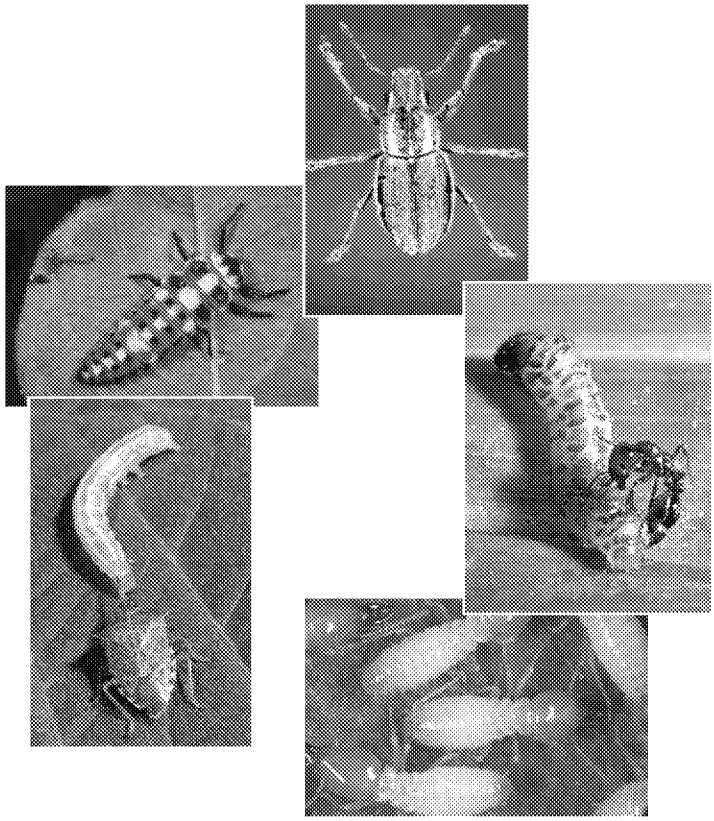
2020

Louisiana Insect Pest Management Guide



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2020 Louisiana Insect Pest Management Guide

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Introduction

The Insect Pest Management Guide is issued annually by the LSU AgCenter. Each edition supersedes guides for all prior years. Visit www.LSUAgCenter.com for the latest information. Call 225-578-1634 with questions about insects and arthropods and management of them. You may also contact your county agent.

Insecticide recommendations and rates of application listed in this guide are in conformance with U.S. Environmental Protection Agency registrations and U.S. Food and Drug Administration tolerances.

Users of this guide still should read the label on the insecticide container and follow the directions and precautions on the label carefully when using the insecticides recommended in this guide.

Some insecticides registered by the U.S. Environmental Protection Agency are not included in this guide for a variety of reasons, such as their hazardous nature, lack of availability, inefficient control of pests or higher costs for use.

Restricted Use Pesticides

Some of the pesticides or certain uses of pesticides in this publication may be classified for restricted use. The labels of those pesticides with restricted uses will contain information regarding these restrictions. Be sure to read all labels thoroughly. It is illegal to use any pesticide in a manner that is inconsistent with the label directions. It is unlawful for a noncertified applicator to use a pesticide that has been classified with restricted uses. Information on pesticide applicator certification programs may be obtained from the LSU AgCenter.

General Information for Users of This Guide

The following pest control recommendations are based on research conducted by LSU AgCenter faculty members in its Louisiana Agricultural Experiment Station and Louisiana Cooperative Extension Service in cooperation with the U.S. Department of Agriculture.

Pest control recommendations made by LSU AgCenter faculty are based on materials for which there is specific information regarding effectiveness under Louisiana conditions, residues that will remain on the crop at harvest, phytotoxicity, and effects on beneficial predators, parasites, honeybees, fish and other wildlife. In addition, effects on the environment, particularly as each pesticide relates to water, are given strong consideration. Recommended chemicals also must be registered and labeled for use by both the Environmental Protection Agency and the Louisiana Department of Agriculture and Forestry.

New materials and formulations will be included in the recommendations only after they have been properly registered, have proven effective and have shown the registered use will not result in a residue that exceeds the legal tolerance when applied as directed under Louisiana conditions.

These suggestions for pest control are based on the best information available for each pesticide listed. If followed carefully, they should result in satisfactory control and should not leave residues that exceed the tolerance established for any particular chemical on a particular crop. To avoid excessive residues on the harvested crop, follow directions carefully with respect to dosage levels, number of applications and minimum interval between application and harvest. Always be sure to observe the waiting period for re-entry into the field after a pesticide application if such a period is stated on the label. Also, wear any protective clothing or devices specified on the label for applying pesticides or entry into a treated field.

The grower is responsible for residues on his or her crop as well as for problems caused by drift from the grower's property to other properties or crops.

General Precautions

All pesticides are poisonous and always should be used with caution. The following suggestions for the use and handling of pesticides will help minimize the likelihood of injury to humans, animals and crops from exposure to the chemicals.

1. Always read all of the label's precautionary directions before using pesticides and follow those directions exactly. Notice warnings and cautions before opening the containers. Repeat the process every time no matter how often you use a pesticide or how familiar you think you are with the directions. Apply the pesticide only in amounts and at times specified.
2. Keep pesticides out of reach of children, pets, irresponsible individuals and livestock. Pesticides should be stored outside the house, away from food and feed and under lock and key.

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3. Always store pesticides in their original containers and keep containers tightly closed. Never keep pesticides in anything but the original containers with legible labels.
4. Never smoke or eat while applying pesticides.
5. Avoid inhaling sprays or dusts. When directed on the label, wear protective clothing and an approved mask.
6. Should pesticides be accidentally spilled on the skin or clothing, remove contaminated clothing immediately and wash the contaminated skin thoroughly.
7. Bathe and put on clean clothing after spraying or dusting. If it is not possible to bathe, wash hands and face thoroughly and change clothes. Also, wear fresh clothing each day.
8. Cover food and water containers when treating around livestock or pet areas. Do not contaminate fish ponds, streams or lakes.
9. Do not reuse pesticide containers for any purpose.
10. Observe label directions and follow recommendations to keep the residue on edible portions of plants within the limits permitted by law.
11. If symptoms of illness occur during or shortly after dusting or spraying, call a physician or get yourself or the affected person to a hospital immediately. Also, bring a label from the container of pesticide that was used to the doctor or hospital.
12. Do not use the mouth to siphon liquids from containers or to blow out clogged lines, nozzles, etc.
13. Do not spray with leaking hoses or connections.
14. Do not work in the drift of a spray or dust.
15. Confine pesticides to the property being treated. Avoid drift to adjacent properties by stopping treatment if weather conditions become unfavorable.
16. Do not apply pesticides over waterways or canals, and do not apply them to a field while it is being irrigated if water runs off a field.
17. If laborers are working in crops with heavy foliage, such as cotton, tomatoes, peaches, citrus, etc., that have been treated with highly toxic compounds, be sure the recommended interval between the treatment and entrance into the treated area is observed. These workers should follow the same precautions given for applicators regarding clothing changes, wearing protective clothing, eating, smoking and bathing. If a worker becomes ill while working under these conditions, call a physician immediately.

Insecticide/Acaricide Resistance Management

The insecticides recommended in this publication are important components of an integrated pest management plan. If the insecticides are not used properly, or if they are used repeatedly over time, there is a possibility resistance to those insecticides will develop.

It is the responsibility of the producer or pesticide applicator to conserve the use of insecticides. It is important that insecticides with different mode-of-action classifications be rotated during a season. The mode of action of an insecticide defines the way a specific pesticide kills an insect or mite. Repeated use of pesticides with the same mode of action often will result in the development of resistance to the entire class of insecticide.

Resistance to insecticides may be defined as "a heritable change in the sensitivity of a pest population that is reflected in the repeated failure of a product to achieve the expected level of control when used according to the label recommendations for that pest species," according to the Insecticide Resistance Action Committee. Once an insect population becomes resistant to a class of insecticides, the entire class can no longer be used to manage the target insect.

While using this pest control guide, please be sure to refer to the IRAC MoA (mode of action) classifications in the final table in this publication. Be sure to keep records of the insecticides you use during the season to control pests in your crop. We encourage you to practice pesticide stewardship and rotate insecticides used during the season based on the mode-of-action classifications.

Pesticide Drift

Pesticide drift is by far the most important cause of illegal residues on forage crops.

No pesticide can be applied by either aerial or ground equipment without some drift occurring. Drift can be kept to a minimum (and therefore the contamination of forage crops reduced), however, if certain precautions are

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observed. Those precautions involve the selection of the pesticide, method of application, type of formulation (dust, spray or granular), timing of treatment, wind direction and velocity and distance between the point of application and the nearest forage crop downwind.

Pesticides Hazardous to Honeybees and Other Beneficial Insects

Many pesticides are highly toxic to honeybees and other beneficial insects. Farmers, beekeepers and the pest control industry should cooperate closely to keep losses of beneficial insects to a minimum.

Certain pesticides are more toxic than others to these insects. Therefore, whenever possible, use the least toxic material.

When bees are present, the safest time and method of application of pesticides should be employed. Avoid drift of pesticides onto bee colonies or nearby crops and weeds in bloom. Do not contaminate bee drinking water.

New label statements to protect bees have been added to some labels (neonicotinoids in particular). Read and follow these statements.

Wildlife Hazards

To protect fish and other wildlife, do not apply pesticides over canals or streams, and do not allow drainage from treated fields to enter waterways immediately after application.

Pesticide Phytotoxicity

Certain chemicals may cause plant injury if used at the wrong stage of plant development or when the temperature is too high. Injury also may result when excessive dosage rates, wrong formulations or incompatible pesticide combinations are applied. To avoid injury, follow recommendations precisely.

Buffers/Water pH

Water pH is a critical factor in the effectiveness of most insecticides. Since most insecticides are acid-formers, it is critical that your water pH be acidic to prevent chemical breakdown, known as hydrolysis.

Optimum pH is between 5.5 and 6.5. The best way to correct a high water pH is with a buffer because it will establish the pH so it will not fluctuate with changes in temperatures.

The water pH can be measured using a swimming pool test kit, litmus paper or a pH meter. Use what will work best for you. Water pH is affected by temperature, sunlight, rainfall, drought and many other factors and is seldom the same from one spraying to the next. Thus, check water pH before each spray.

Several buffers are on the market that are about equal. Use the one available to you. You should test the effectiveness of the buffer, however, by using 1 to 2 ounces per 50 gallons of water and then mixing and rechecking the pH. Whatever is dissolved in the water will determine how much buffer you may need. The label may say 1 quart, but you may need less, or you occasionally may need more.

Check each time and start with about 2 ounces per 50 gallons of water. Then add 1 ounce at a time until the correct pH is reached. Too much of a buffer will cause the water to be too acidic, which can be phytotoxic on your plants.

Buffers help to enhance the initial knockdown of your spray and give you better residual effects. That will, in the long term, reduce the number of sprays you make. Reducing the number of sprays will reduce the development of pest tolerance, harm to the environment, effects on beneficial insects (saving beneficials) and costs while also helping you to produce a good crop.

Oils as Pesticides

Oils may be used to control many pest populations of insects and mites. They may be used alone or in combination with insecticides or miticides. Oils may be used year-round simply by varying the rates for the seasons.

Examples include dormant oil, Volck oil, Superior oil, Sun Spray Ultra Fine oil and others. Some oils can be used on a wide variety of crops such as fruits, vegetables, ornamentals, trees, flowers and foliage plants. Others may be limited. Follow the label for proper control.

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Introduction

Predators and Parasites

The use of beneficial insects or predators to control pest populations is a natural phenomenon. Parasites and predators usually build up once a pest or host becomes established. In some cases, these naturally occurring controls are very effective in maintaining pest numbers below economic thresholds.

As pest density increases, it initiates the development of the "beneficials." Beneficial insects, however, can be purchased to supplement the natural beneficials and enhance control, thereby reducing the need for pesticide use. Beneficials always should be purchased in either the egg or immature stage to help ensure the desired control. Adults are capable of flying off to other areas.

Some beneficials can become a nuisance if numbers become too dense. Such a problem developed in areas with the Asian lady beetle. Another example is the small braconid wasp that will infest catalpa worms when released to control hornworms in vegetables and tobacco.

Restricted Entry Intervals (REIs)

Read the agricultural use requirements on the label very carefully to determine the restricted entry interval for a particular use of an insecticide. The restricted entry intervals may vary for different uses of the same insecticide. ALWAYS READ THE LABEL!

In Case of Poisoning

Louisiana (Nationwide) Toll-Free Poison Center
800-222-1222
24-Hour-a-Day Service

National Pesticide Information Center
800-858-7378
(800-858-PEST)
Monday-Friday, 8:00 a.m.-12:00 p.m. (Pacific Time)
www.npic.orst.edu

Pesticide Spills and Hazardous Material Cleanup
855-452-5323
Read the Pesticide Label for Your Area/Use

Louisiana State Arthropod Museum insect and spider identification services

See http://lsuinsects.org/public_services.html for information.

Entomologists with extension responsibilities

Complete extension. Dennis Ring, 225-578-1634. Email dring@agcenter.lsu.edu with suggestions, comments, concerns and information regarding this guide.

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Introduction

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Acknowledgements:

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Disclaimer Statement:

The pesticides recommended in this publication were registered for the prescribed uses at the time of publication. Pesticide registrations are reviewed continuously. When the registration for a recommended pesticide is canceled, the LSU AgCenter no longer recommends that pesticide.

Uses of brand or trade names in this publication are for clarity and information. Such use does not imply approval of the product to the exclusion of others that may be of similar suitable composition, and it does not guarantee or warrant the standard of any given product. The lists of products provided in this publication are not intended to cover all available products.

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Introduction

All insecticides must be used as instructed on their labels. Most insecticides are registered for particular insects on particular commodities. It is a violation of federal law to use any insecticide for an insect or commodity for which it is not labeled.

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Bees and Wasps as Nuisance Pests[1]

Insect	Insecticide/Rate	Remarks
Bumblebees	Sevin (Carbaryl) 50WP-2 Tablespoons/gal	May need two applications; spray opening to nest. Follow label.
	Pyrethrins 0.15%	
	Tempo Ultra (Beta-cyfluthrin)	
	*Astro (Permethrin) 0.5 teaspoon/gal	
	Talstar (Bifenthrin)	
	Add 8 ounces liquid soap/gal. to all insecticide mixtures.	
Carpenter Bees	*Astro (Permethrin) 0.5 teaspoon/gal.	Mix according to label directions; spray or paint on infested wood.
	* Tempo Ultra (Beta-cyfluthrin)0.54 ounce/gal.	
	Add 8 ounces liquid soap/gal. to both insecticide mixtures.	
Honeybees	Sevin (Carbaryl) 50WP-2 tablespoons/gal.	May need two applications; spray, open wall and remove comb; wash wall with bleach; then close wall again. Have beekeeper remove bees when possible.
	Pyrethrins 0.15%	
	Tempo Ultra (Beta-cyfluthrin)	
	*Astro (Permethrin) 0.5 teaspoon/gal.	
	Talstar (Bifenthrin) 0.03-0.06% emulsion	
	Add 8 ounces liquid soap/gal. to all insecticide mixtures.	
Bald-faced Hornets	Pyrethrins 0.15% + 8 ounces liquid soap/gal.	Saturate nest; repeat in two to three days. When activity stops, nest should be removed. To save nest, place in large garbage bag with no-pest strip in warm area for three to five days before hanging in home or office.
Paper Wasps	Pyrethrins 0.15%	Must wet nest thoroughly with material. Spot treat nest, nest entrance and areas where wasps alight.
	*Astro (Permethrin) 0.5 teaspoon/gal.	
	Orthene TTO/97S (Acephate) -1.2 ounces/gal.	
	Talstar (Bifenthrin) 0.03-0.06% emulsion	
	Battle (Lambda-cyhalothrin)	
	Tempo Ultra (Beta-cyfluthrin)	
	Add 8 ounces liquid soap/gal. to all insecticide mixtures.	
Yellowjackets		Same as bumblebees.
Solitary Bees and Wasps on Structures (Mud Daubers, Potter Wasps, etc.)	Sevin (Carbaryl) 50WP-2 tablespoons/gal.	Spray area around holes or nests to force some application into nest; remove when possible.
	Tempo Ultra (Beta-cyfluthrin)	
	*Astro (Permethrin) 0.5 teaspoon/gal.	
	Add 8 ounces liquid soap/gal. to all insecticide mixtures.	
Solitary Bees and Wasps in Soil (Leafcutters, Cicada Killers, Leafminers)	Sevin (Carbaryl) 50WP-2 tablespoons/gal.	Make solution; spray or pour around and into opening in the soil.
	*Astro (Permethrin) 0.5 teaspoon/gal.	
	Add 8 ounces liquid soap/gal. to both insecticide mixtures.	

* Professional use only

[1]NOTES: Honeybees, bumblebees and solitary bees are pollinators. If the nests are not causing problems or are not found in the walls, they would be more beneficial if left alone. Bald-faced hornets, yellowjackets, paper wasps, cicada killers and mud daubers are predaceous on insects and spiders. Unless the insects are in a location where they will cause problems, they are highly beneficial. To get better coverage on bees and wasps, use 8 ounces liquid soap per gallon of solution in addition to insecticides. For assistance with honeybee removal in walls and other structures, see list of beekeepers at: http://www.lsuagcenter.com/en/environment/insects/bees_wasps/honeybee+removal+and+swarm+collection.htm

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Crops - Commercial

Cotton

Insect	Insecticide	Amount of Concentrate per Acre	Pounds Active Ingredient per Acre	Acres Treated per Gallon or Pound SP	Treatment Threshold / Remarks
Pre-bloom					
Bollworm/ tobacco budworm	indoxacarb Steward (1.25)	11.3 ounce	0.11	11.5	**Non-Bt, WideStrike, TwinLink, and BG2** cotton varieties: Treat when population reaches or exceeds 8 larvae/100 plants or 6% fruit injury of any kind.
	spinosad Blackhawk (0.36)	2.4 - 3.2 ounce	0.054 – 0.072	6.7 – 5.0	
	chlorantraniliprole Prevathon (0.43)	14.0 - 27.0 ounce	0.047 – 0.09	9.1 – 4.7	**WideStrike 3, TwinLink Plus, and BG3** cotton varieties: Treat when population reaches or exceeds 8 larvae/100 plants or 6% fruit injury of any kind. Premix insecticides are available for this pest. See premix table.
Cutworms	esfenvalerate Asana XL (0.66)	5.8 ounce	0.03	22.0	Treat when loss of satisfactory stand is threatened, or in minimum tillage environment.
	beta-cyfluthrin Baythroid XL (1)	0.8 ounce	0.0065	160.0	
	bifenthrin Brigade (2)	2.6-6.4 ounce	0.04 - 0.10	20.0 – 50.0	Premix insecticides are available for this pest. See premix table.
	cyfluthrin Tombstone (2)	0.8 ounce	0.013	154.0	
	lambda-cyhalothrin Karate Z (2.08)	0.9 - 1.3 ounce	0.015 - 0.02	142.0 – 98.0	
	Z-cypermethrin Mustang Max (0.8)	1.3 - 2.8 ounce	0.01- 0.017	80.0 – 47.0	
	gamma-cyhalothrin Declare (1.25)	0.77 - 1.02 ounce	0.0075 - 0.01	166.0 – 125.0	
	A-cypermethrin Fastac (0.83)	1.3 – 1.9 ounce	0.008 – 0.012	80.0 – 67.0	
Plant bugs cotton fleahopper, clouded/ tarnished	Flonicamid Carbine (50)	2.3 - 2.8 ounce	0.072 - 0.089	7.0 – 8.0	Treat when 10 to 25 of these pests per 100 sweeps are found. Adjust pre-bloom treatment levels to maintain between 70% and 85% first position square retention.
	Thiamethoxam Centric (40)	2.5 – 3.0 ounce	0.0625 – 0.075	6.4 – 5.3	
	Imidacloprid Admire Pro (4.6)	0.9 – 1.7 ounce	0.032 – 0.062	142.0 – 75.0	Control of cotton fleahoppers can usually be obtained with lower rates than the rates used to control other plant bug pests.
	imidacloprid (2)	2.0 – 4.0 ounce	0.032 – 0.062	64.0 – 32.0	
	imidacloprid (4)	2.0 ounce	0.0625	64.0	
	acetamiprid Strafer Max (70)	1.7 – 2.3 ounce	0.075 – 0.10	9.4 – 7.0	
	sulfoxaflor	1.5 – 2.25 ounce	0.047 – 0.071	10.7 – 7.1	

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Crops - Commercial

Cotton

Insect	Insecticide	Amount of Concentrate per Acre	Pounds Active Ingredient per Acre	Acres Treated per Gallon or Pound SP	Treatment Threshold / Remarks
	Transform (50)				
	clothianidin Belay (2.13)	3.0 - 6.0 ounce	0.05 - 0.1	42.7 – 21.0	Multiply clouded plant bug number by 1.5 when determining densities for treatment decision.
	oxamyl Vydate C-LV (3.77)	11.2– 17.0 ounce	0.33 – 0.50	11.4 – 7.5	
	novaluron Diamond (0.83)	6.0 – 12.0 ounce	0.039 - 0.078	21.3 - 10.6	NOTE: Diamond will not control adults. For adult control, tank mix with an adulticide. Repeat applications at 7- to 14-day intervals as needed to maintain control. Premix insecticides are available for this pest. See premix table.
Spider mites	abamectin (0.15) Agri-Mek (0.15)	8.0 – 16.0 ounce	0.009 - 0.0187	16.0 – 8.0	Treat when mite infestations cause areas where plants have discolored leaves. Anticipate repeating applications in 5 days.
	fenpyroximate Portal (0.4)	16.0 – 32.0 ounce	0.05 – 0.10	8.0 – 4.0	
	spiromesifen Oberon (4)	4.0 – 8.0 ounce	.0625 – 0.125	32.0 – 16.0	Premix insecticides are available for this pest. See premix table.
	etoxazole Zeal (72)	0.66 – 1.0 ounce	0.030 - 0.045	28.0 – 16.0	
	abamectin Agri-Mek SC (0.7)	1.75 – 3.5 ounce	0.009 – 0.019	73.1 – 36.6	
	hexythiazox Onager (1)	16.0 – 20.0 ounce	0.125 – 0.156	8.0 – 6.4	
Thrips	***Seed treatment***				
	acephate Orthene (90)	6.4 ounce/100 wt			
	Imidacloprid Gaucho Grande (600)	0.375 mg AI/seed			
	Avicta Elite	Commercial pre-treatment of imidacloprid + thiamethoxam			
	Aeris	Commercial pre-treatment of imidacloprid+ thiodicarb			
	At planting in furrow				
	acephate Orthene (90)	1.1 pound	1.0		Premix insecticides are available for this pest. See premix table.
	aldicarb AgLogic (15)	3.3 - 5.0 pound	0.5-0.75		
	imidacloprid	7.4 - 9.2 ounce	0.26 – 0.33		

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Crops - Commercial

Cotton					
Insect	**Insecticide**	**Amount of Concentrate per Acre**	**Pounds Active Ingredient per Acre**	**Acres Treated per Gallon or Pound SP**	**Treatment Threshold / Remarks**
	Admire Pro (4.6)				
	Imidacloprid (4)	8.5 – 10.6 ounce	0.25 – 0.33		
	Imidacloprid (2)	17.0 – 21.1 ounce	0.25 – 0.33		
	Foliar Sprays				
	acephate Orthene (90)	3.2 ounce	0.18	5.0	Treat when immature thrips first appear on seedling cotton before fourth true leaf. Do not apply acephate or Orthene if spider mites are present.
	acephate Orthene (97)	3.0 ounce	0.18	5.3	
	dicrotophos Bidrin (8)	3.2 ounce	0.2	40.0	Premix insecticides are available for this pest. See premix table.
	dimethoate Dimethoate (4)	6.4 ounce	0.2	20.0	
	spinetoram Radiant (1)	1.5 – 3.0 ounce	0.01 – 0.02	85.0 – 42.7	
Bloom to Harvest					
Beet armyworms	methoxyfenozide Inrepid (2)	6.0-10.0 ounce	0.09-0.16	21.0-12.5	Treat when larvae are small and 5 to 6 hatch out spots (hits) are observed per 300 row feet.
	indoxacarb Steward (1.25)	11.3 ounce	0.11	11.5	
	spinosad Blackhawk (0.36)	2.4 - 3.2 ounce	0.054 – 0.072	6.7 – 5.0	
	chlorantraniliprole Prevathon (0.43)	14.0 – 27.0 ounce	0.047 – 0.09	9.1 – 4.7	Premix insecticides are available for this pest. See premix table.
Bollworm/ tobacco budworm	spinetoram Radiant (1)	2.8 – 8.0 ounce	0.022 – 0.0625	46 - 16	**Non-Bt, WideStrike, TwinLink,cotton varieties:** Treat when you find 20 eggs/100 plants or 6% fruit injury of any kind. Regardless of size of larvae, treatment may be warranted if damaged-boll counts exceed 2% and significant numbers of larvae are present and continuing to cause damage.
	indoxacarb Steward (1.25)	11.3 ounce	0.11	11.5	
	spinosad Blackhawk (0.36)	2.4 - 3.2 ounce	0.054 – 0.072	6.7 – 5.0	
	chlorantraniliprole Prevathon (0.43)	14.0 – 27.0 ounce	0.047 – 0.09	9.1 – 4.7	**WideStrike 3, TwinLink Plus, and BG3** cotton varieties: Treat when larvae 1/8-inch long or longer exceed 4 larvae/100 plants or 6% fruit injury of any kind. Regardless of size of larvae, treatment may be warranted

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Crops - Commercial

Cotton

Insect	Insecticide	Amount of Concentrate per Acre	Pounds Active Ingredient per Acre	Acres Treated per Gallon or Pound SP	Treatment Threshold / Remarks
					if damaged-boll counts exceed 2% and significant numbers of larvae are present and continuing to cause damage. **Use Pyrethroids With Caution:** Pyrethroid resistance is prevalent in bollworms in Louisiana. Premix insecticides are available for this pest. See premix table
Brown stink bugs	acephate Orthene (90)	0.8 pound	0.72	1.25	See green stink bug thresholds.
	dicrotophos Bidrin (8)	6.0 - 8.0 ounce	0.33-0.5	24.0 – 16.0	
	oxamyl Vydate (3.77)	17.0 ounce	0.5	7.5	Premix insecticides are available for this pest. See premix table.
Cotton aphid	flonicamid Carbine (50)	1.4 - 2.8 ounce	0.044 - 0.089	11.4 - 5.7	Treat when honeydew, leaf crinkling and stunting begin to occur uniformly.
	sulfoxaflor Transform (50)	0.75 – 1.0 ounce	0.023 – 0.031	21.3 – 16.0	
	acetamiprid Strafer Max (70)	1.1 ounce	0.05	14.5	Note: if neonicotinoid insecticides fail to provide effective control, switch to Strafer Max 70 Carbine 50 or Transform 50.
Fall armyworms	novaluron Diamond (0.83)	6.0 – 12.0 ounce	0.039 - 0.077	21.3 - 10.6	Treat when egg masses or small larvae appear.
	methoxyfenozide Intrepid (2)	6.0 – 10.0 ounce	0.09-0.16	21.0-12.5	
	spinosad Blackhawk (0.36)	2.4 - 3.2 ounce	0.054 – 0.072	6.7 – 5.0	Premix insecticides are available for this pest. See premix table.
	chlorantraniliprole Prevathon (0.43)	14.0 – 27.0 ounce	0.047 – 0.09	9.1 – 4.7	
Green stink bugs	acephate Orthene (90)	0.8 pound	0.72	1.25	Treat stink bugs when 1 adult/nymph are found per 6 row feet, 5% adults/nymphs are found in sweep nets or 15% to 20% of 12- to 16-day-old bolls have internal injury.
	beta-cyfluthrin Baythroid XL (1)	1.6-2.6 ounce	0.0125 - 0.02	80.0 - 50.0	
	dicrotophos Bidrin (8)	4.0 - 8.0 ounce	0.25-0.5	32.0 – 16.0	Stink bug populations normally are very clumped in fields; thus, numerous samples may be required to assess infestation.
	bifenthrin Brigade (2)	2.6-6.4 ounce	0.04-0.1	50.0 - 20.0	
	cyfluthrin	1.6 - 2.6 ounce	0.025 - 0.041	80.0 - 50.0	

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Crops - Commercial

Cotton

Insect	Insecticide	Amount of Concentrate per Acre	Pounds Active Ingredient per Acre	Acres Treated per Gallon or Pound SP	Treatment Threshold / Remarks
	Tombstone (2)				Premix insecticides are available for this pest. See premix table.
	lambda-cyhalothrin Karate Z (2.08)	1.6 - 2.56 ounce	0.025 - 0.04	80.0 – 50.0	
	z-cypermethrin Mustang Max (0.8)	2.6-3.6 ounce	0.017-0.022	47.0 - 36.0	
	a-cypermethrin Fastac (0.83)	2.6 – 3.6 ounce	0.017 – 0.023	49.0 – 36.0	
	gamma-cyhalothrin Declare (1.25)	1.28-2.05 ounce	0.0125-0.02	100.0 - 62.5	
	acephate Orthene (97)	0.75 pound	0.72	1.29	
	oxamyl Vydate (3.77)	11.2-17.0 ounce	0.33-0.5	11.4-7.5	
Loopers	methoxyfenozide Intrepid (2)	6.0 – 10.0 ounce	0.09 - 0.16	21.0 - 12.5	Before cutout, treat when loopers cause 30% defoliation. After cutout treat at 45% defoliation.
	indoxacarb Steward (1.25)	9.2 ounce	0.09	14.0	
	spinosad Blackhawk (0.36)	2.4 - 3.2 ounce	0.054 – 0.072	6.7 – 5.0	
	chlorantraniliprole Prevathon (0.43)	20.0 – 29 ounce	0.067 – 0.097	6.4 – 4.4	Premix insecticides are available for this pest. See premix table.
Plant bug clouded, tarnished	acephate Orthene (90)	0.55 – 1.1 pound	0.5 – 1.0	1.8 – 0.9	After first flower, treat at two to three tarnished plant bugs per 5 feet black drop cloth, 10 tarnished plant bugs per 100 sweep net samples or 10% dirty squares.
	acephate Orthene (97)	0.8-1.0 pound	0.75-0.97	1.3-1.0	
	dicrotophos Bidrin (8)	6.0 – 8.0 ounce	0.33 - 0.5	24.0 – 16.0	NOTE: Diamond will not control adults. For adult control, tank-mix with an adulticide. Repeat applications at 7- to 14-day intervals as needed to maintain control.
	novaluron Diamond (0.83)*	6.0 – 12.0 ounce	0.039 - 0.078	21.3 - 10.67	
	sulfoxaflor Transform (50)	1.5 – 2.25 ounce	0.047 – 0.071	10.7 – 7.1	
	oxamyl Vydate (3.77)	11.2 – 17.0 ounce	0.33 – 0.5	11.4 – 7.5	
	thiamethoxam Centric (40)	2.5 – 3.0 ounce	0.0625 – 0.075	6.4 – 5.3	
	flonicamid Carbine (50)	2.8 ounce	0.089	5.7	
	malathion Fyfanon (ULV)9.9C	16.0 ounce	1.25	8.0	Multiply clouded plant bug number by 1.5 when

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Crops - Commercial

Cotton					
Insect	**Insecticide**	**Amount of Concentrate per Acre**	**Pounds Active Ingredient per Acre**	**Acres Treated per Gallon or Pound SP**	**Treatment Threshold / Remarks**
					determining densities for treatment decision. Premix insecticides are available for this pest. See premix table.
Spider mites	abamectin Agri-mek (0.15)	8.0 – 16.0 ounce	0.009 - 0.0187	16.0 – 8.0	Treat when mite infestations cause areas where plants have discolored leaves. Anticipate repeating applications in 5 days.
	propargite Comite II (6.0)	24.0 – 36.0 ounce	1.1 – 1.7	5.3 – 3.5	
	dicofol Dicofol (4)	1.0 quart	1.0	4.0	**Use Abamectin With Caution:** Abamectin resistance in two spotted spider mites has been detected in Louisiana.
	fenpyroximate Portal (0.4)	16.0 – 32.0 ounce	0.05 – 0.10	8.0 – 4.0	
	spiromesifen Oberon (4)	4.0 – 8.0 ounce	0.0625 – 0.125	32.0 – 16.0	
	etoxazole Zeal (72)	0.66 – 1.0 ounce	0.03 - 0.045	28.0 – 16.0	
	abamectin Agri-Mek (0.7)	1.75 – 3.5 ounce	0.009 – 0.019	73.1 – 36.6	Premix insecticides are available for this pest. See premix table.
	hexythiazox Onager (1)	16.0 – 20.0 ounce	0.125 – 0.156	8.0 – 6.4	
Whitefly	acephate Orthene (90)	0.83-1.0 pound	0.75-0.9	1.2-1.0	Apply when 50% of plant terminals have clustering whiteflies. Control may require three to four applications at 5-day intervals.
	thiamethoxam Centric (40)	2.0 ounce	0.05	8.0	
	acetamiprid Strafer Max (70)	1.7 – 2.3 ounce	0.075 – 0.1	9.4 – 7.0	
	acephate Orthene (97)	0.8-1.0 pound	0.75-0.97	1.3-1.0	
	spiromesifen Oberon (4)	4.0 – 8.0 ounce	.0625 – 0.125	32.0 – 16.0	

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Crops - Commercial

Cotton

Premix Insecticide Products: The following products are available as premixes of two or more insecticides.

Trade Name (Insecticides)	**Amount of Concentrate per Acre**	**Acres Treated per Gallon or Pound SP**	**Primary Target Pests:** (See label for other pests that may be controlled)
Athena (bifenthrin, abamectin)	10.0 – 17.0 ounce	12.8 – 7.5	Spider mites
Besiege (chlorantraniliprole, lambda-cyhalothrin)	6.5 – 12.5 ounce	19.7 – 10.2	Most caterpillar pests, stink bugs
Bidrin XP II (dicrotophos, bifenthrin)	8.0 – 12.8 ounce	16.0 – 10.0	Stink bugs, plant bugs
Brigadier (imidacloprid, bifenthrin)	5.1 – 7.7 ounce	25.0 – 16.6	Stink bugs, plant bugs
Cobalt Advanced (chlorpyrifos, lambda – cyhalothrin)	16.0 – 42.0 ounce	8.0 – 3.0	Stink bugs, plant bugs
Endigo ZC (thiamethoxam, lambda – cyhalothrin)	3.5 – 5.5 ounce	36.6 – 25.6	Stink bugs, plant bugs
Fyfanon Plus ULV (malathion, gamma – cyhalothrin)	8.0 – 16.0 ounce	16.0 – 8.0	Stink bugs, plant bugs
Gladiator (zeta – cypermethrin, avermectin B1)	13.0 – 19.0 ounce	9.8 – 6.7	Stink bugs, spider mites
Hero (zeta – cypermethrin, bifenthrin)	5.2 – 10.3 ounce	24.6 – 12.4	Stink bugs
Intrepid Edge (methoxyfenozide, spinetoram)	3.0 – 6.0 ounce	42.6 – 21.3	Thrips
Leverage 360 (imidacloprid, beta – cyfluthrin)	3.2 ounce	40.0	Stink bugs, plant bugs
Stallion (chlorpyrifos, zeta – cypermethrin)	9.25 – 11.75 ounce	13.8 – 10.9	Stink bugs, plant bugs
Triple Crown (imidacloprid, zeta – cypermethrin, bifenthrin)	4.5 – 6.4 ounce	28.4 – 20.0	Stink bugs, plant bugs
Velum Total (fluopyram, imidacloprid)	14.0 – 18.0 ounce	9.1 – 7.1	Thrips

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Crops - Commercial

Corn

Insect	Insecticide	Amount of Concentrate per Acre	Pounds Active Ingredient per Acre	Acres Treated per Gallon or Pound SP	Economic Threshold When to Treat
Chinch bugs	***At planting***[1]				Preventive treatment. Apply **at planting. Rates are based on 1,000 feet of row.**
	terbufos Counter (15)G[2]	6.0-8.0 ounce per 1,000 row feet	1.0		
	chlorpyrifos Lorsban (15)G[2]	8.0 ounce per 1,000 row feet	1.0		
	Seed treatments See Table 1.				
	Post-emergence				Seedling corn less than 6 inches tall: five or more bugs on 20% or more plants.
	beta-cyfluthrin Baythroid XL (1)	1.6-2.8 ounce	0.013-0.02	80-45.7	
	chlorpyrifos[3] Lorsban (4)	16-32 ounce	0.5-1.0	8-4	Larger plants require a judgment decision based on bug counts, crop vigor and weather conditions.
	lambda-cyhalothrin Karate Z (2.08)	1.92 ounce	0.03	66.7	
	bifenthrin Brigade (2)	2.1-6.4 ounce	0.033-0.1	61-20	
	z-cypermethrin Mustang Max (0.8)	3.2-4.0 ounce	0.02-0.025	40-32	
	cyfluthrin Tombstone (2)	1.6-2.8 ounce	0.025-0.044	80-45.7	
Corn earworm (whorls only)	chlorantranilipole, lambda-cyhalothrin Besiege	5.0-10.0 ounce	premix	25.6-12.8	Chemical treatment for worms in the whorl is not recommended, except in extreme situations.
	chlorantraniliprole Prevathon (0.43)	14.0-20.0 ounce	0.047-0.067	9.1-6.4	
	Bt corn hybrids See Table 2.				Transgenic Bt plant varieties recommended for your area and comply with labeled refuge requirements.
Cucumber beetles and grape colaspis	esfenvalerate Asana XL (0.66)	5.8-9.6 ounce	0.03-0.05	22-13	At silking, treat when five or more bugs are found per ear.
	beta-cyfluthrin Baythroid XL (1)	1.6-2.8 ounce	0.013-0.022	80-45.7	
	bifenthrin Brigade (2)	2.1-6.4 ounce	0.033-0.10	61-20	
	cyfluthrin Tombstone (2)	1.6-2.8 ounce	0.025-0.044	80-45.7	
	lambda-cyhalothrin Karate Z (2.08)	1.28-1.92 ounce	0.02-0.03	100-66.7	
	z-cypermethrin Mustang Max (0.8)	2.72-4.0 ounce	0.017-0.025	47-32	
Cutworms	***At planting***[1]				Preventive treatment. Apply at planting. Rates are based on 1,000 feet of row.
	chlorpyrifos Lorsban (15)G[2]	8.0 ounce per 1,000 row feet	1.0		

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Crops - Commercial

Corn

Insect	Insecticide	Amount of Concentrate per Acre	Pounds Active Ingredient per Acre	Acres Treated per Gallon or Pound SP	Economic Threshold When to Treat
	tefluthrin Force (3)G	3.0-4.0 ounce per 1,000 row feet	0.1		
	bifenthrin Capture LFR (1.5)	0.2-0.39 ounce per 1,000 row feet	0.04-0.08		
	lambda-cyhalothrin Ballista LFC (2.5)	0.66 ounce per 1,000 row feet	0.005		
	chlorethoxyfos, bifenthrin SmartChoice (5)G	4.5-5.0 ounce per 1,000 row feet	0.2-0.25		
Cutworms continued	***At planting bands or postemergence***[1]				Treat when seedling plants show 6% to 8% damage from above-ground cutting or 2% to 4% from below-ground boring.
	lambda-cyhalothrin Karate Z (2.08)	0.96-1.60 ounce	0.015-0.025	133.3-80	
	chlorpyrifos[3] Lorsban (4)	16.0-32.0 ounce	0.5-1.0	8-4	
	z-cypermethrin Mustang Max (0.8)	1.28-2.8 ounce	0.008-0.0175	100-45.7	Transgenic Bt plant varieties recommended for your area and comply with labeled refuge requirements.
	bifenthrin Brigade (2)	2.1-6.4 ounce	0.033-1.0	61-20	
	esfenvalerate Asana XL (0.66)	5.8-9.6 ounce	0.03-0.05	22-13	
	beta-cyfluthrin Baythroid XL (1)	0.8-1.6 ounce	0.007-0.013	160-80	
	cyfluthrin Tombstone(2)	0.8-1.6 ounce	0.013-0.025	160-80	
	bifenthrin Capture LFR (1.5)	3.4-6.8 ounce	0.04-0.08	37.6-18.8	
	Bt corn hybrids: See Table 2.				
Fall armyworm (whorls only)	chlorantranilipole, lambda-cyhalothrin Besiege	6.0-10.0 ounce	premix	21.3-12.8	Chemical treatment for worms in the whorl is rarely needed, except in extreme situations. Treatment for worms in the ear is not recommended.
	chlorantranilipole Prevathon (0.43)	14.0-20.0 ounce	0.047-0.067	9.1-6.4	Transgenic Bt plant varieties recommended for your area and comply with labeled refuge requirements.
	Bt corn hybrids: See Table 2.				
Rootworms	*At planting*[1]. For seed treatments see Table 1.				Preventive treatment. Apply at planting. Rates are based on 1,000 row feet.
	bifenthrin Brigade (2)	0.30 ounce per 1,000 row feet	0.06-0.08		
	terbufos Counter (15)G[2]	6.0-8.0 ounce per 1,000 row feet	1.0		

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Crops - Commercial

Corn

Insect	Insecticide	Amount of Concentrate per Acre	Pounds Active Ingredient per Acre	Acres Treated per Gallon or Pound SP	Economic Threshold When to Treat
	chlorpyrifos Lorsban (15)G[2]	8.0 ounce per 1,000 row feet	1.0		
	tefluthrin Force (3)G	4.0-5.0 ounce per 1,000 row feet	0.1		
	tebupirimphos, cyfluthrin Aztec (2.1)G	6.7 ounce per 1,000 row feet	0.11		
	lambda-cyhalothrin Ballista LFC (2.5)	0.66 ounce per 1,000 row feet	0.005		
	chlorethoxyfos, bifenthrin SmartChoice (5)G	4.5-5.0 ounce per 1,000 row feet	0.2-0.25		
Spider mites	etoxazole Zeal (72)	1.0-3.0 ounce	0.045-0.135	16-5.3	Make applications when spider mite populations are rapidly growing to prevent damage to leaves at ear height or higher.
	fenpyroximate Portal (0.4)	24.0-32.0 ounce	0.075-0.01	5.3-4	
	propargite Comite II (6)	36-54 ounce	1.69-2.53	3.5-2.4	
	spiromesifen Oberon (4)	2.85-8.0 ounce	0.09-0.25	44.9-16	
	hexythiazox Onager (1)	10.0-24.0 ounce	0.078-0.187	12.8-5.3	
Stalk borers	z-cypermethrin Mustang Max (0.8)	2.72-4.0 ounce	0.017-0.025	47-32	Before tassel stage, treat for 5% infested plants. At and after tassel stage, treat for 10% infested plants.
	beta-cyfluthrin Baythroid XL (1)	1.6-2.8 ounce	0.012-0.022	80-45.7	
	esfenvalerate Asana XL (0.66)	5.8-9.6 ounce	0.03-0.05	22-13	
	cyfluthrin Tombstone (2)	1.6-2.8 ounce	0.025-0.044	80-45.7	Transgenic Bt plant varieties recommended for your area and comply with labeled refuge requirements.
	lambda-cyhalothrin Karate Z (2.08)	1.28-1.92 ounce	0.02-0.03	100-66.7	
	methoxyfenozide Intrepid (2)	4-16 ounce	0.06-0.25	32-8	
	bifenthrin Brigade (2)	2.1-6.4 ounce	0.033-0.10	61-20	
	chlorantranilipole, λ-cyhalothrin Besiege	6.0-10.0 ounce	premix	21.3-12.8	
	chlorantraniliprole Prevathon (0.43)	14.0-20.0 ounce	0.047-0.067	9.1-6.4	
	Bt corn hybrids: See Table 2.				

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Crops - Commercial

Corn

Insect	Insecticide	Amount of Concentrate per Acre	Pounds Active Ingredient per Acre	Acres Treated per Gallon or Pound SP	Economic Threshold When to Treat
Stink bugs	beta-cyfluthrin Baythroid XL[4] (1)	1.6-2.8 ounce	0.012-0.022	80-45.7	Treat if 5% of plants have bugs at or prior to ear shoot appearance. Early season plants up to V5, treat when 10% of plants are infested.
	z-cypermethrin[4] Mustang Max (0.8)	2.72-4.0 ounce	0.017-0.025	47-32	
	bifenthrin Brigade (2)	2.1-6.4 ounce	0.033-0.1	61-20	
	cyfluthrin[4] Tombstone (2)	1.6-2.8 ounce	0.025-0.044	80-45.7	
	lambda-cyhalothrin[4] Karate Z (2.08)	1.28-1.92 ounce	0.02-0.03	100-66.7	
Sugarcane beetle	***At planting***[1] For seed treatments see Table 1.				Preventive treatments. Rates are based on 1,000 row feet. Poncho 250, 500and Cruiser 250, 500 and 1250 benefit from the addition of an in-furrow insecticide.
	bifenthrin Brigade (2)	0.30 ounce per 1,000 row feet	0.06-0.08		• Counter 15G[2] • Force 3G • Aztec 2.1G • SmartChoice 5G[3] • Bifenthrin (2) • Ballista LFC (2.5) • Capture LFR (1.5)

[1] Refer to the label for application instructions/restrictions on application method (i.e., in-furrow, surface band, T-band, etc.)

[2] Serious crop injury may occur if an ALS inhibiting herbicide is applied to corn previously treated at planting with Counter 15G, Lorsban 15G or other systemic organophosphate soil insecticide. Read the ALS herbicide label carefully for exact restrictions and precautions.

[3] Crop injury may occur if an ALS-inhibiting herbicide is applied too soon either before or after the application of a foliar organophosphate insecticide. Read the ALS herbicide label carefully for exact restrictions and precautions.

[4] Karate/ Warrior T and Declare will not give effective control of brown stink bugs. Mustang Max**x**, Cyfluthrin and Baythroid XL will give satisfactory brown stink bug control only at the highest recommended rates.

Corn

Insecticide Precautions and Limitations (Refer to insecticide label for complete information.)
Asana XL: Toxic to fish. Do not apply directly to water. Maximum active ingredient per acre per season: 0.25 pound. Preharvest interval: 21 days. REI: 12 hours.
Aztec: Toxic to fish and wildlife. Do not apply directly to water or areas where surface water is present. Maximum active ingredient per acre per season: 0.15 pound. REI: 48 hours (0 hours if the product is soil-injected or soil-incorporated and contact with anything treated is prevented).
Baythroid: Toxic to fish and aquatic invertebrates. Maximum active ingredient per acre per season: 0.088 pound. Preharvest interval: 21days. REI: 12 hours.
Bifenthrin: Same as Brigade.
Brigade: Do not apply within 30 days of harvest. Do not graze or cut for feed within 30 days of last application. Toxic to bees, fish and aquatic invertebrates. Maximum active ingredient per acre per season: 0.3 pound. REI: 24 hours.
Counter: Toxic to birds, fish and other wildlife. Keep out of any body of water. REI: 48 hours.
Cruiser: Toxic to wildlife and aquatic invertebrates. Do not apply directly to water and do not allow drift or runoff. REI: 12 hours.
Cyfluthrin: Same as Baythroid, but Maximum active ingredient per acre per season: 0.175 pound.

