworm
Avaunt (indoxacarb)	ingestion plus contact; slightly to moderately translaminar	Caution	22	caterpillars
Beleaf 50SG (flonicamid)	contact & ingestion; causes rapid cessation of feeding	Caution	9C	aphids
Coragen (chlorantraniliprole)	long residual, especially when applied to soil; systemic	None	28	caterpillars, Colorado potato beetle
Fulfill (pymetrozine)	feeding inhibitor	Caution	9B	aphids, whiteflies
*Proclaim (emamectin benzoate)	ingestion & topical; translaminar, not systemic	Caution	6	caterpillars
Radiant (spinetoram)	ingestion & contact; enters leaf but does not translocate	Caution	5	thrips, caterpillars, some beetles and leafminers

Insecticide	General Characteristics	Signal Word	MOA[1]	Typical Target Pests
SpinTor, Entrust (spinosad)	ingestion & contact; enters leaf but does not translocate	Caution	5	thrips caterpillars, some beetles and leafminers
Synapse WG, Belt (flubendiamide)	long residual; rapid cessation of feeding	Caution	28	caterpillars
Insect Growth Regulators				
Confirm 2F (tebufenozide)	slow-acting; safe for beneficials	Caution	18	caterpillars
Courier 40SC (buprofezin)	disrupts egg hatch and molting; use in rotation with other insecticides	Caution	16	whiteflies
*Dimilin (diflubenzuron)	slow-acting; disrupts molting process; reduces egg hatch	Caution	15	caterpillars, pepper weevil
Esteem Ant Bait (pyriproxyfen)	bait—breaks reproductive cycle of ants; slow-acting but effective	Caution	7C	ants
Extinguish [(S)-methoprene]	slow-acting bait	Caution	7A	fire ants
Intrepid (methoxyfenozide)	stomach poison that acts as an IGR for Lepidoptera; slow-acting; safe for beneficials	Caution	18	caterpillars
Knack (pyriproxyfen)	disrupts egg hatch and molting	Caution	7C	whiteflies
Neemix 4.5, others (azadirachtin)	slow acting; also acts as feeding repellent	Caution—Azatin XL; Warning—Neemix 4.5	un	broad spectrum
Rimon 0.83EC (novaluron)	disrupts cuticle formation and deposition at molting, resulting in death of larva; no effect on adult insect	Warning	15	caterpillars
Trigard (cyromazine)	most effective against small leafminer larvae	Caution	17	dipterous leafminers, maggots, Colorado potato beetle
Zeal (etoxazole)	mite growth inhibitor	Caution	10B	spider mites on melons, cucumbers
Miscellaneous				
Acramite (bifenazate)	contact; long residual; ovicidal activity against spider mites	Caution	un	mites
Bacillus thuringiensis (B.t.) var. *aizawai* (B.t.) var. *kurstaki*	pest must ingest; slow-acting but feeding stops long before death	Caution	11A	caterpillars
Cryolite	pest must ingest; not rainfast; an inorganic fluorine compound	Caution	un	beetles, caterpillars
Kanemite 15SC (acequinocyl)	knockdown and residual control	Caution	20B	mites
M-Pede, Des-X (potassium salts of fatty acids)	contact activity; phytotoxic at high temperatures	Warning		Aphids, whiteflies, and other soft-bodied arthropods

