Edible Ornamental Plant Pest Management:

Options for Controlling Arthropod Pests on Fruiting Trees and Shrubs in Residential Landscapes

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Pesticide Options for Managing Edible Ornamental Plant Pests

Controlling Arthropod Pests on Fruiting Trees and Shrubs in Residential Landscapes

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Pesticide Options for Managing Edible Ornamental Plant Pests: Controlling Arthropod Pests on Fruiting Trees and Shrubs in Residential Landscapes[1,2,12]

Consult product labels and UT Extension Publications like ***PB1622*** *,* ***SP284-C*** *,* ***SP307-D*** *and* ***SP307-J*** *for additional information*

Fruit Types: *TF = tree fruits (e.g., pome and stone fruits); Bl = blackberry; Bb = blueberry; Rs = raspberry; O = other*

Use Site: *L = landscape; N =nursery; G = greenhouse (noncommercial); I = interiorscape*

IRAC Code[3]	Mode of Action	Chemical subgroup	Active Ingredient	Selected Trade Names[4,5]	Fruit types[6]	Use Site[2]	Harvest Interval (range in days)[7]	Compatible with organic production standards[8]	Aphids	Armored scales	Soft scales	Leafhoppers (lh) & Plantbugs (pb)	Stinkbugs	Fruit fly/Spotted wing drosophila	Leaf-feeding caterpillars	Sawflies	Leaf beetles and other Leaf-feeding beetles	Japanese beetles (adult)	Weevils	Longhorned (roundheaded) borers	Clearwing moth borers	Whiteflies	Thrips	Spider mites
1A	Acetylcholinesterase inhibitors	Carbamates	carbaryl[9]	GardenTech Sevin Concentrate	TF, Bl, Rs, Bb, O	L	3-7	N	x	x	x	x[pb]		x	x	x	x	x	x	x				x
1B		Organophosphates	malathion	Bonide Malathion[9,10]	TF, Bl, Rs, Bb, O	L	1-7	N	x	x	x	x[lh]		x	x			x							x
3A	Sodium channel modulators	Pyrethroids	gamma-cyhalothrin	Spectracide Triazide Insect Killer Once & Done Concentrate	TF	L	(nr) 14-21	N	x			x[lh, pb]	x		x			x	x		x			
			esfenvalerate	Monterrey Bug Buster II	TF, Bl, Bb, Rs, O	L	(nr) 14-28	N	x	x		x[lh, pb]		x	x				x		x			
			bifenthrin	Ortho Bug-B-Gon	TF, Bl, Rs	L	3-14	N	x			x[pb]	x		x	x	x	x	x		x	x		x
			permethrin	Bonide Eight[10,12]	TF, Rs, Bl, O	L	7-14	N	x			x[pb]			x			x	x		x			x
				Bonide Total Pest Control[10,12]	TF	L	(nr) 1-14	N	x			x[lh, pb]			x				x		x			
		Pyrethrins	pyrethrin	Monterrey Bug Buster-O[10,11]	TF, Bl, Rs, Bb, O	L, G, I	once dried	y		x	x	x[lh, pb]	x	x			x		x		x	x		x
				Bonide Pyrethrin Garden Insect Spray Concentrate[7]	O	L, G, I	1	N				x[pb]												
3A + Un-known		Pyrethrins + sulfur	pyrethrins + sulfur	Natria Fruit & Vegetable	TF, Bl, Bb, Rs, O	L	1	Y[8]	x	x	x	x[lh]	x	x	x	x	x	x	x			x	x	x
3A + Non-classified		Pyrethrins + canola oil	pyrethrin + canola oil	Pyola	TF, Rs, O	L, G, I	0	N	x	x	x	x[lh, pb]	x	x	x		x	x	x		x	x		x