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Crops - Commercial

Corn
Insecticide Precautions and Limitations (Refer to insecticide label for complete information.)
Declare: Same as Karate, but do not apply more than 0.06 pound active ingredient per acre per season.
Dimethoate: Toxic to wildlife and aquatic organisms. Do not apply after heading. Avoid runoff when spraying. REI: 48 hours.
Force: Highly toxic to fish and other aquatic organisms. Do not apply directly to water or wetlands or within 20 yards of water. Rotate only to corn or soybeans. REI: 0 hours.
Gaucho 600: Highly toxic to birds and aquatic invertebrates. Do not graze or feed livestock on treated seed areas for 45 days after planting. REI: 12 hours.
Intrepid: Drift and runoff may be toxic to sensitive aquatic vertebrates. Do not apply by air within 150 feet or by ground within 25 feet of surface water. Do not apply within 21 days of harvest. REI: 4 hours.
Karate Z: Toxic to fish, aquatic organisms and bees. Do not graze livestock on treated areas or harvest for livestock feed. Maximum active ingredient per acre per season: 0.12 pound. Preharvest interval: 21 days. REI: 24 hours.
Lannate: Toxic to fish, birds, bees, other wildlife. Keep out of any body of water. Do not graze or feed to livestock within 14 days of last application. Do not harvest for grain within 14 days of last application. Maximum active ingredient per acre per season: 0.9 pound. REI: 48 hours.
Lorsban: Toxic to bees, birds, fish and other wildlife. Maximum active ingredient per acre per season: 3 pounds. Preharvest interval is 21 days. Preharvest interval for grazing and silage is 21 days. REI: 12 hours for 15G; 24 hours for 4E.
Mustang Maxx: Toxic to bees, fish and aquatic vertebrates. Maximum active ingredient per acre per season: 0.10 pound. Preharvest interval: 30 days. REI: 12 hours.
Poncho: Do not use treated seed for feed, food or oil. Refer to label for replant restrictions following treated seed planting. Treated seed exposed on soil surface may be hazardous to wildlife.
Respect: Toxic to bees, fish and aquatic vertebrates. Maximum active ingredient per acre per season: 0.10 pound. Preharvest interval: 30 days. REI: 12 hours.
Tracer: Toxic to bees. Do not apply to water. Do not apply more than 14.4 ounces per acre per year. Preharvest treatment for grain or fodder: 7 days; for forage: 14 days. REI: 4 hours.
Warrior T: Same general restrictions as Karate. Do not apply more than 0.12 pound active ingredient per acre per season. Preharvest interval is 21 days.
Abbreviations: REI: Re-entry interval. **AI**: Active ingredient.

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Crops – Commercial

Corn

Corn seed treatments and their relative efficacy for control of seedling insect pests in field corn (updated October 2019).

	Relative Efficacy for Insect Control[1]												
Insecticide	**Rate**	**Corn billbug**	**White grubs**	**Wireworms**	**Seedcorn maggot**	**Cutworms[2]**	**Sugarcane beetle**	**Southern green stink bug**	**Brown stink bug**	**Chinch bug**	**Southern corn rootworm[2]**	**Western corn rootworm**	**Lesser cornstalk borer**
Active Ingredient (a.i.): clothianidin													
PONCHO 250, NIPSIT INSIDE or ACCELERON [3]	0.25 mg a.i./kernel	NL	F	G	G	P	P	F	NL	G	E	NL	G, NL
PONCHO 500, NIPSIT INSIDE or ACCELERON with PONCHO VOTiVO 500 [4]	0.50 mg a.i./kernel	F	E	G	E	P	F	G	NL	G-E	E	P, NL	G, NL
PONCHO 1250, NIPSIT INSIDE ACCELERON with PONCHO VOTiVO 1250, or PONCHO VOTiVO[4]	1.25 mg a.i./kernel	G	E	E	E	F	G	G	G, NL	E	E	F-G	E, NL
Active Ingredient (a.i.): thiamethoxam													
CRUISER MAXX 250 [3]	0.25 mg a.i./kernel	NL	F	G	E	P	P	P	NL	F	G-E, NL	NL	G, NL
PPST 250 [6]	0.25 mg a.i./kernel	NL, F	F	G	E	P	P	P	NL	F	G-E, NL	NL	G, NL
CRUISER MAXX 500 [3] or AVICTA COMPLETE CORN[4]	0.50 mg a.i./kernel	NL	G	G	E	P	P	F	NL	F	E	NL	G, NL
CRUISER MAXX 1250 [3]	1.25 mg a.i./kernel	G	E	E	E	F	P	G	NL	G	E	P	E, NL
Active Ingredients (a.i.): thiamethoxam + chlorantraniliprole (Rynaxypyr)													
PPST 250 PLUS LUMIVIA[3]	0.25 mg a.i.+0.25 mg a.i./kernel	E	G[7]	G[7]	E	G[7]	P	P	NL	F	G-E, NL	NL	G, NL

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Crops – Commercial

Corn

	Relative Efficacy for Insect Control[1]												
Insecticide	**Rate**	**Corn billbug**	**White grubs**	**Wireworms**	**Seedcorn maggot**	**Cutworms[2]**	**Sugarcane beetle**	**Southern green stink bug**	**Brown stink bug**	**Chinch bug**	**Southern corn rootworm[2]**	**Western corn rootworm**	**Lesser cornstalk borer**
Active Ingredient (a.i.): imidacloprid													
IMIDA E-AG 5 FST, SENATOR 600, IMIDACLOPRID 5, ATTENDANT 600, NITROSHIELD IV	0.60 mg a.i./kernel [5]	NL	G	G	E	P, NL	P, NL	P, NL	NL	F	G, NL	NL	NL
LATITUDE [5]	3.5 oz./ hundred-weight	NL	F, NL	G	G	NL	NL	NL	NL	F, NL	G, NL	NL	NL
CONCUR [3]	1.5 oz./ 42 lb. seed	NL	F	G	G	NL	NL	NL	NL	F, NL	G, NL	NL	NL
Active Ingredient (a.i.): permethrin													
KERNEL GUARD SUPREME [3] or KICKSTART VP [3]	1.5 oz./ 42 lb. seed	NL	F, NL	P?	F	NL	NL	NL	NL	NL	NL	NL	NL

[1] E = highly effective, G = effective, F = inconsistent results, P = not effective, based on trials in the Southeastern U.S.; L = insect is on the label for this product; NL = insect is not on the label for this product. In this case, it is best to assume that the product is ineffective against that particular pest, unless there is specific knowledge to the contrary about product efficacy in the Southeast.

[2] In the Southeast, several species of cutworms overwinter as medium to large-sized larvae. They may be capable of cutting considerable numbers of seedlings before they eat a lethal dose of the insecticide. Black cutworm, the cutworm that appears on the label of most of these products, has a different life cycle in which eggs are laid in the spring, so that black cutworm larvae will be small if they have hatched out by the time the corn is planted. Southern corn rootworm larvae are a seedling pest, not a mid-season pest like western corn rootworm larvae. **Ratings based on input from the Southern Corn Insect Working Group who meet at the Annual Meeting of the Southeastern Branch, Entomological Society of America.**

[3] Product name as marketed includes fungicides.

[4] Product name as marketed includes fungicides and a nematicide. AVICTA COMPLETE CORN contains abamectin; PONCHO VOTiVO contains *Bacillus firmus* I-1582.

[5] Other rates for this active ingredient are available. See label.

[6] Product name as marketed includes fungicides and a biological growth promoter.

[7] Product sell sheets state that this product provides enhanced control of white grubs, wireworms and cutworms relative to PPST 250. Therefore efficacy ratings were increased by one level relative to PPST 250.

CBD v. EPA (1:21-cv-00681-CJN) ED_005427A_00029618-00024

Crops – Commercial

Corn

Bt corn products for 2020 in the Southern U.S. (updated October 2019).

		Relative Efficacy for Insect Control[1]							
Product trade name (Abbreviation)	**Bt protein(s)**	**Corn earworm (ear)**	**Fall armyworm (whorl)**	**Corn borers[2] (stalk)**	**Black cutworm (seedling)**	**LCB[3] (seedling)**	**Herbicide tolerance[4]**	**Required refuge in the South[5]**	**Event(s)**
Agrisure Products									
Agrisure 3011	Cry1Ab mCry3A	P	F-G	E	P/F	G	GT LL	50%	Bt11, MIR604, GA21
Agrisure Viptera 3110	Vip3Aa20 Cry1Ab	E	E	E	VG	G	GT LL	20%	MIR162, Bt11, GA21
Agrisure Viptera 3111	Vip3Aa20 Cry1Ab mCry3A	E	E	E	VG	G	GT LL	20%	MIR162, Bt11, MIR604, GA21
Agrisure Viptera 3220	Vip3Aa20 Cry1Ab Cry1F	VG	E	E	VG	VG	GT LL	20%	MIR162, Bt11, TC 1507, GA21
Optimum Products									
Optimum Intrasect (YHR)	Cry1F Cry1Ab	P	G	E	VG	VG	LL RR2	20%	TC 1507, MON810
Optimum Intrasect XTRA (YXR)	Cry1F Cry1Ab Cry34Ab1/Cry 35Ab1	P	G	E	VG	VG	LL RR2	20%	TC 1507, MON810, DAS-59122-7
Optimum Leptra (VYHR)	Cry1F Cry1Ab Vip3Aa20	VG	E	E	VG	VG	LL RR2	20%	TC 1507, MON810, MIR162
YieldGard Products									
YieldGard VT Triple (VT3)	Cry1Ab Cry3Bb1	P	F	E	P	G	RR2	50%	MON810, MON88017
Genuity/SmartStax/POWERCORE Products									
Genuity VT Double PRO (GENVT2P)	Cry1A.105 Cry2Ab2	F	VG	E	P	VG	RR2	20%	MON89034, NK603
Genuity VT Triple PRO (GENVT3P)	Cry1A.105 Cry2Ab2 Cry3Bb1	F	VG	E	P	VG	RR2	20%	MON89034, MON88017
POWERCORE	Cry1A.105 Cry2Ab2 Cry1F	F	E	E	G	VG	LL RR2	20%	MON89034, TC 1507, NK603
SmartStax (SSX, Dow) or Genuity SmartStax (GENSS, Monsanto)	Cry1A.105 Cry2Ab2 Cry1F Cry3Bb1 Cry34Ab1/Cry 35Ab1	F	E	E	G	VG	LL RR2	20%	MON89034, TC 1507, MON88017, DAS-59122-7
Trecepta	Cry1A.105 Cry2Ab2 Vip3Aa20	E	E	E	VG	VG	RR2	20%	MON89034, NK603, MIR162,

[1] E = excellent, VG = very good, G = good, F = fair, P = poor. Excellent usually means better than 95% control. Poor means less than about 30% control.

[2] Southwestern corn borer, European corn borer, sugarcane borer and others.

[3] Lepidopteran Bt traits do not specifically list lesser cornstalk borer (LCB) as a target pest.

[4] GT = Glyphosate tolerant; LL= Liberty Link (glufosinate tolerant); RR2= Roundup Ready 2 (glyphosate tolerant).

[5] See product Insect Resistance Management (IRM) documentation from the seed companies for more details.

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Crops - Commercial

Grain Sorghum

Insect	Insecticide	Amount of Concentrate per Acre	Pounds Active Ingredient per Acre	Acres Treated per Gallon or Pound SP	Economic Threshold When to Treat
Chinch bugs	***Soil Insecticides***				Preventive: Rates are based on 1,000 row feet.
	chlorpyrifos Lorsban 15G[1,2]	8.0 ounces per 1,000 row feet	1.0		
	Seed Treatments				Preventive.
	imidacloprid Gaucho 600	8 fluid ounces per hundredweight seed			
	thiamethoxam Cruiser 5FS	5.1 fluid ounces per hundredweight seed			
	clothianidin Nipsit Inside (5)	5.1-6.4 fluid ounces per hundredweight seed			
	Foliar Sprays				
	cyfluthrin Tombstone (2)	2.0-2.8 ounces	0.038-0.044	64-45.7	Treat when two or more adults are found on 20% seedling plants.
	chlorpyrifos Lorsban	16.0-32.0 ounces	0.5-1.0	8-4	
	gamma-cyhalothrin Declare (1.25)	1.54 ounces	0.015	83.1	For larger plants, a judgment decision based on bug counts, crop vigor and growing conditions will determine need for treatment.
	z-cypermethrin Mustang Max (0.8)	3.2-4.0 ounces	0.02-0.025	40-32	
	lambda-cyhalothrin Karate Z (2.08)	1.92 ounces	0.03	66.7	
	beta-cyfluthrin Baythroid XL (1)	2.0-2.8 ounces	0.02	64-45.7	
	a-cypermethrin Fastac (0.83)	3.2-3.9 ounces	0.02-0.025	40-32.8	
Corn earworm, fall armyworm (whorl feeders)	spinosad Blackhawk (0.36)	1.7-3.3 ounces	0.038-0.075	9.4-4.8	Treatment in the whorl stage is rarely needed.
	chlorantraniliprole Prevathon (0.43)	14.0-20.0 ounces	0.047-0.067	9.1-6.4	
	lambda-cyhalothrin, chlorantranilipole Besiege	6.0-10.0 ounces	premix	21.3-12.8	Treat seed heads for one or more worms per head, up until the hard dough stage.
	spinosad Blackhawk (0.36)	1.7-3.3 ounces	0.038-0.074	4.8-9.4	**Use pyrethroids with caution:** Pyrethroid resistance is prevalent in corn earworms in Louisiana. Heligen is only effective on corn earworm.
Head Worms	chlorantraniliprole Prevathon (0.43)	14.0-20.0 ounces	0.047-0.067	9.1-6.4	
	lambda-cyhalothrin, chlorantranilipole	6.0-10.0 ounces	premix	21.3-12.8	

CBD v. EPA (1:21-cv-00681-CJN) ED_005427A_00029618-00026

Grain Sorghum

Insect	Insecticide	Amount of Concentrate per Acre	Pounds Active Ingredient per Acre	Acres Treated per Gallon or Pound SP	Economic Threshold When to Treat
	Besiege				
	NPV Heligen	1.0 – 1.6	---	128 - 80	
Aphids except Sugarcane Aphid	dimethoate Dimethoate (4)	8.0-16.0 ounces	0.25-0.5	16-8	Treatments are rarely needed for corn leaf aphid. Infestations of greenbug are rare.
	chlorpyrifos Lorsban (4)	16.0-32.0 ounces	0.5-1.0	8-4	
Sugarcane aphid	***Seed Treatments***				Insecticide-treated grain sorghum seed may prevent sugarcane aphid colonization for up to 40 days after emergence.
	imidacloprid Gaucho (600)	8 fluid ounces per hundredweight seed	---	---	
	thiamethoxam Cruiser (5)	5.1 fluid ounces per hundredweight seed	---	---	
	clothianidin Nipsit Inside (5)	5.1-6.4 fluid ounces per hundredweight seed	---	---	
	Foliar Sprays				Treat when an average of 50 aphids per leaf is detected on 20% of leaves in a field. Edge treatments may be justified. Pyrethroids for sorghum midge control may flare aphids. Use of defoliants may aid in harvest efficiency.
	sulfoxaflor Transform (50)	0.75 – 1.5 ounce	0.023 – 0.047	16.0 – 10.7	
	flupyradifurone Sivanto (1.67)	4-7 ounces	0.052-0.091	18.3-32	
	Resistant/toler-ant sorghum varieties				
	List of resistant/tolerant varieties available at http://tiny.cc/SorghumHybridsPDF				
Cutworms	chlorpyrifos Lorsban (4)	16.0-32.0 ounces	0.5-1.0	8-4	Treat before injury reduces stand below optimum plant population.
	esfenvalerate Asana XL (0.66)	5.8-9.6 ounces	0.03-0.05	22-13.3	
	z-cypermethrin Mustang Max (0.8)	1.28-4.0 ounces	0.008-0.025	100-32	
	beta-cyfluthrin Baythroid XL (1)	1.0-1.3 ounces	0.008-0.01	128-98.5	
	cyfluthrin Tombstone (2)	1.0-1.3 ounces	0.016-0.020	128-98.5	
	lambda-cyhalothrin Karate Z (2.08)	0.96-1.28 ounces	0.015-0.02	133.3-100	
	gamma-cyhalothrin	0.77-1.02 ounces	0.0075-0.01	166.2-125.5	

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Crops - Commercial

Grain Sorghum

Insect	Insecticide	Amount of Concentrate per Acre	Pounds Active Ingredient per Acre	Acres Treated per Gallon or Pound SP	Economic Threshold When to Treat
	Declare (1.25)				
	a-cypermethrin Fastac (0.83)	1.3-3.8 ounces	0.008-0.025	98.5-33.7	
Fire ants	thiamethoxam Cruiser (5)	5.1 fluid ounces per hundredweight seed			Preventive treatments.
	imidacloprid Gaucho (480/600)	8/6.4 fluid ounces per hundredweight seed			Soil insecticide rate is based on 1,000 row feet.
	chlorpyrifos Lorsban 15G [1,2]	8.0 ounces per 1,000 row feet	1.0[1]		
	clothianidin Poncho 600	5.1-6.4 fluid ounces per hundredweight seed			
Sorghum midge	chlorpyrifos Lorsban (4)	8.0 ounces	0.25	16	At 25% to 30% bloom, treat for one or more midges per head.
	methomyl Lannate (2.4)	12.0-24.0 ounces	0.225-0.45	10.6-5.3	
	lambda-cyhalothrin Karate Z (2.08)	0.96-1.28 ounces	0.015-0.02	133.3-100	Additional treatments at 5- to 7-day intervals may be needed.
	cyfluthrin Tombstone (2)	1.0-1.3 ounces	0.016-0.02	128-98.5	
	gamma-cyhalothrin Declare (1.25)	0.77-1.02 ounces	0.0075-0.01	166.2-125.5	Plant early and uniformly.
	z-cypermethrin Mustang Max (0.8)	1.28-4.0 ounces	0.008-0.025	100-32	
	esfenvalerate Asana XL (0.66)	2.9-5.8 ounces	0.015-0.030	44.1-22	
	beta-cyfluthrin Baythroid XL (1)	1.0-1.3 ounces	0.008-0.01	128-98.5	
	a-cypermethrin Fastac (0.83)	1.3-3.8 ounces	0.008-0.025	98.5-33.7	
	lambda-cyhalothrin, chlorantranilipole Besiege	5.0-6.0 ounces	premix	21.3-25.6	
Sorghum webworm	spinosad Blackhawk (0.36)	1.7-3.3 ounces	0.038-0.074	4.8-9.4	Treat seed heads for four or more worms per head, up until the hard dough stage.
	methomyl Lannate (2.4)	24.0 ounces	0.45	5.3	
	chlorpyrifos Lorsban (4)	16.0 ounces	0.5	8.0	
	chlorantraniliprole Prevathon (0.43)	14.0-20.0 ounces	0.047-0.067	9.1-6.4	
	lambda-cyhalothrin, chlorantranilipole Besiege	6.0-10.0 ounces	premix	21.3-12.8	
Stalk borers	a-cypermethrin Fastac (0.83)	1.8-3.8 ounces	0.012-0.025	71.1-33.7	Treat before larvae bore into stalk.

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Crops - Commercial

Grain Sorghum

Insect	Insecticide	Amount of Concentrate per Acre	Pounds Active Ingredient per Acre	Acres Treated per Gallon or Pound SP	Economic Threshold When to Treat
	cyfluthrin Tombstone (2)	1.3-2.8 ounces	0.02- 0.044	98.5-45.7	
	lambda-cyhalothrin Karate Z (2.08)	1.28-1.92 ounces	0.02- 0.03	100-66.7	
	gamma-cyhalothrin Declare (1.25)	1.02-1.54 ounces	0.01- 0.015	125.5-83.1	
	beta-cyfluthrin Baythroid XL (1)	1.3-2.8 ounces	0.01- 0.022	98.5-45.7	
	z-cypermethrin Mustang Max (0.8)	1.76-4.0 ounces	0.011-0.025	72.7-32	
	chlorantraniliprole Prevathon (0.43)	14.0-20.0 ounces	0.047-0.067	9.1-6.4	
	lambda-cyhalothrin, chlorantranilipole Besiege	6.0-10.0 ounces	premix	21.3-12.8	

[1] Refer to label for application instructions/restrictions on application method, i.e. in-furrow, surface band, T-band, etc.
[2] May cause phytotoxicity if used on light soils.

Grain Sorghum

Insecticide Precautions and Limitations (Refer to insecticide label for complete information.)

Asana XL: Toxic to fish. Do not apply directly to water. Maximum active ingredient per acre per season: 0.15 pound. Preharvest interval: 21 days. REI: 12 hours.

Baythroid: Toxic to fish and aquatic invertebrates. Maximum active ingredient per acre per season: 0.066 pound. Preharvest interval: 14 days. REI: 12 hours.

Besiege: Extremely toxic to fish, aquatic organisms and toxic to wildlife. Maximum active ingredient per acre per season: 0.06 pound lambda-cyhalothrin or 0.2 pound chlorantraniliprole. Preharvest interval: 30 days. REI: 24 hours.

Bifenthrin: Same as Brigade

Blackhawk: Toxic to bees. Toxic to aquatic invertebrates, do not apply directly to water. Maximum active ingredient per acre per season: 0.28 pound. Preharvest interval for grain, straw: 21 days; for forage, fodder, hay: 3 days. REI: 4 hours.

Brigade: Do not apply within 30 days of harvest. Do not graze or cut for feed within 30 days of last application. Toxic to bees, fish and aquatic invertebrates. Maximum active ingredient per acre per season: 0.3 pound. REI: 24 hours.

Counter: Toxic to birds, fish and other wildlife. Keep out of any body of water. REI: 48 hours.

Cruiser: Toxic to wildlife and aquatic invertebrates. Do not apply directly to water and do not allow drift or runoff. REI: 12 hours.

Cyfluthrin: Same as Baythroid, but maximum active ingredient per acre per season: 0.131 pound.

Declare: Same as Karate, but maximum active ingredient per acre per season: 0.04 pound.

Dimethoate: Toxic to wildlife and aquatic organisms. Do not apply after heading. Avoid runoff when spraying. Do not feed or graze within 28 days of the last application. Maximum active ingredient per acre per season: 1 pound. REI: 48 hours.

Force: Highly toxic to fish and other aquatic organisms. Do not apply directly to water or wetlands or within 20 yards of water. Rotate only to corn or soybeans. REI: 0 hours.

Gaucho 600: Highly toxic to birds and aquatic invertebrates. Do not graze or feed livestock on treated seed areas for 45 days after planting. REI: 12 hours.

Intrepid: Drift and runoff may be toxic to sensitive aquatic vertebrates. Do not apply by air within 150 feet or by ground within 25 feet of surface water. REI: 4 hours.

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Crops - Commercial

Grain Sorghum
Insecticide Precautions and Limitations (Refer to insecticide label for complete information.)
Karate Z: Toxic to fish, aquatic organisms and bees. Do not graze livestock on treated areas or harvest for livestock feed. Maximum active ingredient per acre per season: 0.08 pound. Preharvest interval: 30 days. REI: 24 hours.
Lannate: Toxic to fish, birds, bees, other wildlife. Keep out of any body of water. Do not graze or feed to livestock within 14 days of last application. Do not harvest for grain within 14 days of last application. Maximum active ingredient per acre per season: 0.9 pound. REI: 48 hours.
Lorsban: Toxic to bees, birds, fish and other wildlife. Maximum active ingredient per acre per season: 1.5 pounds. Preharvest interval for grain: 30 days; for grazing and silage: 30 days. REI: 12 hours for 15G; 24 hours for 4E.
Mustang Maxx: Toxic to bees, fish and aquatic vertebrates. Maximum active ingredient per acre per season: 0.125 pound. Preharvest interval: 14 days. REI: 12 hours.
Poncho: Do not use treated seed for feed, food or oil. Refer to label for replant restrictions following treated seed planting. Treated seed exposed on soil surface may be hazardous to wildlife.
Prevathon: Maximum active ingredient per acre per season: 0.2 pound. Preharvest interval: 14 days. REI: 4 hours.
Respect: Toxic to bees, fish and aquatic vertebrates. Maximum active ingredient per acre per season: 0.125 pound. Preharvest interval: 14 days. REI: 12 hours.
Sevin: Maximum active ingredient per acre per season: 6 pounds. Preharvest interval for grain/fodder: 21 days; preharvest interval for grazing/silage: 14 days. REI: 12 hours.

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Crops - Commercial

Pasture and Forage Crops					
Insect and Crop	**Insecticide**	**Amount of Concentrate per Acre**	**Pounds Active Ingredient per Acre**	**Acres Treated per Gallon or Pound SP**	**Comments**
Alfalfa Weevils					
Alfalfa	phosmet Imidan (70)	1.0-1.3 pounds	0.7-1.0	0.75-1	Treat when 50% of growing tips have feeding sign.
	chlorpyrifos Lorsban (4)	16-32 ounces	0.5-1.0	8-4	
	β-cyfluthrin Baythroid XL (1)	1.6-2.8 ounces	0.0125-0.022	80-45.7	
	z-cypermethrin Mustang Max(0.8)	2.24-4.0 ounces	0.014-0.025	57.1-32	
	lambda-cyhalothrin Karate Z (2.08)	1.28-1.92 ounces	0.02-0.03	100-66.7	
Aphids					
Clovers	malathion Malathion (5)	24-32 ounces	0.94-1.25	5.3-4	
Vetches	malathion Malathion (5)	16-32 ounces	0.63-1.25	8-4	
Sorghums	flupyradifurone Sivanto (1.67)	4.0–7.0 ounces	0.052-0.091	32.0-18.3	7-day PHI for forage. REI: 4 hours
Armyworms and Fall Armyworms					
Pasture grasses and hay crops	carbaryl Sevin (4)	32-48 ounces	1.0-1.5	4-2.7	14-day PHI for grazing or harvest. REI: 12 hours.
	spinosad Blackhawk (0.36)	1.1-2.2 ounces	0.025-0.049	14.5-7.3	3-day PHI for harvest. Zero-day PHI for grazing. REI: 4 hours
	chlorantraniliprole Prevathon (0.43)	14-20 ounces	0.047-0.067	9.1-6.4	Zero-day PHI for grazing or harvest. REI: 4 hours.
	beta-cyfluthrin Baythroid XL (1)	1.6-1.9 ounces	0.013-0.015	80-67	Zero-day PHI for grazing or harvest. REI: 12 hours.
	gamma-cyhalothrin Declare (1.25)	1.02-1.54 ounces	0.01-0.015	125.5-83.1	Zero-day PHI for grazing and 7 days for hay. REI: 24 hours.
	lambda-cyhalothrin Karate Z (2.08)	1.28-1.92 ounces	0.02-0.03	100-66.7	One-day PHI for grazing and 7 days for hay. REI: 24 hours.
	z-cypermethrin Mustang Max(0.8)	2.8-4.0 ounces	0.018-0.025	32-45.7	Zero-day PHI for grazing or hay. REI: 12 hours.
	tebufenozide Confirm (2)	6-8 ounces	0.09-0.125	16-21.3	Zero-day PHI for grazing or harvest. REI: 4 hours.
	diflubenzuron Dimilin (2)	2.0 ounce	0.031	64.0	One-day PHI for grazing or harvest. REI: 12 hours
Chinch Bugs					
Pasture grasses	arbaryl Sevin (4)	32-48 ounces	1.0-1.5	4-2.7	
Forage sorghums	carbaryl Sevin (4)	32-64 ounces	1.0-2.0	4-2	

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Crops - Commercial

Pasture and Forage Crops					
Insect and Crop	**Insecticide**	**Amount of Concentrate per Acre**	**Pounds Active Ingredient per Acre**	**Acres Treated per Gallon or Pound SP**	**Comments**
Clover Head Weevils					
Clovers	bifenthrin Brigade (2)	6.4 ounces	0.1	20	Examine seed heads. Treat when 10% to 20% seed heads are infested with larvae.
Imported Fire Ants					
Pasture grasses	hydramethyl-non Amdro Pro		1.0-1.5 pounds/acre or 5 Tbs. /mound		Apply fire ant baits when soil temperature is 60 F or higher and rain is not forecast.
	carbaryl Sevin	Use as a mound drench as per label instructions.			
	Extinguish methoprene Extinquish		1.0-1.5 pounds/acre or 3-5 Tbs./mound		
	Logic* fenoxycarb Logic*		1.0-1.5 pounds/acre or 1-3 Tbs./mound		Horse pastures only.
	spinosad Justice		4-6 Tbs./mound		Do not broadcast.
	pyriproxifen Esteem		1.5-2.0 pounds/acre or 2-4 Tbs./mound		
	A reduction of approximately 50% in mound number and mound size may be obtained by dragging pastures and disrupting ant mounds two times per winter shortly before and/or during the time the air temperature is 32 F or lower.				
Leaf Hoppers					
Pasture grasses and alfalfa	carbaryl Sevin (4)	32.0 ounces	1.0	4	Close graze or harvest bermudagrass pastures at 6-inch height to reduce

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Crops - Commercial

Pasture and Forage Crops					
Insect and Crop	**Insecticide**	**Amount of Concentrate per Acre**	**Pounds Active Ingredient per Acre**	**Acres Treated per Gallon or Pound SP**	**Comments**
					leafhopper/plant hopper populations.
Plant Bugs					
Clovers and legumes	malathion Malathion (5)	24.0-32.0 ounces	0.94-1.25	5.3-4	Seed crop only.
Spittle Bugs					
Bermudagrass	No chemical control is recommended. Prevent a dense mat of grass from forming by grazing or by close mowing and raking.				
Spotted Alfalfa Aphids					
Alfalfa	malathion Malathion (5)	24.0-32.0 ounces	0.93-1.25	5.3-4	Avoid treating pollinating forages when bees are active.
	dimethoate Dimethoate (4)	8.0-16.0 ounces	0.25-0.5	16-8	
	z-cypermethrin Mustang Max (0.8)	2.24-4.0 ounces	0.014-0.025	57.1-32	
	chlorpyrifos Lorsban (4)	16.0-32.0 ounces	0.5-1.0	8-4	

Pasture and Forage Crops
Insecticide Limitations (refer to insecticide label for complete information)
Most insecticides are toxic to bees. Avoid treating pollinating forages when bees are active.
Amdro Pro: PHI: 7 days for cutting and baling hay. Maximum applications per year: Four.
Baythroid XL: Extremely toxic to fish and aquatic invertebrates. Avoid drift, runoff and direct application to water. PHI: 0 day for grazing and harvest. REI: 12 hours.
Confirm: PHI: 0 day for grazing or harvest. REI: 4 hours.
Dimethoate: PHI: 10 days for grazing or harvest. REI: 48 hours.
Esteem: PHI: 1 day.
Extinguish: PHI: 0 day.
Imidan: PHI: 7 days for grazing or harvest. REI: 5 days.
Justice: No grazing restrictions.
Karate Z: PHI: 1 day for forage, 7 days for hay. REI: 24 hours.
Logic: For use on HORSE PASTURES only.
Lorsban: PHI: 14 days for 0.5 pound AI/ acre rate, grazing or cutting. REI: 24 hrs.
Malathion: PHI: 0 day for grazing or harvest. REI: 12 hours.
Mustang Maxx: PHI: 3 days for cutting or grazing, 7 days for seed. REI: 12 hours.

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Pasture and Forage Crops
Insecticide Limitations (refer to insecticide label for complete information)
Prevathon: PHI: 0 day. REI: 4 hours.
Sevin (Alfalfa, Clovers): PHI: 7 days for grazing or harvest. REI: 12 hours.
Sevin (Pastures): PHI: 14 days for grazing or harvest in improved pasture; 0 days for rangeland (no improvements). REI: 12 hours.
Abbreviations: **REI**: Re-entry interval. **AI**: Active ingredient. **PHI:** Pre-harvest interval.

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Crops - Commercial

Rice

The rice water weevil, stem borer complex, and rice stink bug are the primary economic pests of rice in Louisiana. Armyworms, colaspis, rice leaf miner, South American rice miner, and rice seed midge, are occasional pests which can reduce yields. Aphids, grasshoppers, chinch bugs, and thrips are sporadic pests for which no controls are consistently recommended.

Emergence	3-leaf	Tillering	Panicle initiation	Heading	Grain development
Rice seed midge (water seeded)					
Colaspis	Colaspis				
South American rice miner	South American rice miner				
	Rice leaf miner	Rice leaf miner			
Rice water weevil (after flooding)	Rice water weevil (after flooding)	Rice water weevil (after flooding)	Rice water weevil (after flooding)		
		Stem borers	Stem borers	Stem borers	
				Rice stink bug	Rice stink bug

Cultural Controls:
Early planting is critical to reducing impacts of many pest insects including rice water weevils, stem borers, armyworms, and South American rice miner. Delaying establishment of permanent flood can reduce yield losses from rice water weevil by allowing plants to establish a good root system before weevil larval infestations occur. Draining fields and drying out soil after flood can kill rice water weevil larvae. This method is only effective if larvae are feeding on roots and complete drying is achieved. Water-seeded rice is highly susceptible to rice water weevil as well as rice seed midge. Removal or reducing the cutting height of rice stubble can decrease over-wintering stem borer populations. Early flooding can reduce impacts of colaspis. Flooding or flushing can be used to control armyworm infestations in young rice. Reducing the water depth may help control rice leaf miner infestations.

Rice					
Insect	**Insecticide[1]**	**Active Ingredient[2]**	**Application Rate**	**Pre-harvest Interval**	**Comments**
Rice water weevil (adults)	Warrior II[3] [3]	Lambda-cyhalothrin	0.025 - 0.04 lbs A.I./acre (1.6 - 2.56 fl oz/acre)	21 days	Check 10 locations every 3-4 days. Treat when adults are present or fresh feeding scars are observed and when conditions are favorable for egg-laying (i.e. water is present or will be present soon).
	Mustang Maxx[4]	Zeta-cypermethrin	0.020 - 0.025 lbs A.I./acre (3.2 - 4.0 fl oz/acre)	14 days	
	Prolex/Proaxis[5]	Gamma-cyhalothrin	0.0125-0.02 lbs A.I./acre (1.28 - 2.05 fl oz/acre)	21 days	Scout again beginning 5-7 days after application. More than one application may be necessary.
	Declare[6]	Gamma-cyhalothrin	0.0125 - 0.02 lbs A.I./acre (1.28 - 2.05 fl oz/acre)	21 days	

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Crops - Commercial

Rice					
Insect	**Insecticide[1]**	**Active Ingredient[2]**	**Application Rate**	**Pre-harvest Interval**	**Comments**
	Fastac EC[7]	Alpha-cypermethrin	0.020 - 0.025 lbs A.I./acre (3.2- 3.8 fl oz/acre)	14 days	
	Mustang EW[4]	Zeta-cypermethrin	0.04 - 0.05 lbs A.I./acre (3.4 – 4.3 fl oz/acre	14 days	
	Trebon 3G	Etofenprox	6-9 pounds A.I./acre	60 days	
Rice water weevil (adults) cont.	Belay[8]	Clothianidin	0.075 pound A.I./acre (4.5 fluid ounce/acre)	21	Applications made >10 days after the establishment of the permanent flood may not be effective as most larvae are already established in the roots.
Rice water weevil seed treatments	Dermacor X-100 seed treatment[9]	Chlorantranil-iprole	Varies by seeding rate (1.5 fl oz/acre)		Dermacor seed treatment is applied to dry seed which may then be used for drill-, dry broadcast-, or water-seeding.
	Fortenza[9]	Cyantraniliprole	3.47 fl oz/100 lb. seed		Dry-seeded rice only.
	NipsitInside[9]	Clothianidin	1.92 fl oz/100 lb. seed (seed treatment)		CruiserMaxx and NipsitInside are for use in dry-seeded rice only.
	CruiserMaxx[9]	Thiamethoxam	7 fluid oz./100 lb. seed (seed treatment)		
Rice water weevil - eggs[9]	Dimilin 2L[10]	Diflubenzuron	12 - 16 fluid oz. (drill-seeded, dry-seeded or water- seeded, delayed flood rice) 8 fluid ounce + 8 fluid ounce (water seeded, pinpoint flood, or continuous flood rice)	21 days	A flood is required. Do not apply if flooding is in progress.
Stem borers (sugarcane borer, Mexican rice borer, and rice stalk borer)	Warrior II[3]	Lambda-cyhalothrin	0.025 - 0.04 lbs A.I./acre (1.6 - 2.56 fl oz/acre)	21 days	Start scouting at panicle differentiation and early boot stage. Look for early signs of stem borer presence which include orange-tan discoloration around the junction of the leaf-sheath and the leaf blade. This is caused by feeding of young larvae on the inside surface of the leaf sheath. Make application before larvae enter the stalk.
	Declare[6]	Gamma-cyhalothrin	0.0125 - 0.02 lbs A.I./acre (1.28 - 2.05 fl oz/acre)	21 days	
	Prolex/Proaxis[5]	Gamma-cyhalothrin	0.0125-0.02 lbs A.I./acre (1.28 - 2.05 fl oz/acre)	21 days	
	Dermacor X-100 seed treatment[9]	Chlorantranil-iprole	Varies by seeding rate (1.5 fl oz/acre)	NA	
Rice stink bug	Warrior II[3]	Lambda-cyhalothrin	0.025 - 0.04 lbs A.I./acre (1.6 - 2.56 fl oz/acre)	21 days	Scout in the morning for best results. Treat when there are 30 stink bugs per 100 sweeps during first 2 weeks of heading. Treat when there are 100 stink

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Crops - Commercial

Rice

Insect	Insecticide[1]	Active Ingredient[2]	Application Rate	Pre-harvest Interval	Comments
					bugs per 100 sweeps until 2 weeks before harvest.
	Mustang Maxx[4]	Zeta-cypermethrin	0.020 - 0.025 lbs A.I./acre (3.2 - 4.0 fl oz/acre)	21 days	
	Prolex/Proaxis[5]	Gamma-cyhalothrin	0.0125-0.02 lbs A.I./acre (1.28 - 2.05 fl oz/acre)	21 days	
	Declare[6]	Gamma-cyhalothrin	0.0125 - 0.02 lbs A.I./acre (1.28 - 2.05 fl oz/acre)	14 days	
	Fastac EC[7]	Alpha-cypermethrin	0.020 - 0.025 lbs A.I./acre (3.2- 3.8 fl oz/acre)	14 days	
	Sevin 80S[11]	Carbaryl	1.25 - 1⅞ lbs/acre	14 days	
	Sevin 4F[11]	Carbaryl	1.0 - 1.5 quarts/acre	14 days	
	Tenchu 20SG[12]	Dinotefuran	0.094 - 0.131 lbs A.I./acre (7.5 – 10.5 ounce/acre)	7 days	
Rice stink bug (cont.)	Malathion 57% EC[13]	Malathion	1.0 to 1.5 Pt/A	21 days	
Army-worms	Warrior II[3]	Lambda-cyhalothrin	0.025 - 0.04 lbs A.I./acre (1.6 - 2.56 fl oz/acre)	21 days	Treat when there is one armyworm per two plants; better results obtained when larvae are small.
	Mustang Maxx[4]	Zeta-cypermethrin	0.020 - 0.025 lbs A.I./acre (3.2 - 4.0 fl oz/acre)	21 days	
	Prolex/Proaxis[5]	Gamma-cyhalothrin	0.0125-0.02 lbs A.I./acre (1.28 - 2.05 fl oz/acre)	21 days	
	Declare[6]	Gamma-cyhalothrin	0.0125 - 0.02 lbs A.I./acre (1.28 - 2.05 fl oz/acre)	14 days	Flooding is effective for armyworm control if plants are sufficiently develop.
	Fastac EC[7]	Alpha-cypermethrin	0.020 - 0.025 lbs A.I./acre (3.2- 3.8 fl oz/acre)	14 days	
	Sevin 80S[11]	Carbaryl	1.25 - 1⅞ pound/acre	14 days	
	Sevin 4F[11]	Carbaryl	1.0 - 1.5 quarts/acre	14 days	
Colaspis	NipsitInside[9]	Clothianidin	1.92 fl oz/100 lb. seed (seed treatment)	NA	CruiserMaxx and NipsitInside are for use in dry-seeded rice only.
	CruiserMaxx[9]	Thiamethoxam	7 fluid oz./100 lb. seed (seed treatment)	NA	
Thrips	NipsitInside[9]	Clothianidin	1.92 fl oz/100 lb. seed (seed treatment)	NA	CruiserMaxx and NipsitInside are for use in dry-seeded rice only.
	CruiserMaxx[9]	Thiamethoxam	7 fluid oz./100 lb. seed (seed treatment)	NA	
Chinch bugs	Warrior II[3]	Lambda-cyhalothrin	0.025 - 0.04 lbs A.I./acre (1.6 - 2.56 fl oz/acre)	21 days	For foliar sprays: flood fields first to move chinch bugs up onto plants and increase exposure.
	Mustang Maxx[4]	Zeta-cypermethrin	0.020 - 0.025 lbs A.I./acre (3.2 - 4.0 fl oz/acre)	21 days	
	Prolex/Proaxis[5]	Gamma-cyhalothrin	0.0125-0.02 lbs A.I./acre (1.28 - 2.05 fl oz/acre)	21 days	
	Declare[6]	Gamma-cyhalothrin	0.0125 - 0.02 lbs A.I./acre (1.28 - 2.05 fl oz/acre)	14 days	
	Fastac EC[7]	Alpha-cypermethrin	0.020 - 0.025 lbs A.I./acre (3.2- 3.8 fl oz/acre)	14 days	
	Sevin 80S[11]	Carbaryl	1.25 - 1⅞ pound/acre	14 days	
	Sevin 4F[11]	Carbaryl	1.0 - 1.5 quarts/acre	14 days	

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Crops - Commercial

Rice					
Insect	**Insecticide[1]**	**Active Ingredient[2]**	**Application Rate**	**Pre-harvest Interval**	**Comments**
	NipsitInside[9]	Clothianidin	1.92 fl oz/100 lb. seed (seed treatment)	NA	CruiserMaxx and NipsitInside are for dry-seeded rice only.
	CruiserMaxx[9]	Thiamethoxam	7 fluid oz./100 lb. seed (seed treatment)	NA	
Grass-hoppers	Warrior II[3]	Lambda-cyhalothrin	0.025 - 0.04 lbs A.I./acre (1.6 - 2.56 fl oz/acre)	21 days	Use higher rate if most grasshoppers are large in size.
	Mustang Maxx[4]	Zeta-cypermethrin	0.020 - 0.025 lbs A.I./acre (3.2 - 4.0 fl oz/acre)	21 days	
	Prolex/Proaxis[5]	Gamma-cyhalothrin	0.0125-0.02 lbs A.I./acre (1.28 - 2.05 fl oz/acre)	14 days	
	Fastac EC[7]	Alpha-cypermethrin	0.020 - 0.025 lbs A.I./acre (3.2- 3.8 fl oz/acre)	14 days	
Rice leaf miner	Malathion 57% EC[13]	Malathion	1.0 to 1.5 Pt/A	21 days	Apply when eggs and larvae are abundant on seedling rice and/or when stands are being reduced to less than 15 plants/ft^2.
South American rice miner	None	Avoid planting late, particularly in areas known to be prone to severe infestation such as coastal areas in Cameron, Jeff Davis and Vermilion Parishes. Seed treatments applied for rice water weevil may provide some suppression of rice miners.			
Rice seed midge	Warrior II[3]	Lambda-cyhalothrin	0.025 - 0.04 lbs A.I./acre (1.6 - 2.56 fl oz/acre)	21 days	Seed midge is only a pest of water-seeded rice. Check fields for damage during first week after planting. If stands are being reduced significantly (less than 15 plants/ft^2, consider replanting.
	Declare[6]	Gamma-cyhalothrin	0.0125 - 0.02 lbs A.I./acre (1.28 - 2.05 fl oz/acre)	21 days	
	Prolex/Proaxis[5]	Gamma-cyhalothrin	0.0125-0.02 lbs A.I./acre (1.28 - 2.05 fl oz/acre)	21 days	

[1]Insecticides **are not** listed in order of effectiveness and/or preference.
[2]Trade names given are subject to change and many active ingredients are available under several generic formulations.
[3]**Warrior II** Do not use treated rice fields for the aquaculture of edible fish and crustaceans. Do not release floodwater within 7 days of application. Do not apply more than 0.12 pound A.I./acre/season. Do not apply as ultra-low volume (ULV) spray. Warrior II can be safely used when propanil products are being used for weed control. Do not exceed 0.12 pound A.I./acre when Karate is used in addition to Prolex or Proaxis in a single season.
[4]**Mustang Maxx and Mustang EW:** Do not use treated rice fields for the aquaculture of edible fish and crustaceans. Do not release floodwater within 7 days of application. Do not make applications less than 7 days apart. Do not apply more than 0.10 pound A.I. (1.0 pints)/acre/season. Do not apply as ULV spray.
[5]**Prolex/Proaxis:** Do not use treated rice fields for the aquaculture of edible fish and crustaceans. Do not release floodwater within 7 days of application. It can be used safely when propanil products are being used for weed control. Do not exceed 0.06 lbs A.I./acre when Prolex or Proaxis (either product alone) are used in a single season. Do not exceed 0.12 pound A.I./acre when Prolex or Proaxis is used in addition to Karate in a single season.
[6]**Declare:** Do not release floodwater within 7 days of application. Do not use treated fields for the aquaculture of edible fish and crustacean. Do not apply more than 0.06 lbs A.I./acre per season. Do not apply more than 0.04 lbs A.I./acre within 28 days of harvest or 0.02 lbs AI within 21 days of harvest.

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[7]**Fastac EC:** Do not make applications less than 7 days apart. Do not release floodwater within 7 days of application. A maximum of 0.075 pound of active ingredient may be applied per year per acre. Do not use treated rice for the aquaculture of edible fish and crustacea.
[8]**Belay:** Do not apply more than 0.075 pound ai/A as a foliar per year. Do not apply Belay after a NipsitInside seed treatment. Not to be used on rice crops that contain or support crawfish or any form of aquaculture operation. Do not apply after a third tiller has initiated on rice plants.
[9]Insecticidal seed treatments must be applied to dry seed by certified seed treaters only.
[10]**Dimilin 2L:** Do not use treated rice fields for the aquaculture of edible fish and crustaceans. Use at least 5 gallons total volume per acre. Do not release floodwater within 14 days of application.
[11]**Sevin (carbaryl):** May kill shrimp, crabs and crayfish. Do not use Sevin within 15 days before or after application of propanil; up to 2 applications per crop but not more often than once every 7 days.
[12]**Tenchu**: Do not make more than two applications with a minimum of 7 days between applications. Do not apply more than 1.34 pounds total per acre per year. Do not use flood water from treated fields for irrigation or food/feed crops. Do not use if rice fields are used for fish or crustacean farming. Do not apply to rice fields during pollen shedding when bees may be present.
[13]**Malathion 57% EC:** Do not use malathion within 15 days of applying propanil. NOTE FOR AQUATIC USES (rice); Broadcast use only over intermittently flooded areas. Application may not be made around bodies of water where fish or shellfish are grown and/or harvested.
WARNING: Always read the label for additional information. Re-entry times for workers entering treated fields should be strictly observed. Be sure to check the label for this information.