Insecticide	General Characteristics	Signal Word	MOA[1]	Typical Target Pests
Movento (spirotetramat)	ingestion; fully systemic in plant after foliar application; inhibitor of lipid synthesis; most effective on juvenile stages	Caution	23	aphids, psyllids, whiteflies, mites
Mycotrol, BotaniGard (*Beauveria*)	entomopathogenic fungus; slow-acting	None	—	aphids, leafhoppers, whiteflies
Oberon 2SC (spiromesifen)	inhibitor of lipid synthesis; most effective on juvenile stages of mites and on nymphs and pupae of whiteflies and psyllids	Caution	23	mites, psyllids, whiteflies
Portal (fenpyroximate)	contact activity; affects energy metabolism	Warning	21A	mites, including broad mites, leafhoppers, whiteflies
Requiem 25SC (synthetic extract of *Chenopodium ambrosioides*)	affects insect cuticle, disrupting respiration	Caution	Un	aphids, whiteflies, thrips
SunSpray Ultra Fine Spray Oil, others (mineral oil)	contact activity	Caution	—	aphids, mites, whiteflies
*Vendex (fenbutatin-oxide)	affects energy metabolism	Danger—Poison	12B	Mites
Premixes (note: premixes or tank mixes reduce potential rotation partners for resistance management. Use only if both products in mix are needed to control damaging pests.)				
*Brigadier (bifenthrin and imidacloprid)	see Brigade and Admire	Warning	3A + c 4A	broad spectrum
*Cobalt (chlorpyrifos and gamma-cyhalothrin)	see Lorsban and Proaxis	Danger	1B + 3A	broad spectrum
Durivo SC (chlorantraniliprole and thiamethoxam)	see Platinum and Coragen; applied to soil	Keep out of reach of children	28 + 4A	caterpillars, aphids, potato leafhopper, some beetles, stinkbugs, whiteflies
*Endigo ZC (lambda-cyhalothrin and thiamethoxam)	see Warrior and Actara	Warning	3A + 4A	broad spectrum
*Leverage 360 (beta-cyfluthrin and imidacloprid)	see Baythroid XL and Admire	Caution	3A + 4 A	broad spectrum
Vetica (buprofezin and flubendiamide)	see Courier and Synapse WG	Caution	16 + 28	whiteflies and caterpillars
Voliam Flexi (chlorantraniliprole and thiamethoxam)	see Coragen and Actara; foliar application	Caution	28 + 4A	caterpillars, aphids, potato leafhopper, some beetles, stinkbugs, whiteflies
*Voliam Xpress (chlorantraniliprole and lambda-cyhalothrin)	see Coragen and Warrior	Warning	28 + 3A	broad spectrum

*Restricted Use Pesticide

Originally adapted from: Welty, Celeste. Insecticides for use on vegetables in Ohio. pp. 46–48, 2002 Ohio Vegetable Production Guide, Ohio State University.

[1]**Mode of Action codes for vegetable pest insecticides from the Insecticide Resistance Action Committee (IRAC) Mode of Action Classification v.7.2 February 2012.** http://www.irac-online.org/wp-content/uploads/MoA-classification.pdf

1A. Acetylcholinesterase inhibitors, Carbamates (nerve action)
1B. Acetylcholinesterase inhibitors, Organophosphates (nerve action)
2A. GABA-gated chloride channel antagonists (nerve action)
3A. Sodium channel modulators—pyrethroids
4A. Nicotinic acetylcholine receptor agonists (nerve action)
5. Nicotinic acetylcholine receptor allosteric activators—spinosins (nerve action)
6. Chloride channel activators (nerve and muscle action)
7A. Juvenile hormone mimics (growth regulation)
7C. Juvenile hormone mimics (growth regulation)
9B & 9C. Selective homopteran feeding blockers
10B. Mite growth inhibitors (growth regulation)
11A. Microbial disruptors of insect midgut membranes
12B. Inhibitors of mitochondrial ATP synthase (energy metabolism)
15. Inhibitors of chitin biosynthesis, type 0, lepidopteran (growth regulation)
16. Inhibitors of chitin biosynthesis, type 1, homopteran (growth regulation)
17. Molting disruptor, dipteran (growth regulation)
18. Ecdysone receptor agonists (growth regulation)
20B. Mitochondrial complex III electron transport inhibitors (energy metabolism)
21A. Mitochondrial complex I electron transport inhibitors (energy metabolism)
22. Voltage-dependent sodium channel blockers (nerve action)
23. Inhibitors of acetyl Co-A carboxylase (lipid synthesis, growth regulation)
28. Ryanodine receptor modulators (nerve and muscle action)
un. Compounds of unknown or uncertain mode of action