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4A	Nicotinic acetylcholine receptor agonists	Neonicotinoids	acetamiprid	Ortho Flower, Fruit, & Vegetable Insect Killer Concentrate	TF	L	1-7	N	x	x	x	x[lh]		x	x	x	x	x	x			x		
			imidacloprid[9]	Hi-Yield Systemic Insect Spray	TF	L	0-7	N	x	x	x	x[lh, pb]	x	x			x	x		x				
				Bayer Fruit, Citrus & Vegetable Control	TF, Bl, Rs, Bb, O	L	6-21	N	x	x	x	x[lh]					x	x				x		
				Monterey Fruit Tree & Vegetable Systemic Soil Drench[10]	TF, Bl, Bb, Rs, O	L	14-30	N	x	x	x	x[lh, pb]						x				x		
5	Nicotinic acetylcholine receptor allosteric activators	Spinosyns	spinosad	Bonide Bug & Slug Killer	TF, Bl, O	L, G	3	N							x									
				Bulls-eye Garden Insecticide	TF, Bl, Rs, Bb, O	L	1-14	N						Y	x						x		x	
				Ferti-lome Borer, Bagworm, Tent Caterpillar & Leafminer Spray[10]	TF, Bl, Rs, Bb, O	L	1-14	N						x[13]	x						x		x	
11	Microbial disruptors of insect midgut membranes	*Bacillus thuringiensis* (*Bt*) & insecticidal proteins	*Bt* subsp. *kurstaki*[9]	Dipel, Safer Caterpillar Kliler for Trees, Shrubs and Vegetables II	O	L, N, G, I	0	Y							x									
Unknown	Unknown or Uncertain	Azadirachtin	neem oil with AZA	Safer BioNEEM, Neem-Away Insect Spray	TF. O	L, I	once dried	N	x[13]					x[13]	x[13]		x[13]	x[13]				x[13]	x[13]	
			azadirachtin	AzaGuard[14]	TF, Bl, Rs, Bb, O	L, N, G, I	once dried	Y	x	x	x	x	x	x	x	x	x		x	x	x	x	x	x
				AzaMax[14]	TF, Bl, Rs, Bb, O	L, N, G, I	once dried	Y	x	x	x	x	x	x	x	x	x		x	x		x	x	x
				Azatin XL[14]	TF, O	L, N, G, I	0	Y	x[13]			x		x	x	x	x		x			x	x[13]	
				Molt-X	TF, Bl, Rs, Bb, O	L, N, G, I	0	Y	x	x	x	x[lh, pb]	x	x	x	x	x	x	x	x	x	x	x	
			neem oil	Monterey 70% Neem Oil[11]	TF, O	L,I	once dried	Y	x[13]													x[13]		x[13]

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Non-classified	Various		*Beauveria bassiana*[9]	Mycotrol-O	TF, Bl, Rs, Bb, O	N, G	0	Y	x			x[lh, pb]					x		x	x	x	x	x	x
				Botanigard 22WP, Botanigard ES[15]	TF, Bl, Rs, Bl, Bb, O	L*, N, G, I	0	N	x			x[lh, pb]			x		x		x			x	x	x
			Chromobacterium subtsugae	Grandevo PTO[10]	TF, Bl, Rs, Bl, Bb, O	L, N, G	0	Y	x					x	x				x			x	x	x
			horticultural oil[9,11]	Ultra-Pure Oil, TriTek, Bonide All Seasons	TF, Rs, Bb, Bl, O	L, N, G, I	once dried	Y[8]	x	x	x	x[lh]			x		x					x		x
			mineral oil emulsion	SuffOil-X	TF,Bl, Rs,Bb, O	L,N,G	once dried	Y	x	x	x	x[lh]			x							x	x	
			insecticidal soap[9]	Bonide insecticidal soap concentrate	TF, Rs, O	L, G, I	12hr	Y[8]	x	x	x	x[lh, pb]			x	x						x		x
			rosemary oil, clove oil, & cottonseed oil	Monterey All Natural 3 in 1 Garden Insect Spray	TF, Bl, Rs, Bb, O	L	0	Y	x[13]			x[lh,ph,13]			x[13]	x[13]	x[13]	x[13]					x[13]	x[13]
			kaolin clay	Surround at Home, Surround WP	TF, Bl, Rs, Bb, O	L, N, G, I	0	Y[8]				x[lh,13]		x[13]			x[13]	x[13]		x[13]	x[13]	x[13]	x[13]	

Footnotes and Supplemental Information:

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1. Pests listed on pesticide labels are subject to change. The label should always be consulted to confirm that chart-listed pests still appear on the label. Check the product labels for specific site restriction information, notes on application, sensitive plant species and specific target pest species.
2. Use site information (L = landscape (*commercial only); N = nursery; G = greenhouse (non-commercial); I = interiorscape) is provided for reference; consult product labels.
3. IRAC Code designations and Related Modes of Action are explained at the Insecticide Resistance Action Committee Database 2015 vers. 7.4 (IRAC 2015; http://www.irac-online.org/teams/mode-of-action).
4. Trade names of products are provided as examples only. No endorsement of mentioned product nor criticism of unmentioned products is intended.
5. Products may not be registered or renewed for use in all southeastern U.S. states. Consult your state's Dept. of Agriculture to confirm legal use of products in your state. In Tennessee, visit https://agriculture.tn.gov/listproducts.asp.
6. Fruit types specified on product labels that are most frequently encountered in edible landscapes, as indicated: TF = tree fruits (e.g., pome and stone fruits); Bl = blackberry; Bb = blueberry; Rs = raspberry; O = other
7. May not be registered (nr) for all tree fruit types. Harvest intervals may differ between different fruit crops. Consult product label to determine legal and appropriate uses.
8. Not all product labels containing active ingredients compatible with organic production have been certified to organic production standards. Check product labels for OMRI or USDA NOP seals.
9. Multiple formulations and trade names of the same active ingredients are available; representative example(s) presented.
10. Check label for restrictions on the number of times the product can be applied in a growing season or year.
11. See product label for information about potential crop phytotoxicity, known plant sensitivity, and how to test for phytotoxicity.
12. Management of imported fire ants in quarantine areas should follow approved quarantine treatment guidelines developed by USDA-APHIS for plants that may be moved outside the quarantined area; http://www.aphis.usda.gov/plant_health/plant_pest_info/fireants/downloads/IFA_nursery.pdf
13. Label-indicated efficacy against target pest group is primarily by population suppression or action as a repellent.
14. Product works as an *insect growth regulator* and, therefore, DOES NOT control *adult* insects.
15. Label restricts landscape uses only to commercial landscapes. Residential landscapes are not a permitted application site.

Special Notes Regarding Use of This Publication:

- Pest resistance to insecticides and acaricides is a growing concern. Efforts to limit pesticide resistance should be an active part of IPM decision-making. Populations of pest species infesting ornamental plants, like *Tetranychus* and *Panonychus* spider mites, western flower thrips, glasshouse and silverleaf whiteflies, and green peach aphids, are among the Top 12 species to have developed resistance to multiple pesticide active ingredients (a.i.) spanning several chemical classes. Cross-resistance by populations of pest arthropods is increasingly common to multiple a.i. products **within** an Insecticide Resistance Action Committee (IRAC) group. Serial applications to control a generational cycle of a pest should NOT be made using a.i. products **within** an IRAC Group. Cross-resistance occurs much less commonly **between** IRAC groups.
- More detailed information about modes of action and pesticide resistance will be forthcoming in a publication titled: "**Understanding Insecticide and Miticide Modes of Action Used to Manage Arthropod Pests of Ornamental Plants**."
- Product labels change frequently and include more details and specifics about potential phytotoxity that may result in certain plants when products are applied at certain rates. **All** product labels should be reviewed prior to treatment application. Footnote 11 as provided within the chart can assist in indicating products with labels that may provide additional details regarding plant safety.
- Many product labels, particularly among generic products (e.g., carbaryl, bifenthrin, imidacloprid and others), differ in many regards, including which pests may be controlled, details about plant safety/phytotoxicity, re-entry intervals, etc. It is the applicator's responsibility to consult ***each*** product label prior to application and understand its restrictions and limitations.
- See also UT Extension publications PB 1622 Disease and Insect Control in Home Fruit Plantings (4/2015), SP 284-C Blackberries and Raspberries in Home Gardens (7/2014), SP 307-D Fruit Tree Management Timetables (7/2014), and SP307-J Landscaping with Fruit and Nut Crops (9/2014).

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This publication contains pesticide recommendations that are subject to change at any time. The recommendations in this publication are provided only as a guide. It is always the pesticide applicator's responsibility, by law, to read and follow all current label directions for the specific pesticide being used. The label always takes precedence over the recommendations found in this publication.

Use of trade or brand names in this publication is for clarity and information; it does not imply approval of the product to the exclusion of others that may be of similar, suitable composition, nor does it guarantee or warrant the standard of the product. The author(s), the University of Tennessee Institute of Agriculture and University of Tennessee Extension assume no liability resulting from the use of these recommendations.

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