Rice/Crawfish Rotation Fields

Insect	Insecticide	Application Rate	Pre-Harvest Interval	Comments
Armyworms	B.t. (Bacillus thuringiensis) [1]	Follow label directions	0	Treat when there is one armyworm per 2 plants. Flooding is effective for armyworm control if plants are sufficiently developed.

Rice leaf miners	Miner infestations tend to be more severe in deep water.
South American rice miner	Avoid planting late, particularly in areas known to be prone to severe infestation, such as those in coastal areas in Cameron, Jeff Davis and Vermilion parishes.
Rice seed midges	Water management: Check fields for damage during first week after planting. If stands are being reduced significantly (less than 15 plants per square feet), drain and replant if necessary.
Stem Borers	Plant as early as reasonable.
Rice stink bugs	No insecticides are available which are compatible with crawfish production.
Rice water weevil	Water management: 2 to 3 weeks after permanent flood, sample for rice water weevil larvae. If populations are 3 medium-to-large larvae or 5 small larvae per core, drain the field and allow the field to dry 2 to 3 weeks. (This allows soils to dry to the point of cracking). To minimize losses from the rice water weevil, plant as early as reasonable and delay flooding as long as possible from an agronomic perspective.

[1]***Bacillus thuringiensis*:** Several formulations are on the market; follow label directions.
WARNING: Always read the label for additional information. Carefully read labels for aquaculture restrictions. Re-entry times for workers entering treated fields should be strictly observed. Be sure to check the label for this information.

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Crops - Commercial

Soybean

Insect	Insecticide	Amount of Concentrate per Acre	Pounds Active Ingredient per Acre	Acres Treated per Gallon or Pound	When to Treat (Economic threshold)
Banded cucumber beetle[5]	carbaryl Sevin (4)	16 oz.	0.5	8	4 beetles per sweep.
	lambda-cyhalothrin Karate Z (2.08)	1.28-1.60 oz.	0.02-0.025	100-80	
	gamma-cyhalothrin Declare (1.25)	1.02-1.28 oz.	0.01-0.0125	125.5-100	
Bean leaf beetle[5]	carbaryl Sevin (4)	16 oz.	0.5	8	After pod set, 2 beetles per sweep or when 10% of pods are damaged.
	esfenvalerate Asana XL (0.66)	5.8-9.6 oz.	0.03-0.05	22-13	
	lambda-cyhalothrin Karate Z (2.08)	1.28-1.60 oz.	0.02-0.025	100-80	
	gamma-cyhalothrin Declare (1.25)	1.02-1.28 oz.	0.01-0.0125	125.5-100	Pyrethroids may provide inconsistent control.
	bifenthrin Brigade (2)	2.1-6.4 oz.	0.033-0.1	61-20	
	bifenthrin, z-cypermethrin Hero (1.24)	2.6-6.1 oz.	0.025-0.06	49.2-21	
	acephate Orthene	12-16 oz.	0.75-1.0	1.3-1	
	lambda-cyhalothrin, thiamethoxam Endigo ZC	4.0-4.5 oz.	premix	32-28.4	
	Imidacloprid, beta-cyfluthrin Leverage 360	2.8 oz.	premix	45.7	
	Trap crop[1]				
Beet armyworm[3]	chlorpyrifos Lorsban (4)	24 oz.	0.75	5.3	12 worms, ½ inch or longer per row foot or 150 worms in 100 sweeps. If pod feeding occurs, treat when 10% of pods are damaged.
	spinosad Blackhawk (0.36)	1.7 – 2.2 oz.	0.038-.049	9.4-7.3	
	indoxacarb Steward (1.25)	11.3 oz.	0.11	11.3	
	methoxyfenozide Intrepid (2)	6.0-8.0 oz.	0.09-0.125	21.3-16	
	chlorantraniliprole Prevathon (0.43)	14-20 oz.	0.047-0.067	9.1-6.4	
	lambda-cyhalothrin, chlorantraniliprole Besiege	10 oz.	premix	12.8	
Blister beetles[5]	carbaryl (Sevin) (4)	25 oz.	0.80	5.1	Spot treat infested area when defoliation becomes excessive.
Brown stink bug	cyfluthrin Tombstone (2)	2.8 oz.	0.044	45.7	After pods appear, 1 stink bug per row foot or 36 in 100 sweeps.
	beta-cyfluthrin Baythroid XL (1)	2.8 oz.	0.022	45.7	

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Crops - Commercial

Soybean					
Insect	**Insecticide**	**Amount of Concentrate per Acre**	**Pounds Active Ingredient per Acre**	**Acres Treated per Gallon or Pound**	**When to Treat (Economic threshold)**
	z-cypermethrin Mustang Maxx(0.8)	4.0 oz.	0.025	32	Treat soybeans grown for seed at 1 stink bug per 6 row feet or six bugs per 100 sweeps.
	acephate Orthene	12-16 oz.	0.75-1.0	1.3-1	
	lambda-cyhalothrin, thiamethoxam Endigo ZC	4.0-4.5 oz.	premix	32-28.4	
	bifenthrin Brigade (2)	6.4 oz.	0.1	20	
	bifenthrin, z-cypermethrin Hero (1.24)	10.3 oz.	0.1	12.4	
	imidacloprid, beta-cyfluthrin Leverage 360	2.8 oz.	premix	45.3	
Corn earworm[5, 8]	spinosad Blackhawk (0.36)	1.7 – 2.2 oz.	0.038-.049	9.4-7.3	After bloom, 3 worms per row foot or 38 in 100 sweeps. **Use Pyrethroids With Caution:** Pyrethroid resistance is prevalent in corn earworms in Louisiana. [8]
	esfenvalerate Asana XL (0.66)	5.8-9.6 oz.	0.03-0.05	22-13	
	carbaryl Sevin (4)	24-32 oz.	0.75-1.0	5.3-4	
	Npv Heligen	1.0-1.6 oz.	---	128-80	
	acephate Orthene	12-16 oz.	0.75-1.0	1.3-1	
	indoxacarb Steward (1.25)	5.6-11.3 oz.	0.055-0.011	22.8-11.3	
	lambda-cyhalothrin Karate (2.08)	0.96-1.60 oz.	0.015-0.025	133.3-79.4	
	gamma-cyhalothrin Declare (1.25)	0.77-1.28 oz.	0.0075-0.0125	166.2-100	
	z-cypermethrin Mustang Maxx (0.8)	2.8-4.0 oz.	0.0175-0.025	45.7-32	
	beta-cyfluthrin Baythroid XL (1)	1.6-2.8 oz.	0.013-0.022	80-45.7	
	cyfluthrin Tombstone (2)	1.6-2.8 oz.	0.025-0.044	80-45.7	
	bifenthrin Brigade (2)	2.1-6.4 oz.	0.033-0.1	61-20	
	bifenthrin, z-cypermethrin Hero (1.14)	4.0-10.3 oz.	0.04-0.1	32-12.4	
	lambda-cyhalothrin, chlorantraniliprole Besiege	5-8 oz.	premix	25.6-16	
	chlorantraniliprole Prevathon (0.43)	14-20 oz.	0.047-0.067	9.1-6.4	

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Crops - Commercial

Soybean					
Insect	**Insecticide**	**Amount of Concentrate per Acre**	**Pounds Active Ingredient per Acre**	**Acres Treated per Gallon or Pound**	**When to Treat (Economic threshold)**
	Methoxyfenozide, spinetoram Intrepid Edge	4.0-6.4 oz.	premix	32-20	
Fall armyworm (corn strain)[5]	carbaryl Sevin (4)	16 oz.	0.5	8	When seedling beans are reduced to six or less plants per foot of fewer. In older beans treat when defoliation becomes excessive[5].
	methomyl Lannate (2.4)	16-24 oz.	0.3-0.45	8-5.3	
	spinosad Blackhawk (0.36)	1.7 – 2.2 oz.	0.038-.049	9.4-7.3	
	indoxacarb Steward (1.25)	7.7-11.3 oz.	0.075-0.11	16.6-11.3	
	lambda-cyhalothrin, chlorantraniliprole Besiege	8-10 oz.	premix	16-12.8	
	chlorantraniliprole Prevathon (0.43)	14-20 oz.	0.047-0.067	9.1-6.4	
Fall armyworm (grass strain)[5]	carbaryl Sevin) (4)	16 oz.	0.5	8	When seedling beans are reduced to 6 or fewer plants per foot of row. In older beans, treat when defoliation becomes excessive[5].
	methomyl Lannate (2.4)	6.7 oz.	0.3-0.45	8-5.3	
	spinosad Blackhawk (0.36)	1.7 – 2.2 oz.	0.038-.049	9.4-7.3	
	indoxacarb Steward (1.25)	7.7-11.3 oz.	0.075-0.11	16.6-11.3	
	lambda-cyhalothrin, chlorantraniliprole Besiege	8-10 oz.	premix	16-12.8	Grass strain fall armyworm unlike corn strain fall armyworm primarily originates from grass hosts.
	chlorantraniliprole Prevathon (0.43)	14-20 oz.	0.047-0.067	9.1-6.4	
	lambda-cyhalothrin, Karate (2.08)	0.96-1.60 oz.	0.015-0.025	133.3-80	
	gamma-cyhalothrin Declare (1.25)	0.77-1.28 oz.	0.0075-0.0125	166.2-100	
	z-cypermethrin Mustang Maxx(0.8)	1.2-4.0 oz.	0.0075-0.025	106.7-32	
	beta-cyfluthrin Baythroid XL (1)	0.8-1.6 oz.	0.007-0.013	160-80	
	cyfluthrin Tombstone (2)	0.8-1.6 oz.	0.013-0.025	160-80	
	bifenthrin, z-cypermethrin Hero (1.24)	2.6-6.1 oz.	0.025-0.06	49.2-20.9	

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Crops - Commercial

Soybean					
Insect	**Insecticide**	**Amount of Concentrate per Acre**	**Pounds Active Ingredient per Acre**	**Acres Treated per Gallon or Pound**	**When to Treat (Economic threshold)**
	methoxyfenozide, spinetoram Intrepid Edge	4.0-6.4 oz.	premix	32-20	
Grasshoppers [5]	diflubenzuron Dimilin (2)	2.0 oz.	0.031	64	Treat to prevent excessive stand loss or foliage loss. **Not effective on adults.** Apply to second and third stage nymphs only.
Green cloverworm[3, 5]	carbaryl Sevin (4)	8-16 oz.	0.25-0.5	16-8	8 worms, ½ inch or longer, per row foot or 300 worms in 100 sweeps.
	spinosad Blackhawk (0.36)	1.1 – 2.2 oz.	0.025-.049	14.5-7.3	
	methomyl Lannate (2.4)	6.7 oz.	0.125	19.1	
	indoxacarb Steward (1.25)	5.6-11.3 oz.	0.055-0.11	22.9-11.3	
	lambda-cyhalothrin Karate (2.08)	0.96-1.60 oz.	0.015-0.025	133.3-80	
	gamma-cyhalothrin Declare (1.25)	0.77-1.28 oz.	0.0075-0.0125	166.2-100	
	z-cypermethrin Mustang Maxx (0.8)	1.2-4.0 oz.	0.0075-0.025	106.7-32	
	beta-cyfluthrin Baythroid XL (1)	0.8-1.6 oz.	0.007-0.013	160-80	
	cyfluthrin Tombstone (2)	0.8-1.6 oz.	0.013-0.025	160-80	
	bifenthrin, z-cypermethrin Hero (1.24)	2.6-6.1 oz.	0.025-0.06	49.2-20.9	
	chlorantraniliprole Prevathon (0.43)	14-20 oz.	0.047-0.067	9.1-6.4	
	lambda-cyhalothrin, chlorantraniliprole Besiege	5-8 oz.	premix	25.6-16	
	methoxyfenozide, spinetoram Intrepid Edge	4.0-6.4 oz.	premix	32-20	
Kudzu bug	acephate Orthene	12-16 oz.	0.75-1.0	1.3-1	1 nymph per sweep. For more information see kudzubug.org.
	bifenthrin Discipline (2)	6.4 oz.	0.1	20	
	thiamethoxam, lambda-cyhalothrin Endigo ZC	4.5 oz.	premix	28.4	
	gamma-cyhalothrin Declare (1.25)	1.28-1.54 oz.	0.0125-0.015	100-83.11	

CBD v. EPA (1:21-cv-00681-CJN) ED_005427A_00029618-00043

Crops - Commercial

Soybean

Insect	Insecticide	Amount of Concentrate per Acre	Pounds Active Ingredient per Acre	Acres Treated per Gallon or Pound	When to Treat (Economic threshold)
Redbanded stink bug[4]	acephate Orthene	12-16 oz.	0.75-1.0	1.3-1	16 bugs in 100 sweeps. **Caution:** 8 oz. of acephate applied alone has provided unsatisfactory control of redbanded stinkbugs.
	thiamethoxam, lambda-cyhalothrin Endigo ZC	-4.5 oz.	premix	28.4	
	bifenthrin Brigade (2)	6.4 oz.	0.1	20	
	bifenthrin, z-cypermethrin Hero (1.24)	10.3 oz.	0.1	12.4	
	imidacloprid, beta-cyfluthrin Leverage 360	2.8 oz.	premix	45.7	
	clothianidin Belay (2.13)	4.0 oz.	0.067	32	
Salt marsh caterpillar[5]	methomyl Lannate (2.4)	24 oz.	0.45	5.3	Spot treat when 8 worms per row foot or when seedling beans are reduced to 6 or fewer per row foot.
	acephate Orthene	12.0 oz.	0.75	1.3	
	methoxyfenozide Intrepid (2)	4-8 oz.	0.06-0.125	32-16	
	methoxyfenozide, spinetoram Intrepid Edge	4.0-6.4 oz.	premix	32-20	
Southern green stink bug, Green stink bug	cyfluthrin Tombstone (2)	1.6-2.8 oz.	0.025-0.044	80-45.7	After pods appear, 1 stink bug per row foot or 36 in 100 sweeps. Treat soybeans grown for seed at 1 stink bug per 6 row feet or 6 bugs per 100 sweeps.
	z-cypermethrin Mustang Maxx (0.8)	3.2-4.0 oz.	0.02-0.025	40-32	
	lambda-cyhalothrin Karate Z (2.08)	1.60-1.92 oz.	0.025-0.03	80-66.7	
	gamma-cyhalothrin Declare (1.25)	1.28-1.54 oz.	0.0125-0.015	100-83.11	
	beta-cyfluthrin Baythroid XL (1)	1.6-2.8 oz.	0.013-0.022	80-45.7	
	acephate Orthene	12-16 oz.	0.75-1.0	1.3-1	
	bifenthrin Brigade (2)	2.1-6.4 oz.	0.033-0.1	61-20	
	bifenthrin, z-cypermethrin Hero (1.24)	4.0-10.3 oz.	0.04-0.1	32-12.4	
	imidacloprid, beta-cyfluthrin Leverage 360	2.8 oz.	premix	45.7	

CBD v. EPA (1:21-cv-00681-CJN) ED_005427A_00029618-00044

Crops - Commercial

Soybean					
Insect	**Insecticide**	**Amount of Concentrate per Acre**	**Pounds Active Ingredient per Acre**	**Acres Treated per Gallon or Pound**	**When to Treat (Economic threshold)**
	thiamethoxam, lambda-cyhalothrin Endigo ZC	4.0-4.5 oz.	premix	32-28.4	
	Trap crop[1,2]				
Soybean looper[3, 5]	methomyl Lannate[6] (2.4)	24.0 oz.	0.45	5.3	8 worms, ½ inch or longer, per row foot or 150 worms in 100 sweeps. **Caution:** Resistance to Intrepid, Prevathon and Besiege has been detected across the South.
	spinosad Blackhawk (0.36)	1.7 – 2.2 oz.	0.038-.049	9.4-7.3	
	indoxacarb Steward (1.25)	5.6-11.3 oz.	0.055-0.11	22.9-11.3	
	methoxyfenozide Intrepid (2)	6.0-8.0 oz.	0.09-0.125	21.3-16	
	chlorantranilirpole Prevathon (0.43)	14-20 oz.	0.047-0.067	9.1-6.4	
	lambda-cyhalothrin, chlorantraniliprole Besiege	10 oz.	premix	12.8	
	methoxyfenozide, spinetoram Intrepid Edge	4.0-6.4 oz.	premix	32-20	
Threecornered alfalfa hopper	esfenvalerate Asana XL (0.66)	5.8 – 9.6 oz.	0.03-0.05	22 – 13	Starting at pod set, 3 nymphs per row foot or one adult per sweep.
	lambda-cyhalothrin, Karate Z (2.08)	1.60 oz.	0.025	80	
	gamma-cyhalothrin Declare (1.25)	1.28 oz.	0.0125	100	
	cyfluthrin Tombstone (2)	1.6 – 2.8 oz.	0.025-0.044	80-45.7	
	beta-cyfluthrin Baythroid XL (1)	1.6-2.8 oz.	0.013- 0.022	80-45.7	
	z-cypermethrin Mustang Maxx (0.8)	2.8-4.0 oz.	0.017-0.025	45.7-32	
	acephate Orthene)	12-16 oz.	0.75-1.0	1.3-1	
	bifenthrin, z-cypermethrin Hero (1.24)	4.0-10.3 oz.	0.04- 0.1	32-12.4	
Velvetbean caterpillar[3, 5]	carbaryl Sevin (4)	8-16 oz.	0.25-0.5	16-8	8 worms, ½ inch or longer, per row foot or 300 worms in 100 sweeps.
	spinosad Blackhawk (0.36)	1.1 – 2.2 oz.	0.025-.049	14.5-7.3	
	chlorpyrifos Lorsban (4)	16.0 oz.	0.5	8	

CBD v. EPA (1:21-cv-00681-CJN) ED_005427A_00029618-00045

Crops - Commercial

Soybean					
Insect	**Insecticide**	**Amount of Concentrate per Acre**	**Pounds Active Ingredient per Acre**	**Acres Treated per Gallon or Pound**	**When to Treat (Economic threshold)**
	lambda-cyhalothrin, Karate Z (2.08)	0.96-1.28 oz.	0.015-0.02	133.3-100	
	gamma-cyhalothrin Declare (1.25)	0.77-1.28 oz.	0.0075-0.015	166.2-100	
	cyfluthrin Tombstone (2)	1.8 oz.	0.028	71.1	
	beta-cyfluthrin Baythroid XL (1)	1.6-2.8 oz.	0.013-0.022	80-45.7	
	z-cypermethrin Mustang Maxx (0.8)	2.8-4.0 oz.	0.0175-0.025	45.7-32	
	methoxyfenozide Intrepid (2)	4.0-8.0 oz.	0.06-0.125	32-16	
	methomyl Lannate (2.4)	6.7 oz.	0.125	19.1	
	bifenthrin, z-cypermethrin Hero (1.24)	4.0-10.3 oz.	0.04-0.1	32-12.4	
	diflubenzuron Dimilin (2)	2.0 oz.	0.031	64	**Preventive –** Apply at or shortly after bloom.
	chlorantraniliprole Prevathon (0.43)	14-20 oz.	0.047 – 0.067	9.1-6.4	
	lambda-cyhalothrin, chlorantraniliprole Besiege	5.0-8.0 oz.	premix	25.6-16	
	methoxyfenozide, spinetoram Intrepid Edge	4.0-6.4 oz.	premix	32-20	

[1] **Trap crops for control of bean leaf beetle or stinkbugs:** Where bean leaf beetle and stinkbugs occur in damaging numbers, both pests can be controlled by use of the same early planted trap crops. Plant early maturing varieties, Group IV or V, in small blocks near favorable hibernation quarters two weeks before planting most of the crop. Areas planted to trap crops need not exceed 5% of the total acreage. Bean leaf beetles are attracted to the trap crop areas as soon as the plants emerge. The Southern green and brown stinkbug is attracted to the trap areas at the beginning of flowering and pod set. Thus treatment will differ for the two pests. For bean leaf beetles, foliar insecticide applications can be made to control the first field generation that develops in the trap crop. The first treatment should be made when new adults begin to emerge, about four to five weeks after planting and the second, one week later.

[2] For southern green stinkbug, treat the trap area or soybeans grown for seed with a recommended material at one bug per 6 feet of row or six bugs in 100 sweeps and before immature bugs become adults. Start monitoring insect numbers at bloom. A second application may be necessary. For both pests, it is imperative that the insects produced in the trap areas be prevented from moving to the main plantings regardless of how many applications are required. ***The widespread adoption of early planting and early maturing varieties has made trap cropping less feasible in some areas.***

[3] Beet armyworms, green cloverworms, soybean loopers and velvetbean caterpillars should be counted together, and an insecticide to control them should be applied when any combination of the four reaches 300 worms in 100 sweeps. However, treatment should be made anytime soybean loopers and/or beet armyworms exceed 150 worms in 100 sweeps.

[4] Effective control of the redbanded stinkbug has been difficult to achieve with labeled insecticides. Multiple applications may be required to achieve season long control.

[5] Prior to bloom, soybeans can tolerate 30% to 35% defoliation. During bloom and pod set, defoliation should not exceed 20%- to 25%.

[6] Recent LSU AgCenter research has shown satisfactory control of soybean looper with Lannate at 0.45 pound AI per acre. In past years, however, this pest has been highly resistant to Lannate at some locations. Producers should be aware that the current use of Lannate might still give inconsistent results.

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[7] LSU AgCenter Research indicates that low rates of Blackhawk will not give satisfactory control of rapid outbreaks of soybean looper that far exceed the economic threshold. Also, ground application is more effective than aerial application.
[8] Some corn earworms are exhibiting resistance to pyrethroids. When numbers exceed two times the action threshold, use other products or add 0.5 pound Orthene (Acephate) to the recommended pyrethroid.

CAUTION: A species of green stinkbug that feeds almost exclusively on morning glory occurs in soybean fields infested with this weed. This species is not a pest and should not be controlled. The adult can readily be recognized by a white, heart-shaped spot in the middle of the upper surface. In early September this species turns a dark brown to deep red resembling the brown stinkbug, but it can be recognized by the white spot.

CAUTION: The lesser cornstalk borer can be a serious soil insect problem. Most problems occur in late-planted soybeans that follow wheat or rye grass. Drought and high temperatures are also usually associated with the problem. Some states recommend Lorsban 15G applied at planting in a T-band at 8 oz granules per 1,000 row feet for preventive control.

Soybean
Insecticide Precautions and Limitations (refer to insecticide label for complete information)
Asana XL: Extremely toxic to fish and aquatic invertebrates. Do not feed or graze livestock on treated fields. Do not exceed 0.2 pound AI per acre per season. Preharvest interval: 21 days. REI: 12 hours.
Baythroid XL: Same as cyfluthrin (2) except maximum AI per acre per season is 0.0875 pound. Preharvest interval: 21 days.
Brigade: Toxic to fish and aquatic invertebrates. Do not exceed 0.3 pound AI per acre per season. Preharvest interval is 18 days. REI: 12 hours.
Carbaryl (Sevin): Toxic to bees, estuarine and aquatic organisms. Preharvest intervals: 21 days for grain, 14 days for grazing or forage. Maximum AI per acre per season is 6 pounds. REI: 12 hours.
Cyfluthrin: Toxic to fish and aquatic invertebrates. Maximum AI per acre per season is 0.175 pound. Do not feed forage within 15 days of harvest. Preharvest interval: 45 days. REI: 12 hours.
Declare: Extremely toxic to fish and aquatic organisms and toxic to wildlife. Do not graze or harvest treated soybean forage, straw or hay for livestock feed. Do not apply more than 0.03 pound AI per acre per season. Preharvest interval: 30 days. REI: 24 hours.
Dimilin: Toxic to aquatic invertebrates. Do not make more than two applications per season. Preharvest interval: 21 days. REI: 12 hours.
Endigo ZC: Toxic to fish, aquatic organisms and wildlife. Do not apply to water. Avoid weather conditions that favor drift and runoff. Do not exceed a total of 9 fluid oz. of Endigo, or 0.06 pound AI of lambda-cyhalothrin products or 0.125 pound AI of thiamethoxam products per acre per season. Do not graze or harvest straw, forage or hay for livestock. Preharvest interval: 30 days. REI: 24 hours.
Hero: Toxic to fish, oysters, shrimp and aquatic invertebrates. Do not exceed 0.4 pound AI per acre per season. Do not graze or harvest forage, straw or hay for livestock. Preharvest interval: 21 days. Re-entry interval: 12 hours.
Intrepid: Drift and runoff may be toxic to sensitive aquatic invertebrates. Do not apply by air within 150 feet or by ground within 25 feet of surface water. Apply no more than 1 pound AI per acre per season or four applications per acre per season. Preharvest interval: 14 days for seed and 7 days for hay or forage. REI: 4 hours.
Karate: Toxic to fish, aquatic organisms and bees. Do not graze or harvest treated forage, straw or hay for livestock. Do not apply more than 0.06 pound AI per acre per season. Preharvest interval: 30 days. REI: 24 hours.
Lannate: Toxic to fish, aquatic invertebrates, bees and wildlife. Do not apply within 14 days of harvest. Do not apply more than 1.35 pounds AI per acre per year. Do not graze forage within 3 days of last application. Preharvest interval: 12 days. REI: 48 hours.
Leverage 360: Extremely toxic to fish and aquatic invertebrates. Direct sprays and residues are highly toxic to bees. Avoid drift and runoff when treating. Use of this product on highly permeable soils with a shallow water table may result in ground water contamination. Maximum formulated product allowed per crop season: 9 fluid oz. (0.07 pound AI of beta-cyfluthrin and 0.14 pound AI of imidacloprid). Preharvest interval: 21 days for seed and 15 days for hay and green forage. REI: 12 hours.
Lorsban: Toxic to bees, birds, fish and other wildlife. Do not feed treated soybean forage or hay to livestock. Do not apply more than 3 pounds AI per acre per season. Preharvest interval: 28 days. REI: 24 hours.
Mustang Maxx: Toxic to aquatic invertebrates, fish, oysters and shrimp. Do not apply more than 0.15 pound AI per acre per season. Preharvest interval: 21 days. REI: 12 hours.
Orthene/Acephate: Apply by air at 5-10 GPA and by ground at 10-50 GPA. Do not harvest for hay or forage. Do not apply more than 1.5 pounds AI per acre per season. Preharvest interval: 14 days. REI: 24 hours.

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Crops - Commercial

Soybean
Insecticide Precautions and Limitations (refer to insecticide label for complete information)
Respect: Same as Mustang Maxx.
Steward: Toxic to fish, birds and aquatic invertebrates. Do not feed or graze livestock on treated fields. Do not apply more than 0.44 pound AI per acre per year. Preharvest interval: 21 days. REI: 12 hours.
Blackhawk: Toxic to bees and mollusks. Do not apply more than 0.186 pound A.I. per acre per year. Do not feed treated forage/hay to beef or dairy cattle. Preharvest interval: 28 days. REI: 4 hours.
Abbreviations: REI: re-entry interval; **AI:** active ingredient; **GPA**: gallons per acre

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Crops - Commercial

Stored Grain	
Clean the storage bin	Good sanitation practices can prevent at least one early fumigation. Bins should be thoroughly cleaned at least two weeks prior to storing grain. All old grain, trash and debris should be cleaned from within and around the storage bins and fumigated or burned. Spray the bin inside and out including overhead with a labeled insecticide.
Treat the storage bin	1. Centynal (Deltamethrin) – Apply 0.25 to 1.5 fluid ounces in 1 gallon water per 1,000 square feet. 2. Diacon – D IGR ((S)-Methoprene) – Apply 1.5 ounces per 1,000 square feet. 3. Tempo SC Ultra (ß- Cyfluthrin) – Apply 8-16 millileters of concentrate per 1,000 square feet. See label for the amount of water to add in preparing the spray solution. Storcide II (Chlorpyrifos-methyl) – Mix 1.8 fluid ounces per gallon water per 1,000 square feet of bin surface. (See label for specific application instructions).
Grain protectants	Grain that is to be held in storage should be protected from stored grain insects. An approved grain protectant applied to the grain at the time of storage will help prevent an early infestation. Grain must be at the proper moisture content for storage. Do not apply before high temperature drying. High temperaturear and high moisture content grain will shorten the residual life of grain protectants. See insecticide labels for specific application instructions. Most grain protectant solutions should be applied to the grain as it enters the storage bin on the conveyor belt, unless it is applied as a surface treatment. 1. B.t. (*Bacillus thuringiensis*) sold as Dipel and others. Follow label directions for surface treatment only to control Indian meal moth. 2. Actellic 5E[1] (Pirimiphos-methyl): Corn[2] and Grain Sorghum: 9.2 to 12.3 ounces per 5 gallons water per 1,000 bushels; as a surface treatment for Indian Meal moth 3 ounces per 2 gallons of water per 1,000 square feet. 3. Storcide II (Chlorpyrifos-methyl) (21.6% chlorpyrifos-methyl and 3.7% deltamethrin) Wheat – 12.4 fluid ounces per 5 gallons water per 1,000 bushels Barley – 9.9 fluid ounces per 5 gallons water per 1,000 bushels Oats – 6.6 fluid ounces per 5 gallons water per 1,000 bushels Rice – 9.3 fluid ounces per 5 gallons water per 1,000 bushels Grain Sorghum – 11.6 fluid ounces per 5 gallons water per 1,000 bushels 4. Fyfanon (Malathion) 6 percent Grain Dust[3]: Wheat, Corn, Oats – 10 pounds of dust per 1,000 bushels as grain is being loaded or turned into final storage. (See label for further mixing instructions) 5. Pyrenone (Pyrethrins) (6% pyrethrins and 60% PBO) – Short term knock-down control. Degrades rapidly. Barley, corn, rice, sorghum and wheat – mix 1 part Pyrenone with 29 parts water. Apply 4-5 gallons per 1,000 bushels. 6. Diatomaceous earth (several trade names). Barley, corn, oats, rye, sorghum, wheat. Follow the label. 7. Dichlorvos resin strips (DDVP, Vapona). Barley, corn, oats, rye, sorghum, soybean, sunflower, wheat. One strip is needed per 1,000 cubic feet of bin headspace. A vapor is realeased from dichlorvos strips that kills adult Indianmeal moths preventing reproduction. 8. Centynal (Deltamethrin) – Wheat 9.14 fluid ounces per 5 gallons water per 1,000 bushels Barley 7.31 fluid ounces per 5 gallons water per 1,000 bushels Oats 4.88 fluid ounces per 5 gallons water per 1,000 bushels 9. Apply 8-10 pounds per 1,000 bushels 10. Sensat (Spinosad) – Wheat 10.5 fluid ounces per 5 gallons water per 1,000 bushels Barley 8.2 fluid ounces per 5 gallons water per 1,000 bushels Oats 5.9 fluid ounces per 5 gallons water per 1,000 bushels

[1] Actellic should give 9 to 12 months control of all stored grain insects in Louisiana (except lesser grain borer).

[2] Not labeled or effective for corn stored in the shuck.

[3] This insecticide may not be a suitable grain protectant because it breaks down rapidly and many stored-grain insects have developed high resistance to it in other states. National tolerances for malathion on grain are very low. Grain treated with malathion may be unmarketable in international markets.

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Stored Grain

Fumigation

Insect	Fumigant*	Amount Per 1,000 Bushel Grain	*Minimum No. of Days Bin Must Be Closed During Fumigation
Rice weevils	Aluminum Phosphide (Phostoxin)	Follow label Instructions.	Four days – check label for additional information. (Do not fumigate below 40 F)
Lesser grain borer		Follow label Instructions.	
Bran beetles		Follow label Instructions.	
Sawtoothed grain beetle		Follow label Instructions.	
Flat grain beetle		Follow label Instructions.	
Angoumois grain moth		Follow label Instructions.	
Indian meal moth		Follow label Instructions.	

***Note:** Bins must be gas tight. Phosphine gas is deadly to people and other animals. Follow all safety and application guidelines on the label.

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Crops - Commercial

Louisiana Recommendations for Control of Sugarcane Insects

The sugarcane borer is the most destructive insect attacking the Louisiana sugarcane crop. Soil insects, including wireworms and the sugarcane beetle, and Hemipteran pests, including the sugarcane aphid, yellow sugarcane aphid and West Indian cane fly, are sporadic pests for which no controls are consistently recommended. Other insects, such as sugarcane mealybugs, root stock weevils and mole crickets, are not considered economic pests of sugarcane in Louisiana. The Mexican rice borer is an emerging pest, and it is known to infest sugarcane in the following parishes: Calcasieu, Jefferson Davis, Vermilion, West Baton Rouge and Pointe Coupee.

Stem Borers: Sugarcane Borer and Mexican Rice Borer

Cultural practices	The following farming practices can reduce stem borer infestations and damage: **1.** Plant noninfested seed cane to improve crop stands. Stem borer larvae in seed cane can destroy 20 percent or more of the vegetative buds (eyes) and contribute substantially to overwintering populations. **2.** Plant corn as far as possible from sugarcane to reduce midsummer moth movement from senescing cornfields to sugarcane. **3.** Plow out old stubble soon after final harvest to reduce the number of overwintering larvae. **4.** Leave crop residues such as cane tops and stalk pieces exposed on the soil surface throughout winter to obtain maximum kill of larvae by winter temperatures. **5.** Avoid early August plantings, which are more susceptible to stem borer deadhearts and often harbor increased densities of overwintering larvae. Plant cane fields often have earlier treatable infestations. Sugarcane borer infestations are greatest in vigorously growing cane, while Mexican rice borer infestations are exacerbated by drought conditions.
Varietal resistance	Some varieties of sugarcane withstand or avoid stem borer attack better than others. The following commercial varieties are ranked in order of their susceptibility to stem borers based on results from replicated field trials. **Rating** — **Available Varieties** Resistant — HoCP 85-845, L 01-299 Moderate — L 99-226, L 01-283, , *HoCP 04-838, HoCP 09-804, Ho 12-615 Susceptible — HoCP 96-540, , HoCP 00-950, L 03-371, L 03-371, L 12-201, L 11-183 *HoCP 04-838 is moderately resistant to sugarcane borer, but susceptible to Mexican rice borer.
Relative susceptibility to stem borer injury	Plant each variety in as large an acreage block as possible. This method helps the scouting program and cuts down on the treatment of resistant varieties when mixed with susceptible varieties. Plant resistant varieties wherever appropriate. This can reduce the need for insecticide applications. It is also important to plant resistant varieties adjacent to schools, waterways and other areas where aerial applications are not recommended. No variety exhibits complete resistance, and periodic scouting of resistant varieties is recommended.

Insecticides labeled for control of stem borers. In addition to the reduced risk insecticides listed below, several pyrethroids are labeled for stem borers, but are not recommended.

Insecticide	IRAC Mode of Action*	Sugarcane Borer Rate Fluid Once/Acre	Mexican Rice Borer Rate Fluid Ounce/Acre
Confirm 2F (tebufenozide)	Diacylhydrazine [IGR] (18)	6.0–8.0	16.0
Diamond 0.83 EC (novaluron)*	Benzoylurea [IGR] (15)	9.0–12.0	12.0
Prevathon (chlorantraniliprole)	Diamide (28)	14.0–20.0	NA
Besiege (chlorantraniliprole + lambda-cyhalothrin)	Diamide (28) + Pyrethroid (3A)	8.0–10.0	8.0–10.0

*Use of adjuvants with Diamond is prohibited by the label.

Application timing: Insecticide applications should be made only after internodes have begun to form and when economic infestations are detected. It is important that fields be scouted at weekly intervals from June through September, and that insecticides be applied only when economically injurious borer infestations exist at an action threshold of 5% stalks infested with live larvae in leaf sheaths and on stalks. Applications may be made after September 15 as long as the PHI is considered, however, late season borer infestations are less likely to reduce yields than mid-summer infestations.

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Application methods: Because of the limited exposure of stem borer larvae and the high biomass of sugarcane, insufficient water volume can reduce insecticide efficacy. A minimum of 5 gal/acre is recommended for aerial applications and 10 gal/acre for applications made with a ground sprayer. The use of adjuvants including spreaders and/or binders can improve coverage in late season applications when a dense canopy is present. Use of a large droplet size will reduce the risk of pesticide drift. If more than one application per season is needed, alternation of chemistries is recommended to delay the development of insecticide resistance.

Warning: Re-entry times for workers entering treated fields should be strictly observed. Be sure to check the label for this information. The time required between the last application and harvest (PHI) is generally 14 days, however, Besiege requires 21 days.

West Indian Canefly

The West Indian canefly (WIC) is a sporadic pest of sugarcane that may become problematic following warm winters without hard freezes. Only pyrethroids are labeled for WIC control. Caution should be used when applying pyrethroids for WIC control, as these products may flare aphid infestations. Apply with a minimum water volume of 5 gal/acre (aerial) and 10 gal/acre (ground).

Insecticide	Active ingredient	Rate (Fluid Oz/Acre)
Warrior, generics	lambda-cyhalothrin	1.6–2.6
Besiege	chlorantraniliprole + lambda-cyhalothrin	8.0–10.0

Sampling: Scouting should be done by examining the underside of canopy leaves (3rd or 4th down from the dewlap) and counting the number of nymphs present. Growers should make an insecticide application when populations are increasing for two consecutive weeks and average > 30 nymphs/leaf with honeydew and sooty mold building up in the upper canopy. The relationship between WIC infestations and yield reductions is still being investigated. WIC infestations generally decline as cane matures later in the season, and treatment after August is not recommended.

Wireworms

Soil treatment is recommended to control wireworms where sod/pastureland is planted to cane or where wireworms are known to be a problem. Wireworm damage results in reduce stands and generally occurs in patches. Wireworms are usually confined to sandy or sandy-loam soils. Apply granular insecticide over seed pieces in the open furrow in a band 12-16 inches wide so that all the seed pieces have contact. The application should be made just before the seed pieces are covered with soil. Heavy soils never have wireworm problems.

Insecticide	Active Ingredient	Dosage	Application
Thimet 20G	Phorate	1.0–1.5 lbs/A.I./acre 5.0–7.5 lbs/acre	Apply in furrow directly around planted cane in a 12–16-inch band and cover with soil.
Mocap 20G	Ethoprop		

Sampling: Wireworms can be sampled by setting up 1 to 2 bait stations per 10 acres 1 to 4 weeks before planting. For each bait station, bury a handful of fermented corn seeds 2–4 inches deep (corn seeds must not be coated with a seed treatment). Cover with a small mound of soil and mark location with a flag. Remove the soil and count the number of wireworms attracted to each bait station one week after set up. An average of greater than one wireworm per bait station should be treated.

Soil applied insecticides may reduce populations of fire ants and lead to increased stem borer infestations.

Note: No liquid formulations are labeled for wireworms. Use of the smart-box "lock'N load" applications systems for granular insecticides greatly reduces hazard to the applicator.

Aphids: Sugarcane Aphid and Yellow Sugarcane Aphid

Aphids are sporadic pests of sugarcane which have potential to reduce yields through direct feeding and through transmission of the sugarcane yellow leaf virus. **No insecticides are recommended for control of aphids**, and insecticides are not effective at reducing virus transmission. Only pyrethroids are registered for aphid control and these products can potentially flare aphid infestations by reducing populations of beneficial insects. Sugarcane variety HoCP 91-555 is known to be resistant to both aphid species.

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Sweet Potatoes

Sweet potatoes can be damaged by soil and foliage feeding insect species throughout the production season. In addition, sweetpotato weevils can be a problem in storage. Insect damage results in economic losses, due to yield and overall quality losses.

Root feeding Insects

Banded cucumber beetles, whitefringed beetles, flea beetle species:

Foliar applied insecticides are applied to manage the adult stages of these pests in order to prevent them from laying eggs in the soil. Insecticide applications should be made only when the pests are present in sufficient numbers to warrant control. The threshold for spotted and banded cucumber beetles is 2 beetles/100 sweeps. The threshold for whitefringed beetles is 1 beetle/100 sweeps. See insecticide chart for approved insecticides. *Please read and follow all label directions*

Wireworms, white grubs, rootworms:

These are larvae of click beetles, June bugs and banded and spotted cucumber beetles, respectively, that tunnel or chew large holes in the developing sweet potato roots. Preplant, soil incorporated insecticides are applied to control the immature stages of these pests that are present in the soil at the time of applications. These chemicals provide a residual control of 4 to 6 weeks. Insecticides labeled for preplant application, include: Lorsban, Mocap, Brigade, Belay and Admire Pro. Please consult the approved list of insecticides labeled for sweet potato in Louisiana included below. *Read and follow all label directions.*

Sugarcane beetle:

Research is ongoing to identify management strategies for this insect in sweet potato. Damage may be increased in fields bordering pasture or field corn. The adult is the damaging stage of this insect. Damage occurs late in the production season prior to harvest. Soil applications of approved insecticides may reduce damage. Please consult the table on the next page for recommended insecticides.

Aphids, flea beetles and whiteflies:

Apply Admire Pro to the soil and incorporate to control aphids and whiteflies (vectors of virus diseases). Rates per application range from 4.4-10.5 fl. ounces/acre.

Use Platinum 2F (thiamethoxam) applied in-furrow at planting or as a lay-by- shanked application to control aphids, whiteflies and flea beetles. Recommended rates per application range from 5-8 fl. ounces/acre. Follow mixing directions and read the label carefully.

Foliage feeding loopers, beet armyworms, other Lepidoptera species

When defoliation reaches 35 percent or higher apply approved insecticides. Please consult the below table for a list of foliar insecticides and consult the label for specific looper or armyworm species controlled.

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Crops - Commercial

Sweetpotato Weevils – Cultural and Chemical Control Measures

Sweetpotato weevil larvae attack the roots of the sweet potato plant, tunneling through the root as they feed. Sweet potatoes are susceptible to attack by the sweetpotato weevil at any time during the growing period as well as in storage.

All cultural and sanitation practices for control of the sweetpotato weevil should be followed. This includes acquiring weevil-free seed, cutting vines or slips (rather than pulling), destroying all potatoes left in fields, controlling weevils in the seedbed and destruction of the seedbed when plant production is finished. Also, if infestation is bad, spray fields with approved insecticides (see insecticide chart). Pheromone traps should be placed in fields to help determine weevil population levels. If several weevils are caught per trap per night then foliar spray applications should be made.

In the Field: Rotate field plantings. Plant the new crop as far away as possible from the plantings of the previous year.

Producers in the pink tag production region should follow the regulations set by the Louisiana Department of Agriculture and Forestry, regarding the mandatory spray program for sweetpotato weevils. Apply approved insecticides on a 7-10 day spray schedule to all seed beds and production fields to suppress sweetpotato weevil populations in the field.

At Harvest: Seed sweet potatoes should be selected at harvest from fields apparently free of sweetpotato weevil. Destroy all vines and roots left in the field. If seed potatoes appear to be heavily infested consider purchasing weevil-free seed from a weevil-free area.

In Storage: Remove all old sweet potatoes from the storage area at least one month before storing the new crop. Store only those potatoes that are apparently weevil-free and reasonably clean. Treat potatoes going into storage with 5% Imidan dust (2-4 ounces per bushel) using an applicator approved by the Louisiana Department of Agriculture and Forestry.

In Seed beds: Locate seedbeds away from sweet potato storage and last season's plantings. Weevils may enter seedbeds from outside sources. To minimize the infestation from invading weevils apply approved insecticides at weekly intervals beginning when plants first emerge (or when the plastic cover is removed from the seedbed) and continuing as long as the seedbed is used. Almost all weevil eggs in plants stems are found near the soil surface so plants should be cut at least an inch above the soil level. Destroy the seedbed when it is no longer needed but no later than July 15th each year.

Warning: Re-entry time for workers entering treated fields should be strictly observed. Be sure to check for this information.

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Labeled Insecticides					
Insect	**Insecticide***	**Amount Concentrate Per Acre**	**Pounds Active Ingredient/ Acre**	**Acres Treated Per Gallon/Lb**	**Comments**
Cucumber beetles, white grubs, whitefringed beetles, wireworms	Bifenthrin**	19.2 fluid ounces	0.30	6.5	Preplant and layby, not to exceed 0.5 pounds AI/acre per year
		3.2-9.6 fluid ounces	0.05-0.15	40-13	At cultivation or layby
	Mocap EC	5.1-6.9 fluid ounces per 1000 row ft.	3-4	2-1.5	Preplant 12-15 in. band on 42 in. row
	Mocap 15G	20-26 pounds	3-4		preplant12-15 in. band on 42 in. row
Wireworms flea beetles	Lorban 4E	0.5 gallon	2	2	Preplant / broadcast
	Lorsban 15G	13.5 pounds	2		Preplant / broadcast
	Lorsban Advanced	0.5 gallon	1.87	2	Preplant / broadcast 24© (60-Day PHI)
Sugarcane beetles, flea beetles, white grubs **Wireworm suppression**	Belay	9-12 fluid ounces	0.15-1.21	10-9	Preplant and layby
Aphids, whiteflies, flea beetles	Admire Pro***	4.4-10.5 fluid ounces	0.16-0.38	29-12	Preplant and layby
Aphids, flea beetles	Platinum 2F	5-8 fluid ounces	0.078-0.125	25-16	Preplant and layby
Cucumber beetles, whitefringed beetles, flea beetle	Bifenthrin**	2.1-6.4 fluid ounces	0.033-0.10	61-20	Foliar
	Imidan 70-W	1.3 pounds (pH 5.5)	0.91		Foliar
	Sevin XLR-Plus	1-2 quarts	1-2	4-2	Foliar
	Assail 30 SG	1.5-4 ounces	0.028-0.075	10.5-4	Foliar
	Baythroid XL	1.6-2.8 fluid ounces	0.013-0.022	80-46	Foliar
	Mustang Max	1.76-4 fluid ounces	0.011-0.025	73-32	Foliar
	Leverage 360	2.4-2.8 fluid ounces	-	53-46	Foliar
Sweetpotato weevils	Leverage 360	2.4-2.8 fluid ounces	-	53-46	Foliar
	Bifenthrin**	2.1-6.4 fluid ounces	0.033-0.10	61-20	Foliar
	Imidan 70-W	1.3 pounds (pH 5.5)	0.91		Foliar
	Sevin XLR-Plus	1-2 quarts	1-2	4-2	Foliar
	Baythroid XL	1.6-2.8 fluid ounces	0.013-0.022	80-46	Foliar
	Imidan Dust 5%	*2-4 ounces/bushel*			*Dust after harvest*
Armyworms	Intrepid 2F***	6-10 fluid ounces	0.09-0.16	21-12.8	Foliar
	Coragen	3.5-5 fluid ounces	0.04-0.06	36-25	Foliar
	Rimon 0.83 EC	9-12 fluid ounces	0.06-0.08	14-10.6	Foliar
	Mustang Max	3.2-4 fluid ounces	0.02-0.025	40-32	Foliar

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Crops - Commercial

Labeled Insecticides					
Insect	**Insecticide***	**Amount Concentrate Per Acre**	**Pounds Active Ingredient/ Acre**	**Acres Treated Per Gallon/Lb**	**Comments**
	Besiege	6-9 fluid ounces	0.04-0.06 0.02-0.03	21-14	Foliar
Soybean looper	Rimon 0.83 EC	9-12 fluid ounces	0.06-0.08	14-10.6	Foliar
	Besiege	6-9 fluid ounces	0.04-0.06 0.02-0.03	21-14	Foliar
	Intrepid Edge	4.5-12 fluid ounces	0.08-0.23 0.02-0.05	28.4-10.6	Foliar
Cabbage looper	Avaunt	2.5-6.0 fluid ounces	0.045-0.11	51-21	Foliar
	Mustang Max	1.76-4 fluid ounces	0.011-0.025	72-32	Foliar
	Baythroid XL	1.6-2.8 fluid ounces	0.013-0.022	80-46	Foliar
	Intrepid Edge	4.5-12 fluid ounces	0.08-0.23 0.02-0.05	28.4-10.6	Foliar
Aphids	Assail 30 SG	2.5-4 ounces	0.048-0.075	10.5-4	Foliar
	Leverage 360	2.4-2.8 fluid ounces	-	53 - 46	Foliar

*Note incorporation instructions and methods of application for preplant and layby insecticides.
*Apply preplant insecticides as close to transplant as possible in accordance with label directions.
*Please note species listed, preharvest intervals, maximum usage per acre on all labels.
*Do not exceed 0.5 pound active ingredient bifenthrin per acre/per season.
** Bifenthrin is labeled under several trade names.
*** 24C special local needs label

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Crops - Commercial

Wheat and Oats

Insect	Insecticide	Amount of Concentrate per Acre	Pounds Active Ingredient/ Acre	Acres Treated per Gallon or Pound SP	Comments
Aphids (including greenbug aphid)	malathion Malathion (5)	24 ounces	1	5.3	General guideline for greenbug treatment levels:
	sulfoxaflor Transform (50)	0.75 ounce	0.023	21.3	Plant height (inches): 3-6, 4-8, 6-16 Number of greenbugs (per linear foot): 100-300, 200-400, 300-800
	dimethoate Dimethoate (4)	8-12 ounces	0.25-0.375	16-10.7	Wheat only.
	SUPPRESSION				
	lambda-cyhalothrin Karate Z (2.08)	1.92 ounces	0.03	66.7	Wheat only. See labels. Treat when greenbugs cause areas with dead plants. Other aphid species may not require control.
	z-cypermethrin Mustang Max (0.8)	3.2-4 ounces	0.02-0.025	40-32	
True armyworm, fall armyworm	lambda-cyhalothrin Karate Z (2.08)	1.28-1.92 ounces	0.02-0.03	100-66.7	Treat when 5 or more worms per square foot are found, and foliage loss is occurring.
	spinosad Blackhawk (0.36)	1.7-3.3 ounces	0.038-0.075	9.4-4.8	
	z-cypermethrin Mustang Max (0.8)	3.2-4 ounces	0.02-0.025	40-32	Wheat only.
Stink bugs	z-cypermethrin Mustang Maxx (0.8)	3.2-4 ounces	0.02-0.025	40-32	Wheat only.
	lambda-cyhalothrin Karate Z (2.08)	1.28-1.92 ounces	0.02-0.03	100-66.7	Treat when 10% of spikes (wheat heads) in the milk stage are infested. Treat when 25% of spikes in the soft dough stage are infested.

Hessian fly	***Host plant resistance and cultural control tactics***
	1. Plant resistant varieties where available. Use of resistant varieties is the key method for management of Hessian fly. The resistant variety must have the resistant gene(s) for the Hessian fly biotype present. 2. Plant during recommended time period. There is no "fly-free date" for Louisiana. 3. Rotate wheat ground, if possible. 4. Use conventional tillage in the spring. 5. Eliminate volunteer wheat in the summer (following harvest) and fall (prior to harvest). 6. Avoid using susceptible wheat for cover crops and wildlife plantings.

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Wheat and Oats					
Insect	**Insecticide**	**Amount of Concentrate per Acre**	**Pounds Active Ingredient/ Acre**	**Acres Treated per Gallon or Pound SP**	**Comments**
Hessian fly - Continued	***Seed treatments***				
	imidacloprid Gaucho 600	1.6 fluid ounces per cwt.			Wheat only.
	imidacloprid Gaucho XT	3.4 fluid ounces + Gaucho 600 @ 1 fluid ounce/cwt			Wheat only.
	thiamethoxam Cruiser 5FS	1.33 fluid ounce per cwt.			Wheat only.
	thiamethoxam Cruiser Maxx Cereals	5 fluid ounces + Cruiser 5S @ 0.5 – 1 fluid ounce/cwt.			Wheat only.
	clothianidin Nipsit INSIDE	1.79 fluid ounce per cwt			Wheat only
	Foliar treatments				
	lambda-cyhalothrin Karate Z (2.08)	1.92 ounce	0.03	66.7	Wheat only. Apply when adult Hessian fly are emerging and active in the fall (2- to 4-leaf stage) or the late winter, early to mid-March). Timing of applications is difficult.

Insecticide Precautions and Limitations (refer to insecticide label for complete information)
Malathion: Do not apply within 7 days of harvest. REI: 12 hours.
Dimethoate: Do not apply within 14 days of grazing or 35 days of harvest. REI: 48 hours.
Karate Z: Do not apply within 30 days of harvest. Waiting period for grazing is 7 days. Do not apply more than 0.06 pound per acre per season. REI: 24 hours.
Tracer: Preharvest treatment interval: 21 days for grain, 14 days for forage or hay harvest. Do not apply more than 0.28 pound AI per acre per year. REI: 4 hours.
Mustang Maxx: Do not apply more than 0.125 pound AI per acre per season. Postharvest interval is 14 days. REI: 12 hours.
Cruiser: Toxic to wildlife and aquatic organisms. REI: 12 hours.
Gaucho: Toxic to birds and aquatic invertebrates. Do not graze livestock for 45 days. REI: 12 hours.

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Fruit and Nuts – Commercial

Apple Spray Schedule			
Time of Spray and Pest	**Materials/ Insecticides**	**To Make 50 Gallons**	**Precautions**
Dormant (apply in December or January)			
San Jose scale (when present)	Oil emulsion 3% actual oil in diluted spray. Follow recommendations of the manufacturer for mixing.		Use two applications 7-10 days apart prior to bud break with no time limit.
	Imidan (Phosmet) 70W	0.5-1.28 pounds	PHI=14 days; highly toxic to bees. Do not use in home gardens. Not to exceed 5.125 pounds A.I./acre.
	Esteem 35WP (Pyriproxyfen)	0.5-0.62 ounce (= 4-5 ounces/acre)	PHI=45 days; limit to two applications per season. Allow 14 days between applications. Apply at delayed dormant thru pink. For delayed dormant, mix with oil emulsion at the recommended manufacturer's rate. Must be timed to coincide with crawler emergence.
	Proaxis (Gamma-cyhalothrin)	0.427-0.853 fluid ounce	PHI=21 days; do not apply more than 0.1 pound A.I./acre/season.
Calyx (apply when three-fourths of petals have fallen)			
Catfacing insects	Imidan (Phosmet) 70W	0.5-1.28 pounds	See above information on Imidan.
Leafrollers, scales, leafhoppers	SpinTor 2SC (Spinosad – mixture of Spinosyn A and D)	0.62-1.25 fluid ounce	PHI=7 days. Not labeled to control scales.
Thrips	Carbaryl 50% WP (Sevin) [follow label in other Carbaryl (Sevin) formulations]	0.5-1.0 pound	PHI=3 days; highly toxic to bees; avoid during periods of full bloom until 30 days after full bloom. Allow 14 days between sprays. Use higher rate of Carbaryl 50WP for apple maggot, leafrollers, wooly apple aphid, plum curculio. Carbaryl might promote mite infestations.
	Pounce (Permethrin) 3.2EC	1.25 fluid ounce (=10 fluid ounce/acre)	Do not apply after petal fall. Follow label.
	Proaxis (Gamma-cyhalothrin)	0.427-0.853 fluid ounce	PHI=21 days; do not apply more than 0.1 pound A.I./acre/season.
Aphids (not wooly apple aphid)	Provado 1.6F (Imidacloprid)	1.0-2.0 fluid ounce	PHI=7 days; apply post-bloom only.
Leafhoppers	Provado 1.6F (Imidacloprid)	0.5-1.0 fluid ounce	Provado is highly toxic to bees and aquatic invertebrates. Toxic to wildlife. Allow 10 or more days between applications. Do not apply more than 40 fluid ounce per acre per year.
	Mustang Max (Zeta-cyprmethrin)	0.21-0.32 fluid ounce	PHI=14 days; allow 7 days between applications.
Mites	Nexter (Pyridaben)	5.2-10.67 ounces/acre	PHI=25 days; Do not make more than one application per season. Apply at the beginning of mite infestations.
	Savey 50DF (Hexythiazox)	3.0-6.0 ounces/acre	PHI=28 days; limit to one application per year. Apply at the beginning of mite infestations.
Apply cover sprays at 10- to 14-day intervals			
Same as above.	Same as above		Same as above

Warning: Re-entry time for worker entering treated areas should be strictly observed. Read the label for this information.
Note: Chemical should be applied at a rate of 200-300 gallons/acre for adequate coverage with material.

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Fruit and Nuts – Commercial

Note: Selection of proper materials and timing of application are of primary importance for effective control of insects and diseases of citrus. The rate of pesticide product per 100 gallons used in this guide is based on a volume of 400 gallons/acre diluted spray.

Citrus Spray Schedule					
Pest	**Pesticide and Formulation**	**Rate of Product per Acre**	**Amount To Use for 100 Gallons***	**Amount To Use for 1 Gallon**	**Remarks**
Prebloom: Jan. 15 - Feb. 15 Satsuma, Grapefruit, Temple, Valencia, Lemon, Tangelo, Tangerine					
Spider mites	Nexter 75WP (Pyridaben)	6.6 ounces (=1 water-soluble packet/acre)			PHI = 7 days; do not make more than 2 applications/year. Allow 30 days between treatments at lowest labeled rate. Higher rates require longer intervals. Highly toxic to bees, fish and aquatic invertebrates. Read label.
Rust mites	Micromite 80WGS (Diflubenzuron) + 97% petroleum-based oil	6¼ fluid ounces (=2 water-soluble packet/acre)			Micromite 80WGS: PHI = 21 days; do not mix with boron products. Use sufficient water to ensure coverage. Applications may be repeated no less than 90 days apart. Active on eggs and nymphal stages but not on adult rust mites. Results visible 3-10 days after application.
	Sulfur				Limit sulfur applications to 1 per season where supplemental rust mite control is needed. Do not mix with oils and/or do not apply within 3 weeks of oil applications to avoid fruit burn. Some sulfur formulations should not be combined with spreader/stickers. Follow labeled rate. Do not use more than 6 pounds/100 gallons.
Asian citrus psyllid	Danitol 2.4EC (Fenpropathrin) + Lorsban 4E (Chlorpyrifos) + Horticultural oil	16-21 1/3 fluid ounces 5 pints			Use for control of overwintering adults. Do not apply if harvesting fruit. PHI = 21 days (Lorsban) and 1 day (Danitol); do not exceed 2 2/3 pints of Danitol per season. Do not exceed 15 pints/acre/season of Lorsban. Sulfur may cause irritation to eyes. Avoid contact with eyes, skin and clothing. To avoid foliage/fruit burn, do not apply sulfur products when hot temperatures (above 90 F) are expected within 3 days of spraying. **NOTE:** Lime sulfur use – do not use this material on tangerine trees during late winter and early spring.
Postbloom: All citrus (satsumas - when 75% petals have fallen, other					

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Citrus Spray Schedule

Pest	Pesticide and Formulation	Rate of Product per Acre	Amount To Use for 100 Gallons*	Amount To Use for 1 Gallon	Remarks
oranges - when pea size.)					
Scales, thrips	Malathion 57EC (Malathion)	5-7½ pints	1¾ pints	2 teaspoons	Malathion: PHI = 7 days; Malathion is highly toxic to honeybees. Do not apply during full bloom. Nutritional mixtures should not be used in combination with oil sprays.
	Malathion 8F (Malathion)	6 pints	1½ pints	1½ teaspoons	
Aphids, scales	Lorsban 4E (Chlorpyrifos)	4-7 pints	1-1¾ pints	1-2 teaspoons	REI = 5 days; PHI = 21 days; Lorsban applications may increase spider mite activity. A miticide may be needed after using this product. Do not make more than 2 Lorsban applications (or more than 15 pints of 4E formulation)/ acre /year. Use 30-day interval between applications. Do not use Lorsban when temperature is above 95 F. To avoid excessive ridging of the fruit, do not apply Lorsban from December until 10% bloom. Lorsban is toxic to birds and wildlife, highly toxic to honeybees and extremely toxic to fish. Do not use where shrimp or crawfish would be affected. Do not apply during full bloom.
Scales, mealybugs, whiteflies, citrus blackflies, Asian citrus psyllids	Supracide 2E (Methidathion)		½-2 pints	½-2 teaspoons	PHI = 14 days; make no more than two applications per season. Allow 45-day intervals between sprays; highly toxic to bees; do not apply during full bloom. In lemons do not apply more than once if tank-mixed with oil. PHI = 5 days; do not apply more than 20 quarts/acre/crop.
	Supracide 2E Plus (Methidathion)		1-2 pints	1-2 teaspoons	
	Sevin XLR plus (Carbaryl)	1.5 quarts			
Scales, whiteflies, citrus blackflies, spider mites, rust mites	Esteem 0.86 EC (Pyriproxyfen) + 1% Superior oil	16 fluid ounces			PHI = 1 day; use sufficient water to ensure enough coverage. Apply when scales are at crawler (young) stage; maximum 2 applications/season; allow 21 days between sprays.
	Nexter 75WP (Pyridaben)	6.6 ounces (1 water-soluble packet/acre)			See preceding remarks on Nexter.
	Vendex 50WP (Fenbutatin-oxide) +	2-3 pounds (2-3 water-soluble packets/acre)	8-12 ounces	1-1½ teaspoons	PHI = 7 days; apply when daily temperatures at application average above 70 F and when mite populations are beginning to build for best performance. Complete coverage is needed for optimum control. Limit to two applications/ year at 60-day intervals. Do not use Vendex on

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Citrus Spray Schedule

Pest	Pesticide and Formulation	Rate of Product per Acre	Amount To Use for 100 Gallons*	Amount To Use for 1 Gallon	Remarks
					tangerines, tangelos, Reed grapefruit or Webb red blush grapefruit.
	Latron CS 7		1 quart		
Thrips	SpinTor 2SC (Spinosad)	6 fluid ounces			PHI = 1 day; do not spray more than 29 fluid ounces/acre/crop or more than two applications/year. For best results, add emulsified crop oil (follow label).
80% Petal Fall: All Citrus					
Rust mites, broad mites, bud mites, Two-spotted spider mites, citrus thrips	Agri-mek 0.15 EC (Abamectin)	5-20 fluid ounces	1¼-5 ounces	¼ teaspoon	PHI = 7 days; always apply with a minimum of 0.20% horticultural (not dormant) spray oil. Allow 30 days between treatments. Do not apply more than 40 fluid ounces/acre/season; highly toxic to honeybees. For best results use a minimum of 500 gallons/acre of spray and no less than 0.5% oil for citrus bud mites; 100-150 gallons/acre spray for citrus leafminers; 100-250 gallons/acre spray for citrus thrips and adjust the rate of product/acre accordingly. Use caution when applying oils, read the label and do not spray when temperatures exceed 85 F.
	+ Ultra fine oil	10-20 fluid ounce	2½-5 ounces	¼ teaspoon	
Rust mites	Micromite 80WGS (Diflubenzuron) + 97% petroleum-based oil	6¼ fluid ounces (=2 water-soluble packet/acre)			PHI = 21 days; do not mix with boron products. Use sufficient water to ensure coverage. Applications may be repeated no less than 90 days apart; active on eggs and nymphal stages but not on adult rust mites; results visible 3-10 days after application.
Leafminers	Assail 70WP (Acetamiprid)	2 ounces			PHI = 7 days; toxic to bees exposed to direct treatment.
Leafminers, thrips	Spintor 2SC (Spinosad)	6 fluid ounces			PHI = 1 day; do not spray more than 29 fluid ounces/acre/crop or more than two applications/year. For best results add emulsified crop oil (follow label).
Aphids, citrus thrips, Asian citrus psyllid	Admire Pro (Imidacloprid)	3.5-7.0 fluid ounces			Admire Pro: PHI = 0 days; do not apply during bloom or 10 days prior to bloom; limit to 20 ounces/acre/application and 40 ounces/acre/year; allow at least 10 days between applications. Limit 14.0 fluid ounces/acre per crop season.
	Admire 2F (soil-applied systemic) (Imidacloprid)	16-32 fluid ounces (or 1/8 fluid ounce/tree)			Admire 2F: PHI = 0 days; intended for containerized trees and young trees (4 ft-6 ft height); apply as soil drench. For best results apply prior to the onset of

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Citrus Spray Schedule

Pest	Pesticide and Formulation	Rate of Product per Acre	Amount To Use for 100 Gallons*	Amount To Use for 1 Gallon	Remarks
					infestations. See label for soil application options.
April: All Citrus					
Fire ants	Extinguish IGR (Methoprene)	1-1½ pounds	3-5 tablespoons/mound	Apply when ants are actively foraging.	Fire ants
June 15 – July 15: All Citrus					
Thrips, leafminers	SpinTor 2SC (Spinosad)	6 fluid ounces			See above preceding remarks on SpinTor.
	Agri-mek 0.15 EC (Abamectin)	Refer to label			See preceding remarks.
	Admire Pro (Imidacloprid)	3.5-7.0 fluid ounces			PHI = 0 day; minimum interval between applications-10 days; maximum Admire Pro allowed per crop season – 40.0 fluid ounces/acre (0.5 pound AI/acre). Do not apply during bloom or within 10 days prior to bloom or when bees are actively foraging.
Rust mites	Agri-mek 0.15 EC (Abamectin)	5-20 fluid ounces	1¼ -5 ounces	¼ teaspoon	See above preceding remarks on Agri-mek. Rate varies depending on insect/mite control; refer to label.
Broad mites, bud mites, two-spotted spider mites	+ Ultra fine oil	10-20 fluid ounces/acre	2½ -5 ounces	¼ teaspoon	Always use caution when spraying oil and oil combinations; read the label; do not apply when temperatures exceed 85 F; see footnotes.
Rust mites. leafminers	Micromite 80WGS (Diflubenzuron) + 97% petroleum-based oil	6¼ fluid ounces (=2 water-soluble packet/acre)			See previous remarks on Micromite 80WGS.
Mites	Ultra fine oil		1¼-1¾ gallons	3-4½ tablespoons	Always use caution when spraying oil and oil combinations; read the label. Do not apply when temperatures exceed 85 F; see footnotes.
Spider mites, whiteflies, mealybugs, scales, aphids	Summer oil +		1-1½ gallons	2½-4 tablespoons	
	Malathion 57EC (Malathion)	5-7½ pints	1¾ pints	2 teaspoons	See above for Malathion remarks.
Asian citrus psyllid, aphids, scales	Danitol (Fenpropathrin) +	16-21 1/3 fluid ounces			Use for control of overwintering adults; do not apply if harvesting fruit; PHI = 1 day; do not exceed 2 2/3 pints of Danitol/season.
	Summer Oil	4-7 pints	1-1 ¾ pints	1-2 teaspoons	
	Lorsban 4E (Chlorpyrifos)	4-7 pints	1-1¾ pints	1-2 teaspoons	Lorsban may increase spider mite activity. A miticide may be needed after using this product; see remarks above.

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Citrus Spray Schedule

Pest	Pesticide and Formulation	Rate of Product per Acre	Amount To Use for 100 Gallons*	Amount To Use for 1 Gallon	Remarks
Mealybugs, whiteflies, citrus blackflies, black scales	Supracide 2E (Methidathion)		½-2 pints	½-2 teaspoons	See preceding remarks on Supracide.
			1-2 pints	1-2 teaspoons	
Aug. 14 – Sept. 15: All Citrus					
Aphids	Lorsban 4E (Chlorpyrifos)	4-7 pints	1-1¾ pints	1-2 teaspoons	Avoid copper applications during this time to avoid increasing mite populations. Lorsban may increase spider mite activity. A miticide may be needed after using this product. See remarks above.
	Admire Pro (Imidacloprid)	3.5-7.0 fluid ounces			See above for remarks.
Leaf-footed bugs	Baythroid 2 (Cyfluthrin)	2.2.4 fluid ounces			Baythroid 2: PHI = 0 days; throughout coverage of foliage and fruits is necessary for optimal results. Use 2-3 gallons of spray/tree. If multiple applications are needed may make a first spray at 2.4 fluid ounces/acre and 2 additional sprays of 2 fluid ounces/acre at a minimum of 7-day intervals. Maximum amount/season is 6.4 fluid ounces/acre (or 0.10 pound active ingredient/acre/season).
Scales, plant bugs	Malathion 57EC (Malathion)	5-7½ pints	1¾ pints	2 teaspoons	See above for remarks on Malathion.
Citrus blackflies, whiteflies, mealybugs, scales, plant bugs	Ultra fine oils		1½ gallons	4 tablespoons	Oils may be used with all materials particularly against whiteflies, mites and scales; however, read footnotes for important information.
	Supracide2E (Methidathion)		½-2 pints	½-2 teaspoons	
Spider mites, rust mites	Vendex 50WP (Fenbutatin-oxide) +	2-3 pounds (2-3 water-soluble packets/acre)	8-12 ounces	1-1½ teaspoons	See preceding remarks and temperature requirements for Vendex.
	Latron CS 7		1 quart		
	Nexter 75WP (Pyridaben)	6.6 ounces (1 water-soluble packet/acre)			See preceding limitations.
Asian citrus psyllid	Mustang Max (Zeta-cyprmethrin)	4.3 fluid ounces			PHI = 1 day; apply by ground equipment using sufficient water to obtain full coverage of foliage in a minimum of 20 gallons for concentrate spray or a minimum of 100 gallons for dilute spray. Apply by air in a minimum of 10 gallons/acre. Begin applications drift

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Citrus Spray Schedule					
Pest	**Pesticide and Formulation**	**Rate of Product per Acre**	**Amount To Use for 100 Gallons***	**Amount To Use for 1 Gallon**	**Remarks**
					precautions on this label. Do not apply more than 0.20 pound active ingredient/acre/season. Do not make applications less than 14 days apart.
Oct. 15 – Nov. 15: All Citrus					
Spider mites, rust mites	Vendex 50WP (Fenbutatin-oxide)	2-3 pounds	8-12 ounces	1-1½ teaspoons	Performance of Vendex is reduced when daily temperatures at application average below 70 F. See preceding remarks for additional restrictions.
Rust mites	Sulfur				Sulfur: Apply postharvest only if supplemental rust mite control is needed. See preceding remarks for oil and temperature restrictions.
	Agri-mek 0.15EC (Abamectin)	5-20 fluid ounces	1¼ -5 ounces	¼ teaspoon	See details above.
Asian citrus psyllid	Sevin XLR (Carbaryl)	1.5 quarts			PHI = 5 days; do not apply more than 20 quarts/acre/crop.
Leafminers	SpinTor 2SC (Spinosad)	6 fluid ounces			
	Admire Pro (Imidacloprid)	3.5-7.0 fluid ounces			
Fire ants	Extinguish IGR (Methoprene)	1-1½ pounds/acre	3-5 tablespoons/mound		

Note: Add a spreader sticker or liquid soap to spray mixture to obtain better coverage especially when emulsifiable concentrates are used. If rust mite control is poor, reduce speed or increase gallonage/acre if using a speed sprayer.

Mite-Resistance Management Plan: Repeated use of the same miticide is documented to result in rapid buildup of miticide-resistant strains of mites. To reduce the potential risk of developing resistant mite populations, miticides should be alternated as part of a mite-resistance management plan. If more than one application is needed to control heavy and prolonged mite infestations, always alternate to products with different mode of action. Observe the minimum required spray intervals and restrictions on amount of product and numbers of applications/area/season. Closely monitor mite populations to determine species, infestation levels and presence of predatory organisms. Use miticide sprays only when needed.

Caution: Oil emulsion sprays should not be applied to drought-stricken trees when temperature is above 85 F and humidity less. Oil emulsion sprays applied after August 15 may inhibit solid formation, retard coloring of fruit and reduce the tolerance trees to cold. Follow specific instructions on the label of all pesticides.

Warning: Always wear appropriate personal protective equipment when handling and spraying pesticides.
Re-entry times for workers entering groves and/or treated fields should be strictly observed; be sure to check the label for this information.

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Fruit and Nuts – Commercial

Citrus Spray Schedule

Diaprepes Root Weevil Management Recommendation

Treat every life stage (egg, larva, adult) with at least one treatment each year. Continue treatment until Diaprepes root weevils are not found for a full year. All adult treatments should be applied in 100-300 GPA water to ensure good coverage of insecticide (unless otherwise directed by the label). Be sure to read and follow all insecticide label instructions. Remember: the label is the law!

Timing of Adult Sprays:

- First spray during peak summer flush – usually late May (scout for adults beginning in April).
- Second spray four weeks later, combined with Micromite 80SG with oil for egg sterilization – usually late June (timing will vary depending on adult emergence).

Chemical Barrier for Larval Suppression:

- Target is larvae that will burrow into the soil after hatching from eggs deposited on leaves.
- Apply about two weeks after peak adult emergence – typically late July.
- Must be applied to soil that is mostly free of vegetation
- Uniformly apply from the trunk to the dripline of the tree to a moistened soil surface devoid of litter.
- Minimize disturbance of soil beneath the tree to maintain the barrier.
- Brigade should provide about three weeks of activity.

Diaprepes Root Weevil Management				
Insecticide	**Target**	**Method of Application**	**Rate Per Acre**	**Comments**
Micromite 80SG (Diflubenzuron)	Diaprepes root weevil egg	Apply to vegetation	6.25 ounces + 0.5% oil	Apply when adults are actively depositing eggs. Helps prevent egg hatch (oranges, grapefruit and tangerines).
Admire Pro (Imidacloprid)	Diaprepes root weevil larva	Irrig sys or apply to pre-wet soil.	14 fluid ounces	Apply when root growth is occurring. Apply to soil; remains effective for up to 4-5 months.
Brigade WSB (Bifenthrin)	Diaprepes root weevil Adult/Larva	Soil barrier	40 ounces	Apply twice per year to coincide with adult emergence. Do not exceed 80 ounce/year. Will control larva when they burrow into the soil. Will also control adults when they emerge from the soil. Must be applied to soil that is relatively free of debris and vegetation. Avoid disturbing the soil surface after application.
Baythroid 2E (Cyfluthrin)	Diaprepes root weevil Adult	Apply to vegetation	6.4 ounces	Only a single application may be made per crop season.
Danitol 2.4EC (Fenpropathrin)	Diaprepes root weevil Adult	Apply to vegetation	16-21 ounces	Citrus trees must be 3 years or older. Do not exceed 21.33 fluid ounces/year.

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Diaprepes Root Weevil Management				
Insecticide	**Target**	**Method of Application**	**Rate Per Acre**	**Comments**
Kryocide 96 WP or Prokil Cryolite 96 (Cryolite)	Diaprepes root weevil Adult	Apply to vegetation	8-10 pounds	This slow-acting stomach poison may take several days of warm weather to kill beetles. Do not exceed 90 pounds/acre/season.
Mustang (Zeta-cyprmethrin)	Diaprepes root weevil Adult	Apply to vegetation	4.3 fluid ounces	Apply by ground equipment using sufficient water to obtain full coverage of foliage in a minimum of 20 gallons for concentrate spray or a minimum of 100 gallons for dilute spray. Apply by air in a minimum of 10 gallons per acre. Begin applications when pest activity is noted. Follow appropriate spray drift precautions.
Orthene 97*[1] (Acephate)	Diaprepes root weevil Adult	Apply to vegetation	0.5 – 0.75 pound	Apply at 100 gallons water/acre or less.
Sevin 80S[1] (Carbaryl)	Diaprepes root weevil Adult	Apply to vegetation	5-10 pounds + 0.5% oil	Do not apply during bloom. Do not exceed 25 pounds/acre/ application.
Sevin XLR Plus[1] (Carbaryl)	Diaprepes root weevil Adult	Apply to vegetation	6 quarts + 0.5% oil	During bloom period, apply from 1 hour after sunset until 2 hours after sunrise.
Insecticide	Target	Method of Application	Rate Per Acre	Comments
Micromite 80SG (Diflubenzuron)	Diaprepes root weevil egg	Apply to vegetation	6.25 ounces + 0.5% oil	Apply when adults are actively depositing eggs. Helps prevent egg hatch (oranges, grapefruit and tangerines).

*Nonbearing citrus only,
[1] Be sure to adjust water pH into the range of 5.5 to 6.5.

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Fig Spray Schedule

Insect or Arthropod	Material	Rate	Restrictions
Vinegar flies	Malathion 57 EC (Malathion)	2 quarts plus 1-2 gallons unsulfurized molasses/acre	PHI=3 days; use 300 gallons water/acre. Sanitation: Early harvest and complete fruit removal at harvesting will reduce fruit exposure to flies. Disc under affected hosts to destroy fermented fruit residues.
Fig scale	Volk supreme oil	3 gallons/100 gallons water	Dormant or delayed dormant spray only.
Spider mites	Omite 30WP (Propargite)	6 pounds/acre Two applications	Use only on nonbearing trees and when trees will not bear fruits within 1 year of application.
	Omite 6E (Propargite)	2 pints/acre Two applications	
	Volk supreme oil	3 gallons/100 gallons water	Dormant or delayed dormant spray only.
	Sulfur	Follow labeled rate	Do not mix with oils and/or do not apply within 3 weeks of oil applications to avoid fruit burn. Some sulfur formulations should not be combined with spreader stickers. Sulfur may cause eye and skin irritation. Avoid when hot temperatures (above 90 F) are expected within three days of spraying.

Warning: Re-entry time for worker entering treated areas should be strictly observed. Read the label for this information.

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Mayhaw Spray Schedule

Insect	Material	Rate	Restrictions
Aphids (except wooly apple aphid)	Admire Pro (Imidacloprid)	2.8 fluid ounces/per acre	PHI=7 days; apply postbloom; highly toxic to bees.
	Mustang Max (Zeta-cyprmethrin)	0.21-0.32 fluid ounce/50 gallons or 1.28 fluid ounces/acre	PHI=14 days; allow 7 days between applications.
Leafminers	SpinTor 2SC (Spinosad)	1.0-2.5 fluid ounces/100 gallons or 4.0-10.0 fluid ounces/acre	PHI=7 days; do not apply more than 29 fluid ounces/acre/year.
Leafhoppers	Admire Pro (Imidacloprid)	1.4 – 2.8 fluid ounces/per acre	PHI=7 days; apply post-bloom; highly toxic to bees.
	Mustang Max (Zeta-cyprmethrin)	0.21-0.32 fluid ounce/50 gallons or 1.28 fluid ounces/acre	PHI=14 days; allow 7 days between applications.
Aphids, plum curculio	Actara (Thiamethoxam)	4.5 ounces/acre	PHI=35 days; highly toxic to bees; do not make more than 1 prebloom application.
	Mustang Max (Zeta-cyprmethrin)	0.21-0.32 fluid ounce/50 gallons or 1.28 fluid ounces/acre	PHI=14 days; allow 7 days between applications.
Spider mites	Savey 50DF (Hexythiazox)	3.0-6.0 ounces/acre	PHI=28 days; apply at the beginning of mite infestations. Savey is not effective against adult mites. Limit to one application/year. Do not use in home plantings.

Warning: Re-entry time for worker entering treated areas should be strictly observed. Read the label for this information.

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Fruit and Nuts – Commercial

Peaches Spray Schedule

Time of Spray and Pest	Material/ Insecticide	Amounts in 100 Gallons of Spray	Minimum Number of Days Before Harvest and Comments
Dormant			
Scales, if present	Oil emulsion, 3% actual oil in diluted spray (follow recommendations of manufacturer).		Two sprays must be conducted at least 1 week and no more than 10 days apart to be effective. Be sure to cover underside of scaffold with pressure and not from run-off.
Severe scale infestations	Lorsban 4E (Chlorpyrifos)	0.5-1.0 pint	Only one application of Lorsban per dormant season (and one postharvest for borer control). Do not apply after delayed dormant stage. Not recommended for in-season use. Use a minimum of 1.5 pints/acre.
	Esteem 35WP (Pyriproxyfen)	4.0-5.0 ounce/acre + 1.5 gallons oil	PHI=14 days; use highest labeled rate under heavy infestations. Limit to 3 Esteem applications per season. Allow 14 days between treatments. Sprays must be timed to coincide with crawler emergence. Pyrethroids such as Ambush, Asana, Proaxis and Pounce are often associated with scale outbreaks.
Pink bud to bloom			
Catfacing insects (stink bugs, leaf-footed bugs) (at pink to 10% bloom)	Proaxis (Gamma-cyhalothrin)	0.427-0.853 fl. ounce	Do not apply more than 0.1 pound AI/acre/season; PHI=21 days.
	Mustang Max (Zeta-cypermethrin)	0.43-1.3 fl. ounce	Apply as required by scouting. Allow a minimum of 7 days between applications; PHI=14 days.
Petal fall (when 75% of petals have fallen)			
Curculio	Imidan 70W (Phosmet)	3/4 to 1.0 pound	PHI=14 days; do not apply more than 16lb./acre/season.
	Ambush 25W (Permethrin)	1.6-4.8 ounces	Use higher rate for curculio control. PHI=14 days; Ambush not to exceed 400 gallons/acre/application.
	Mustang Max (Zeta-cypermethrin)	0.43-1.3 fl. ounces	Apply as required by scouting. Allow a minimum of 7 days between applications; PHI-14 days.
	Proaxis (Gamma-cyhalothrin)	0.427-0.853 fl. ounce	Do not apply more than 0.1 pound/ AI/acre/season; PHI=14 days.
Catfacing insects, aphids, scales	Lannate LV (Methomyl)	3/4 pint	PHI=4 days; Highly toxic material; use with caution. Lannate may promote mite infestation. Not for use to control scales.
	Lannate SP (Methomyl)	1/4 pound	
Catfacing insects (stinkbugs, leaf-footed bugs)	Pounce 3.2 EC (Permethrin)	2.0-6.0 ounces	Pyrethroids such as Ambush, Asana, Mustang Max, Proaxis and Pounce are often associated with scale insect outbreaks.
	Proaxis (Gamma-cyhalothrin)	0.427-0.853 fl. ounce	
	Mustang Max (Zeta-cypermethrin)	0.43-1.3 fl. ounce	
Shuck split or first cover (10-12 days later)			
Curculio, catfacing insects, aphids, scales	Same as petal fall		See above.
Second cover (10-12 days later)			
Curculio	Imidan 70W (Phosmet)	3/4 to 1.0 pound	PHI=14 days. See above for remarks.

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Peaches Spray Schedule

Time of Spray and Pest	Material/ Insecticide	Amounts in 100 Gallons of Spray	Minimum Number of Days Before Harvest and Comments
Catfacing insects (stinkbugs, leaf-footed bugs)	Ambush 25W (Permethrin)	1.6-4.8 ounces	PHI=14 days; See remarks above.
	Pounce 3.2 EC (Permethrin)	2.0-6.0 ounces	
	Proaxis (Gamma-cyhalothrin)	0.427-0.853 fl. ounce	Do not apply more than 0.1 pound AI/acre/season; PHI=21 days.
	Mustang Max (Zeta-cypermethrin)	0.43-1.3 fl. ounce	Apply as required by scouting. Allow a minimum of 7 days between applications; PHI=14 days.
	Lannate LV (Methomyl)	3/4 pint	PHI=4 days; see notes above for additional remarks.
	Lannate SP (Methomyl)	1/4 pound	
Third cover (12-15 days later)			
Curculio, catfacing insects, scales	Same as second cover spray. (It is recommended to rotate mode of action).		See above for additional remarks.
Fourth cover (14 -21 days later)			
Curculio, catfacing insects	Same as third cover spray. (It is recommended to rotate mode of action).		See above for additional remarks.
Fifth cover (one month prior to harvest)			
Oriental moth, curculio	Sevin 80S (Carbaryl	0.63-0.94 pounds (= 2½-3¾ pounds/acre)	PHI=3 days; Carbaryl is highly toxic to bees. It tends to increase scales and sometimes mite problems.
Catfacing insects (stinkbugs, leaf-footed bugs)	Imidan 70W (Phosmet)	3/4 to 1.0 pound	PHI=14 days; see notes above.
	Proaxis (Gamma-cyhalothrin)	0.427-0.853 fl. ounce	Do not apply more than 0.1 pound AI/acre/season; PHI=21 days.
	Mustang Max (Zeta-cypermethrin)	0.43-1.3 fl. ounce	Apply as required by scouting. Allow a minimum of 7 days between applications; PHI=14 days.
Oriental moth, catfacing insects	Lannate LV (Methomyl)	3/4 pint	PHI=4 days; see notes above for additional remarks and cautionary statement.
Mites	Savey 50F (Hexythiazox)	3.0-6.0 ounces/acre	PHI=28 days; limit to one application per season. Apply during early infestations. Savey is not effective against adult mite populations.
3 weeks prior to harvest			
Oriental moth, curculio	Imidan 70W (Phosmet)	3/4 to 1.0 pound	PHI=14 days; see notes above.
	Proaxis (Gamma-cyhalothrin)	0.427-0.853 fl. ounce	Do not apply more than 0.1 pound AI/acre/season; PHI=21 days.
	Mustang Max (Zeta-cypermethrin)	0.43-1.3 fl. ounce	Apply as required by scouting. Allow a minimum of 7 days between applications; PHI=14 days.
Oriental moth	Malathion 57EC (Malathion)	2 pints/acre	PHI=7 days.
	Proaxis (Gamma-cyhalothrin)	0.427-0.853 fl. ounce	Do not apply more than 0.1 pound AI/acre/season; PHI=21 days.

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Peaches Spray Schedule

Time of Spray and Pest	Material/ Insecticide	Amounts in 100 Gallons of Spray	Minimum Number of Days Before Harvest and Comments
	Mustang Max (Zeta-cypermethrin)	0.43-1.3 fl. ounce	Apply as required by scouting. Allow a minimum of 7 days between applications; PHI=14 days.
Catfacing insects (stinkbugs, leaf-footed bugs)	Sevin 80S (Carbaryl)	0.63-0.94 pound (= 2½-3¾ pounds/acre)	PHI=3 days; Carbaryl is highly toxic to bees. See notes above.
	Lannate LV (Methomyl)	3/4 pint	PHI=4 days; see notes above.
	Proaxis (Gamma-cyhalothrin)	0.427-0.853 fl. ounce	PHI=21 days; see notes above.
	Mustang Max (Zeta-cypermethrin)	0.43-1.3 fl. ounce	PHI=14 days; see notes above.
Mites	Vendex 50 WP (Fenbutatin-oxide)	4.0-8.0 ounces	PHI=14 days; limit to two applications/season. Do not apply more than 3 pounds/acre/year.
2 weeks prior to harvest			
Catfacing insects (stinkbugs, leaf-footed bugs)	Lannate LV (Methomyl)	3/4 pint	PHI=4 days; see notes above.
	Mustang Max (Zeta-cypermethrin)	0.43-1.3 fl. ounce	PHI=14 days; see notes above.
Oriental moth	Malathion 57% EC (Malathion)	2 pints/acre	PHI=7 days.
	Mustang Max (Zeta-cypermethrin)	0.43-1.3 fl. ounce	PHI=14 days; see notes above.
Curculio	Sevin 80S (Carbaryl)	0.63-0.94 pound (= 2½-3¾ pounds/acre)	PHI=3 days; Carbaryl is highly toxic to bees. See notes above.
	Mustang Max (Zeta-cypermethrin)	0.43-1.3 fl. ounce	PHI=14 days; see notes above.
1 week prior to harvest			
Catfacing insects (stinkbugs, leaf-footed bugs)	Sevin 80S (Carbaryl)	0.63-0.94 pounds (= 2½-3¾ pounds/acre)	PHI=3 days; Carbaryl is highly toxic to bees. See notes above.
	Lannate LV (Methomyl)	3/4 pint	PHI=4 days; see notes above.
Mites	Nexter (Pyridaben)		Refer to label for rate for specific species of mites. PHI=7 days; toxic to aquatic organisms; highly toxic to bees. Follow label.
Postharvest trees			
Scales, leafhoppers, shot hole borers	Lorsban 4E (Chlorpyrifos)	1/2 – 1.0 pint	Use as dormant or delayed dormant spray. Limit to one application during dormant or delayed dormant (and one postharvest for borer control). Do not use more than 4 pints/acre. As many as three or more generations of scales may occur after harvest. Any of the regular spray materials may be used to alternate during postharvest at the rates used during the season.
April/October			
Fire ants	Extinguish IGR (Methoprene)	1–1 1/2 pounds/acre	Apply broadcast over orchard floor in April when ants are actively foraging and prior to cold weather in October. Do not allow contact with fruit. Methoprene (A.I. for Extinguish) is an Insect Growth Regulator and therefore is slow acting. Ant population reductions may be observed 3-4 weeks after initial treatment. Apply on dry soil. Follow label for optimal results.

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Fruit and Nuts – Commercial

Trunk Sprays for Peach Tree and Lesser Peach Tree Borer

Thoroughness of coverage is essential for borer control. It is suggested that all growers adopt the practice of spraying the trunk and scaffold limbs each time they spray. This practice will help control the few peach tree borers that emerge early in the season and particularly the lesser peach tree borer.

Effective control of the peach tree borer has been obtained by spraying trunks with Lorsban as listed below.

Material	Formulation	Amount/ 100 Gallons	Time Of Application	Remarks
Lorsban (Chlorpyrifos)	4E	3.0 quarts	Recommended for postharvest use only. Apply as soon after harvest as possible. Use 0.75-1.0 quart of mixture on small trees and 1.5 quarts on larger trees. Best results are obtained closer to peak emergence, between August 2 and September 1. Application may be made early from mid-July on nonbearing trees.	Apply as a directed, handgun application to lower scaffolds, base and trunk. Postharvest use only; limit to one application per season; toxic to fish. Do not use Lorsban on home plantings.
Lorsban (Chlorpyrifos)	4E	1.5 quarts	This rate should be used only when new plantings are being sprayed or low populations of borers exist.	

Peach Pests	
Armored scale	San Jose scale has an ashy-gray appearance, is slightly convex and is about the size of a pinhead. White peach scale spreads very rapidly and is distinguished by a cottony mass that is formed over the infested areas. The entire trunk and main branches will be white in a very short time. Common privet is a wild host for white peach scale which makes this scale abundant all year. Host list is unlimited. Dormant sprays of Lorsban or Esteem plus oil should be used during the dormant season for heavy infestations and once for light infestations. Each season has several generations. It is imperative that each generation be controlled. Several generations occur after harvest, and it is imperative that scale insects be controlled if the trees re to survive.
Soft scale	The terrapin scale is a soft scale about the size of a pencil eraser. The young hatchings settle on the foliage and remain there until the third instar when they migrate back to the stems to mature and overwinter. The regular spray schedule will control these pests if enough water is used to get proper coverage. They are easiest to control when on the foliage. Oil sprays are ineffective on this scale.
White peach scale and West Indian peach scale	White peach attacks the entire tree and can kill trees if uncontrolled. During the growing season a regular spray program will help to maintain this pest under control. Dormant sprays in the fall or prior to bud break may be applied in commercial production. Two sprays should be applied at 10- to 14-day intervals. COMPLETE COVERAGE IS ESSENTIAL.
Twig borers	Two types of caterpillars infest peaches: the larvae of the Oriental fruit moth and the peach twig borer. The larvae of the Oriental fruit moth infest both the young twigs and fruits and breed throughout the warm season of the year. The peach twig borer attacks the young growing twigs early in the season soon disappearing.
Plum curculio	The plum curculio is a white legless grub that infests the fruits only. The adult is a brownish weevil about 3/16 inch long. It has two generations a year. The first generation is out about bloom. Those that infest the peaches cause the growing fruit to drop. The second generation occurs some 40 to 50 days later.
	Damage: The curculio causes the fruit to drop during two periods, soon after the young fruit sets and just prior to ripening. The first drop is caused by punctures made and worms hatching from eggs laid by overwintered weevils and the second by worms or grubs of the second generation.
	Sanitation: The drops should be picked up twice each week during these two periods and destroyed. Picking up and destroying first drops is most important and if thoroughly done will aid materially in ensuring a crop that will be nearly free of worms at harvest time, providing there are no other nearby sources of infestation. Native plums are the most common and important of such sources. Therefore, native plum thickets should be destroyed or fenced in and hogged during the

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Peach Pests	
	dropping periods. Also, volunteer peach and plum trees should be destroyed or treated along with the producing orchard.
	Pruning: At pruning time, pull and burn all old mummies that carry the brown rot organism over the winter. Also, during the winter, clean and burn weeds and other debris in all areas in and around the orchard such as fence rows, ditch banks, etc. where the adult curculio and other pests may hibernate. These precautions aid in reducing infestations the following season.
	Note: Where chewing or sucking insects are a potential problem, sprays should be made when buds are in the pink stage. Do not apply during blossoming. Effectiveness of the cover sprays may be improved by the addition of a spreader sticker. One should certainly be used when this schedule is followed with plums and nectarines.
Peach tree borer and lesser peach tree borer	Borer tunneling is particularly injurious to young trees. Lesser peach tree borer (LPTB) adults lay eggs from spring to early winter. Most egg-laying from the peach tree borer (PTB) occurs from mid-June to early September. The peach tree borer attacks the crown area of the roots of peach, plum and related trees. Borer infestations can be detected by the presence of frass and pupal cases protruding from the ground near the trunk (PTB) or scaffold limbs (LPTB). Initiate sprays soon after harvest. Use a hand-gun spray directed to lower scaffolds, vase and trunk. Direct the spray at the trunk from the crotch at the scaffold limbs to the soil line. Completely wet the trunk and spray enough solution to wet or slightly puddle the spray at the base of the tree. It is essential that the trunk and soil area are wet all around the tree. Older trees may benefit from thorough coverage as some LPTB infestation concentrate in areas where primary scaffolds split.
Rusty brown plum aphid	The rusty brown plum aphid is present each year doing more or less damage to the foliage of plum and young peach trees shortly after they put out leaves. New foliage that is attacked becomes distorted and crumpled. Heavy infestations may injure the terminal buds that will stop growth, kill the blossoms and prevent fruit from setting.
Plant bugs	Several species of plant bugs injure peaches. These include the leaf-footed bug, several species of stinkbugs and the tarnished plant bug. These insects pierce the green peaches with their beaks and then suck the sap for food. Young peaches, especially those punctured by the larger bugs, may drop. Otherwise, the peaches are usually misshaped, knotty or catfaced. This damage renders the fruit unmarketable. These insects are usually worse following winter cover crops, and the damage is done when the peaches are small. Plant bugs may also be pests after harvest by feeding on young terminals. This injury or flagging of terminals may appear to be an Oriental fruit moth. If stems are dry and not hollowed out, damage it is from plant bugs.
Shot hole borer	The shot hole borer is a small beetle that attacks peach and related trees boring numerous small holes in the trunks and limbs. Its attack is confined largely to trees that are dying or in low vitality due to attack of insects, diseases, or other causes. The control and prevention consist of removing all dying trees, pruning infested limbs of other trees and burning. The control of other insects and diseases, fertilization and cultivation keep the trees healthy and vigorous. Without proper management of potential habitats for these beetles, they can seriously affect leaf and fruit buds. These beetles overwinter in all forms. If weather conditions are favorable, they can emerge in January or February. At this time they have only the buds to feed on and they can eat every bud of available trees.

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Fruit and Nuts – Commercial

Pear Spray Schedule				
Name and Time of Spray	**Pest**	**Materials/ Insecticide**	**To Make 50 Gallons of Spray**	**Precautions**
Dormant: December or January	San Jose scale	Oil Emulsion, 3% actual oil in diluted spray (follow manufacturer's recommendation for mixing).		No time limit.
		Admire Pro (Imidacloprid)	2.8 fluid ounce/per acre	PHI=7 days; toxic to bees; allow 10 days between applications. Max=45 fluid ounces/ per acre/per season.
		Esteem (Pyriproxyfen)	13.0-16.0 fluid ounces/acre + oil	PHI=45 days; limit to 2 applications per season. Allow 14 days between Esteem sprays. Complete coverage is essential for control.
Calyx – apply when petal fall is 80%	Catfacing Insects, Leafrollers, Scales	SpinTor 2SC (Spinosad)	0.62-1.25 fluid ounces/50 gallons	PHI=7 days; toxic to aquatic invertebrates; toxic to bees exposed to treatment within 3 hours of spray; not labeled to control scales.
	Leafhoppers, Eastern Tent Caterpillars	Carbaryl (Sevin)	0.5 pound, 50% WP	PHI=3 days; extremely toxic to aquatic invertebrates; highly toxic to bees.
	Leafhoppers	Imidan 70W (Phosmet)	0.5-1.34 pounds A.I./50 gallons	PHI=7 days; do not use Imidan on homegrown trees; extremely toxic to fish; highly toxic to bees.
		Admire Pro (Imidacloprid)	1.4-2.8 fluid ounces/per acre	PHI=7 days; toxic to bees; allow 10 days between applications. Max=45 fluid ounces/per acre/per season.
		Proaxis (Gamma-cyhalothrin)	0.427-0.853 fluid ounce	PHI=21 days; do not apply more than 0.1 pound A.I./acre/season.
		Mustang Max (Zeta-cybermethrin)	0.21-0.32 fluid ounce/50 gallons	PHI=14 days; allow 7 days between applications.
Apply in mid-April or when leaves start unfolding	Catfacing Insects, Leafrollers, Scales	Same as above. *Except do not use Proaxis or Mustang Max for scales.*		Same as above.
	Eastern Tent Caterpillars, Leafhoppers	Actara (Thiamethoxam)	2.0-2.75 ounces/acre	PHI=14 days; (or 35 days PHI if rates higher that 2.75 ounces/acre are used); allow 10 days between applications; highly toxic to bees. Follow label.
	Mites: European Red Mite, Two-spotted Mite	Savey 50DF (Hexythiazox)	3.0-6.0 ounces/acre	PHI=28 days; limit to 1 application/year. Make applications when mite populations first appear.
Apply in mid-May	Catfacing Insects, Leafrollers, Scales, Leafhoppers, Eastern Tent Caterpillars	Same as above.		Same as above.
	Mites: European Red Mite, Two-spotted Mite, Pear Rust Mite	Vendex 50WF (Fenbutatin-oxide)	1.0-2.0 pounds/acre	PHI=14 days; efficacy of Vendex is reduced at temperatures below 70 F. Limit to 2 applications/season. Make applications when mite populations first appear.
Mid-May to harvest	Catfacing Insects, Leafrollers, Scales, Leafhoppers, Eastern Tent Caterpillars	Same as above.		Same as above. See limitations of preharvest intervals. Follow label.

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Fruit and Nuts – Commercial

Pecan Spray Schedule

Control of insects is essential for profitable pecan production in Louisiana. Commercial pecan producers must be equipped to spray at the proper time with the recommended insecticides. Knowing how to identify the major insect pests of pecans during the growing season is important in determining if an insecticide application is needed and, if so, when it should be applied.

Many generic insecticides now are available. Carefully read the label to make sure the correct active ingredient is being used for the insects or mites being controlled.

When using pesticides, it is very important that they be applied only when needed. The correct insecticide should be used for a given pest, and it should be applied at the correct rate. The pH of the water being used for spraying should be between 5.5 to 6.5 to ensure the optimal efficacy of the insecticide. If the pH of the water does not fall within this range, a buffering agent to adjust should be used to adjust the pH accordingly. Use of a buffering agent will help to maintain the desired pH once insecticides have been added to a solution.

Be sure to follow the directions on the label of the insecticide being used. In addition to what the insecticide can control and the rates to use, the label will provide additional information regarding the use of spray adjuvants, re-entry times following treatment applications, harvest intervals, grazing restrictions, product safety information and worker protection information.

Spray Guide for Control of Pecan Insects and Mite Pests		
Insect	**Time of Application**	**Suggested Insecticides and Rates***
Scale insects	Late February until buds first begin to break.	3 gallons of dormant oil/acre. If trees are weak use only 2 gallons/acre.
Pecan phylloxera	Between the time the buds begin to open and approximately ½-¾ inch of new growth begins to appear; use a hand lens or magnifying glass to make sure phylloxera are present. Treat only those trees previously infested and those adjacent to them. If infestation levels are high, 2 insecticide applications may be needed.	Lorsban 4E (chlorpyrifos): .5-2.0 pints/acre Provado 1.6F (imidicloprid): 3.5-7.0 fl. ounces/acre Warrior (lambda-cyhalothrin): 2.56-5.12 fl. ounces/acre Warrior II (lambda-cyhalothrin): 1.28-2.56 fl. ounces/acre Centric 40WG (thiamethoxam): 2.0-2.5 fl. ounces/acre Proaxis (gamma-cyhalothrin): 2.56-5.12 fl. ounces/acre Fulfill (pymetrozine): 4.0 fl. ounces/acre Endigo ZC (lambda-cyhalothrin+thiamethoxam): 5.0-6.0 fl. ounces/acre Admire Pro(imidicloprid, foliar application): 1.2 – 2.4 fl. ounces/acre Movento (spirotetramat): 6.0 – 9.0 fl. ounces/acre
Pecan nut casebearer	Begin scouting for casebearer eggs on May 1. If pheromone traps are used to monitor adult activity, they should be in place by the 3rd week of April. Once adults are observed in the traps begin inspecting nut clusters for egg lay. Insecticide applications should be made when egg lay is observed on 1%-3% of the nut clusters. A second application may be necessary if infestation levels are high or emergence and egg lay are prolonged. Continue monitoring adult activity and egg lay after the initial insecticide application to determine if a second application is necessary.	Lorsban 4E (chlorpyrifos): .5-2.0 pints/acre Imidan 70W (phosmet): 2.0-3.0 pounds/acre Confirm 2F (tebufenozide): 8.0-16.0 fl. ounces/acre Intrepid 2F (methoxyfenozide): 4.0-8.0 fl. ounces/acre Spintor 2SC (spinosad): 4.0-10.0 fl. ounces/acre Warrior (lambda-cyhalothrin): 2.56-5.12 fl. ounces/acre Warrior II (lambda-cyhalothrin): 1.28-2.56 fl. ounces/acre Dimilin 2L (diflubenzuron): 8.0-16.0 fl. ounces /acre Ammo 2.5EC (cypermethrin): 3.0-5.0 fl. ounces /acre Entrust (spinosad): 1.25-3.0 ounces/acre** Mustang Max (zeta-cypermethrin): 3.2-4.0 fl. ounces /acre Proaxis (gamma-cyhalothrin): 2.56-5.12 fl. ounces /acre Altacor (chlorantraniliprole): 2.0-4.5 ounces/acre Belt (flubendiamide): 3.0-4.0 fl. ounces/acre Endigo ZC (lambda-cyhalothrin+thiamethoxam): 5.0-6.0 fl. ounces/acre Voliam Xpress (lambda-cyhalothrin): 6.0-12.0 fl. ounce/acre Proclaim (emamectin benzoate): 3.2-4.8 fl. ounce/acre

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Fruit and Nuts – Commercial

Spray Guide for Control of Pecan Insects and Mite Pests		
Insect	**Time of Application**	**Suggested Insecticides and Rates***
	For information on the use of pheromone traps and a degree day model for making treatment decisions go to http://pecan.ipmpipe.org. Go to tool box and click on the section on insect monitoring and control.	
Pecan spittlebug	Begin treatments when 5%-10% of nut-bearing terminals are infested. Apply treatments when spittle masses first appear.	Provado 1.6F (imidicloprid): 3.5-7.0 ounces/acre Imidan 70 WSB (phosmet): 1.0-1.5 pounds/acre Lorsban 4E (chlorpyrifos): 1.5-2.0 quarts/acre Warrior (lambda-cyhalothrin): 2.56-5.12 fl. ounces/acre Warrior II (lambda-cyhalothrin): 1.28-2.56 fl. ounces/acre Proaxis (gamma-cyhalothrin): 2.56-5.12 fl. ounces/acre Voliam Xpress (lambda-cyhalothrin): 6.0-12.0 fl. ounces/acre Admire Pro (imidicloprid, foliar application): 1.2-2.4 fl. ounces/acre Endigo ZC (lambda-cyhalothrin+thiamethoxam): 5.0-6.0 fl. ounces/acre
Hickory shuckworm	Begin treatment applications at half-shell hardening (around August 10-15); 2-3 applications may be needed depending on the severity of the infestation. Insecticide applications should be made 10-14 days apart.	Confirm 2F (tebufenozide): 8.0-16.0 fl. ounces/acre Lorsban 4E (chlorpyrifos): 1.5-2.0 pints/acre Spintor 2SC (spinosad): 4.0-10.0 fl. ounces/acre Warrior (lambda-cyhalothrin): 2.56-5.12 fl. ounces/acre Warrior II (lambda-cyhalothrin): 1.28-2.56 fl. ounces/acre Intrepid 2F (methoxyfenozide): 4.0-8.0 fl. ounces/acre Mustang Max (zeta-cypermethrin): 3.2-4.0 fl. ounces/acre Proaxis (gamma-cyhalothrin): 2.56-5.12 fl. ounces /acre Dimilin 2L (diflubenzuron): 8.0-16.0 fl. ounces /acre Imidan 70WSB (phosmet): 2.0-3.0 pounds/acre Entrust (spinosad): 1.25-3.0 fl. ounces/acre Altacor (chlorantraniliprole): 2.0-4.5 ounces/acre Belt (flubendiamide): 3.0-4.0 fl. ounces/acre Endigo ZC (lambda-cyhalothrin+thiamethoxam): 5.0-6.0 fl. ounces/acre Voliam Xpress (lambda-cyhalothrin): 6.0-12.0 fl. ounces/acre Proclaim (emamectin benzoate): 3.2-4.8 fl. ounces/acre Brigade WSB (bifenthrin): 8.0-32.0 fl. ounces/acre
Pecan leaf scorch mite	When leaf discoloration (light brown to bronze colored blotches) begins to appear, use a hand lens or magnifying glass (at least 10X) to inspect the leaves for the presence of mites. Sample 10 compound leaves on 5-10 trees throughout the orchard. Treat when an average of 8 or more mites per compound leaf are found.	Vendex 50WP (fenbutin-oxide): 1.0-2.5 fl. ounces/acre Savey 50DF (hexythiazox): 3.0-6.0 fl. ounces/acre Portal (fenpyroximate): 32.0 fl. ounces/acre Epi-Mek (abamectin): 2.5-5.0 fl. ounces/acre Onager (hexythiazox): 12.0-24.0 fl. ounces/acre
Yellow aphid	Separate treatments for yellow aphids generally not recommended. If a separate treatment is desired, treat when aphid numbers average 25-30 aphids per compound leaf. Do not treat for yellow aphids before July 15. Sample 10 compound leaves on 5-10 trees throughout the orchard.	Provado 1.6 (imidicloprid): 3.5-7.0 fl. ounces/acre Ammo 2.5EC (cypermethrin): 3.0-5.0 fl. ounces/acre Mustang Max (zeta-cypermethrin): 3.2-4.0 fl. ounces/acre Warrior (lambda-cyhalothrin): 2.56-5.12 fl. ounces/acre Warrior II (lambda-cyhalothrin): 1.28-2.56 fl. ounces/acre Proaxis (gamma-cyhalothrin): 2.56-5.12 fl. ounces/acre

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Spray Guide for Control of Pecan Insects and Mite Pests		
Insect	**Time of Application**	**Suggested Insecticides and Rates***
		Centric 40WB (thiamethoxam): 2.0-2.5 fl. ounces/acre Admire Pro ((imidicloprid, foliar application): 1.2-2.4 fl. ounces/acre Movento (spirotetramat): 6.0-9.0 fl. ounces/acre Endigo ZC (lambda-cyhalothrin+thiamethoxam): 5.0-6.0 fl. ounces/acre Assail 30SG (acetamiprid): 2.5-9.6 ounces/acre Fulfill (pymetrozine): 4.0 fl. ounces/acre Brigade WSB (bifenthrin): 8.0-32.0 fl. ounces/acre
Black pecan aphid	Treat when there is an average of one black aphid per compound leaf. Sample 10 leaves on 5-10 trees throughout the orchard.	Ammo 2.5EC (cypermethrin): 3.0-5.0 fl. ounces/acre Imidan 70WSB (phosmet): 2.0 pounds/acre Warrior (lambda-cyhalothrin): 2.56-5.12 fl. ounces/acre Warrior II (lambda-cyhalothrin): 1.28-2.56 fl. ounces/acre Mustang Max (zeta-cypermethrin): 3.2-4.0 fl. ounces/acre Proaxis (gamma-cyhalothrin): 2.56-5.12 fl. ounces/acre Centric 40WB (thiamethoxam): 2.5 fl. ounces/acre Fulfill (pymetrozine): 4.0 fl. ounces/acre Provado 1.6 (imidicloprid): 8.0 fl. ounces/acre Admire Pro ((imidicloprid), foliar application): 2.8 fl. ounces/acre Dimethoate 4E (dimethoate): 11.0 fl. ounces/acre Endigo ZC (lambda-cyhalothrin+thiamethoxam): 6.0 fl. ounces/acre Brigade WSB (bifenthrin): 8.0-32.0 fl. ounces/acre
Pecan weevil	Treatment applications should begin when nuts enter the dough stage (around August 20) and adult weevils are present; 2 or 3 applications may be needed. Insecticide applications should be made at 7-10-day intervals. The first treatment should be made following rain because this loosens the soil allowing for weevil emergence.	Sevin 80S (carbaryl): 1.5-2.0 pounds/acre Sevin XLR Plus (carbaryl): 2.5 quarts/acre Mustang Max (zeta-cypermethrin): 3.2-4.0 fl. ounces/acre Proaxis (gamma-cyhalothrin): 2.56-5.12 fl. ounces/acre Imidan 70WSB (phosmet): 2.0-3.0 pounds/acre
Fall webworm	Normally, this insect is controlled when treating for other insect pests within the orchard. The presence of an occasional colony generally does not warrant treatment. However, if a grower decides an insecticide application is needed, it should be made when colonies are first observed and the larvae are small. The larger the colony, the more difficult it becomes to reach the larvae within the webbing with the Insecticide.	Confirm 2F (tebufenozide): 8.0-16.0 fl. ounces/acre Intrepid 2F (methoxyfenozide): 4.0-8.0 fl. ounces/acre Spintor 2SC (spinosad): 4.0-10.0 fl. ounces/acre Javelin WG (*Bacillus thuringiensis*): 0.25-4.0 pounds/acre** DiPel FS (*Bacillus thuringiensis*): 1.0-4.0 pints/acre Sevin 80S (carbaryl): 2.5-6.25 pounds/acre Sevin XLR Plus (carbaryl): 2.0-5.0 quarts/acre Proclaim (emamectin benzoate): 3.2-4.8 ounces/acre Belt (flubendiamide): 3.0-4.0 fl. ounces/acre

* Rates are expressed in the amount of material to use per acre. If a sprayer is calibrated to deliver 75 gallons per acre, you should add the amount of material listed to each 75 gallons of water. If your sprayer is calibrated to deliver 150 gallons of water per acre, you should add the suggested amount of insecticide to each 150 gallons.
** Certified for use in organic orchards.
Note: When ground equipment is not available, or when inclement weather prevents the use of ground equipment, insecticides can be applied with aircraft. The rates listed are also the rates to use when applying insecticides by air. The amount of finished spray per acre will vary depending on the type of aircraft being used.

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Fruit and Nuts – Commercial

Small Fruit Spray Schedule (Grape, Blueberry and Bramble)

Grape	
Time of Application and Pest	**Spray Materials in 1 Gallon and Remarks**
Dormant spray	
Scales	**Copper sulfate (bluestone)** – 6 teaspoons; apply after pruning; burn all pruned vines. Complete coverage is important for scale control. Do not use dormant oils after buds start to open.
	Superior oil 1% – Follow manufacturer's recommendations.
Just before bloom	
Grape berry moths, leaf-chewing insects	**Carbaryl 50WP (Sevin)** – 2 tablespoons/gal water. PHI=7 days; Carbaryl is highly toxic to bees. Read label.
	Imidan 70W (Phosmet) – 1⅓-2⅛ pounds/acre. PHI=14 days; do not use Imidan in home and gardens.
Postbloom sprays: just after bloom and later at 10- to 14-day intervals to harvest	
Citrus blackflies, citrus leafminers citrus whiteflies,	**Esteem 0.86EC (Pyriproxyfen)** – 10 fl. ounces/acre. Be sure to apply in sufficient water to ensure thorough coverage of tree. Apply before populations build; 1 day pre-harvest interval. Do not make more than 2 applications/season. Allow 21 days between applications.
European red mites, two-spotted mites	**Vendex 50WP (Fenbutatin-oxide)** – PHI=14 days; apply 1-2 pounds/acre when mites first appear. Limit to 2 applications/season; efficacy reduced at temperatures below 70 F.
Grape berry moths, leaf-chewing insects	**Carbaryl 50WP (Sevin)** – 2 tablespoons/gal water. PHI=7 days; Carbaryl is highly toxic to bees. Read label.
	Imidan 70W (Phosmet) – 1⅓-2⅛ pounds/acre. PHI=14 days; do not use Imidan in home and gardens.
Leafhoppers, mealybugs	**Admire Pro (Imidacloprid)** – 1.0-1.4 ounce/acre; no pre-harvest interval limitation. Allow 14 days between applications. Limit to 2.8 ounces/acre/year.

Warning: Re-entry times for workers entering groves and/or treated fields should be strictly observed. Be sure to check the label for this information.

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Fruit and Nuts – Commercial

Small Fruit Spray Schedule (Grape, Blueberry and Bramble)

Blueberry		
Time of Application and Pest	**Insecticide**	**Remarks**
Dormant spray oil		
Scales	Esteem 0.86EC (Pyriproxyfen) – 16 ounces/acre + Oil – 1.5 gallons	PHI=7days; limit to 2 applications/growing season. Allow 14 days between Esteem applications.
	Summer or Superior oil (2%-3% actual oil)	Follow manufacturer's directions when using or mixing oil. Thorough coverage is necessary when using any foliar product to control scale insects.
Petal fall and cover spray: 10-14 days apart		
Maggots, weevils	Carbaryl 50WP (Sevin) 3-4 pounds/100 gallons	PHI=7 days; highly toxic to bees. A diluted spray of 125-150 gallons/acre is recommended first application, 3 weeks before harvest. Repeat 10 days later if needed.
	Lannate SP (Methomyl) – ½ pound/acre	PHI=3 days; highly toxic to bees. Do not apply during bloom. Toxic to fish, aquatic invertebrates and mammals. Limit to 4 applications/season. Use with care.
	Lannate (2.4) LV (Methomyl) – 1½ pints/acre	
Fruitworms	Esteem 0.86EC (Pyriproxyfen) – 16 ounces/acre	PHI=7 days; see preceding remarks; follow label.
Fruitworms (suppression)	SpinTor 2SC (Spinosad) – 4-6 fl. ounces/acre	PHI=3 days; see preceding remarks.
Fruitworms, maggots, weevils	Imidan 70W (Phosmet) – 1 ⅓ pounds/acre	PHI=3 days; do not make more than 5 applications/acre/year.
Maggots, weevils, maggots	Carbaryl 50WP (Sevin) 3-4 pounds/100 gallons	PHI=7 days; highly toxic to bees. A diluted spray of 125-150 gallons/acre is recommended first application, 3 weeks before harvest. Repeat 10 days later if needed.
	Lannate SP (Methomyl) – ½ pound/acre	PHI=3 days; highly toxic to bees. Do not apply during bloom. Toxic to fish, aquatic invertebrates and mammals. Limit to 4 applications/season. Use with care.
	Lannate (2.4) LV (Methomyl) – 1½ pints/acre	
Postharvest		
Fire ants	Extinguish IGR (Methoprene) – 1.0-1.5 pounds/acre (Broadcast)	Apply in April when ants are actively foraging and in October prior to cool weather. Apply to dry soil.

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Fruit and Nuts – Commercial

Bramble (Blackberry, etc.)		
Pest to Control	**Time of Application and Insecticide/Gallon**	**Remarks**
Dormant		
Mites, scales	Summer or Superior oil	Follow manufacturer's directions. Complete spray coverage is necessary.
Delayed dormant as buds begin to break		
Scales	Summer or Superior oil	Follow manufacturer's directions. Complete spray coverage is necessary.
Prebloom just before blossoms open		
Aphids	Malathion 57EC (Malathion) – 3 pints/acre	PHI=1 day; highly toxic to bees. Do not apply at bloom or when bees may be exposed.
Leafhoppers, leafrollers, sawflies, thrips	Carbaryl 50W (Sevin) – 1 tablespoon	PHI=7 days; highly toxic to bees; do not apply at bloom or when bees may be exposed.
	SpinTor 2SC (Spinosad) – 4-6 fl. ounces/acre	SpinTor is toxic to bees exposed to treatment within 3 hours of spray; toxic to aquatic invertebrates. Rotate products after 2 continuous applications of SpinTor. Limit to 29 fl. ounces/acre/ season. Allow 3 days before harvest.
Leafrollers	Brigade WSB (Bifenthrin) – 8-16 ounces/acre	PHI=3 days; highly toxic to bees and extremely toxic to fish and aquatic invertebrates. May not be used if endangered species may get in contact with treatment. Read label. Consult local agents.
Mites	Brigade WSB (Bifenthrin) – 16 ounces/acre	
Mites, thrips	Malathion 57EC (Malathion) – 1½ pints/100 gallons water	PHI=1 day; highly toxic to bees. Do not apply at bloom or when bees may be exposed.
After blossom to harvest		
Blackberry and raspberry crown borers, leafhoppers, mites, sawflies, thrips,	Malathion 57EC (Malathion) – 1½ pints/100 gallons water	August-September: Ideal time for fall applications; PHI=1 day; highly toxic to bees. Do not apply at bloom or when bees may be exposed.
April/October		
Fire ants	Extinguish (Methoprene) – 1.0-1.5 pounds	Broadcast in April when ants are actively foraging and in October prior to cool weather. Apply on dry soil.

Note: Various borers cause problems in the canes. Infested or galled canes should be cut out and destroyed. Thorough spray coverage is important for any foliar product used. The volume of spray used should increase throughout the season.

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Fruit and Nuts – Commercial

Strawberry Spray Guide

Insect	Insecticide and Formulation	Rate/50 Gallons	Cutoff Date	Restrictions or Limitations
Aphids	Admire Pro	1.3 fl. ounces/acre	7 days	Allow 5 days between applications. Toxic to bees; do not apply during bloom. Use spreader sticker to improve coverage. Apply before heavy infestations get established. Limit 3.9 fluid ounces/acre per crop season.
	Malathion 5 pounds EC	1.0-1½ pints	3 days	Toxic to fish and highly toxic to bees. Observe label. Do not use when cyclamen mites are a problem.
	Malathion 25% WP	3 pounds	3 days	Toxic to fish and highly toxic to bees. Observe label. Do not use when cyclamen mites are a problem.
Armyworms	Carbaryl 4L	1-2 quarts/acre	7 days	A dilute spray of 100-200 gallons/acre is suggested. Read label for susceptibility of some varieties; highly toxic to bees. Repeated use may cause spider mite problems.
	SpinTor 2SC	4-6 fl. ounces/acre	1 day	SpinTor is toxic to bees exposed to treatment within three hours of spray; toxic to aquatic invertebrates. Rotate product after two continuous applications. Limit to 29 fl. ounces/ acre/season. See preceding remarks on SpinTor.
Fire ants	Extinguish IGR	1.0-1.5 pounds/ acre		Apply to row middles in April when ants are actively foraging and in October prior to cool weather. Do not allow contact with fruit. Do not use when soil is too wet.
Lygus bugs and leafhoppers	Malathion 5 pounds EC	1.0-1½ pints	3 days	Toxic to fish and highly toxic to bees. Observe label. Do not use when cyclamen mites are a problem.
	Malathion 25% WP	3 pounds	3 days	Toxic to fish and highly toxic to bees. Observe label. Do not use when cyclamen mites are a problem.
Lygus and tarnished plant bugs	Brigade WSB	24 fl. ounces/ acre (3 soluble bags)	0 days	Highly toxic to bees and extremely toxic to fish and aquatic invertebrates. May not be used if endangered species could get in contact with treatment. Read label. Consult local agents.
	Danitol 2.4 EC	10 ⅔ fl. ounces/acre	2 days	Allow 30 days between treatments. Use only when mite populations are low. Add spreader sticker. Limit to 2 applications/year
Snails and slugs	Metaldehyde bait		Per label	Apply to soil around plants. Do not contaminate edible parts. Toxic to dogs and cats.
Spittle bugs	Malathion 5 pounds EC	1.0-1.5 pints	3 days	Toxic to fish and highly toxic to bees. Observe label. Do not use when cyclamen mites are a problem.
	Malathion 25% WP	2-4 pounds	3 days	Toxic to fish and highly toxic to bees. Observe label. Do not use when cyclamen mites are a problem.
	Danitol 2.4EC	10 ⅔ fl. ounces/ acre	2 days	Allow 30 days between treatments. Use only when mite populations are low. Add spreader sticker. Limit to 2 applications/year
	Carbaryl 80% S	1¼ pounds	7 days	A dilute spray of 100-200 gallons/acre is suggested. Read label for susceptibility of some varieties; highly toxic to bees. Repeated use may cause spider mite problems.
Strawberry leaf rollers	Carbaryl 80% S	1¼ pounds	7 days	A dilute spray of 100-200 gallons/acre is suggested. Read label for susceptibility of some varieties; highly toxic to bees. Repeated use may cause spider mite problems.
	Malathion 5 pounds EC	1.0-1½ pints	3 days	Toxic to fish and highly toxic to bees. Observe label. Do not use when cyclamen mites are a problem.
	Malathion 25% WP	3 pounds	3 days	Toxic to fish and highly toxic to bees. Observe label. Do not use when cyclamen mites are a problem.
	SpinTor 2SC	4-6 fl. ounces/acre	1 day	SpinTor is toxic to bees exposed to treatment within three hours of spray; toxic to aquatic invertebrates. Rotate product after two continuous applications. Limit to 29 fl. ounces/ acre/season.

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Strawberry Spray Guide

Insect	Insecticide and Formulation	Rate/50 Gallons	Cutoff Date	Restrictions or Limitations
Strawberry weevils	Carbaryl 80% S	1¼-2½ pounds/acre	7 days	A dilute spray of 100-200 gallons/acre is suggested. Read label for susceptibility of some varieties; highly toxic to bees. Repeated use may cause spider mite problems.
Two-spotted mites	Acramite 50WS	0.75-1.0 pound/acre	1 day	**See footnotes for important mite-resistance management plans.** Effective mite control is better accomplished when treatments are conducted when mites first appear before populations build up. Each bag contains two water soluble bags of ½ pound each. Limit to 2 applications/season and a minimum of 21 days between applications.
	Agri-Mek 0.15 EC	16 fl. ounces/acre	3 days	Do not apply more than 64 fl. ounces/acre. Do not apply within 3 days of harvest. Allow 21 days between treatments.
	Danitol 2.4EC	16-21⅓ fl. ounces/acre	2 days	Allow 30 days between treatments. Use only when mite populations are low. Add spreader sticker. Limit to 2 applications/year.
	Insecticidal soap (M-Pede)	1 gallon	0 days	Thorough coverage needed.
	Savey 50DF	6.0 fl. ounces/ acre	3 days	Limit to 1 application/year. Apply as soon as mites are detected. Savey is predominantly an ovicide/larvicide and will not control adult mites.
	Vendex 50WP	6-8 fl. ounces (1½-2 pounds/acre)	1 day	Do not apply more than 2 times/season. Efficacy of Vendex is reduced when daily temperatures are below 70 F. Toxic to birds, mammals and fish.
	Zeal	2-3 fl. ounces/ acre	1 day	Apply when populations are low. Works better against eggs and larvae (immature mites). Limit to one application/season.

Strawberry Spray Guide	
Mite-resistance management plan	Repeated use of the same miticide is documented to result in rapid buildup of miticide-resistant strains of mites. To reduce the potential risk of developing resistant mite populations, miticides should be alternated as part of a mite-resistance management plan. If more than one application is needed to control heavy and prolonged mite infestations, always alternate with products of different modes of action. Observe the minimum required spray intervals and restrictions on amount of product and numbers of applications/area/season. Closely monitor mite populations to determine species, infestation levels and presence of predatory organisms. Use miticide sprays only when needed.
Recommended miticide rotation	If you follow this rotation of miticides, you should be able to decrease the spider mite population while conserving predatory mites. Scout for mites using a 10X hand lens before you spray. Treat when you see more than five mites per leaflet on young plants. A balance of natural control (predatory mites and other insects that eat the mites) and miticides is the best way to control mites. It may be possible that predatory mites can keep your mites in check, but only if you don't kill them by using a broad-spectrum product that will kill the predators. If you use the wrong product at the beginning of the season (e.g. Brigade), then the entire season could be worse because all the natural enemies were killed by that first spray. In general, mites can become a huge problem if they are sprayed on a schedule. We recommend rotating the following three miticides in the order they are listed.
	1. Acramite – limit to one application per season. This is a contact miticide, meaning that it kills mites that come into contact with the miticide. It also has long residual activity, so larvae that hatch out of eggs will also be killed from the first application.
	2. Agri-Mek – If mites are still present, apply this product 21 days after the acramite application. This is best when applied in a paired application; two applications spaced 7 to 10 days apart. This product moves in the leaf from the top to the bottom and will remain in the leaf for a period of time. It is less effective when used in cold weather because it does not move in the leaf as well as in warm weather. Combine Agri-Mek with a horticultural oil to help movement in the leaf except in extremely hot weather because the oil may burn the leaf. Do not exceed 16 fl. ounces/application or 64 fl. ounces (4 applications)/acre in

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	a growing season. Do not apply in less than 100 gallons water/acre (200 gallons/acre is optimal). Do not repeat treatment within 21 days of second application.
	3. Savey – This is a growth regulator that kills eggs, young nymphs (immature mites) and sterilized females. This should also be limited to 1 application per season.
	In general, be sure to include enough water to adequately cover your strawberry plants since most of these are contact miticides. It is important to make sure there is good spray coverage on your plants.
Note	Add a spreader sticker or liquid soap to spray mixture to obtain better coverage. Follow the manufacturer's recommendations.
Warning	Always wear appropriate personal protective equipment when handling and spraying pesticides. Re-entry times for workers entering treated fields should be strictly observed. Be sure to check the label for this information.

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Fruit and Nuts – Homeowner

The three spray applications suggested should control most pests and provide quality fruit.

Citrus Spray Schedule				
Pests to Control	**Pesticide and Formulation**	**Amount to Use for: 50 gallons**	**Amount to Use for: 1 gallons**	**Limitations**
Postbloom spray: when 75% of petals have fallen				
Scales, whiteflies, mealybugs, mites	Malathion 57EC or	1 pint	2 teaspoons	Do not apply Malathion or Vendex fewer than 7 days before harvest. Do not apply Malathion to plants in full bloom. Do not use Vendex on tangerines, tangelos, Reed or Red blush grapefruit. Do not apply Vendex when daily temperatures at application average below 70 F. Make no more than 2 applications of Vendex/year and allow 60-day intervals between applications.
	Vendex 50WP	4-6 ounces	1-1½ teaspoons	
Thrips, leafminers	Spinosad	4-6 ounces	1 teaspoon	Allow a minimum of 7 days between last application and harvest; several formulations available for home gardens (i.e. Spinosad, Success, Conserve, Naturalyte, etc.); follow label recommendations.
Asian citrus psyllid	Bayer Advanced Fruit, Citrus & Vegetable Insect Control	Varies, depending on size of tree.		See product label for instructions and restrictions. 0.15 to 0.2 fluid ounce/inch of trunk diameter at breast height or/foot of tree height. Do not apply more than 5.9 fluid ounces of product/year.
Summer spray: July 15- August 15				
Scales, whiteflies, mealybugs, leaf-footed bugs, mites	Vendex 50WP +	4-6 ounces	1-1½ teaspoons	Same as above.
	Sun spray ultra fine oil or	½-1 gallon	2½-4 tablespoons	Use caution when applying oils; read the label; do not spray when temperatures exceed 85 F; read footnotes.
	Summer oil emulsion or	½ gallon	5 tablespoons	
	Malathion 57EC	1 pint	2 teaspoons	Same as above.
Asian citrus psyllid	Bayer Advanced Fruit, Citrus & Vegetable Insect Control	Varies, depending on size of tree.		See product label for instructions and restrictions.
Thrips, leafminers	Spinosad			See limitations above; read the label.
Fall spray: October 15- November 15				
Scales, whiteflies, mealybugs, leaf-footed bugs	Malathion 57EC	1 pint	2 teaspoons	Same as above.
Asian citrus psyllid	Bayer Advanced Fruit, Citrus & Vegetable Insect Control or	Varies, depending on size of tree.		See product label for instructions and restrictions.

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Citrus Spray Schedule				
Pests to Control	**Pesticide and Formulation**	**Amount to Use for: 50 gallons**	**Amount to Use for: 1 gallons**	**Limitations**
	Vendex 50WP or	4-6 ounces	1-1½ teaspoons	
	Spinosad			See limitations above; read the label.

Cautions:

- Read the pesticide label, and follow manufacturer's safety recommendations.
- Oil emulsion sprays should not be applied to drought-stricken trees when temperature is above 85 F. Oil emulsion sprays applied after August 15 may inhibit solid formation, retard coloring of fruit and reduce the tolerance of trees to cold. Follow specific instructions on the label of all pesticides.

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Fruit and Nuts – Homeowner

Figs Spray Schedule			
Insect or Arthropod	**Material**	**Rate**	**Restrictions**
Vinegar flies	Malathion 57 EC	2 quarts plus 1-2 gallons unsulfurized molasses/acre	PHI=3 days; use 300 gallons water/acre. Sanitation: Early harvest and complete fruit removal at harvesting will reduce fruit exposure to flies. Disc under affected hosts to destroy fermented fruit residues.
Fig scale	Volk supreme oil	3 gallons/100 gallons water	Dormant or delayed dormant spray only.
Spider mites	Volk supreme oil	3 gallons/100 gallons water	Dormant or delayed dormant spray only.
	Sulfur	Follow labeled rate.	Do not mix with oils, and/or do not apply within 3 weeks of oil applications to avoid fruit burn. Some sulfur formulations should not be combined with spreader stickers. Sulfur may cause eye and skin irritation. Avoid when hot temperatures (above 90 F) are expected within 3 days of spraying.

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Fruit and Nuts – Homeowner

Peach and Plum Spray Schedule				
Time of Spray and Pest	**Insecticides**	**Rates: 25 Gallons Water**	**Rates: 3 Gallons Water**	**Comments**
Dormant (mid-winter before bud swell)				
Mites, scales	Dormant oil	2 quarts	4 ounces or 8 tablespoons	Apply every 10 days during dormant season. Complete coverage is essential. Do not use when temperature is expected to exceed 85 F or be below 40 F.
Petal fall				
Plant bugs, plum curculio, Oriental fruit moths, aphids	Carbaryl 50WP	1 pound	2 ounces or 4 tablespoons	Allow minimum 3 days before harvest. Carbaryl is highly toxic to bees. It tends to increase scales and sometimes mite problems.
	Carbaryl 80% Sprayable	0.5 pound	1 ounce or 2 tablespoons	
	Malathion 25WP	0.5 pound	1 ounce or 2 tablespoons	Do not use within 7 days of harvest.
Cover sprays (7-14 days apart) from petal fall to two weeks before harvest				
Plum curculio, stink bugs, catfacing insects, Oriental fruit moths	Malathion 25WP	0.5 pound	1 ounce or 2 tablespoons	Do not use within 7 days of harvest.
	Carbaryl 50 WP	1 pound	2 ounces or 4 tablespoons	Allow minimum 3 days before harvest.
	Fine spray oil	Follow label.	Follow label.	Use fine spray oils for mite control as needed. Do not use on heat or drought stressed trees.
2 weeks before harvest, to harvest				
Plum curculio, stink bugs, catfacing insects, Oriental fruit moths	Carbaryl 50WP	1 pound	2 ounces or 4 tablespoons	Allow minimum 3 days before harvest.
	Fine spray oil	Follow label	Follow label	Use fine spray oils for mite control as needed. Do not use on heat or drought stressed trees.

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Fruit and Nuts – Homeowner

Pecan Spray Schedule for Yard Trees and Home Orchards

Insects and diseases can reduce the quantity and quality of pecans harvested from yard trees by homeowners. Insects and diseases also can have a negative effect on the overall health and vigor of the trees, thus affecting their value as a shade trees.

Pecan Spray Schedule	
Pest identification	It is important to learn how to identify the major insect pests and diseases of pecans. Knowing which insect pest is present will determine what insecticide to use. If an insect pest or disease is not present, control measures are unnecessary. Fact sheets on the major pecan insect pests can be found on the LSU AgCenter website, www.lsuagcenter.com.
Cultural practices	Pecan trees that are healthy and vigorous are less susceptible to certain types of insects, such as wood borers. Proper fertilization, watering and pruning are conducive to optimum tree growth and health. Keeping the area around the tree free of old and aborted nuts, leaves and twigs and limbs will also help in reducing insect and disease problems.
Spray equipment	Good spray coverage is essential for insect and disease control. It generally is not practical for homeowners to spray trees that are more than 30 feet tall since the spray equipment necessary to use on trees of that height or higher is quite expensive. Hose-on sprayers can be used on trees up to 30 feet tall. A commercial applicator can be used; however, it can be expensive if multiple pesticide applications are required.
Pesticide safety	When purchasing and using any pesticide, be sure to read the label. The label will tell you what the active ingredient is and its relative toxicity, safety precautions when using the pesticide, what it's labeled for and what rates to use and how to properly dispose of the empty container. To avoid accidental injury or death, always keep the pesticide in its original container.
Suggested materials * ***(listed as active ingredients)***	Malathion 55% EC Carbaryl 23.7% (liquid formulation, not dust) Imidacloprid 1.47% (applied as soil drench) Spinosad 0.5% Bacillus thuringiensis (B.t.) Horticultural Oil Spray (80%-97% oil emulsion) * See label for correct rates to use.
Spray periods	**Dormant (late-winter) –** Apply a dormant oil before bud break in late winter for control of scales.
	Bud Break – Pecan Phylloxera. This spray should be applied when the opening buds are 0.75-1.0 inch in length (leaves expanding and starting to unfurl). Spraying for this insect is unnecessary if galls formed by pecan phylloxera have not been observed. Use Malathion for control of this insect.
	Pollination – Pecan Nut Casebearer. This spray should be applied around May 10-15 (about 5 days earlier in south Louisiana). Pheromone traps can be used to detect casebearer activity and to determine if treatment is necessary. For information on the use of pheromone traps and a degree day model for making treatment decisions go to http://pecanipm.tamu.edu/. Go to tool box and click on the section on insect monitoring and control. Use Malathion, Spinosad, or Bacillus thuringiensis for casebearer control.
	Post-Pollination – Pecan Nut Casebearer and Aphids. This spray, if necessary, should be made around June 20, or about 6 weeks after the pollination spray. Use pheromone traps to determine if casebearer are present; if not, treatments are unnecessary. Insecticides for casebearer control are the same as those listed for the pollination spray. For aphids use imidacloprid applied as a soil drench.
	Half-Shell Hardening – Pecan Weevil, Hickory Shuckworm and Fall Webworm. This spray is usually applied in mid-August. If hickory shuckworm is a problem, two sprays, one applied in mid-August and a second spray applied approximately 2 weeks later, will usually control shuckworm. Raking up and destroying old pecans and shucks will also help control hickory shuckworm. For hickory shuckworm use carbaryl, spinosad or Bacillus thuringiensis. For pecan weevil us carbaryl. The first application should be made when nuts enter the dough stage and weevils are present around August 20. If infestation levels are high and additional 1-2 applications, applied 10-14 days apart, may be needed. On tall trees, thoroughly spraying the trunk and lower limbs can suppress pecan weevil. Use spinosad or Bacillus thuringiensis for control of fall webworm. Spray web and surrounding foliage. Fall webworms can also be controlled by removing (where practical) the webbing and enclosed caterpillars from the tree.
Fire ant control	Many different types of insecticides are available for control of fire ants. These products can be applied directly to the mound as contact insecticides or drenches, or they can be broadcast as baits to the area around the mounds. For a comprehensive listing of insecticides that can be used for fire ant control refer to the section, Louisiana Recommendations for Control of Insects on Lawns, in the Louisiana Insect Pest Management Guide. www.lsuagcenter.com/managementguides.

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Fruit and Nuts – Homeowner

Small Fruit Spray Schedule
(Grape, Blueberry and Bramble)

Pests to Control	When to Spray	Spray Materials in 1 Gallon and Remarks
Blueberry		
Scales	Delayed dormant – buds 0.25-0.25 inch green	**Summer or Superior Oil** (2%-3% actual oil). Follow manufacturer's directions. Thorough coverage necessary when using spray products to control scale insects.
Fruit worms, maggots, weevils	Petal fall	**Malathion 57EC** – 2 teaspoons. Allow 1 day before harvest; toxic to fish and highly toxic to bees. Follow label.
Fruit worms, maggots, weevils		**Carbaryl 50W** – 1 tablespoon. Allow 7 days before harvest; highly toxic to bees.
Fruit worms (suppression)		**SpinTor 2SC** – 4-6 fl. ounces/acre. SpinTor is toxic to bees exposed to treatment within 3 hours of spray; toxic to aquatic invertebrates. Rotate product after 2 continuous applications. Limit to 29 fl. ounces/ acre/season. Allow 3 days before harvest.
Maggots	Covers sprays – 10 days after petal fall to harvest	Same as above. Follow labels.
Bramble (blackberry, etc.)		
Scales, mites	Dormant	**Summer or Superior oil.** Follow manufacturer's directions. Complete spray coverage is necessary.
Scales	Delayed dormant – as buds begin to break	**Summer or Superior oil.** Follow manufacturer's directions. Complete spray coverage is necessary.
Aphids	Prebloom – just before blossoms open	**Malathion 57EC – 3 pints/acre. PHI=1 day; highly toxic to bees.**
Leafhoppers, leafrollers, sawflies, thrips		**Carbaryl 50W** – 1 tablespoon. PHI=7 days; highly toxic to bees; do not apply at bloom or when bees may be exposed.
Grape		
Scales	Dormant spray	**Superior oil 1%.** Follow manufacturer's recommendations.
		Copper sulfate (bluestone) – 6 teaspoons. Apply after pruning; burn all pruned vines. Complete coverage is important for scale control. Do not use dormant oils after buds start to open.
Grape berry moths, leaf chewing insects	Just before bloom	**Carbaryl 50WP** – 2 tablespoons/gal. water. PHI=7 days; Carbaryl is highly toxic to bees. Read label.
Grape berry moths, leaf chewing insects	Postbloom sprays – just after bloom and then at 10- to 14-day intervals to harvest	**Carbaryl 50WP** – 2 tablespoons/gal. water. PHI=7 days; Carbaryl is highly toxic to bees. Read label.

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Household Insects – Homeowners

CAUTION:
All insecticides are toxic to some degree; therefore, care should be exercised in their use. The manufacturer's directions on the label in the use of the material must be followed explicitly.

Insect	Threats	Insecticides and Treatment*	Remarks
Ants (several species)	Feed on foods and may damage clothing; may also sting, causing severe reaction to some people.	**Baits (active ingredient and product):** sodium tetraborate decahydrate (Amdro Kills Ants Liquid Bait, Terro Liquid Ant Baits); hydramethylnon (Amdro Kills Ants Bait Stations and Stakes); orthoboric acid (Terro Perimeter Ant Bait); fipronil (Combat Max Ant Killing Bait Stations and Gel); abamectin (Raid Max Double Control Ant Baits, Raid Ant Baits III); dinotefuran (Hot Shot Ultra Clear Roach & Ant Gel Bait, Hot Shot Ultra Liquid Ant Bait); spinosad (Ortho Home Defense Liquid Ant Bait); thiamethoxam (Raid Precision Placement Ant Bait Gel)	Identify the insect. Remove food and clean up the area. Place bait where ants occur or congregate. May use several different baits at the same time to discover one that ants will consume. Care should be taken not to contaminate foodstuffs. Also treat nests in yard. Follow label.
		Crack and crevices: prallethrin, esfenvalerate, pyrethrins, pyrethrum, permethrin, tetra-methrin, phenothrin, beta-cyfluthrin, cyfluthrin **Indoor space:** prallethrin, esfenvalerate, pyrethrins, pyrethrum, permethrin, tetramethrin, phenothrin, cyfluthrin, bifenthrin **Outdoor barrier:** prallethrin, esfenvalerate, permethrin, beta-cyfluthrin, cyfluthrin, bifenthrin, malathion, carbaryl **Outdoor broadcast:** hydramethylnon, pyriproxyfen, beta-cyfluthrin, esfenvalerate, bifenthrin, cyfluthrin, malathion, carbaryl	Follow label.
Ants (carpenter ants)	Damage wooden structures, making smooth, round holes in wood for nesting purposes.	**Baits:** fipronil (Maxforce Carpenter Ant Bait); abamectin (Advance Granular Ant Bait) **Crack and crevice:** deltamethrin (D-Fense Dust); dinotefuran (Alpine PT Aerosol; Alpine Ant and Termite Foam) **Sprays:** fipronil (Taurus SC); fipronil and imidacloprid (FUSE Termiticide & Insecticide)	Spraying infested areas in midspring will usually reduce populations for the season. Solve moisture problems and leaks. Stack firewood away from the house. Carpenter ants may move into houses from trees located near the house. Trim tree branches that contact structures. Seal cracks and openings for electrical and water lines that enter the building.
Ants (fire ants)	Sting people who disturb a nest. Multiple stings often occur, and stings are painful. Cause severe reaction to people who are allergic to the venom.	**Baits:** indoxacarb (Advion Fire Ant Bait, Ortho Fire Ant Killer Mound Bait); fipronil (Maxforce FC Fire Ant Bait); hydramethylnon (Amdro Granules Fire Ant Bait); hydramethylnon and s-methoprene (Amdro Kills Fire Ants Yard Treatment Bait; Extinguish Plus Fire Ant Bait);	For areas with heavy fire ant infestations and low numbers of beneficial native ants, a two-step method is suggested. The first step is a broadcast application of a bait insecticide over the entire yard in early- to midfall, and the second step is to treat individual problem mounds with an approved bait, drench, granule, or dust insecticide.

*Labels on insecticides should state "material may be used in the household" and should be registered by the EPA for that purpose.

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Household Insects – Homeowners

Insect	Threats	Insecticides and Treatment*	Remarks
		spinosad (Payback Fire Ant Bait); abamectin (Ascend Fire Ant Bait, Award II Fire Ant Bait); metaflumizone (Altrevin® Fire Ant Bait); pyriproxyfen (Distance and Esteem Fire Ant Bait); fenoxycarb (Award Fire Ant Bait) **Contact (various active ingredients):** allethrin, resmethrin, sumithrin, tetramethrin, bifenthrin, cyfluthrin, cypermethrin, deltamethrin, fenvalerate, fluvalinate, lambda-cyhalothrin, permethrin, s-bioallethrin, esfenvalerate, tefluthrin, tralomethrin, carbaryl, acephate, fipronil, boric acid. **Botanicals:** d-limonene, pyrethrins, rotenone, pine oil, turpentine.	
Ants (pharaoh ants)	Indoor nuisance pest, especially in hospitals; causes the spread of infection, contaminates sterilized equipment and supplies, and disturbs patients. Also causes electrical interference and contaminates food.	**Baits:** indoxacarb (Advion Ant Bait Arena, Advion Ant Bait Gel, Advion Ant Bait Kit); abamectin (Advance 375A Select Ant Bait); fipronil (Maxforce FC Ant Bait Stations); hydramethylnon (Amdro Kills Ants Bait Stations); boric acid; borax	Difficult to manage. Spray applications will break the colonies into multiple colonies and make management more difficult. Place baits where the ants are trailing and in all areas ants are found. Use fat-based and sweet baits in combination. Try small amounts of baits to see which ones are preferred before applying extensive baiting (use less than 1 percent concentrations).
Ants (crazy ants)	Damages electrical and computer equipment. High number of ants (particularly tawny crazy ants) can cover the yard or landscape. Causes a negative impact on ecological systems by displacing other organisms.	**Baits:** hydramethylnon (Maxforce Complete Granular Bait); abamectin (Advance Carpenter Ant Bait)	Most ant baits are not effective for these ants. Baits alone are inadequate to reduce high densities of these ants but may be effective when densities are low in the spring. Use fresh bait and apply it when the ground is dry and no rain is expected for 24 hours. Broadcast bait over the entire infested area.
		Perimeter sprays: dinotefuran (Alpine WSG); imidacloprid (Dominion 2L Insecticide); permethrin (Hi-Yield Lawn, Garden, Pet, & Livestock Insect Killer, Hi-Yield 38 Plus Turf Termite and Ornamental Insect Control); bifenthrin (Ortho Home Defense); acephate (Orthene Spray 97); fipronil (Termidor SC)	The tawny crazy ant must be specifically identified from a parish before Termidor can be used for this pest. Louisiana received a Section 18 quarantine exemption use label for Termidor SC insecticide to be used in management of tawny crazy ants. The renewed exemption was authorized on April 22, 2019, and will expire April 22, 2022. The following parishes are included in the exemption: Ascension, Assumption, Beauregard, Calcasieu, East Baton Rouge, Iberia, Iberville, Jefferson, Lafayette, Lafourche, Livingston, Morehouse, Orleans, Rapides, St. Bernard, St. Charles, St. Landry, St. Martin, St. Mary, St. Tammany, Tangipahoa, Terrebonne, Vermilion, Vernon, Washington, and West Baton Rouge. When dead ants accumulate, carefully remove them with a leaf blower outdoors

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CBD v. EPA (1:21-cv-00681-CJN) ED_005427A_00029618-00092

Household Insects – Homeowners

Insect	Threats	Insecticides and Treatment*	Remarks
			or vacuum indoors. Do not disturb or remove the insecticide from the treated surfaces. Do not vigorously wipe or scrape clean treated surfaces.
Bed bugs	Feed at night by sucking blood of sleeping persons.	**Crack and crevice and mattress:** deltamethrin (Buggslayer Insecticide RTU); diatomaceous earth (Hi-Yield Crawling Insect Control; InsectiGone Crawling Insect Killer); diatomaceous earth and pyrethrins (Results Indoor Insect Killer); phenothrin (Pronto Plus Bedbug & Dust Mite Killer, Ortho Home Defense Max Bedbug Killer) **Residual sprays:** bifenthrin (Bifen IT); esfenvalerate (Stop Bugging Me!, FenvaStar EcoCap); permethrin (Martin's Permethrin Termiticide/Insecticide); lambda-cyhalothrin (Demand CS, Surrender Brand Pestabs) **Indoor spaces:** cyfluthrin (Cy-Kick CS Controlled Release Insecticide); deltamethrin (Black Flag Home Insect Control Concentrate); synergized pyrethrins (CB-40 Insecticide, Clear Zone Double Impact Farm Fly Spray) **Fumigation:** sulfuryl fluoride **Insect growth regulators:** s-hydroprene (Gentrol IGR Concentrate) **Traps (for detection only):** ClimbUp Insect Interceptor	Eliminating bed bugs from a house is very difficult and requires killing the bugs in all infested sites throughout the entire house at the same time. The insecticides must contact the bed bugs when they are applied. Bed bugs may walk across insecticides and not be killed. Eggs are not killed by these insecticides. There is little residual from these insecticides, and applications may have to be repeated. Aerosol bombs are not effective. Few, if any, insecticides are labeled to treat mattresses or electrical wiring. Follow the label. Spray lightly in all cracks and baseboards, crevices of floors, behind loose wallpaper and other hiding places. Additionally, heat treatment, steam treatment, cold treatment, mattress encasings, CO_2 monitors and traps are important tools in managing bed bugs. These tools should be used in combination with insecticides. Treating wall voids with diatomaceous earth may be very advantageous. Do not use swimming pool grade diatomaceous earth. Sulfuryl fluoride products are restricted-use pesticides that can only be legally purchased and used by licensed professionals.
Booklice (Psocids)	Damages book bindings, clothing and articles containing starch or glue. Damage is usually insignificant.	Reduce moisture. Use commercially prepared insect spray containing 0.25% pyrethrins. Other active ingredients: lambda-cyhalothrin, cyfluthrin, acephate	Remove infested items and eliminate excessive moisture. Insecticides are not normally necessary to control booklice. When using insecticides for large and uncontrolled infestations, follow the label carefully to ensure safety.
Carpenter bees	Drill round tunnels in wood for nesting purposes. Feces of carpenter bees can stain wood. More severe damage can be made by woodpeckers in search of bee larvae in the tunnels.	**Crack and crevice:** pyrethrins and silica gel (Drione Dust); prallethrin and lambda-cyhalothrin (Spectracide Carpenter Bee & Ground-Nesting Yellow Jacket Killer Foaming Aerosol)	Dusts provide longer residual. Repeated applications may be needed.
Carpet beetles	Feed on items composed of animal fibers, such as wool, furs, silk, feathers, felt and leather. Adults are small	**Crack and crevice:** pyrethrins, tetramethrin, etofenprox and PBO (Zenprox Aerosol) **Dusts:** silicon dioxide (CimeXa Insecticide Dust)	Routine vacuum cleaning effectively removes carpet beetles as well as hair and lint. Clothing to be stored should be kept in tightly closed containers.

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CBD v. EPA (1:21-cv-00681-CJN) ED_005427A_00029618-00093

Household Insects – Homeowners

Insect	Threats	Insecticides and Treatment*	Remarks
	beetles, and only the larval stage feeds on fabric and causes damage.	**Insect growth regulators:** s-hydroprene (Gentrol IGR Concentrate)	Infested rugs, carpets, and furniture should be cleaned thoroughly before application of insecticide. Insecticides should not be used to treat clothing.
Clothes moths	Furs, rugs, clothing, overstuffed furniture and silken materials are the most common items attacked by the larvae of clothes moths. Adults are small moths but in the immature stage are small worms.	**Storage:** naphthalene (mothballs and moth flakes, various products); paradichlorobenzene (Enoz Moth Ice Crystals); dichlorovos (ProZap Insect Guard) **Crack and crevice and indoor treatment**: d-phenothrin, n-octyl bicycloheptene dicarboximide (synergist), imidacloprid (Bedlam Plus Aerosol Insecticide); imidacloprid and cyfluthrin (Temprid Ready Spray); deltamethrin (D-Fense SC Insecticide); tralomethrin; pyrethrin	**CAUTION:** Wet rugs must be protected from metal stains. Very important to find and clean up source of infestation. Dry clean garments in spring prior to storing in a box. Place moth balls or moth crystals in box before closing. May freeze infested items. Also see remarks above for carpet beetles.
Cockroaches	Feed on most foods, but also will damage book bindings, stamps, papers and starched clothing.	**Baits:** fipronil (Combat Max Roach Killing Gel and Baits); dinotefuran (Hot Shot Ultra Clear Roach and Ant Gel); indoxacarb (Raid Roach Gel); imidacloprid (Bayer Home Pest Roach Killer Gel); abamectin (Raid Double Control Roach Baits); abamectin and s-hydroprene (Raid Double Control Small Roach Baits Plus Egg Stoppers); hydramethylnon (Combat Roach Killing Bait, Ortho Home Defense Roach Bait) **Indoor sprays:** permethrin and pyriproxyfen (Bengal Gold Roach Spray); bifenthrin and zeta-cypermethrin (Ortho Home Defense Insect Killer for Indoor & Perimeter2); neo-pynamin and cypermethrin (Combat Max Ant & Roach Killing Foam Spray); imiprothrin and deltamethrin (Raid Max Ant & Roach Killer); cypermethrin (Demon WP); prallethrin; pyrethrins; tetramethrin; phenothrin; beta-cyfluthrin; cyfluthrin **Dusts:** deltamethrin (Delta Dust); diatomaceous earth (Hi-Yield Crawling Insect Control; InsectiGone Crawling Insect Killer); orthoboric acid (Borid Insecticide, Pic Orthoboric Acid); boric acid (Zap-A-Roach); cyfluthrin (Tempo Dust); pyrethrins and silica gel (Drione Dust) **Outdoor:** lambda-cyhalothrin (LambdaStar UltraCap 9.7) cypermethrin (Demon WP); prallethrin; esfenvalerate; cyfluthrin; beta-cyfluthrin; bifenthrin; malathion	To treat cockroaches indoors, use baits where cockroaches are found (mainly the kitchen). In cases of extreme infestation, use a fogger or spray to treat cracks and crevices where cockroaches live. Do not use insecticide sprays when baits are in use.

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CBD v. EPA (1:21-cv-00681-CJN) ED_005427A_00029618-00094

Household Insects – Homeowners

Insect	Threats	Insecticides and Treatment*	Remarks
		Insect growth regulator: abamectin, hydroprene, pyriproxyfen	
Earwigs, millipedes	Occasionally invade the home especially during wet, rainy weather. Contrary to common belief, these arthropods are harmless.	**Outdoor:** bifenthrin (Bifen IT); lambda-cyhalothrin (Cyzmic CS, LambdaStar Ultracap 9.7); cypermethrin (Cyper WSP) **Other active ingredients:** acephate; pyrethrin; cyfluthrin; deltamethrin; permethrin; tralomethrin; prallethrin; boric acid; beta-cyfluthrin; disodium octaborate tetrahydrate; tau-fluvalinate; carbaryl (outdoor); malathion (outdoor)	Treat outside area at least 15 feet from base of house. Particular attention should be paid to ground area adjacent to foundations of house, edges of walkways and carports of any cracks or crevices that could provide a hiding place. Also treat flower beds and other areas that are heavily mulched and remain damp. Remove any debris under which the insect is found. Treatment inside house is usually not practical.
Fleas	Feed on animals and humans and transmit disease.	**Indoor:** pyriproxyfen, tetramethrin and sumithrin (Bengal Full Season Flea Killer); pyrethrins, tetramethrin and methoprene (Raid Flea Killer Plus Carpet and Room Spray); gamma-cyhalothrin and pyriproxyfen (Black Flag Flea & Tick Spray Plus Growth Regulator Home Treatment Aerosol and Ready-To-Use); dinotefuran, prallethrin, pyriproxyfen (PT Alpine Flea and Bed Bug Insecticide Aerosol with IGR); etofenprox, tetramethrin, pyrethrins, PBO, and s-methoprene (Precor 2625 Premise Spray); pyriproxyfen (Martin's I. G. Regulator); esfenvalerate (FenvaStar Plus); beta-cyfluthrin; bifenthrin; deltamethrin; permethrin; tralomethrin **Outdoor:** gamma-cyhalothrin and pyriproxy (Black Flag Flea & Tick Killer Concentrate Yard Treatment 2 Ready-To-Spray); esfenvalerate (FenvaStar Plus); pyriproxyfen (Martin's I. G. Regulator) **Insect growth regulator:** hydroprene, pyriproxyfen, methoprene, novaluron **Traps (for detection only):** Victor: The Ultimate Flea Trap	Fleas are very difficult to control. It usually takes two applications applied 10 days to 2 weeks apart to control them. It is important to treat the pet along with the premises, preferably on the same day. Adult fleas spend virtually their entire life on the animal, not in the carpet. Untreated pets will continue to be bothered by fleas. They may also transport fleas in from outdoors, eventually overcoming the effectiveness of the insecticide applied inside the home. Pets can be treated either by a veterinarian or the pet owner with labeled products such as Advantage or Frontline. Pet owners should always read the product label. Certain products can be used only on dogs and some list specific treatment procedures for puppies and kittens. Do not treat pets with the same products used to treat carpeting or the yard. It is also very important to treat where the pet sleeps, making sure the product used is labeled for use in the area treated. **It is important that pets be kept off treated carpets and surfaces until the spray has completely dried.**
Houseflies	Flies are a nuisance around the home and contaminate food. Larvae breed in decaying organic matter, garbage and manure.	pyrethrins and PBO (Country Vet CV-80D Aerosol, CB 80 Insecticide Aerosol); lambda-cyhalothrin (LambdaStar UltraCap 9.7); cypermethin (Cyper WSP); deltamethrin (D-Fense Dust); trichlorfon (Dipterex); imidacloprid (Maxforce Fly Spot Bait); cyantraniliprole (Zyrox Fly Bait); methomyl and (Z)-9-tricosene (Golden Malrin Fly Bait); beta-cyfluthrin; cyfluthrin; permethrin; tetramethrin; esfenvalerate; prallethrin	Spray screens, door facings, window jambs, porches, posts and other places where flies alight with 1 percent Dipterex and where pets, poultry or livestock cannot reach them. Inside homes use prepared spray containing pyrethrins. Keep premises clean. Eliminate fly-breeding sites.
Mosquitoes	Attack humans, pets, and livestock. They are blood feeders	**Long-lasting repellants:** DEET; picaridin; permethrin **Shorter-lasting repellants:**	Remove old cans, tires and other containers that might hold rainwater. Drain pools of stagnant water. Improve drainage in yard and around home.

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CBD v. EPA (1:21-cv-00681-CJN) ED_005427A_00029618-00095

Household Insects – Homeowners

Insect	Threats	Insecticides and Treatment*	Remarks
	and may transmit disease.	oil of lemon eucalyptus; IR3535 **Plant-based repellants:** Lotions and creams last longer than liquids. Higher concentrations last longer than lower concentrations.	
		Adults (outdoors in resting areas): malathion (Fyfanon ULV); cypermethrin (Demon Max); permethrin (various products, see labels); deltamethrin (D-Fense SC)	Use tight-fitting screens; spray potential resting areas on the building exterior and the building perimeter (shrubs, grass, etc.). Spray the interior walls of garages and sheds. Spray under porches and carports.
		Adults (indoors): pyrethrin + PBO or other commercially prepared aerosol products.	Commercially prepared repellents can be used to avoid mosquito attack.
Pantry pests	Small brown beetles and larvae of small moths infest flour meal, spices, dog food, grits, rice, oatmeal, cookies, candies, nuts and other cereal grain products.	**Indoor surface and crack and crevice:** pyrethrin and PBO (Stryker 54); dinotefuran (Alpine Aerosol PT); deltamethrin (Delta Dust); pyrethrin, PBO and silica gel (Tri-Die Pressurized Dust); acephate; cyfluthrin; bifenthrin; permethrin; tralomethrin; lambda-cyhalothrin; esfenvalerate; prallethrin; boric acid; hydroprene **Indoor space:** hydroprene, pyrethrin, prallethrin, permethrin	Place flour, meal, etc., in tight glass or plastic containers. Remove and destroy infested packages of food products. Remove everything from shelves and cabinets and treat the interior. Let shelves dry and cover with paper before replacing items. May freeze items. Rotate food products, eating them before 90 days.
Powder post beetles	When present, these very small black or brown beetles are usually found in sills, joints, floors or furniture. Their presence is indicated by tiny holes in the wood from which sawdust is exuded.	**Borate wood treatment:** disodium octaborate tetrahydrate (Bora-Care, Tim-bor) **Insecticides that will not penetrate wood:** beta-cyfluthrin, bifenthrin, cyfluthrin, cypermethrin, deltamethrin, fenvalerate, imidacloprid, lambda-cyhalothrin. **Fumigation:** sulfuryl fluoride	Borate wood treatment products must be used under dry conditions. Apply as directed by label. Surface applications of borates will penetrate wood up to one-quarter inch. Sulfuryl fluoride products are restricted-use pesticides that can only be legally purchased and used by licensed professionals.
Scorpions	Scorpions hide during the day and are active at night. They sting to kill prey or as a defense mechanism. They can sting people if agitated.	**Outdoor:** esfenvalerate, prallethrin and PBO (Onslaught FastCap Spider and Scorpion Insecticide); bifenthrin (Bifen IT); lambda-cyhalothrin (LambdaStar Ultracap 9.7); cypermethrin (Cyper WSP) **Dusts:** deltamethrin (D-Fense Dust, Delta Dust); pyrethrins and silica gel (Drione Dust) **Other active ingredients:** cyfluthrin; permethrin; boric acid; beta-cyfluthrin; carbaryl (outdoor)	Eliminate harborage sites around the house, including trash, boards, stones and firewood. Spray around doorways, windows and other places where scorpions might enter. Dusts should be used to treat cracks and crevices. Follow label directions.
Silver fish	Feed on cotton, rayon, nylon, silk, book bindings, wallpaper and materials containing starch; frequently injure books.	**Crack and crevice or indoor space:** cyhalothrin (PT 221L Pressurized Insecticide); pyrethrins and PBO (CB 80 Insecticide Aerosol); esfenvalerate (FenvaStar Plus); imidacloprid and cyfluthrin (Temprid Ready Spray)	Eliminate sources of excessive moisture. Spray back wall, shelves, baseboards of cupboards, floors and shelves of clothes closets, around water pipes, lavatories, sinks and on the sides of book shelves. Spray around door and window frames of papered

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CBD v. EPA (1:21-cv-00681-CJN) ED_005427A_00029618-00096

Household Insects – Homeowners

Insect	Threats	Insecticides and Treatment*	Remarks
		Outdoor: cyfluthrin, esfenvalerate, prallethrin, beta-cyfluthrin, bifenthrin, malathion, carbaryl **Dusts:** deltamethrin (Delta Dust, D-Fense Dust); pyrethrins and silica gel (Drione Dust); diatomaceous earth (Hi-Yield Crawling Insect Control; InsectiGone Crawling Insect Killer) **Bait:** orthoboric acid (InTice 10 Perimeter Bait)	rooms with a commercially prepared insect spray. Follow label.
Spiders	Make unsightly webs in corners, on porches and under furniture. They do no other harm (except black widow, brown widow and brown recluse spiders).	**Crack and crevice:** etofenprox, tetramethrin, PBO and pyrethrin (Zenprox Aerosol); pyrethrin and PBO (Stryker 54 Contact Spray); deltamethrin (D-Force HPX Aerosol) **Outdoor:** lambda-cyhalothrin (Cyzmic CS, LambdaStar Ultracap 9.7); cypermethrin (Cyper WSP); esfenvalerate, prallethrin and PBO (Onslaught FastCap Spider and Scorpion Insecticide) **Other active ingredients:** cyfluthrin; bifenthrin; permethrin; tralomethrin; boric acid; beta-cyfluthrin; imiprothrin; phenothrin, carbaryl (outdoor); malathion (outdoor)	Spray house overhang in May to reduce spider populations for most of the year. Use yellow lights to reduce the numbers of insects attracted to the house. Spiders come for the insects, wasps come for the spiders. Seal the structure to exclude spiders.
Ticks	Ticks feed on animals and humans and transmit disease.	**Repellants:** DEET; permethrin; picaridin **Indoor:** gamma-cyhalothrin and pyriproxyfen (Black Flag Flea & Tick Spray Plus Growth Regulator Home Treatment Aerosol and Ready-To-Use); pyriproxyfen and novaluron (Tekko Pro Insect Growth Regulator Concentrate); bifenthrin (Bifen IT); esfenvalerate (FenvaStar Plus); methoprene, permethrin, phenothrin (Precor 2000 Plus Premise Spray); pyrethrins and silica gel (Drione Dust); deltamethrin (D-Fense Dust); beta-cyfluthrin; cyfluthrin; deltamethrin; permethrin; tralomethrin; cypermethrin; tetramethrin; phenothrin; tau-fluvalinate **Outdoor:** pyriproxyfen and novaluron (Tekko Pro Insect Growth Regulator Concentrate); bifenthrin (Bifen IT); esfenvalerate (FenvaStar Plus); permethrin (Permethrin SFR Insecticide); pyrethrins; beta-cyfluthrin; cyfluthrin; deltamethrin; permethrin; tralomethrin	Follow label.
Wasps (mud daubers, paper wasps)	Paper wasps are vicious stingers when disturbed. Mud daubers are usually not aggressive and	**Aerosol sprays:** prallethrin (PT Wasp & Hornet Freeze); etofenprox; tetramethrin and PBO (Wasp X Wasp & Hornet Spray);	Spray nests and wall. Treat paper wasps in the late evening when all insects have settled for the night. Use red cellophane on light at night.

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CBD v. EPA (1:21-cv-00681-CJN) ED_005427A_00029618-00097

Household Insects – Homeowners

Insect	Threats	Insecticides and Treatment*	Remarks
	sting only when handled.	prallethrin and lambda cyhalothrin (Spectracide Carpenter Bee and Yellow Jacket Foam) **Residual sprays:** lambda-cyhalothrin (LambdaStar Ultracap 9.7); cypermethrin (Cyper WSP); 2.0% malathion (outdoor only)	

Termites

Subterranean Termites: Integrated pest management (IPM) of subterranean termites is unique compared to management (IPM) of other pests. Post-construction treatments include liquid soil treatments, wood treatments and baits. Liquid soil treatments are designed to protect the structure using a barrier placed around the perimeter of the structure and at additional termite entry points. These treatments may be repellent or nonrepellent.

Repellent soil treatments are detected by subterranean termites. Subterranean termites are repelled by these treatments. Nonrepellent soil treatments are not detected by subterranean termites. Subterranean termites pass through the nonrepellent soil treatment and are killed. Wood treatments kill subterranean termites when the termites feed on the treatments.

Baits and nonrepellent termiticides are designed to kill termites, including reproductives, in the colony. Baits do not provide a barrier around the structure.

Subterranean termites are hidden (cryptic) and live in colonies (social). In addition, the construction of structures is quite diverse. Thus, integrated pest management of subterranean termites is very complex. Pay attention to the label to make sure the product is labeled for termites and for required methods of application.

CAUTION: All insecticides are toxic to some degree; therefore, care should be exercised in their use. The manufacturer's directions on the label in the use of the material must be followed explicitly.

Repellent Soil Termiticide	% to be Used	Remarks
Bifenthrin: Baseline, Bifen, Bifenthrin, Biflex, MasterLine, Maxxthor, Menace, Talstar, ValueLine Bifenthrin, Up-star Wisdom	0.6%, 0.12%	Observe label
Cypermethrin: Cyper, Cypermethrin G-Pro, Cypro, Demon, Demon Max, Prevail, Pro-Build, UP-Cyde	0.25%, 1.00%	Observe label
Esfenvalerate: Tribute	0.059%, 0.125%, 0.25%	Observe label
Permethrin: Cede ii, Dragnet, Permaster, Permethrin, Prelude, Pmn hg, Tengard, Termethrin	9.590, 2.00%	Observe label

Nonrepellent Soil Termiticide	% to be Used	Remarks
Acetamiprid and Bifenthrin: Transport, F 4, F 4668 50 WSP, F 5688	0.11%	Observe label
Chlorantraniliprole: Altriset	0.059%	Observe label
Chlorfenopyr: Phantom	0.063%, 0.25%	
Imidacloprid: Adonis, AmTide, Centerfire, Dominion, Imi, Lada, Lpi, Masterline I Maxx Pro, Premise, Prothor	0.05%, 0.10%	Observe label.
Fipronil: F-2010, Taurus, Termidor, Termidor HE, Termini	0.06%, 0.125%	Observe label
Imidacloprid and fipronil: Fuse	0.067%, 0.13%	Observe label.

Borate Wood Treatment Termiticide (Spray on)	% to be Used	Remarks
Disodium octaborate tetrahydrate: Board defense, Bora-care, BOR-RAM, Borathor Max PT, Cellu-treat, EZ Bor, Mguard, Shell-guard	23%	Observe label

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CBD v. EPA (1:21-cv-00681-CJN) ED_005427A_00029618-00098

Household Insects – Homeowners

CAUTION: All insecticides are toxic to some degree; therefore, care should be exercised in their use. The manufacturer's directions on the label in the use of the material must be followed explicitly.

Insect	Threats	Insecticides and Treatment*	Remarks
Baits			
Advance (diflubenzuron) Amdro (hexaflumuron) Impasse (lufenuron) Isopthor (diflubenzuron) Labyrinth (diflubenzuron) Lufenuron (lufenuron) Recruit II (hexaflumuron) Recruit III (noviflumuron) Recruit IV (noviflumuron) Recruit IV AG (noviflumuron) Shatter (hexaflumuron) Spectrum (hexaflumuron) T-Max (noviflumuron) T-Max II (diflubenzuron) Trelona (novaluron) Zyrox(lufenuron)			

Drywood Termites
Drywood termites do not have contact with the soil. Integrated pest management of drywood termites is different from integrated pest management of subterranean termites. Prevention is a good method of reducing injury from drywood termites. Prevention includes sealing cracks and joints, screening (20 mesh) vents and other openings, using pressure-treated wood and spraying untreated wood with a borate. Colonies of drywood termites are small in number compared to subterranean termites. Thus, infested wood may be removed and replaced to manage drywood termites. All infested pieces of wood must be removed. Chemical treatments include injection of nonrepellent termiticide foams, liquids or dusts. Nonchemical methods include the use of microwaves, cold, heat and electrocution. **Termiticides for drywood termites: imidacloprid:** Adonis, AmTide, Centerfire, Dominion, Imi, Lpi, Masterline I Maxx Pro, Premise. **fipronil:** F-2010, Taurus, Termidor dry, Termini. **imidacloprid and fipronil:** Fuse. d**isodium octaborate tetrahydrate:** Board defense, Bora-care, BOR-RAM, Borathor Max PT, Cellu-treat, Mguard

Pesticide Safety

READ THE LABEL — Do not exceed the amounts recommended. Do not contaminate food or feed. Avoid hazards to pets, fish and wildlife.

Four Keys to Pesticide Safety:

1. **Read the label on each pesticide container before each use.** Follow instructions; heed all cautions and warnings. Why read the label each time? Because the chemical nature of pesticides and their uses vary greatly. You should refresh your mind each time on the material's specific uses. Be sure the product is registered for use in or around the home.
2. **Store pesticides in their original, labeled containers.** Keep them out of the reach of children and irresponsible people. They cannot be properly identified unless they are in original containers. Lock pesticides in a shed or closet away from food and other household items.
3. **Apply pesticides only as directed.** Apply them only to the areas specified, in amounts specified and at times specified in label instructions or by your agricultural authorities.
4. **Dispose of empty containers safely.** It is almost impossible to remove all material from a container. Empty containers with small amounts of pesticides that could harm children or animals and dispose out of reach. Call the Louisiana Department of Agriculture and Forestry with questions about proper disposal of pesticides.

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CBD v. EPA (1:21-cv-00681-CJN) ED_005427A_00029618-00099

Interior Plants

Insecticide	Rates Per Gallon	Rates Per 100 Gallons	To Control
Acelepryn		1.0-16.0 ounces	16 ounces maximum residual control; caterpillars only
°Adept IGR	Follow label chart		Soil insects, fungus gnats, shore flies
Arena 0.25G	3.0-3.6 pounds/1,000 gallons	133-160 pounds/acre	Aphids, lace bugs, caterpillars, leafhoppers, root weevils, scales, white grubs, whiteflies
*Astro 3.2 EC	1.0-2.0 teaspoons/ 3.0 gallons	4.0-8.0 ounces	
Celero		2-4 ounce	Spray or drench (See label). Aphids, mealy bugs, whiteflies
°Citation	6.0 gms	1.0 pound 5.0 ounces/ 2.66 ounces/acre	Greenhouse whiteflies, leafminers
	-	2.66 ounces	Fungus gnats, sawflies, leafminers
Confirm	0.25-1.0 teaspoon	4.0-16.0 ounces	
Cyfluthrin Tempo 2	2 scoops/gallon		Aphids, whiteflies, caterpillars
Dimilin SC		2.0-4.0 ounces	Armyworms, leafminers, whiteflies, fungus gnats
Distance IGR		6-8 ounces	Whiteflies, gnats, shore flies, leafminers, armored scales, and spotted tentiform leafminers
		8-12 ounces	
Endeavor	0.25-0.5 teaspoon	2.5-5.0 ounces	Aphids, whiteflies
		10.0 ounces/acre	
Endeavor 50WP	1/3-2/3 teaspoon	2.5-5.0 ounces	Whiteflies, aphids
Enstar II (IGR)	1.5 teaspoons/5.0 gallons		Aphids, whiteflies, scales
Floramite 50%		2.0-4.0 ounces	Ants, caterpillars, leafminers, thrips, wasps, bees, mites, whiteflies
Forbid 4F		1.4-4.0 ounces	All mites, whiteflies
Kontos	1.7-3.4 ounces/100 gallons	5-8 ounce/Acre	Aphids, leafhoppers, mealybugs, psyllids, spider mites, spittle bugs, and whiteflies
M-Pede	3.0 tablespoons		Mites, scales, aphids
Marathlon Z	Follow label – Rate is pot size as per plant.		Drench for container plants.
Marathlon II			
Marathlon 1% G	Rate based on container size		See label.
Marathon 60WP	Rate based on container size		See label.
Mavrik Aquaflow	1.3-3.0 teaspoons/ 5.0 gallons		Aphids, thrips, whiteflies, springtails, caterpillars
Meridian 25WG	0.7-1.95 ounces/ 5,000 square feet		Drench
Merit 2		1.5 ounces	
Merit 75WSP		1.6 ounces 1 packet/300 gallons Foliar application	Aphids, adelgids, lace bugs, leafhoppers, leafminers, thrips, mealybugs, whiteflies
Ornazin (IGR)	0.25-0.5 teaspoon	8.0-16.0 ounces	Whiteflies, aphids, thrips, caterpillars, fungus gnats, sawflies
Talstar F or GCF	0.125-1.0 ounce/ 1,000 square feet		Wide range of pests: mites, scales, whiteflies, thrips, caterpillars
Ultra-fine oils	2.5-5.0 tablespoons	1.0-2.0 gallons	Aphids, leafminers, mealybugs, scales, spider mites, whiteflies

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Lawns – Commercial

Pest	Insecticide	To Make 1 Gallon To Treat 5,000 Square Feet	To Make 100 Gallons To Treat 5,000 Square Feet	Remarks
Chinch bugs	Acelepryn	-	8.0-20.0 ounces/acre	
	Arena 0.25G	-	80-160 pounds/acre	
	Oftanol (5G)	-	40 pounds/acre or 0.9 pound/1,000 square feet	
	Scimitar GC or CS	-	7.0 milliliters/1,000 square feet or 10 ounces/acre	
	Battle WP	-	6.0 gms/1,000 square feet	
	*Astro 3.2EC	-	0.4-0.8 ounce/1,000 square feet	
	Talstar 10WP	1.0 tablespoon	1.76 ounces-3.5 ounces/100 gallons	
	Carbaryl (Sevin)		4.0-6.0 ounces/1,000 square feet	
	Mavrick Aquaflow		0.75-1.5 teaspoons/1,000 square feet	
	Meridian 25WG	-	12.7-17.0 ounces/acre	
Crane flies	Acelepryn	-	8.0-16.0 ounces/acre	
	Arena 50WDG	-	9.6-12.8 ounces/acre	
	Allectus GS/SC	-	2.3-2.9 pounds/1,000 square feet	
	Allectus GC/SC	-	1.3-1.6 ounces/1,000 square feet	
	*Dursban 5DW	-	2.0 pounds/acre	
	Merit	0.46-0.6 ounces/1,000 square feet or 14.0-17.0 milliliters/1,000 square feet or 1.25-1.6 pints/acre		
	Permethrin (Carbaryl)	10.0 pounds/acre	1 packet/5,000 square feet	
	Talstar PL-G	-	4.6 pounds/1,000 square feet or 200 pounds/acre	
	Zenith 75	-	1.6 ounces/11,000 square feet	
Fleas and ticks	Transport		1 packet/1,000 square feet	Follow label.
	*Yardex	-	3.2-10.0 ounces	
	Scimitar GS, S	7.0 milliliters/1,000 square feet	10.0 ounces/acre	
	°Conserve SC	1.2 fluid ounces/1,000 square feet	52.0 ounces/acre	
	Battle WP	6.0 gms/1,000 square feet		
	Battle GC	-	10.0 ounces/acre	
	Carbaryl (80%WP)	2.0 tablespoons	2.0 pounds	

*Professional use only, °Biological, ¹Not around homes

CBD v. EPA (1:21-cv-00681-CJN) ED_005427A_00029618-00101

Lawns – Commercial

Pest	Insecticide	To Make 1 Gallon To Treat 5,000 Square Feet	To Make 100 Gallons To Treat 5,000 Square Feet	Remarks
Sod webworms	Acelepryn	-	2.0-4.0 ounces/acre	
Armyworms	Arena 0.25G	-	80-160 pounds/acre	
cutworms	Arena 50WDG	-	9.6-12.8 ounces/acre	
	°Azatin XL	-	5.0-16.0 ounces/acre	
	Battle GC	-	5.0-10.0 ounces/acre	
	°Mach 2	1.5 ounces/1,000 square feet, 2.0 quarts/acre		
	Lepinox WDG	-	1.0-2.0 pounds/acre	
	°Conserve SC (Spinosad)	0.25 ounce/1,000 square feet	10.0 ounces/acre	
	Talstar 10WP	1.0 tablespoons	0.9 ounce-3.5 ounces	
	Onyx	0.07-0.15 ounce/1,000 square feet		
	Dylox (80% SP)	2.5-3.75 ounces/1,000 square feet		
	Dylox LS	4.0-6.0 ounces/1,000 square feet		
	Dylox LS	4.0-6.0 ounces/1,000 square feet (1/4-3/8 pint in 15-50 gallons/1,000 square feet)		
	°Condor XL	0.75-1.75 pints/acre		
	°Crymax	0.5-1.5 pounds/acre		
	Carbaryl (50% Dust)	6.5 ounces/1,000 square feet		
	Mavrick Aquaflow	0.75-1.5 teaspoons/ 1,000 square feet		
Narcissus bulb flies	Dylox 80 T&O	-	20.0 ounces	
Pillbugs	Acelepryn	-	8.0-20.0 ounces/acre	
	Arena 0.25G	-	80-160 pounds/acre	
	Arena 50WDG	-	6.4-12.8 ounces/acre	
	Transport		1 packet/1,000 square feet	Follow label.
Pillbugs, sowbugs	Scimitar GS, CS	3.4-7.0 milliliters/ 1,000 square feet		
	Battle WP	3.0-6.0 gms/ 1,000 square feet		
Slugs, snails	Niban G	-	6.0 ounces/100 square feet	Follow label.
	5% Metaldehyde (bait)	-	-	Apply to infested areas and clean up hiding places, four times per season; do not use with foliar fertilizers. Toxic to dogs and cats.
	Mesurol 75WP	-	2.0/5.0 gallons/acre	
	Mesurol (4% bait)			

*Professional use only, °Biological, ¹Not around homes

CBD v. EPA (1:21-cv-00681-CJN) ED_005427A_00029618-00102

Lawns – Commercial

Pest	Insecticide	To Make 1 Gallon To Treat 5,000 Square Feet	To Make 100 Gallons To Treat 5,000 Square Feet	Remarks
Chiggers (redbugs)	Transport	1 packet/1,000 square feet		Follow label.
	Battle	7.0 milliliters/1,000 square feet or 10.0 ounces/acre		
	Malathion (57% EC)	1.0 tablespoon/1,000 square feet		
Black turfgrass ataenius	Acelepryn	-	8.0-12.0 ounces/acre	
	Arena 0.25G	-	80-160 pounds/acre	
	Arena 50WDG	-	6.4-12.8 ounces/acre	
	Battle GC	7.0 milliliters/ 1,000 square feet	10.0 ounces/acre	
	Meridian 25WG	-	12.7-17.0 ounces/acre	
White grubs	Meridian 25WG	-	12.7-17.0 ounces/acre	
	*Flagship	-	8.0 ounces/acre	Follow label.
	Battle GC	7.0 milliliters/1,000 square feet	10.0 ounces/acre	
	Carbaryl SL	10.0 ounces in 3,040 gallons water/1,000 square feet		
	Carbaryl 80S	1 7/8 pounds in 150,200 gallons water/5,000 square feet		
	*Merit 75WP	3.0-4.0 teaspoons/1,000 square feet		
	Dylox 6.2G	3.0 pounds/1,000 square feet		
	Oftanol 2	1.0 gallon/acre or 3.0 fluid ounces/1,000 square feet		Follow directions on watering; water within 24 hours of treatment.
	Oftanol 1.5G	3.0 pounds/1,000 square feet		
	Mach 2	2.2 fluid ounces/1,000 square feet; 3 quarts/acre		
	Oftanol 5G	40.0 pounds/acre or 0.9 pound/1,000 square feet		Water in after treatment.
Ants	Transport	1 packet/1,000 square feet		Follow label.
	Orthene TTO/75S	2.0 teaspoons/mound		Apply dry formulation as a dust to tops of mounds; distribute as evenly as possible.
	Amdro Ant Block			Follow label.
	Oftanol 2	3.0 ounces/1,000 or 1.0 gallon/acre		

*Professional use only, [O]Biological, [I]Not around homes

CBD v. EPA (1:21-cv-00681-CJN) ED_005427A_00029618-00103

Lawns – Commercial

Pest	Insecticide	To Make 1 Gallon To Treat 5,000 Square Feet	To Make 100 Gallons To Treat 5,000 Square Feet	Remarks
	Orthene TTO/75S	1.0 ounce/5 gallons water		Mound treatment only, 1 gallon/mound.
	97S	0.75 ounce/5 gallons		
	°Distance 0.86 EC	3.0-4.0 tablespoons/mound (Apply at 0.35 to 0.5 ounce/1,000 square feet)		Not approved as quarantine treatment.
	Carbaryl 50WP	-	2.0 pounds	Water area around mound; may slightly burn grass.
	Carbaryl SL	-	1.5 quarts	
	Carbaryl 80	-	2.0 pounds	
	Scimitar GS, CS	3.4-7.0 milliliters/1,000 square feet		
	Battle WP	3.0-6.0 gms/1,000 square feet or 5.0-10.0 ounces/acre		
	MaxForce FG	4-8 ounce /200 – 400 linear feet		Apply in band 1-2 feet wide around structures. Not for edible food areas.
Mole crickets	Arena 0.25G	-	80-160 pounds/acre	
	Arena 50WDG	-	12.8 ounces/acre	Suppression.
	Meridian 25WG	-	12.7-17.0 ounces/acre	Suppression.
	*Dursban Pro[1]	4.0-6.0 pounds/acre		Golf course.
	Oftanol 2	1.0 gallon/acre or 3.0 fluid ounces/ 1,000 square feet		Follow directions on watering.
	Oftanol (5% G)	0.9 pound/1,000 square feet; 4.0 pounds/acre		
	Advion bait	1.15-4.6 pounds/1,000 square feet or 50.0-200.0 pounds/acre		Follow label directions.
	Dylox 6.2G	3.0 pounds/1,000 square feet		
	Carbaryl (20% bait)	2-4 ounces/1,000 square feet		
	Scimitar GS, CS	3.4-7.0 milliliters/1,000 square feet		Spray in late afternoon and add 8.0 ounces liquid soap with lemon; adjust pH to 5.5-6.0 before adding to water; 0.5 inch water after application.
	Battle WP	3.0-6.0 gms/1,000 square feet or10.0 ounces/acre		
	Onyx	0.07-0.15/1,000 square feet		
	Merit 0.5G	-		
	Merit 75WSP	1.8 pounds/1,000 square feet or 80 pounds/acre		

*Professional use only, °Biological, [1]Not around homes

CBD v. EPA (1:21-cv-00681-CJN) ED_005427A_00029618-00104

Lawns – Commercial

Pest	Insecticide	To Make 1 Gallon To Treat 5,000 Square Feet	To Make 100 Gallons To Treat 5,000 Square Feet	Remarks
	*Chipco Choice	1.6 ounces/11,000 square feet		
	Talstar F	12.5-25.0 pounds/acre, 4.6-9.4 ounces/ 1,000 square feet		
	Talstar G	10.0-40.0 ounces/acre, 0.5-1.0 ounce/ 1,000 square feet		
	*Top Choice	100-200 pounds/acre or 2.3-4.6 ounces/1,000 square feet		
	*Merit 75WP	87.0 pounds/acre or 2.0 pounds/1,000 square feet		
	Vector MC	4 teaspoons/1,000 square feet or 8.6 ounces/acre		1 box treats 11,000 square feet.
	Homemade baits	50 pounds crumbled laying mash (Purina Layena); 2 quarts 50%-75% Malathion EL; 3 pints crude cottonseed oil; 6 pounds table sugar. OR 100 pounds lay mash; 2 quarts crude molasses; 1-5 quarts water; 2 pounds Malathion; 10-12 pounds/acre.		
Imported fire ants	Transport	-	1 packet/1,000 square feet	Follow label.
	Meridian 25WG	-	12.7-17.0 ounces/acre	1.0 gallon/6 inch, drench mound; larger use: 2.0-3.0 gallons, drench. Broadcast uniformly with ground equipment. Prolonged exposure to air will turn oil base rancid; close container tightly after use; use within 3 days after opening; apply when ants are active; distribute uniformly 3-4 feet around base of the mound.
	Amdro or Seige, fire ant bait	1.0-1.5 pounds/acre or 5 level teaspoons/mound		
	Astro (pyrethroid)	17.0-34.0 ounces/acre, 0.4-0.8 ounces/1,000 square feet		
	Firestar	1.5-15.0 pounds/acre		
	Taurus G (Fipronil)	87 pounds/acre or 2 pounds/1,000 square feet		The primary purpose of this product is for control of fire ants. When treating for

*Professional use only, [O]Biological, [I]Not around homes

CBD v. EPA (1:21-cv-00681-CJN) ED_005427A_00029618-00105

Lawns – Commercial

Pest	Insecticide	To Make 1 Gallon To Treat 5,000 Square Feet	To Make 100 Gallons To Treat 5,000 Square Feet	Remarks
				imported fire ants, the following pests will be controlled for a limited time: Fleas and Ticks (1 month); Nuisance ants (3 months); Mole crickets (4 months). Do not apply to field-grown nursery stock; do not apply to bare ground or other impervious surfaces such as concrete, asphalt, compacted soil surfaces, plastic film or wood surfaces; do not apply to areas where plants grown for food will be placed.
	Organic Solution Fire Ant Killer	-	-	Follow label.
	PT 370 Ascend (Clinch/Varsity)	5.0-7.0 tablespoons/mound or 1.0 pound/acre		Turf, lawns, noncrop areas.
	Citrex			Organic.
	Citrex	8.0 ounces/gal		Mound treatment.
	°°Logic 1 % (Award)	1.0-1.5 pounds/acre	1.0-3.0 tablespoons/ mound	Follow label.
	Talstar G	100.0-200.0 pounds/ acre	2.3-4.6 ounces/ 1,000 square feet	
	Talstar F	0.5-10.0 ounces/acre	20-40 ounces/acre	
	Scimitar GS, CS	3.4-7.0 milliliters/1,000 square feet		Submerge container or ball until completely saturated. Do not remove container, burlap, or plastic.
	Battle GS	3.0-6.0 gms/1,000 square feet or 5.0-10.0 ounces/acre		
	Ceasefire	0.5-5.5 ounces/1,000 square feet or 1.5-15.0 pounds/acre		
	°Conserve SC (Spinosad)	0.1 ounce	1.0 ounce/10 gallons	1.0-2.0 gallons/mound depending on size.
	*Oftanol 2	1.0 gallons/acre or 3.0 fluid ounces/ 1,000 square feet	*Oftanol 2	Follow label directions.
	Oftanol 1.5G	3.0 pounds/1,000 square feet	Oftanol 1.5G	Follow label directions.
	*Fireban 1.5G	Rates dependent on media bulk density	*Fireban 1.5G	Follow label directions.
	Carbaryl 50WP	-	3.0 pounds	Apply 2 gallons of solution over mound.
	Carbaryl SL	-	1.5 quarts	Thoroughly wet mound and surrounding area to 4-foot diameter.
	Advion (fire ant bait)	0.5 ounces/1,000 square feet	1.5 pounds/acre	Do not disturb mounds prior to treatment.

*Professional use only, °Biological, ¹Not around homes

CBD v. EPA (1:21-cv-00681-CJN) ED_005427A_00029618-00106

Lawns – Commercial

Pest	Insecticide	To Make 1 Gallon To Treat 5,000 Square Feet	To Make 100 Gallons To Treat 5,000 Square Feet	Remarks
	Orthene TTO/75S	2 teaspoons/mound (mound treatment only)		Apply dry formulation as a dust to tops of mounds; distribute as evenly as possible.
	Carbaryl 80S	-	2.0 pounds	For best results, apply in cool weather.
	XLR Plus	3.0 tablespoons/2.0 gallons/mound		65 F - 80 F early morning or late evening hours.
	Amdro Pro			For pastures and replant.
	°°Distance	1.5 pounds/acre		
	°°Logic/Award	1.5 pounds/acre		
	Grenade ER	0.2-0.4 ounce/gal		
	Premise	1.0-1.5 pounds/acre		
	Esteem	2.0-4.0 Tbsps./mound	2.0 pounds/acre	
	°°Distance 0.86EC	3.0-4.0 tablespoons/mound Apply at 0.35-0.5 ounce/1,000 square feet		Not approved as quarantine treatment.
	°°Extinguish	3.0-5.0 tablespoons/mound to perimeter of 4.0 feet or 1.0-1.5 pounds/acre		Follow label.
	°°Extinguish Plus	Same as Extinguish.		These two are a combination of Amdro and Extinguish.
	Fire Strike	-	1.5 pounds/acre	
	Transport	1 packet/1,000 square feet/acre		Follow label.
	MaxForce			Sprinkle 2 tablespoons of bait around mound.

*Professional use only, °Biological, ¹Not around homes

CBD v. EPA (1:21-cv-00681-CJN) ED_005427A_00029618-00107

Lawns – Homeowner

Pest	Insecticide and Formulation	Amount per 1,000 Square Feet	Precautions and Remarks
Armyworms, fall armyworms, cutworms	Pyrethroids (Advance Lawn, Bug-B-Gone, Deltaguard, Talstar, others)	See label	
	Spinosad (several products available)	See label	
	B.t. (Thuricide, several products available) Carbaryl (Sevin) 50WP and baits	See label 6-8 oz.	Do not water into soil. Do not cut grass for one to three days after treatment.
Chinch bugs	Pyrethroids (Advanced Lawn, Bug-B-Gone, Deltaguard, Talstar, others)	See label	
Grubs, white	Carbaryl (50% WP) (Sevin)	6 oz.	
	Imidacloprid (Advanced Lawn Grub Control, others)	See label	
Imported fire ants	Acephate (Ortho Fire Ant Killer and others)	1-2 tsp/mound	Distribute uniformly over mound. For best results, apply in morning or late afternoon.
	Carbaryl (Sevin XLR)	See label	Use as mound drench.
	Hydramethylnon (Amdro Fire Ant Bait, Amdropro, MaxforceG)	See label	Use fresh bait. Repeat treatment usually required.
	Indoxacarb (Spectracide Fire Ant Once and Done) (Over n' Out Fire Ant Killer Mound Treatment)	See label	
	Methoprene (Extinguish) bait	See label	Mound or broadcast.
	Pyrethroids (Bayer Advanced, Ortho Fire Ant Killer, others)	See label	
	Spinosad (Come and Get It Fire Ant Bait by Fertilome, Entrust, Payback, Greenlight Fire Ant Control with Conserve, Green Light Fire Ant Killer with Spinosad Mound Drench	See label	May be used in fruit and vegetable gardens.
Mole crickets	Carbaryl (Sevin) 80WP and baits	8 oz.	
	Fipronil (several products)	2 lb.	Apply as a broadcast.
	Imidacloprid (Advanced Lawn Grub Control)	See label	
	Pyrethroids (Advance Lawn, Bug-B-Gone, Deltaguard, Talstar	See label	
Snails, slugs	Measurol 2%B Metaldehyde	1lb. See label	Apply in late afternoon. Toxic to dogs and cats.
Sod webworms	Carbaryl (Sevin) 80 WP 50 WP	 6 oz. 8 oz.	Use 6 gallons of water plus the insecticide per 1,000 sq. ft. Treat in late afternoon. Do not cut grass for one to three days after treatment.

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Livestock – Horses

Pest	Insecticides	Rates/Mixing/Dilution
Flies and mosquitoes	Co-Ral (6.15%)	Mix 5 ounces in 4 gallons water. Spray thoroughly. Do not make applications less than 10 days apart.
	Python (0.075%) Dust	Apply up to 2 ounces evenly per animal and not more than every three days.
	Many commercial products containing the following common name chemicals are available as concentrates and ready-to-use diluted formulations for either spray or wipe-on: Pyrethrins + PBO (synergist) Permethrin Permethrin + Pyrethins Resmethrin Resmethrin + Pyrethrins + PBO Cypermethrin Cypermethrin + Pyrethrins + PBO	Refer to labels of concentrates for mixing instructions. Refer to all product labels for minimum treatment intervals. Some ready-to-use products may also contain repellants such as dipropyl isocinchomeronate (MGK 326) and/or butoxypolypropylene (Stabilene).
Lice and ticks	Co-Ral (6.15%)	Mix 5 ounces per 4 gallons water for lice and 10 ounces per 4 gallons water for ticks. Do not make applications less than 10 days apart.
	Python (0.075%) Dust	Apply up to 2 ounces evenly per animal and not more than every three days. For ear ticks, apply 1/3 ounce (1 Tbsp.) per year.
	The following are common name insecticides sold under numerous trade names. Refer to labels for mixing and treatment instructions. Permethrin Resmethrin (Ticks only) Cypermethrin	
Bots	Use worming products for internal parasites.	Refer to labels for application instructions: Ivermectin (sold as Zimectrin, Eqvalan and Phoenectrin), Moxidectin (sold as Quest).

For a simple searchable list of products and formulations registered in Louisiana, please visit the following website: http://veterinaryentomology.ucr.edu/vet_pesticides.html.

CBD v. EPA (1:21-cv-00681-CJN) ED_005427A_00029618-00109

Livestock – Cattle, Hogs, Poultry, Sheep and Goats

The most important pests of livestock in Louisiana are horse flies, horn flies, mosquitoes, lice, ticks, cattle grubs, mites and houseflies. These pests are responsible for large losses to the livestock industry of Louisiana.

Extreme care should be exercised when applying insecticides on livestock.

Observe the following safety precautions:

1. Do not treat sick animals.
2. Do not use more insecticide than is recommended.
3. Since some of the insecticides are secreted in milk or stored in body fat, it is highly important to observe all precautions and conform to the regulations regarding the minimum time allowed from last treatment to slaughter or the freshening interval for dairy cattle.
4. Do not use insecticide formulations for livestock treatment unless this use is listed on the container label.
5. Do not use any insecticide in a dip unless this use is recommended.
6. When using an emulsifiable concentrate, be sure it mixes uniformly with the water. If an oil layer forms, do not use it.
7. When selecting an insecticide for use, read the precautions listed in this guide and the precautions listed on the label of the container.
8. When applying insecticides to livestock or around barns, do not contaminate feed or food and water troughs or allow runoff into streams.

The following pages include lists of commonly used products used on livestock animals.
For a simple searchable list of products and formulations registered in Louisiana, please visit the following website: http://veterinaryentomology.ucr.edu/vet_pesticides.html.

CBD v. EPA (1:21-cv-00681-CJN) ED_005427A_00029618-00110

Livestock – Cattle, Hogs, Poultry, Sheep and Goats

Beef Cattle

Pest	Insecticides	To Make 50 gallons	To Make 3 gallons	Minimum Days Treatment to Slaughter	Remarks
Cattle Grubs	***Pour-ons***				
	Ivomec (0.5%) (and other Ivermectin products)			48	Apply 1 milliliter per 22 pounds of body weight down back.
	Eprinex			0	Apply 1 milliliter per 22 pounds of body weight down back.
	Dectomax (0.5%)			45	Apply 1 milliliter per 22 pounds of body weight down back.
	Cydectin			0	Apply 1 milliliter per 22 pounds of body weight down back.
Face Flies	Python dust			0	For use in dust bags. Use about 10 pounds of dust per bag. Hang so bottom of bag is 30-36 inches above ground.
	Permethrin dust				
	1% Co-Ral dust			0	
Horn Flies	***Sprays***				
	Co-Ral (6.1%)	2 quarts	4 ounces	0	
	Co-Ral (11.6%)	1 quart	2 ounces	0	
	Rabon (50% WP)	2.66 pounds	2.5 ounces	0	
	Ravap (23% + 5.7%)	2.6 quarts	5 ounces	0	
	Permethrin EC's			0	Many formulations. Refer to labels.
Horn Flies	***Pour-ons (ready-to-use)***				
	Dectomax			45	Apply 1 milliliter per 22 pounds of body weight down back.
	Ivomec (0.5%) (and other Ivermectins)			48	Apply 1 milliliter per 22 pounds of body weight.
	Cylence			0	Apply down back line, 4 milliliters per 400 pounds of body.
	Saber			0	Apply down back line, 10 milliliters per head for cattle less than 600 pounds, 15 milliliters per head for cattle larger than 600 pounds.
	Permethrin Pour-ons			0	Many formulations. Refer to labels.
Horn Flies	***Ear Tags - Organophosphate Tags***				Treat all adult animals as per label instructions. Treatment of nursing calves not required if cows are treated. Remove tags at end of fly season or if fly populations exceed the economic threshold.
	X-Terminator (20% diazinon)			0	All ear tags will provide approximately 10 weeks of control for susceptible flies.
	Optimizer (20% diazinon)			0	For resistant horn flies, tags with an asterisk (*) are more likely to give satisfactory control.
	*Patriot (40% diazinon)			0	

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Livestock – Cattle, Hogs, Poultry, Sheep and Goats

Beef Cattle					
Pest	**Insecticides**	**To Make 50 gallons**	**To Make 3 gallons**	**Minimum Days Treatment to Slaughter**	**Remarks**
	Co-Ral Plus (20% coumaphos + 20% diazinon)			0	
	*Warrior (30% diazinon + 10% chlorpyriphos)			0	
	Dominator (20% pirimphos-methyl)			0	
	Ear Tags - Pyrethroid Tags				
	Python (zetacypermethrin 10% + PBO 20%)			0	
	Python Magnum (zetacypermethrin 10% + PBO 20%)			0	
	Cylence Ultra (beta-Cyfluthrin 8% + 20% PBO)			0	
	Saber Extra (lamdacyhalothrin 10% + PBO 13%)			0	
	Ear Tags - Chlorinated hydrocarbon (Cyclodiene) Tags				
	Avenger (endosulfan 30%)			0	
Horn Flies	***Backrubbers***				
	Co-Ral (11.6%)	29 ounce/ 3 gallons diesel fuel		0	
	Co-Ral (6.1%) (1% oil solution)	1 quart/ 3 gallons diesel fuel		0	
	Ravap (1% + 0.25% oil solution)	1 pint/ 3 gallons diesel fuel		0	
	Permethrin (0.1% oil solution)				Refer to labels.
	Lintox HD (2% oil solution)			3	Refer to labels.
Horn Flies	***Dust Bags***				
	Co-Ral 1% dust			0	
	Permethrin Dust			0	
	Python 0.075% dust			0	
	Rabon 3% dust			0	

CBD v. EPA (1:21-cv-00681-CJN) ED_005427A_00029618-00112

Livestock – Cattle, Hogs, Poultry, Sheep and Goats

Beef Cattle

Pest	Insecticides	To Make 50 gallons	To Make 3 gallons	Minimum Days Treatment to Slaughter	Remarks
Horse Flies, Stable Flies, Mosquitoes	***Sprays***				
	Pyrethrins + Synergist (1% + 10% EC)	2.5 gallons	1.25 pints.	0	Apply 1-2 quarts per animal as a wet spray every 2-3 days.
	Pyrethrins + Synergist (0.1% + 1.0% oil solution)			0	1-2 fluid ounces per animal as a mist spray daily.
	Permethrin EC's			0	Many formulations. Refer to labels.
	Effective control of horse flies, stable flies and mosquitoes with insecticides is difficult to achieve. Multiple applications may be required.				
Ticks	***Sprays***				
	Rabon (50%WP)	4 pounds	4 ounces	0	
	Ravap (23% + 5.7%EC)	1 quart	2 ounces	0	
	Amitraz (Taktic 12.5%)	1 pint	1 ounce	0	Other Amitraz formulations available.
	Co-Ral (42%) DIP	1-2 pints		0	
	Co-Ral (6.1%)	1 gallons	8 ounces	0	
	Co-Ral (11.6%)	0.5 gallons	4 ounces	0	
Lice	***Sprays***				
	Co-Ral (6.1% EC)	2 quarts	4 ounces	0	
	Co-Ral (11.6% EC)	1 quart	2 ounces	0	
	Ravap (23% + 5.7%)	2.6 quarts	5 ounces	0	
	Rabon 50%	2.66 pounds	2.5 ounces	0	
	Amitraz (12.5%) Taktic	1 pint.	1 ounce	0	Other Amitraz formulations available.
	Pour-ons (ready-to-use)				
	Ivomec 0.5% (and other Ivermectin products)			48	Apply 1 milliliter per 22 pounds of body weight.
	Dectomax			45	Apply 1 milliliter per 22 pounds of body weight.
	Cylence			0	Apply down back line 8 milliliters per 400 pounds per body weight; 24 milliliters for animals over 800 pounds
	Saber			0	Apply down back line, 10 milliliters per head for cattle less than 600 pounds; 15 milliliters per head for cattle larger than 600 pounds.
	Eprinex or Cydectin				Apply 1 milliliter per 22 pounds of 0/0 body weight along back.
	Permethrin Pour-ons			0	Many formulations. Refer to labels.

CBD v. EPA (1:21-cv-00681-CJN) ED_005427A_00029618-00113

Livestock – Cattle, Hogs, Poultry, Sheep and Goats

Beef Cattle

Pest	Insecticides	To Make 50 gallons	To Make 3 gallons	Minimum Days Treatment to Slaughter	Remarks
Mange Mites	Dectomax			45	Apply 1 milliliter per 22 pounds of body weight down back.
	Co-Ral (42%) DIP	2.5 pints/ 50 gallons as a dip		0	
	Eprinex 5 mgs./mls.			0	Apply 1 milliliter per 22 pounds of body weight down back.
	Ivomec (0.5%) and other ivermectins			48	Apply 1 milliliter per 22 pounds of body weight down back.
	Amitraz 12.5% (Tactic)	1 pint	1 ounce	0	Other Amitraz formulations available.
	Cydectin			45	Apply 1 milliliter per 22 pounds of body weight down back.
Ticks	***Ear Tags (Ear ticks only)***				
	Brand Name	***Formulation***			Apply 1 tag in each ear.
	Avenger	30% endosulfan		0	Once every 10 days. Do not treat calves under 6 months of age. Do not treat Brahman.
	Optimizer	20% diazinon		0	
	X-Terminator	20% diazinon		0	
	Patriot	40% diazinon		0	
	Co-Ral Plus	20% diazinon + 20% coumaphos		0	
	Dominator	20% pirimiphos-methyl		0	
	Cylence Ultra	8% beta-Cyfluthrin + 20% PBO		0	
	Saber Extra	10% Lambdacyhalothrin + 13% PBO		0	
	Python	10% Zetacypermethrin + 20% PBO		0	

CBD v. EPA (1:21-cv-00681-CJN) ED_005427A_00029618-00114

Livestock – Cattle, Hogs, Poultry, Sheep and Goats

Beef Cattle
Insecticide Use Precautions
Amitraz: For dairy cattle, no milk withholding period or discard time. Do not treat cattle in stress. Spray to wet and runoff.
Co-Ral 6.15%: Do not apply at rates above 1 quart per 50 gallons water to lactating or nonlactating dairy cattle within 14 days of freshening. Do not make applications within 10 days apart. Do not make more than 6 applications per year. Spray to wet and run-off.
Co-Ral 11.6%: Restricted use insecticide. Do not apply in conjunction with pyrethroid or other organic phosphate insecticides. Repeat applications as necessary. Do not apply at rates above 1 ounce per 3 gallons water to lactating or nonlactating dairy cattle within 14 days of freshening. Spray to wet and run-off.
Co-Ral 42%: Restricted use insecticide. Not labeled for lactating dairy cattle. As a dip treatment, do not make applications more than twice a year, and do not make applications less than 10 days apart.
Cydectin: Also controls certain internal parasites. Do not apply to areas of the skin with lesions, scabs or caked mud/manure. For dairy cattle, no milk withholding or discard time.
Cylence: Do not apply pour-on more than once every 3 weeks.
Dectomax: Also controls certain internal parasites. Do not apply to areas of the skin with lesions, scabs or caked mud/manure.
Eprinex: Also controls certain internal parasites. No milk withholding period and no milk discard. Do not apply to areas of hide with lesions, scabs or caked mud/manure.
Ivomec: Also controls certain internal parasites. Do not apply to areas of the skin with lesions, scabs or caked mud/manure. Do not apply to wet hide/hair or within 6 hours of rain.
Lintox-HD: Do not treat cattle younger than 3 months old.
Python Dust: For direct application. Do not apply more than every 3 days.
Permethrin: Do not treat more than once every 2 weeks. For EC solutions spray to wet and run-off. Pyrethrins: none.
Rabon: Not labeled for dairy cattle. On beef cattle, apply 0.5 to 1.0 gallon spray solution per animal.
Ravap: Do not treat more than once every 10 days. Do not treat calves less than 6 months old. Do not treat Brahman or Brahman-crossed cattle with Ravap. Spray cattle with 0.5 to 1.0 gallon diluted spray per animal. For dairy cattle, no milk discard is required. Spray dairy cattle with 0.5 gallon diluted spray per animal.
Saber: Do not treat more than once every 2 weeks or more than four times within a 6-month period.

CBD v. EPA (1:21-cv-00681-CJN) ED_005427A_00029618-00115

Livestock – Cattle, Hogs, Poultry, Sheep and Goats

Dairy Cattle (lactating)

Pest	Insecticides	To Make 50 gallons	To Make 3 gallons	Minimum Days Treatment to Slaughter	Remarks
Cattle Grubs	***Pour-on***				
	Eprinex or Cydectin			0	Apply 1 milliliter per 22 pounds of body weight along back.
Face Flies	***Dusts***				
	1% or 3% Rabon			0	Use about 10 pounds of dust per bag. Hang so bottom of bag is 30-36 inches above ground.
	Permethrin dust			0	
Horn Flies	***Sprays***				
	Permethrin			0	Many formulations. Refer to labels.
	Ravap (23% + 5.7%)	1 quart	2 ounces	0	
Horn Flies	***Backrubbers***				
	Co-Ral (6.15%) (1% oil solution)	1 quart/ 3 gallons diesel fuel		0	
	Ravap (1% + 0.25% oil solution)	1 pint/ 3 gallons diesel fuel		0	
	Permethrin (0.1% oil solution)			0	Many formulations. Refer to labels.
Horn Flies	***Dusts (ready-to-use)***				
	1% Co-Ral dust			0	Use about 10 pounds of dust per bag. Hang so bottom of bag is 30-36 inches above ground.
	Permethrin dust				
	0.075% Python dust				
Horn Flies	***Ear Tags***				
	Python and Python			0	Remove ear tags at end of fly season. If fly control with ear tags is lost, remove ear tags and use alternate recommended treatment.
	Magnum (10% zetacypermethrin + 20% PBO)				
	Cylence Ultra (8% betacyfluthrin + 20% PBO)				
Horn Flies	***Pour-ons (ready-to-use)***				
	Cylence			0	Apply down back line: 4 milliliters per 400 pounds of body weight, 12 milliliters for animals over 800 pounds.
	Eprinex or Cydectin			0	Apply 1 milliliter per 22 pounds of body weight along back.
	Permethrin Pour-ons				Many formulations. Refer to labels.

CBD v. EPA (1:21-cv-00681-CJN) ED_005427A_00029618-00116

Livestock – Cattle, Hogs, Poultry, Sheep and Goats

Dairy Cattle (lactating)					
Pest	**Insecticides**	**To Make 50 gallons**	**To Make 3 gallons**	**Minimum Days Treatment to Slaughter**	**Remarks**
Horse Flies, Stable Flies, MosquitoeS	***Sprays***				
	Pyrethins + Synergist (1% + 10% EC)	2.5 gallons	0.25 pint	0	Apply 1-2 quarts per animal; apply every 2-3 days.
	Pyrethrins + Synergist (0.1 + 1.0% oil solution)			0	Apply 1-2 ounces per animal daily as a mist.
	Permethrin EC's			0	Many formulations. Refer to labels.
	Effective control of horse flies, stable flies and mosquitoes with insecticides is difficult to achieve. Multiple applications may be required.				
Lice	***Sprays***				
	Permethrin			0	Many formulations. Refer to labels.
	Ravap (23% + 5.7%)	1 quart	2 ounces	0	
	Co-Ral (6.15%)	1 quart	2 ounces	0	
	Co-Ral (11.6%)	1 pint	1 ounce	0	
	Amitraz (Taktic) 12.5%	1 pint	1 ounce	0	Other Amitraz formulations available)
	Pour-ons (ready-to-use)				
	Permethrin Pour-on			0	Many formulations. Refer to labels.
	Cylence			0	Apply down back line: 8 milliliters per 400 pounds of body weight, 24 milliliters for animals over 800 pounds.
	Eprinex or Cydectin			0	Apply 1 milliliter per 22 pounds of body weight along back.
Mange Mites	***Spray***				
	Amitraz (Taktic) 12.5%	1 pint	1 ounce	0	Other Amitraz formulations available.
	Permethrin EC				Many formulations. Refer to labels.
Ticks	***Sprays***				
	Ravap (23% + 5.7%)	1 quart	2 ounces	0	
	Amitraz (Taktic) 12.5%	1 pint	1 ounce	0	Other Amitraz formulations available.
	Ear Tags (ear ticks only)				
	Python (zetacypermethrin 10% + PBO 20%)			0	Attach 2 ear tags to all animals in the herd.
	Cylence Ultra (8% betacyfluthrin + 20% PBO)				

CBD v. EPA (1:21-cv-00681-CJN) ED_005427A_00029618-00117

Livestock – Cattle, Hogs, Poultry, Sheep and Goats

Dairy Cattle (lactating)
Insecticide Use Precautions
Amitraz: For dairy cattle, no milk withholding period or discard time. Do not treat cattle in stress. Spray to wet and runoff.
Co-Ral 6.15%: Do not apply at rates above 1 quart per 50 gallons water to lactating or nonlactating dairy cattle within 14 days of freshening. Do not make applications within 10 days apart. Do not make more than 6 applications per year. Spray to wet and run-off.
Co-Ral 11.6%: Restricted use insecticide. Do not apply in conjunction with pyrethroid or other organic phosphate insecticides. Repeat applications as necessary. Do not apply at rates above 1 ounce per 3 gallons water to lactating or nonlactating dairy cattle within 14 days of freshening. Spray to wet and run-off.
Co-Ral 42%: Restricted use insecticide. Not labeled for lactating dairy cattle. As a dip treatment, do not make applications more than twice a year and do not make applications less than 10 days apart.
Cydectin: Also controls certain internal parasites. Do not apply to areas of the skin with lesions, scabs or caked mud/manure. For dairy cattle, no milk withholding or discard time.
Cylence: Do not apply pour-on more than once every 3 weeks.
Dectomax: Also controls certain internal parasites. Do not apply to areas of the skin with lesions, scabs or caked mud/manure.
Eprinex: Also controls certain internal parasites. No milk withholding period and no milk discard. Do not apply to areas of hide with lesions, scabs or caked mud/manure.
Ivomec: Also controls certain internal parasites. Do not apply to areas of the skin with lesions, scabs or caked mud/manure. Do not apply to wet hide/hair or within 6 hours of rain. **Lintox-HD:** Do not treat cattle younger than 3 months old.
Python Dust: For direct application. Do not apply more than every 3 days.
Permethrin: Do not treat more than once every 2 weeks. For EC solutions spray to wet and run-off. **Pyrethrins:** none.
Rabon: Not labeled for dairy cattle. On beef cattle, apply 0.5 to 1.0 gallons spray solution per animal.
Ravap: Do not treat more than once every 10 days. Do not treat calves less than 6 months old. Do not treat Brahman or Brahman-crossed cattle with Ravap. Spray cattle with 0.5 to 1.0 gallon diluted spray per animal. For dairy cattle, no milk discard is required. Spray dairy cattle with 0.5 gallon diluted spray per animal.
Saber: Do not treat more than once every 2 weeks or more than four times within a 6-month period.

CBD v. EPA (1:21-cv-00681-CJN) ED_005427A_00029618-00118

Livestock – Cattle, Hogs, Poultry, Sheep and Goats

Hogs					
Pest	**Insecticides**	**To Make 50 gallons**	**To Make 3 gallons**	**Minimum Days Treatment to Slaughter**	**Remarks**
Lice	Co-Ral (6.15% WP)	2 quarts.	4 ounces	0	
	Co-Ral 1% Dust				1 ounce per animal, evenly
	Permethrin (spray)			5	Numerous formulations. Refer to labels.
	Taktic (12.5% Amitraz)	2 quarts	1.5 ounces		Other Amitraz formulations available.
Mange Mites	Permethrin			5	Numerous formulations. Refer to labels.
	Taktic (12.5% Amitraz)	2 quarts	1.5 ounces		Other Amitraz formulations available.
Lice	Ivermectin 1%				Inject 1 milliliter per 75 pounds body weight.
Mange Mites	Injectable Ivomec				Subcutaneous injection; not for intravenous or intramuscular use.

Insecticide Use Precautions
Co-Ral: Do not make applications less than 10 days apart, and do not treat more than 6 times a year. Spray to wet and run-off.
Permethrin: Do not apply more than every 2 weeks. Spray to wet and run-off.
Ivermectin 1% Injectable: Also controls certain other internal parasites.
Amitraz: Treat animals no more than four times per year. Spray to wet and run-off. Two applications at 7- to10-day intervals for mites and 10- to14-day intervals for lice. Do not apply within 3 days of slaughter.

CBD v. EPA (1:21-cv-00681-CJN) ED_005427A_00029618-00119

Livestock – Cattle, Hogs, Poultry, Sheep and Goats

Poultry					
Pest	**Insecticides**	**To Make 50 gallons**	**To Make 3 gallons**	**Minimum Days Treatment to Slaughter**	**Remarks**
Lice	Rabon (50% WP)	4 pounds	4 ounces	0	
Mites					
	Ravap 23% + 5.3%	1 gallons	7.5 ounces	0	
	Permethrin			0	Numerous formulations. Refer to labels.
Fowl Ticks	Rabon (50% WP)	8 pounds	0.5 pound	0	

* Apply 1 gallon per 100-150 square feet to walls, ceilings and cracks and crevices.

Insecticide Use Precautions
Permethrin: Apply 1 gallon of spray solution per 100 birds. Do not apply more than every 2 weeks.
Rabon: For lice and mites, apply 1 gallon of spray solution per 100 birds. Do not reapply within 14 days.
Ravap: Apply 1 gallon of spray solution per 100 birds. Do not reapply within 14 days.

CBD v. EPA (1:21-cv-00681-CJN) ED_005427A_00029618-00120

Livestock – Cattle, Hogs, Poultry, Sheep and Goats

Sheep and Goats					
Pest	**Insecticides**	**To Make 50 gallons**	**To Make 3 gallons**	**Minimum Days Treatment to Slaughter**	**Remarks**
Keds, Lice, Ticks	Python dust (0.075%)	2 ounces per animal, evenly		0	
	Permethrin	Many formulations. Refer to labels.		0	

Insecticide Use Precautions
Python: Do not apply more than every 3 days.
Permethrin: Do not apply more than every 2 weeks. Apply 1 pint diluted spray per animal.

CBD v. EPA (1:21-cv-00681-CJN) ED_005427A_00029618-00121

Livestock – Cattle, Hogs, Poultry, Sheep and Goats

Fire Ant Management
Around Livestock Premises, Including Poultry Houses

Insecticide	Formulation	How to Apply
Amdro	Bait	2-5 tablespoons per mound or broadcast at 1-1.5 pounds per acre.
Clinch	Bait	5-7 tablespoons per mound or broadcast at 1 pound per acre.
Justice	Bait	4-6 tablespoons per mound or broadcast at 2.5-5 pounds per acre.
Extinguish Plus	Bait	2-5 tablespoons per mound or broadcast at 1.5 pounds per acre.
GuardStar	EC	Drench each mound with 1 gallon of 1% solution.
Countdown	EC/WP	Spray surfaces or drench mounds with 0.1% solution.
Grenade	EC/WP	Spray with 0.015-0.03 solution.

CBD v. EPA (1:21-cv-00681-CJN) ED_005427A_00029618-00122

Livestock – Cattle, Hogs, Poultry, Sheep and Goats

Fly Control			
Insecticides	**Chemical Class**	**How to Mix**	**Remarks**
In and Around Dairy Barns (Not Milk Rooms)			
Permethrin	Pyrethroid	Mix 0.1% spray solution as per label instructions.	Apply 1 gallon per 750 square feet. Numerous formulations: Atroban, Ectiban, Anchor, Permectrin, Gardstar, Insectrin and others.
Ectrin	Pyrethroid	Mix 2 ounces concentrate per 1.5 gallons or 1 quart. per 25 gallons	Apply 1 gallon per 750 square feet. Remove animals before spraying.
Countdown	Pyrethroid	Prepare 0.1 spray solution as per label instructions.	Inside use spot treatment only. Treat surfaces outside.
Ravap	Organophosphate	Mix 5 ounces concentrate per gallons water or 1 gallons per 25 gallons	Apply 1 gallon per 500-1,000 square feet. Remove animals before spraying and keep out for at least four hours.
Rabon	Organophosphate	Mix 4-8 pounds (see label) concentrate per 25 gallons water.	Apply 1 gallon per 500-1,000 square feet (see label). Remove animals before spraying.
Grenade WP	Pyrethroid	Prepare solution as per label instructions.	Remove animals before spraying.
Manure Treatment			
Rabon 50	Organophosphate	Mix 4 pounds in 25 gallons water. (1% solution)	Apply 1 gallon per 100 square feet. Can be repeated at 7- to 10-day intervals.
Ravap	Organophosphate	Mix 5 ounces in 1 gallon water or 1 gallon in 25 gallons water.	Apply 1 gallon per 100 square feet. Can be repeated at 7- to 10-day intervals.
Vapona	Organophosphate	Mix 2 ounces in 1.5 gallons water or1 gallons in 100 gallons water.	Apply 1-2 quarts per 100 square feet. Can be repeated at 7-day intervals.

CBD v. EPA (1:21-cv-00681-CJN) ED_005427A_00029618-00123

Ornamental and Flowering Plants

Plant and Pest	Insecticide	To Make 1 gallon	To Make 100 gallons	Remarks
BULBS				
Leaf-feeding caterpillars	Acelepryn (chlorantraniliprole)	-	1.0-2.0 ounces	Follow label. Treat when insect appears as small larvae.
	Arena 0.25G (clothianidin)	-	3.0-3.6 pounds/ 1,000 square feet	
	Arena 50WDG (clothianidin)	-	Variable	
	Sevin 10% dust (carbaryl)	-	-	
	Sevin 50% WP (carbaryl)	2.0 tablespoons	2.0 pounds	
	Conserve SC (spinosad)	0.06 fluid ounce	6.0 fluid ounces	
AFRICAN VIOLET				
Cyclaman mites	Forbid 4F (spiromesifen)		1.4-4.0 ounces	
	Ultra-Fine oil (paraffinic oil)	2/3-2.5 ounces		May be used alone for thrips, whiteflies, mealybugs, mites and aphids or in combination with the above insecticides.
	*Judo (spiromesifen)	3.0-6.0 milliliters/ 5 gallons	2.0-4.0 ounces	
ANNUAL FLOWERING PLANTS				
Aphids	Arena 0.25G (clothianidin)		3.0-3.6 pounds/ 1,000 square feet	Follow label.
	Arena 50WDG (clothianidin)			
	°°Distance 0.86 EC (pyrproxyfen)	0.5-2/3 teaspoon	6.0-12.0 ounces	
	Orthene TTO/75S (acephate)		2/3 pound	
	Orthene TTO/97S (acephate)	0.25-0.5 teaspoon	0.25 to 0.5 pound	
	Duraguard ME (chlorpyrifos)	0.5 ounce	1.0-1.5 quarts	
	*Flagship 25 WG (thiamethoxam)		2.0-4.0 ounces	For greenhouses, shade houses and field nurseries.
	Safari (dinotefuran)		4.0-8.0 ounces	
	Malathion (57% EC)	2.0 teaspoons	1.5 pints	
	Mavrik Aquaflow (tau-fluvalinate)	0.25-0.6 teaspoon	4-10 ounces	
	*Merit 75WP (imidicloprid)	1.0 teaspoon/gallon	3.5 tablespoons	
	Endeavor 50WP (pymetrozine)	1/3-2/3 teaspoon	2.5-5.0 ounces	
	Tristar 70SW (acetamiprid)		1 packet	
	Ultra-Pure oil (mineral oil)	2.5-4.0 ounces winter		
		1.0-2.5 ounces summer		
	Meridian 25WG (thiamethoxam)		2.0-8.5 ounces	Drench, 6.0-17.0 ounces/ acre.
Caterpillars	Acelepryn (chlorantraniliprole)	-	1.0-2.0 ounces	

*Professional use only; °Biological; °°IGR; WP = Wettable Powder; EC = Emulsifiable Concentrate
Note: Ultra-Pure oils and Ultra-Fine oils can be used with insecticides to enhance pest management on most ornamentals.
Rates vary with time of year. Do not spray oils during bloom.

CBD v. EPA (1:21-cv-00681-CJN) ED_005427A_00029618-00124

Ornamental and Flowering Plants

Plant and Pest	Insecticide	To Make 1 gallon	To Make 100 gallons	Remarks
	Arena 0.25G (clothianidin)	-	3.0-3.6 pounds/ 1,000 square feet	
	Arena 50WDG (clothianidin)	-		Follow label.
	Mavrik Aquaflow (tau-fluvalinate)	0.25-0.6 teaspoon	4-10 ounces	
	Sevin 50% WP (carbaryl)	2.0 tablespoons	2.0 pounds	
	Sevin 10% Dust (carbaryl)	-	-	Follow label.
	*Astro 3.2 EC (permethrin)	1.0-2.0 teaspoons/ 3.0 gallons	4.0-8.0 ounces	
	Orthene TTO/75S (acephate)		2/3 pound	
	Orthene TTO/97S (acephate)	0.25-0.5 teaspoon	0.25-0.5 pound	
	°Condor XL (*Bacillus thuringiensis*)		0.75-1.75 pints/ acre	
	°Crymax XL (*Bacillus thuringiensis*)		0.5-1.5 pounds/ acre	
Mealybugs	Same as for aphids	Same as for aphids	Same as for aphids	Treat when crawlers appear; re-treat once dry.
	Tristar 70SW (acetamiprid)		1 packet	
	Kontos (spirotetramat)	1.7-3.4oz/100	5-8 ounce/Acre	
	Celero (clothianidin)		2-4 ounce	Aphids, Whiteflies, Mealy bugs
AZALEA				
Bark scales	*Supracide 25 WP (methidathion)		2.0 pounds	
	Ultra-Pure oil (mineral oil)	2.5-4.0 ounces winter		Scales: Do not use during flowering; use only 4 times during growing season; do not use on stressed plants.
		1.0-2.5 ounces summer		
	Ultra-Fine oil (paraffinic oil)	2.5-5.0 tablespoons	1.0-2.0 gallons	
	Talstar 10W (bifenthrin)	1.0 teaspoon	0.6-1.6 ounces/10.0 gallons (3.0-8.0 tablespoons/ 10.0 gallons)	
Crotch scales, azalea mealybugs	Summer oil emulsion plus	5.0 tablespoons plus 2.0 gallons plus		Sprays for scale control are most effective if they are made during crawler stages. Spray April 1 to June 1 and October. Time of application is most important. Repeat application in 3-4 weeks.
	Malathion (57% EC)	1.0 tablespoon	2.0 pints	
	Sevin 50% WP (carbaryl)	2.0 tablespoons	2.0 pounds	
	*Supracide (methidathion)		2.0 pints	
	*Merit 75 WP (imidicloprid)	1.0 teaspoon/10.0 gallons	3.5 tablespoons	

*Professional use only; °Biological; °°IGR; WP = Wettable Powder; EC = Emulsifiable Concentrate
Note: Ultra-Pure oils and Ultra-Fine oils can be used with insecticides to enhance pest management on most ornamentals.
Rates vary with time of year. Do not spray oils during bloom.

CBD v. EPA (1:21-cv-00681-CJN) ED_005427A_00029618-00125

Ornamental and Flowering Plants

Plant and Pest	Insecticide	To Make 1 gallon	To Make 100 gallons	Remarks
	Orthene TTO/75S (acephate)		2/3 pound (10.5 ounces)	
	Orthene TTO/97S (acephate)	0.5 teaspoon		
	*Flagship (thiamethoxam)		2.0-4.0 ounces or 4.0-8.0 ounces	Not closer than 7-day intervals; for use in greenhouses, shade houses and field nurseries.
	Safari (dinotefuran)		4.0-8.0 ounces	
	Meridian 25WG (thiamethoxam)		2.0-8.5 ounces	Drench, 6.0-17.0 ounces/acre.
Leafminers, Leafrollers, Leaf tiers	Acelepryn (chlorantraniliprole)	-	1.0-2.0 ounces	Follow label.
	Arena 0.25G (clothianidin)	-	3.0-3.6 pounds/ 1,000 square feet	
	Arena 50WDG (clothianidin)	-	Variable	
	Avid 0.15 EC (abamectin)	0.5 teaspoon	8.0 ounces	
	°Azatin XL (azadirachtin)		10.0-16.0 ounces	
	*Astro 3.2 EC (permethrin)	1.0-2.0 teaspoons	4.0-8.0 ounces	
	Orthene TTO/75S (acephate)	0.5 teaspoon	4.0 ounces	
	Orthene TTO/97S (acephate)			
	°Conserve SC (spinosad)	0.06 fluid ounce	6.0 fluid ounces	
	Citation (cyromazine)	-	2.66 ounces	
	Ultra-Pure oil (mineral oil)	2.5-4.0 ounces winter		
		1.0-2.5 ounces summer		
Peony scales	Same as bark scale	Same as bark scale	Same as bark scale	Spray about May 1 to June 1. Repeat application in 3-4 weeks.
Spider mites *(all species)*	Avid 0.15 EC (abamectin)	0.25 teaspoon	4.0 ounces	Follow label instructions. Make application when mites first appear and repeat in 7-10 days. Repeat treatment as necessary when populations build up again. Alternating materials will provide better control than using the same material each time mites occur. Do not use with oils or spreader stickers. Treat when symptoms first appear.
	Malathion (57% EC)	1.0 tablespoons	1.5 pints	
	*Mesurol 75 WP (methiocarb)		0.5-1 pound/50 gallons/acre	
	Talstar 10 WP (bifenthrin)	1.0 teaspoon	3.0-8.0 tablespoons/ 10.0 gallons	
	Floramite 50% (bifenazate)	1/3-2/3 teaspoon	2.0-4.0 ounces	
	Conserve SC (spinosad)	0.2 fluid ounce	22.0 fluid ounces	

*Professional use only; °Biological; °°IGR; WP = Wettable Powder; EC = Emulsifiable Concentrate
Note: Ultra-Pure oils and Ultra-Fine oils can be used with insecticides to enhance pest management on most ornamentals.
Rates vary with time of year. Do not spray oils during bloom.

CBD v. EPA (1:21-cv-00681-CJN) ED_005427A_00029618-00126

Ornamental and Flowering Plants

Plant and Pest	Insecticide	To Make 1 gallon	To Make 100 gallons	Remarks
	Ornamite (propargite)	1.0 ounce/6.25 gallons	1.0 pound	
	Ultra-Fine oil (paraffinic oil)	2.5-5.0 tablespoons	1.0-2.0 gallons	
	*Judo (spiromesifen)		2.0-4.0 ounces	
	Ultra-Pure oil (mineral oil)	2.5-4.0 ounces winter		Do not use during flowering. Use only four times during growing season. Do not use on stressed plants.
		1.0-2.5 ounces summer		
	*Ovation SC (clofentezine)		2.0 ounces	One application per crop cycle in greenhouses, lath, shade houses, or outdoor ornamentals.
	Forbid 4F (spiromesifen)		1.4-4.0 ounces	
	Kontos (spirotetramat)	1.7-3.4 ounces/100	5-8 ounce/Acre	
	Pylon (chlorfenapyr)		2.6-5.2 ounces	
Thrips, lace bugs	Acelepryn (chlorantraniliprole)	-	2.0-4.0 ounces	Follow label.
	Arena 0.25G (clothianidin)	-	3.0-3.6 pounds/1,000 square feet	
	Arena 50WDG (clothianidin)	-	Variable	
	Malathion (57% EC)	1.0-1.5 teaspoons	1.0-1.5 pints	
	Mavrik Aquaflow (tau-fluvalinate)	0.25-0.6 teaspoon	4-10 ounces	
	*Merit 75 WP (imidicloprid)	1.0 teaspoon/ 10.0 gallons	3.5 tablespoons	
	Merit 2.5G (imidicloprid)	Rate based on plant height		
	*Astro 3.2 EC (permethrin)	1.0-2.0 teaspoons/ 3 gallons	4.0-8.0 ounces	
	Orthene TTO/75S (acephate)		2/3 pound	
	Orthene TTO/97S (acephate)	0.5 teaspoon	8.0 ounces	
	°Conserve SC (spinosad)	0.06-0.1 ounce	6.0-11.0 ounces	
	Ultra-Pure oil (mineral oil)	2.5-4.0 ounces winter		
		1.0-2.5 ounces summer		
	Zenith (imidicloprid)		1.6 ounces	
Tea scales, Camellia scales	Ultra-Fine oil (paraffinic oil)	2.5-5.0 ounces	1.0-2.0 gallons	Can be used alone or in combination with insecticides.
	*Dursban 50W (chlorpyrifos)		2.0-4.0 pounds	
	°°Distance 0.86 EC (pyrproxyfen)	2/3-1.5 teaspoons	8.0-12.0 ounces	
	Safari (dinotefuran)		8.0-12.0 ounces	

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Note: Ultra-Pure oils and Ultra-Fine oils can be used with insecticides to enhance pest management on most ornamentals.
Rates vary with time of year. Do not spray oils during bloom.

CBD v. EPA (1:21-cv-00681-CJN) ED_005427A_00029618-00127

Ornamental and Flowering Plants

Plant and Pest	Insecticide	To Make 1 gallon	To Make 100 gallons	Remarks
	Summer oil emulsion	5.0 tablespoons	2.0 gallons	
	Sevin 50% WP (carbaryl)	2.0 tablespoons	2.0 pounds	
	*Merit 75WP (imidicloprid)	2.0 teaspoons/ 10.0 gallons	3.5 tablespoons	
	Merit 2.5G (imidicloprid)	Rate based on plant height		
	Zenith (imidicloprid)		1.6 ounces	
	Meridian 25WP (thiamethoxam)		2.0-8.5 ounces	Drench, 6.0-17.0 ounces/acre.
	Orthene TTO/75S (acephate)		2/3 pound	(Crawlers only)
	Orthene TTO/97S (acephate)	0.5 teaspoon	8.0 ounces	
	*Supracide 25 WP (methidathion)		2 pounds	
	Supracide 2E (methidathion)		2.0 pints	
	°°Distance 0.86 EC (pyrproxyfen)	0.5-2/3 teaspoon	8.0-12.0 ounces	
	° Precision (fenoxycarb)	1.0-4.0 packets		
	Ultra-Pure oil (mineral oil)	2.5-4.0 ounces winter		
		1.0-2.5 ounces summer		
	Sprays for scale control are most effective if applied during the crawler stages. Prune nongrowing branches on inside of plants. Remove heavily infested leaves.			
Peony scales	Same for tea scale and camellia scale.			Prune dead and non-growing branches. Spray stems thoroughly about May to June.
Spider mites	Same for spider mites on azaleas.			Same as for azaleas.
Rust mites	Pylon (chlorfenapyr)		2.6-5.2 ounce	
	Sevin 2T (carbaryl)		2.0 pounds	
	Ultra-Pure oil (mineral oil)	2.5-4.0 ounces winter		
		1.0-2.5 ounces summer		
	Avid (abamectin)		4.0 ounces	
Aphids	Arena 0.25G (clothianidin)		3.0-3.6 pounds/ 1,000 square feet	Treat when insects appear on young spring growth.
	Malathion (57% EC)	2.0 teaspoons	1.5 pints	
	Zenith 75 (imidicloprid)		1.6 ounces	
	*Flagship 25WG (thiamethoxam)		2.0-4.0 ounces	For greenhouses, shade houses, and field nurseries.
	Safari (dinotefuran)		4.0-8.0 ounces	
	Orthene (15.6% EC) (acephate)	1.0 tablespoons	3.0 pints	

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CBD v. EPA (1:21-cv-00681-CJN) ED_005427A_00029618-00128

Ornamental and Flowering Plants

Plant and Pest	Insecticide	To Make 1 gallon	To Make 100 gallons	Remarks
	Talstar 10WP (bifenthrin)	1.0 teaspoon	3.0-8.0 tablespoons/ 10.0 gallons	
	*Merit 75WP (imidicloprid)	1.0 teaspoon/ 10.0 gallons	3.5 tablespoons	
	Orthene TTO/75S (acephate)		2/3 pound	
	Orthene TTO/97S (acephate)	0.25-0.5 teaspoon	0.25-0.5 pound	
	Endeavor 50WP (pymetrozine)	1/3-2/3 teaspoon	2.5-5.0 ounces	
	Tristar 70SP (acetamiprid)		1 packet	
	Ultra-Pure oil (mineral oil)	2.5-4.0 ounces winter		
		1.0-2.5 ounces summer		
	Meridian 25WP (thiamethoxam)		2.0-8.5 ounces	Drench, 6.0-17.0 ounces/acre.
	∞Distance IGR (pyrproxyfen)		6.0-8.0 ounces	
Cranberry root worm beetles	Sevin 10% Dust (carbaryl)	-	-	Apply in late afternoon.
	Sevin 80% WP (carbaryl)	4.0 teaspoons	1.25 pounds	
	Malathion (57% EC)	2.0 teaspoons	1.5 pints	
Euonymous scales	Same as Tea scales			Prune out dead and dying branches then spray.
CANNA LILY				
Leafrollers	Sevin 10% Dust (carbaryl)	-	-	Treat weekly as long as insects are present.
	°Azatin XL (azadirachtin)			
	Battle WP (lambda-cyhalothrin)	1.0-2.0 gms	1.2-4.8 ounces	
	Ultra-Pure oil (mineral oil)	2.5-4.0 ounces winter		
		1.0-2.5 ounces summer		
CHILI THRIPS				
Homeowners:				
	Orthene (acephate)		10 2/3 ounces	
	Merit 2F (imidacloprid)		1.5 ounce	
	Spinosad		8 ounce	
Nursery and Landscape Maintenance:				
	Tristar (acetamiprid)		3-6 sol pkg	
	Safari (dinotefuran)		3/4 -1.5 pounds	
	*Flagship (thiamethoxam)		8 ounces	
	Avid (abamectin)		8 ounces	

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CBD v. EPA (1:21-cv-00681-CJN) ED_005427A_00029618-00129

Ornamental and Flowering Plants

Plant and Pest	Insecticide	To Make 1 gallon	To Make 100 gallons	Remarks
Greenhouse Nursery and Landscape Materials:				
	Aria (flonicamid)		3-4 packets	
	Pylon (chlorfenapyr)		10-20 ounces	
	Overture (pyridalyl)		8 ounce	
CHRYSANTHEMUM				
Aphids	Arena 0.25G (clothianidin)		3.0-3.6 pounds/ 1,000 square feet	
	Talstar 10WP (bifenthrin)	1.0 teaspoon	3.0-8.0 tablespoons/ 10 gallons	Follow label.
	Malathion (57% EC)	1.0 tablespoons	1.0 quart	Treat when aphids first appear.
	Mavrik Aquaflow (tau-fluvalinate)	0.25-0.6 teaspoon.	4-10 ounces	
	*Merit 75 WP (imidicloprid)	1 teaspoon/10 gallons	3.5 tablespoons	
	Tristar 70SP (acetamiprid)		1 packet	
	Endeavor 50 WP (pymetrozine)	1/3-2/3 teaspoon/gal	2.5-5.0 ounces	
	°°Distance 0.86 EC (pyrproxyfen)	1/3-2/3 teaspoon	6.0-12.0 ounces	
	Orthene TTO/75S (acephate)		2/3 pound	
	Orthene TTO/97S (acephate)		4.0 ounces	
	Celero (clothianidin)	2-4 ounce/100		
	Ultra-Pure oil (mineral oil)	2.5-4.0 ounces winter		
		1.0-2.5 ounces summer		
	Zenith 75 (imidicloprid)		1.6 ounces	
	Safari (dinotefuran)		4.0-8.0 ounces	
	Meridian 25WG (thiamethoxam)		2.0-8.5 ounces	Drench, 6.0-17.0 ounces/acre.
Caterpillars	Acelepryn (chlorantraniliprole)		1.0-2.0 ounces	
	Arena 0.25G (clothianidin)		3.0-3.6 pounds/ 1,000 square feet	
	Sevin 10% Dust (carbaryl)	-	-	Watch for small caterpillars feeding in terminal buds or under leaves and treat when first appearing and weekly thereafter.
	Orthene TTO/75S (acephate)		2/3 pound	
	Orthene TTO/97S (acephate)		4.0 ounces	
	*Astro 3.2 EC (permethrin)	1.0-2.0 teaspoons/ 3.0 gallons	4.0-8.0 ounces	
	Conserve SC (spinosad)	0.06 fluid ounce	6.0 fluid ounces	

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CBD v. EPA (1:21-cv-00681-CJN) ED_005427A_00029618-00130

Ornamental and Flowering Plants

Plant and Pest	Insecticide	To Make 1 gallon	To Make 100 gallons	Remarks
Mealybugs	Arena 0.25G (clothianidin)		3.0-3.6 pounds/ 1,000 square feet	
	Arena 50WDG (clothianidin)			Follow label.
	Malathion (57% EC)	1.0 tablespoons	3.0 pints	Treat when insects appear. Follow label.
	Talstar 10 WP (bifenthrin)	0.6-1.6 ounces/ 10 gallons		
	Sevin 50% WP (carbaryl)	2.0 tablespoons	2.0 pounds	
	*Merit 75 WP (imidicloprid)	1 teaspoon/10 gallons	3.5 tablespoons	
	Kontos (spirotetramat)	1.7-3.4 ounces/100 gallons	5-8 ounces/Acre	
	Celero 16WSG (clothianidin)		2-4 ounces	
	Tristar 70SP (acetamiprid)		2 packet	
	Orthene TTO/75S (acephate)		2/3 pound	
	Orthene TTO/97S (acephate)		8.0 ounces	
	*Flagship 25WG (thiamethoxam)		2.0-4.0 ounces	For greenhouses, shade houses and field nurseries.
	Safari (dinotefuran)		4.0-8.0 ounces-spray	
			12.0-24.0 ounces-drench	
	Zenith 75 (imidicloprid)		1.6 ounces	
	Ultra-Pure oil (mineral oil)	2.5-4.0 ounces winter		
		1.0-2.5 ounces summer		
	Meridian 25WG (thiamethoxam)		2.0-8.5 ounces	Drench, 6.0-17.0 ounces/acre
Termites	Dursban 4 EC (chlorpyriphos)	1.0 fluid ounce	1.0 quart	
Thrips	Malathion (57% EC)	2 teaspoons	1.5 pints	Start spraying when thrips first appear.
	Safari (dinotefuran)		4.0-8.0 ounces	
	Mavrik Aquaflow (tau-fluvalinate)	0.25-0.6 teaspoon	4-10 ounces	
	*Merit 75WP (imidicloiprid)	1.0 teaspoon/10.0 gallons	3.5 tablespoons	
	Orthene TTO/75S (acephate)		2/3 pound	
	Orthene TTO/97S (acephate)		8.0 ounces	
	Overture 35WP (pyridalyl)		8.0 ounces	
	°Precision (fenoxycarb)	1.0-4.0 packets		Based on volume and square footage.
	*Mesurol 75WP (methiocarb)		0.5-1.0 pound/ 50 gallons/acre	2 sprays; 5 days apart.
	Conserve SC (spinosad)	0.06 fluid ounce	6.0 fluid ounces	

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CBD v. EPA (1:21-cv-00681-CJN) ED_005427A_00029618-00131

Ornamental and Flowering Plants

Plant and Pest	Insecticide	To Make 1 gallon	To Make 100 gallons	Remarks
	Zenith 75 (imidicloprid)		1.6 ounces	
	Spinosad		6.0-11.0 ounces	
Leafminers	Arena 0.25G (clothianidin)		3.0-3.6 pounds/1,000 square feet	
	°Citation (cyromazine)		2.66 ounces/acre	
	°Azatin XL (azadirachtin)			
	°Precision (fenoxycarb)	1.0-4.0 packets		Based on volume and square footage.
	Avid 0.15 EC (abamectin)	0.5 teaspoon	8.0 ounces	
	Conserve SC (spinosad)	0.2 fluid ounce	22.0 fluid ounces	
	*Astro 3.2 EC (permethrin)	1-2 teaspoons/ 3 gallons	4.0-8.0 ounces	
	Pounce 3.2 EC (permethrin)	1.0 teaspoon	20.0 ounces	
Spider mites	Malathion (57% EC)	1.0 tablespoons	3.0 pints	Treat when mites first begin to appear on foliage.
	Forbid 4F (spiromesifen)		1.4-4.0 ounces	
	Talstar 10 WP (bifenthrin)	1.0 teaspoon	3.0-8.0 tablespoons/ 10 gallons	
	*Mesurol 75 WP (methiocarb)		0.5-1pound/ 50 gallons/acre	
	Floramite (bifenazate)	1/3-2/3 teaspoon/gal	2.0-4.0 ounces	
	Ultra-Fine oil (parafinic oil)			
	M-PEDE (potassium salts of fatty acids)	3.0 tablespoons	0.5-2.0 gallons	
	*Judo (spiromesifen)		2.0-4.0 ounces	
	*Ovation SC (chlorfentezine)		2.0 ounces	
	Ultra-Pure oil (mineral oil)	2.5-4.0 ounces winter		One application per crop cycle in greenhouse, lath, shade houses or outdoor ornamentals.
		1.0-2.5 ounces summer		
	Avid (abamectin)		4 ounces	
CRAPE MYRTLE				
Aphids	Arena 0.25G (clothianidin)		3.0-3.6 pounds/ 1,000 square feet	
	Arena 50WDG (clothianidin)			Follow label.
	Ultra-Pure oil (mineral oil)	2.5-4.0 ounces winter		
		1.0-2.5 ounces summer		
	Talstar 10 WP (bifenthrin)	1.0 teaspoon	3.0-8.0 tablespoons/ 10 gallons	Follow label.
	Malathion (57% EC)	1.0 tablespoons	3.0 pints	Treat when aphids first appear to prevent sooty mold stain.
	Endeavor 50 WP (pymetrozine)	1/3-2/3 teaspoon/gal	2.5-5.0 ounces	

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CBD v. EPA (1:21-cv-00681-CJN) ED_005427A_00029618-00132

Ornamental and Flowering Plants

Plant and Pest	Insecticide	To Make 1 gallon	To Make 100 gallons	Remarks
	Orthene TTO/75S (acephate)		2/3 pound	Make slurry with 4.0 tablespoons Orthene and 1.0 tablespoons water. Paint band on trunks twice width of diameter in April and late May.
	°Endeavor (pymetrozine)	1/3-2/3 teaspoon	2.5-5.0 ounces	
	Malathion	1.0 tablespoon	3.0 pints	
	*Merit 75 WP (imidicloprid)	1.0 teaspoon/ 10 gallons	3.5 tablespoons	
	*Flagship 25WG (thiamethoxam)		2.0-4.0 ounces	For greenhouses, shade houses and field nurseries.
	Zenith 75 (imidicloprid)		1.6 ounces	
	Tristar 70SP (acetamiprid)		1 packet	
	Safari (dinotefuran)		4.0-8.0 ounces	
	Meridian 25WG (thiamethoxam)		2.0-8.5 ounces	Drench, 6.0-17.0 ounces/acre.
Bark scales	Arena 0.25G (clothianidin)	Follow labeled rate for drench application		When treating multi-trunk trees, measure the circumference of each trunk at breast height and add the numbers together (16 + 15 + 17 = 48 inches). Divide this number by 3 if the label for the product you are using specifies the rate based on inches of trunk diameter, rather than circumference.
	Arena 50WDG (clothianidin)	Follow labeled rate for drench application		
	Safari (dinotefuran)	Follow labeled rate for drench application		
	Merit or Bayer Advanced Garden Tree and Shrub Insect Control (imidicloprid)	Follow labeled rate for drench application		
	Meridian 25 WG (thiomethoxam)	Follow labeled rate for drench application		
DAHLIA				
Spider mites	Ultra-Pure oil (mineral oil)	2.5-4.0 ounces winter		
		1.0-2.5 ounces summer		
	Ultra-Fine oil (parafinic oil)			
	Avid 0.15 EC (abamectin)	0.25 teaspoon	4.0 ounces	
	Forbid 4F (spiromesifen)		1.4-4.0 ounces	
	Kontos (spirotetramat)	1.7-3.4 ounces/100	5-8 ounce/acre	
	Malathion (57% EC)	1.0 tablespoons	3.0 pints	
	Floramite (bifenazate)	1/3-2/3 teaspoon/gal	2.0-4.0 ounces	
Termites	Same as for Chrysanthemum			

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CBD v. EPA (1:21-cv-00681-CJN) ED_005427A_00029618-00133

Ornamental and Flowering Plants

Plant and Pest	Insecticide	To Make 1 gallon	To Make 100 gallons	Remarks
DAYLILY				
Aphids	Arena 0.25G (clothianidin)		3.0-3.6 pounds/1,000 square feet	
	Arena 50WDG (clothianidin)			Follow label.
	Ultra-Pure oil (mineral oil)	2.5-4.0 ounces winter		
		1.0-2.5 ounces summer		
	Malathion (57% EC)	1.0 tablespoons	3.0 pints	Make 3 applications of Malathion.
	Talstar 10WP (bifenthrin)	0.6-1.6 ounces/ 10 gallons		Spray 4 weeks apart beginning in January.
	°°Distance 0.86 EC (pyrproxyfen)	1/3-2/3 teaspoon	6.0-12.0 ounces	
	Orthene TTO/75S (acephate)		2/3 pound	
	Orthene TTO/97S (acephate)		8.0 ounces	
	Endeavor 50WP (pymetrozine)	1/3-2/3 teaspoon/gal	2.5-5.0 ounces	
	*Merit 75WP (imidicloprid)	1.0 teaspoon/ 10 gallons	3.5 tablespoons	
	Tristar 70WSP (acetamiprid)		1 packet/100	
	Meridian 25WG (thiamethoxam)		2.0-8.5 ounces	Drench, 6.0-17.0 ounces/acre.
Spider mites	Avid 0.15 EC (abamectin)	0.25 teaspoon	4.0 ounces	Make two applications 2-3 weeks apart when mites appear. Do not use with oils or spreader stickers.
	Floramite (bifenazate)	2.0-4.0 ounces/acre	1/3-2/3 teaspoon/gal	
	*Mesurol 75WP (methiocarb)		0.5-1 pound/50 gallons/acre	
	Ultra-Fine oil (parafinic oil)			Apply as needed up to 8 pounds/acre/ year.
	*Judo (spiromesifen)		2.0-4.0 ounces	
	Ultra-Pure oil (mineral oil)	2.5-4.0 ounces winter		
		1.0-2.5 ounces summer		
	Forbid 4F (spiromesifen)		1.4-4.0 ounces	
GARDENIA				
Whiteflies	Kontos (spirotetramat)	1.7-3.4ounces/100	5-8 ounce/acre	
	Arena 0.25G (clothianidin)	-	3.0-3.6 pounds/ 1,000 square feet	
	Arena 50WDG (clothianidin)	-		Follow label.
	Forbid 4F (spiromesifen)		2.0-4.0 ounces	
	Ultra-Pure oil (mineral oil)	2.5-4.0 ounces winter		

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Rates vary with time of year. Do not spray oils during bloom.

CBD v. EPA (1:21-cv-00681-CJN) ED_005427A_00029618-00134

Ornamental and Flowering Plants

Plant and Pest	Insecticide	To Make 1 gallon	To Make 100 gallons	Remarks
		1.0-2.5 ounces summer		
	Ultra-Fine oil (parafinic oil)	2.5-5.0 ounces	1.0-2.0 gallons	Can be used alone or in combination with insecticides.
	Zenith 75 (imidicloprid)		1.6 ounces	
	Talstar 10 WP (bifenthrin)	1.0 teaspoon	3.0-8.0 tablespoons/ 50.0 gallons	Treat when adults are emerging and laying eggs.
	*Judo (spiromesifen)		2.0-4.0 ounces	
	Astro 3.2 EC (permethrin)	1.0-2.0 teaspoons/3.0 gallons	4.0-8.0 ounces	
	*Flagship 25 WG (thiamethoxam)		2.0-4.0 ounces	For greenhouses, shade houses and field nurseries.
	*Merit 75W (imidicloprid)	1.0 teaspoon/10.0 gallons	3.5 tablespoons	
	Tristar 70SP (acetamiprid)		1 packet	
	Orthene TTO/75S (acephate)		2/3 pound	
	Orthene TTO/97S (acephate)		8.0 ounces	
	Orthene + Tame (acephate + fenpropathrin)		10 2/3 ounces	
	Endeavor 50 WP (pymetrozine)	1/3-2/3 teaspoon/gal	2.5-5.0 ounces	
	°Precision (fenoxycarb)	1.0-4.0 packets		Based on volume and square footage.
	°Azatin XL (azadirachtin)		6.0-10.0 ounces	
	°°Distance 0.86 EC (pyrproxyfen)	1/3-2/3 teaspoon	6.0-12.0 ounces	
	Summer oil emulsion	0.5 pint	2.0 gallons	Treat April 1, April 15 and October 1.
	Malathion (57% EC)	1.0 tablespoons	1.5 quarts	
	Meridian 25WG (thiamethoxam)		2.0-8.5 ounces	Drench, 6.0-17.0 ounces/acre.
	Celero (clothianidin)		3-4 ounces	
GLADIOLA				
	Spinosad		6.0-11.0 ounces	
	Zenith 75 (imidicloprid)		1.6 ounces/300	
	Overture 35WP (pyridalyl)		8 ounces/100	
	Orthene TTO/75S (acephate)		2/3 pound	Spray or dust growing plants at weekly intervals beginning when leaves are 6 inches high.
	Orthene TTO/97S (acephate)		8 ounces	
	Sevin 10% Dust (carbaryl)	--	--	
	Sevin 50% WP (carbaryl)	2.0 tablespoons	2.0 pounds	
	Safari (dinotefuran)		4.0-8.0 ounces	
	*Merit 75WP (imidicloprid)	1.0 teaspoon/10 gallons	3.5 tablespoons	

*Professional use only; °Biological; °°IGR; WP = Wettable Powder; EC = Emulsifiable Concentrate
Note: Ultra-Pure oils and Ultra-Fine oils can be used with insecticides to enhance pest management on most ornamentals.
Rates vary with time of year. Do not spray oils during bloom.

CBD v. EPA (1:21-cv-00681-CJN) ED_005427A_00029618-00135

Ornamental and Flowering Plants

Plant and Pest	Insecticide	To Make 1 gallon	To Make 100 gallons	Remarks
HOLLY				
Tea scales	*Supracide 25WP (methidathion)		2 pounds	
	Arena 0.25G (clothianidin)		3.0-3.6 pounds/ 1,000 square feet	
	Ultra-Fine oil (parafinic oil)	2.5-5.0 ounces	1.0-2.0 gallons	
San Jose scales, camellia scales	*Supracide 25WP (methidathion)		2 pounds	
	Supracide 2E (methidathion)		2.0 pints	
	Orthene TTO/75S (acephate)		2/3 pound	
	Orthene TTO/97S (acephate)		8.0 ounces	
	Meridian 25WG (thiamethoxam)		2.0-8.5 ounces	
Spider mites	Ultra-Fine oil (parafinic oil)	2.5-5.0 ounces	1.0-2.0 gallons	
	*Mesurol 75WP (methiocarb)		0.5-1.0 pound/ 50 gallons/acre	
	Forbid 4F (spiromesifen)		1.4-4.0 ounces	
	Talstar 10WP (bifenthrin)	1.0 teaspoon	3.0-8.0 tablespoons/ 50 gallons	
	Avid 0.15EC (abamectin)	0.25 teaspoon	4.0 ounces	Follow label.
	Malathion 57% EC	2.0 teaspoons	1 1/3 pounds	
	Floramite (bifenazate)	1/3-2/3 teaspoon	2.0-4.0 ounces	
	*Judo (spiromesifen)		2.0-4.0 ounces	
	Ultra-Pure oil (mineral oil)	2.5-4.0 ounces winter		
		1.0-2.5 ounces summer		
	Kontos (spirotetramat)	1.7-3.4 ounces/100 gallons	5-8 ounces/acre	
PEACH AND QUINCE, FLOWERING				
	Arena 0.25G (clothianidin)		3.0-3.6 pounds/1,000 square feet	
	Arena 50WDG (clothianidin)			Follow label.
	Talstar 10WP (bifenthrin)	1.0 teaspoon	3.0-8.0 tablespoons/ 10 gallons	Follow label.
	Orthene TTO/75S (acephate)		2/3 pound	
	Orthene TTO/97S (acephate)		8.0 ounces	
	Malathion (57% EC)	1.0 tablespoon	3.0 pints	Treat when aphids appear.
	*Merit 75 WP (imidicloprid)	1.0 teaspoon/ 10 gallons	3.5 tablespoons	

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Rates vary with time of year. Do not spray oils during bloom.

CBD v. EPA (1:21-cv-00681-CJN) ED_005427A_00029618-00136

Ornamental and Flowering Plants

Plant and Pest	Insecticide	To Make 1 gallon	To Make 100 gallons	Remarks
	Tristar 70SP (acetamiprid)		1 packet	
	Ultra-Pure oil (mineral oil)	2.5-4.0 ounces winter		
		1.0-2.5 ounces summer		
	Meridian 25WG (thiamethoxam)		2.0-8.5 ounces	Drench, 6.0-17.0 ounces/acre.
Scales	Winter oil emulsion	0.5 pint	6.0 gallons	Apply during dormant season.
	*Supracide 25WP (methidathion)		2 pounds	
POINSETTIA				
Whiteflies	Arena 0.25G (clothianidin)		3.0-3.6 pounds/1,000 square feet	
	Arena 50WDG (clothianidin)			Follow label.
	Ultra-Pure oil (mineral oil)	2.5-4.0 ounces winter		
		1.0-2.5 ounces summer		
	Forbid 4F (spiromesifen)		2.0-4.0 ounces	
	Celero (clothianidin)		3.0-4.0 ounces	
	Safari (dinotefuran)		4.0-8.0 ounces	
	Orthene TTO/75S (acephate)	1.0 teaspoon	2/3-1.0 pound	
	Orthene TTO/97S (acephate)	0.5 teaspoon	8.0-12.0 ounces	
	°°Distance 0.86 EC (pyrproxyfen)	1/3-2/3 teaspoon	6.0-12.0 ounces	
	Mavrik Aquaflow (tau-fluvalinate)	--	4.0-10.0 ounces	
	Talstar 10 WP (bifenthrin)	--	3.0-8.0 tablespoons/ 10 gallons	
	Endeavor 50% (pymetrozine)	10.0 ounces/acre		
	Tame 2.4 EC + Orthene 75S (fenpropathrin + acephate)		10 2/3 ounces + 16.0 ounces	Whiteflies only.
	Tristar 70WSP (acetamiprid)		2.0-4.0 packets	
	Meridian 25WG (thiamethoxam)		2.0-8.5 ounces	
	*Merit 75 WP (imidicloprid)	1.0 teaspoon/ 10 gallons	3.5 tablespoons	
PYRACANTHA				
Aphids, lace bugs	Arena 0.25G (clothianidin)		3.0-3.6 pounds/ 1,000 square feet	
	Ultra-Pure oil (mineral oil)	2.5-4.0 ounces winter		
		1.0-2.5 ounces summer		
	Talstar 10 WP (bifenthrin)	1.0 teaspoon	3.0-8.0 tablespoons/ 10 gallons	Follow label.

*Professional use only; °Biological; °°IGR; WP = Wettable Powder; EC = Emulsifiable Concentrate
Note: Ultra-Pure oils and Ultra-Fine oils can be used with insecticides to enhance pest management on most ornamentals.
Rates vary with time of year. Do not spray oils during bloom.

CBD v. EPA (1:21-cv-00681-CJN) ED_005427A_00029618-00137

Ornamental and Flowering Plants

Plant and Pest	Insecticide	To Make 1 gallon	To Make 100 gallons	Remarks
	Malathion (57% EC)	1.0 tablespoons	3.0 pints	When insects appear.
	Ultra-Fine oil (parafinic oil)	2.5-5.0 tablespoons	1.0-2.0 gallons	
	Orthene TTO/75S (acephate)		2/3 pound	
	Orthene TTO/97S (acephate)		8.0 ounces	
	Tristar 70WSP (acetamiprid)		1 packet	
	Meridian 25WG (thiamethoxam)		2.0-8.5 ounces	Drench, 6.0-17.0 ounces/acre.
	*Merit 75 WP (imidicloprid)	1.0 teaspoon/ 10 gallons	3.5 tablespoons	
ROSE				
Aphids	Arena 0.25G (clothianidin)		3.0-3.6 pounds/ 1,000 square feet	
	Ultra-Pure oil (mineral oil)	2.5-4.0 ounces winter		
		1.0-2.5 ounces summer		
	Zenith 75 (imidicloprid)		1.6 ounces/300	
	*Merit 75 WP (imidicloprid)	1.0 teaspoon/ 10 gallons	3.5 tablespoons	
	Talstar 10 WP (bifenthrin)	1.0 teaspoon	3.0-8.0 tablespoons/ 10 gallons	Follow label.
	Malathion (57% EC)	1.0 tablespoons	3.0 pints	When insects appear.
	Meridian 25WG (thiamethoxam)		2.0-8.5 ounces	Drench, 6.0-17.0 ounces/acre.
	Tristar 70WSP (acetamiprid)		1 packet	
	Ultra-Fine oil (parafinic oil)	2.5-5.0 tablespoons	1.0-2.0 gallons	
	Safari (dinotefuran)		4.0-8.0 ounces	
	Orthene TTO/75S (acephate)		2/3 pound	
	Orthene TTO/97S (acephate)		8.0 ounces	
Spider mites	M-PEDE (potassium salts of fatty acids)	3.0 tablespoons	0.5-2.0 gallons	
	*Mesurol 75 WP (methiocarb)		0.5-1.0 pound/ 50 gallons/acre	
	Malathion (57% EC)	1.0 tablespoons	3.0 pints	When mites appear.
	Talstar 10 WP (bifenthrin)	1.0 teaspoon	3.0-8.0 tablespoons/ 10 gallons	Follow label.
	Avid 0.15 EC (abamectin)	0.25 teaspoon	4.0 ounces	
	Floramite (bifenazate)	0.5-2/3 teaspoon/gal	2.0-4.0 ounces/acre	
	Ultra-Fine oil (parafinic oil)	2.5-5.0 tablespoons	1.0-2.0 gallons	
	*Judo (spiromesifen)		2.0-4.0 ounces	

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Rates vary with time of year. Do not spray oils during bloom.

CBD v. EPA (1:21-cv-00681-CJN) ED_005427A_00029618-00138

Ornamental and Flowering Plants

Plant and Pest	Insecticide	To Make 1 gallon	To Make 100 gallons	Remarks
	Ultra-Fine oil (parafinic oil)	2.5-5.0 tablespoons	1.0-2.0 gallons	
	Ultra-Pure oil (mineral oil)	2.5-4.0 ounces winter		
		1.0-2.5 ounces summer		
	Forbid 4F (spiromesifen)		1.4-4.0 ounces	
Thrips – outside/ greenhouse	Orthene TTO/75S (acephate)		2/3 pound	
	Orthene TTO/97S (acephate)		4.0 ounces	
	Orthene + Tame (acephate + fenpropathrin)		10 2/3 ounces	
	Sevin 10% Dust (carbaryl)	--	--	Treat plants at 3-day intervals when buds begin to show. Make 2 applications, 5 days apart; alternate with other materials.
	Sevin 50% WP (carbaryl)	2.0 tablespoons	2.0 pounds	
	*Mesurol 75 WP (methiocarb)		0.5-1.0 pound/ 50 gallons acre	
	Mavrick 2E (tau-fluvalinate)	0.25-0.5 teaspoon	2.0-5.0 ounces	
	Malathion (57% EC)	1.0 tablespoons	1.0 quart	
	*Merit 75 WP (imidicloprid)	1.0 teaspoon/ 10 gallons	3.5 tablespoons	
	Spinosad		6.0-11.0 ounces	
	Overture 35WP (pyridalyl)		8 ounce	
Beetles	Sevin 10% Dust (carbaryl)	-		Apply when damage appears on foliage.
	Sevin 50% WP (carbaryl)	2.0 tablespoons	2.0 pounds	
	Battle (lambda-cyhalothrin)		1.5-5.0 ounces	
Stinging caterpillars	Acelepryn (chlorantraniliprole)		1.0-2.0 ounces	
	Arena 0.25G (clothianidin)		3.0-3.6 pounds/ 1,000 square feet	
	Sevin Carbaryl (10% Dust) (carbaryl)	-	-	Apply when damage appears on foliage.
	Sevin Carbaryl (50% WP) (carbaryl)	2.0 tablespoons	2.0 pounds	
	Orthene TTO/75S (acephate)		2/3 pound	
	Orthene TTO/97S (acephate)		8.0 ounces	
	*Astro 3.2 EC (permethrin)	1.0-2.0 teaspoons/ 3 gallons	4.0-8.0 ounces	
	Pounce 3.2 EC (permethrin)	0.5 teaspoon	4.0-8.0 ounces	
	°Condor XL (*Bacillus thuringiensis*)		0.75-1.75 pints/acre	Caterpillars only.

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Rates vary with time of year. Do not spray oils during bloom.

CBD v. EPA (1:21-cv-00681-CJN) ED_005427A_00029618-00139

Ornamental and Flowering Plants

Plant and Pest	Insecticide	To Make 1 gallon	To Make 100 gallons	Remarks
	°Crymax XL (*Bacillus thuringiensis*)		0.5-1.5 pounds/acre	
	DeltaGard GC (deltamethrin)	1.0 teaspoon	4.0-8.0 ounces	
	Ultra-Pure oil (mineral oil)	2.5-4.0 ounces winter		
		1.0-2.5 ounces summer		

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CBD v. EPA (1:21-cv-00681-CJN) ED_005427A_00029618-00140

Ornamental and Flowering Plants

Greenhouse				
Plant and Pest	**Insecticide**	**To Make 1 gallon**	**To Make 100 gallons**	**Remarks**
Greenhouse-Grown Ornamentals				
Thrips, whiteflies, mealybugs, scales, caterpillars, sawflies, fungus gnats, aphids	Forbid 4F (spiromesifen)		1.4-4.0 ounces	White flies only.
	Arena 0.25G (clothianidin)		3.0-3.6 pounds/1,000 square feet	
	Arena 50WDG (clothianidin)			Follow label.
	Tristar 70WSP (acetamiprid)		1-4 packets	
	°Azatin XL (azadirachtin)		10.0-16.0 ounces	
	*Astro 3.2EC (permethrin)		1.0-2.0 teaspoons/ 3 gallons/4.0-8.0 ounces	
	Pedestal (novaluron)		6.0-8.0 ounces	Whiteflies, thrips, caterpillars.
	Marathon 1% G (imidicloprid)	3.0 pounds/cubic yard of growing media		Follow label for amounts to use in individual containers.
	Ultra-Fine oil (parafinic oil)	2.5-5.0 tablespoons/gal		Follow label.
	Marathon 60WP (imidicloprid)			Follow label.
	Marathon II (imidicloprid)			Follow label.
	°Precision (fenoxycarb)		2.0-8.0 ounces	Thrips, scales, gnats, whiteflies; repeat at 7-day intervals as needed.
	*Flagship (thiamethoxam)		2.0-4.0 ounces	
	°Conserve SC (spinosad)	0.06-0.1 ounce	6.0-11.0 ounces	
	°°Ornazin (IGR) (azadirachtin)	0.25 teaspoon-0.5 teaspoon	8.0-16.0 ounces	
	Endeavor 50% (pymetrozine)	1/3-2/3 teaspoon or 2.5-5.0 ounces or 10.0 ounces/acre		Aphids, whiteflies.
Leafminers	°Conserve SC (spinosad)	0.2 fluid ounce	22.0 fluid ounces	
	Pedestal (novaluron)		6.0-8.0 ounces	
Mites				
Spider mites	Forbid 4F (spiromesifen)		2.0-4.0 ounces	
Broad mites	Ultra-Fine oil (parafinic oil)	2.5-5.0 tablespoons		Follow label for plants covered. Use in rotation with other miticides; no more than 2 consecutive applications; 3 total per year per crop.
	Pylon (chlorfenapyr)	0.25 teaspoon-0.5 teaspoon	2.6-5.2 ounces	
Cyclamen mites	Tetrasan 5WDG (etoxazole)		8.0-16.0 ounces	
Rust mites	Avid 0.15EC (abamectin)	2/3 teaspoon	4.0 ounces	
	Endeavor 50% (pymetrozine)	1/3-2/3 teaspoon or 2.5-5.0 ounces		Aphids and whiteflies. Not for carnation, dianthus, calanchoe, poinsettia, rose, salvia, zinnia; do not

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CBD v. EPA (1:21-cv-00681-CJN) ED_005427A_00029618-00141

Ornamental and Flowering Plants

Greenhouse				
Plant and Pest	**Insecticide**	**To Make 1 gallon**	**To Make 100 gallons**	**Remarks**
		or 10.0 ounces/acre		spray with oil, fertilizer or surfactants.
	Endeavor (pymetrozine)	1/4-1/2 teaspoon or 2.5-5.0 ounces or 10.0 ounces/acre		
	Floramite SC (bifenazate)	2/3-1.5 teaspoons	4.0-8.0 ounces	
	Talstar F (bifenthrin)	0.12-0.4 ounces	12.0-40.0 ounces	
Beet armyworms loopers, thrips leafhoppers leafminers	Acelepryn (chlorantraniliprole)	1.0-2.0 ounces		Caterpillars only.
	°Condor XL (*Bacillus thuringiensis*)	0.75-1.75 pints/acre		Caterpillars only.
	°Citation (cyromazine) (Leafminers)		2.66 ounces/100/acre	
	°Conserve SC (spinosad)	0.06-0.1 ounce	6.0-11.0 ounces	Thrips: use lower rates. Caterpillars and leafminers: use higher rates.
Whiteflies	Forbid 4F (spiromesifen)		2.0-4.0 ounces	Whiteflies only.
Greenhouse Roses				
Armyworms, leafrollers, loopers, spider mites, whiteflies, fungus gnats, thrips	Tristar 70WSP (acetamiprid)		1-4 packets/100	
	Pounce 3.2 EC (permethrin)		8.0 ounces (0.2 pounds/A.I.)	Follow label for varieties.
	*Astro 3.2 EC (permethrin)		4.0-8.0 ounces	
	*Mesurol 75 WP (methiocarb)		0.5-1.0 pound/ 50 gallons/acre	
	Attain TR (bifenthrin)			Release based on square footage.
	1300 Orthene TR (acephate)		8.0 ounces	
	Preclude TR (fenoxycarb)			
	Orthene TTO/75S (acephate)			
	Ultra-Pure oil (mineral oil)	2/3-2.5 ounces	0.5-2.0 gallons	
	Ultra-Fine oil (parafinic oil)	2/3-2.5 ounces	0.5-2.0 gallons	
	oConserve SC (spinosad)		6.0-11.0 ounces/100	
	Flagship 25WG (thiamethoxam)		8 ounces/acre	
Outside				
Imported fire ants	Transport (acetamiprid + bifenthrin)	1 packet		Perimeter treatment – 1,000 square feet; follow label.
	Over'n Out (fipronil)	2.0 pounds/1,000 square feet		

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CBD v. EPA (1:21-cv-00681-CJN) ED_005427A_00029618-00142

Ornamental and Flowering Plants

Greenhouse				
Plant and Pest	**Insecticide**	**To Make 1 gallon**	**To Make 100 gallons**	**Remarks**
	Orthene TTO/75S (acephate)	2.0 teaspoons/mound		Apply dry formulation as a dust to tops of mounds. Distribute as evenly as possible.
	Orthene TTO/75S (acephate)	1.0-2.0 ounces in 5.0 gallons water		Apply 1 gallon of finished mixture to mound covering 3-4-square-foot area around mound; may burn grass slightly.
	Top Choice (fipronil)	87.0 pounds/acre		
	Chipco Choice (fipronil)	12.5 pounds/acre	4.3 ounces/1,000 square feet	Follow label.
	Gardstar (permethrin)	5.0-10.0 milliliters/ gallon/mound		Follow label.

Nursery Stock (Field Grown)

Greenhouse				
Plant and Pest	**Insecticide**	**To Make 1 gallon**	**To Make 100 gallons**	**Remarks**
Beet armyworms, loopers, thrips, leafhoppers, leafminers, whiteflies	Acelepryn (chlorantraniliprole)	-	2.0-4.0 ounces	Caterpillars.
	Arena 0.25G (clothianidin)	-	133-160 pounds/ acre	
	Astro 3.2EC (permethrin)		1.0-2.0 teaspoons/ 3 gallons/4.0-8.0 ounces	
	Avid 1.5 EC (abamectin)			
	°Crymax (*Bacillus thuringiensis*)			Caterpillars only.
	Pounce 3.2EC (permethrin)		4.0-8.0 ounces	Do not spray Salvia, Dieffenbachia or Pteris fern.
	Endeavor 50% (pymetrozine)		10.0 ounces/acre	Aphids, whiteflies.
	Talstar 10 WP (bifenthrin)	1.0-2.0 tablespoons	1.7-3.5 ounces	
	Judo (spiromesifen)		2.0-4.0 ounces	Mites or whiteflies only.
Whiteflies, aphids, thrips, caterpillars, fungus gnats, sawflies	°°Ornazin (IGR) (azadirachtin)	0.25-0.5 teaspoon	8.0-16.0 ounces	
Aphids, whiteflies	Endeavor (pymetrozine)	0.25-0.5 teaspoon	2.5-5.0 ounces 10.0 ounces/acre	
Fire ants	Talstar T&O 0.2G, Flowable (bifenthrin)			Varies with bulk density of potting media.
	°°Distance (pyrproxyfen)	1.0-4.0 tablespoons/mound Apply at 0.35 to 0.5 ounce/1,000 square feet		Not approved as quarantine treatment. Varies with bulk density of potting media.

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CBD v. EPA (1:21-cv-00681-CJN) ED_005427A_00029618-00143

Ornamental and Flowering Plants

Greenhouse				
Plant and Pest	**Insecticide**	**To Make 1 gallon**	**To Make 100 gallons**	**Remarks**
	Extinguish (methoprene)	3.0-5.0 tablespoons/mound to perimeter of 4 feet		
Imported fire ants	Meridian 25WG (thiamethoxam)	-	12.7-17.0 ounces/acre	1.0 gallons/6 inch, drench mound; larger use – 2.0-3.0 gallons, drench.
	Amdro or Siege fire ant bait (hydramethylnon)	1.0 to 1.5 pounds/acre or 5 level teaspoons/mound		Broadcast uniformly with ground equipment. Prolonged exposure to air will turn oil base rancid. Close container tightly after use. Use within 3 days after opening; apply when ants are active; distribute uniformly 3-4 feet around base of mound.
	Astro (permethrin))	17.0-34.0 ounces/acre, 0.4-0.8 ounce/ 1,000 square feet		
	Firestar (fipronil)	1.5-15.0 pounds/acre		
	Organic Solution Fire Ant Killer			Follow label.
	PT 370 Ascend (Clinch/Varsity)	5.0-7.0 tablespoons/mound or 1.0 pound/acre		Turf, lawns, noncrop areas
	Citrex			Organic.
	Citrex	8.0 ounces/gallon		Mound treatment.
	°°Logic 1% (Award)	1.0-1.5 pounds/acre	1.0-3.0 tablespoons/mound	Follow label.
	Talstar G (bifenthrin)	100-200 pounds/acre	2.3-4.6 ounces/ 1,000 square feet	
	Talstar F (bifenthrin)	0.5-10.0 ounces/acre	20.0-40.0 ounces/ acre	
	Scimitar GS, CS (lambda-cyhalothrin)	3.4-7.0 milliliters/1,000 square feet		Submerge container or ball until completely saturated. Do not remove container, burlap or plastic.
	Battle GS (lambda-cyhalothrin)	3.0-6.0 gms/1,000 square feet or 5.0-10.0 ounces/acre		
	Ceasefire (bifenthrin)	0.5-5.5 ounces/1,000 square feet or 1.5-15.0 pounds/acre		
	°Conserve SC (spinosad)	0.1 ounce	1.0 ounce/ 10 gallons	
		1.0-2.0 gallons/mound depending on size		

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CBD v. EPA (1:21-cv-00681-CJN) ED_005427A_00029618-00144

Ornamental and Flowering Plants

Greenhouse

Plant and Pest	Insecticide	To Make 1 gallon	To Make 100 gallons	Remarks
	Advion fire ant bait (indoxacarb)	0.5 ounces/1,000 square feet	1.5 pounds/acre	Do not disturb mounds prior to treatment
	Orthene TTO/75S (acephate)	2 teaspoons/mound		Mound treatment only. Apply dry formulation as a dust to tops of mounds; distribute as evenly as possible.
	Sevin 50WP (carbaryl)	3.0 pounds/100 gallons		Apply 2.0 gallons solution over mound.
	Sevin SL (carbaryl)	1.5 quarts/100 gallons		Thoroughly wet mound and surrounding area to 4-foot diameter.
	Sevin 80S (carbaryl)		2.0 pounds	For best results, apply in cool weather.
	Sevin XLR Plus (carbaryl)	3.0 tablespoons/2.0 gallons/mound		65 F-80 F early morning or late evening hours.
	Amdro Pro (hydramethylnon)			
	°°Distance (pyrproxyfen)	1.5 pounds/acre		
	°°Logic/Award II (abamectin)	1.5 pounds/acre		
	Grenade ER (lambda-cyhalothrin)	0.2-0.4 ounce/gal		
	Premise (imidicloprid)	1.0-1.5 pounds/acre		
	Esteem (pyriproxyfen)	2.0-4.0 tablespoons/mound	2.0 pounds/acre	
	°°Distance 0.86EC (pyrproxyfen)	3.0-4.0 tablespoons/mound Apply at 0.35 to 0.5 ounces/1,000 square feet		Not approved as quarantine treatment.
	°°Extinguish (methoprene)	3.0-5.0 tablespoons/mound to perimeter of 4.0 feet or 1.0-1.5 pounds/acre		Follow label.
	°°Extinguish Plus (methoprene + hydramethylnon)	Same as Extinguish		These 2 are a combination of Amdro and Extinguish.
Whiteflies	Talstar 10WP (bifenthrin)	1.0 tablespoon/2.0 gallons 3.0-8.0 tablespoons/10 gallons		Follow label.
Two-spotted mites	Endeavor 50% (pymetrozine)	-	10.0 ounces/acre	Mites only.
	°Conserve SC (spinosad)	0.2 ounce	22.0 ounces/acre	
Mealybugs	Judo (spiromesifen)	2.0-4.0 ounces or 4.0-8.0 ounces		Aphids and whiteflies.
Aphids	*Flagship (thiamethoxam)	-	2.0-4.0 ounces	Mealybugs and aphids.

*Professional use only; °Biological; °°IGR; WP = Wettable Powder; EC = Emulsifiable Concentrate
Note: Ultra-Pure oils and Ultra-Fine oils can be used with insecticides to enhance pest management on most ornamentals.
Rates vary with time of year. Do not spray oils during bloom.

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Ornamental and Flowering Plants

Greenhouse				
Plant and Pest	**Insecticide**	**To Make 1 gallon**	**To Make 100 gallons**	**Remarks**
Leafrollers	Talstar 10WP (bifenthrin)	3.0-8.0 tablespoons/4 gallons 5.0-12.0 tablespoons/10 gallons		
Pill bugs	Transport (acetamiprid + bifenthrin)	1 packet/1,000 square feet/acre		Follow label.
	Astro (permethrin)		4.0-8.0 ounces	Ants, aphids, worms, thrips, gnats, mealybugs, whiteflies.
	*Mesurol 75WP (methiocarb)	0.5-1.0 pound/50 gallons/acre		
Armyworms	Acelepryn (chlorantraniliprole)		2.0-4.0 ounces/ acre	
	Arena 0.25G (clothianidin)		80-160 pounds/acre	
	°Azatin XL (azadirachtin)	5.0-16.0 ounces/acre		Caterpillars only.
	°Crymax (*Bacillus thuringiensis*)	0.5-1.5 pounds/acre		Caterpillars only.
	°Condor XL (*Bacillus thuringiensis*)	0.75-1.75 pints/acre		Caterpillars only.
	*Mesurol 75WP (methiocarb)	0.5-1.0 pound/50 gallons/acre		
	Talstar 10WP (bifenthrin)	2.0 tablespoons (5.0-12.0 tablespoons/ 10 gallons)		
Mites	Avid 0.15EC (abamectin)		8.0 ounces	
	Floramite (bifenazate)	1/3-2/3 teaspoons	2.0-4.0 ounces/acre	
	Talstar 10WP (bifenthrin)	2.0 tablespoons	5.0-12.0 tablespoons/ 10 gallons	
	Conserve SC (spinosad)	0.2 ounce	22.0 ounces/acre	
	TetraSan 5WDG (etoxazole)		8.0-16.0 ounces/ acre	
Grasshoppers	Decathlon 20WP (cyfluthrin)		1.3-1.9 ounces	Greenhouse and nursery.
Crickets	Orthene TTO/97S (acephate)	0.5 ounce/1,000 square feet	1.31 pounds/acre	
	Sevin SL (carbaryl)	1.5-3.0 ounces/1,000 square feet	2.0-4.0 quarts/acre	
	Scimitar (lambda-cyhalothrin)	3.4-7.0 milliliters/ 1,000 square feet	5.0-10.0 ounces/acre	
	DeltaGard 5SC (deltamethrin)	0.4-0.6 ounce/1,000 square feet	17.5-26.0 ounces/acre	
	Battle (lambda-cyhalothrin)	1.5-5.0 ounces/93 gallons		
	Tempo 20WP (beta-cyfluthrin)	5.0 gms/93 gallons		

*Professional use only; °Biological; °°IGR; WP = Wettable Powder; EC = Emulsifiable Concentrate
Note: Ultra-Pure oils and Ultra-Fine oils can be used with insecticides to enhance pest management on most ornamentals.
Rates vary with time of year. Do not spray oils during bloom.

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Ornamental and Flowering Plants

Greenhouse				
Plant and Pest	**Insecticide**	**To Make 1 gallon**	**To Make 100 gallons**	**Remarks**
	Tempo SC Ultra (beta-cyfluthrin)		1.5-5.4 ounces	
Millipedes, centipedes	Transport (acetamiprid + bifenthrin)	1 packet/1,000 square feet		Follow label.

*Professional use only; °Biological; °°IGR; WP = Wettable Powder; EC = Emulsifiable Concentrate
Note: Ultra-Pure oils and Ultra-Fine oils can be used with insecticides to enhance pest management on most ornamentals.
Rates vary with time of year. Do not spray oils during bloom.

CBD v. EPA (1:21-cv-00681-CJN) ED_005427A_00029618-00147

Ornamental and Flowering Plants

Pink Hibiscus Mealybug Control Strategies and Current Chemical Control Recommendations

The following list of recommendations by the LSU AgCenter shows products that may be effective in treating pink hibiscus mealybug (*Maconellicoccus hirsutis*) in nurseries or stock dealers. Additional materials will be added, as available. For additional product information, labeled rates or guidelines for application, contact the local LSU AgCenter extension service office.

Chemical	Application Method	Rate	Interval	Comments
For Quarantine Treatments				
Imidacloprid (such as Marathon) Dinotefuran (such as Safari) Thiamethoxam (such as Flagship)	Soil drench	See label rates	Initial treatment	Soil drench must be followed by a foliar application of either Bifenthrin, Chlorpyrifos, or Acephate.
Bifenthrin (such as Talstar)	Foliar application	See label rates	Following Imidacloprid Treatment	Apply with Ultra-Fine oil or other oil; follow-up treatments as needed.
Acephate (such as Orthene)	Foliar application	See label rates	Following Imidacloprid Treatment	May be applied in conjunction with Bifenthrin unless phytotoxicity prohibits.
For Preventative/Prophylactic Treatments*				
Acephate (such as Orthene)	Foliar application	See label rates	As needed	Follow-up treatments as needed.
Acetamiprid (such as Tristar) Thiamethoxam (such as Flagship)	Foliar application	See label rates	As needed	Apply with Ultra-Fine oil or other oil; follow-up treatments as needed.
Bifenthrin (such as Talstar)	Foliar application	See label rates	As needed	Apply with Ultra-Fine oil or other oil.
Imidacloprid (Marathon-Merit)				Follow-up treatments as needed.
Buprofezin (such as Talus) IGR	Foliar application	See label rates	As needed	Follow-up treatments as needed.
Imidacloprid + Cyfluthrin (such as Discus)	Foliar application	See label rates	As needed	Follow-up treatments as needed.
Insecticidal soaps	Foliar application	See label rates	As needed	Follow-up treatments as needed.
Pesticidal oils, Ultra-Fine oils	Foliar application	See label rates	As needed	Follow-up treatments as needed.
Pyrproxyfen (such as Distance) IGR	Foliar application	See label rates	As needed	Apply with Ultra-Fine oil or other oil; follow-up treatments as needed.
Dinotefuran (such as Safari)				

***Note:** Limited information is available concerning phytotoxicity of these products. Test on a few plants before application, or consult the Extension Service agent. When using new materials, phytotoxicity trials should be conducted in your nursery under your specific conditions. The use of trade names in this publication is solely for the purpose of providing specific information. The LSU AgCenter does not guarantee or warrant the products named and references to them in this publication. It does not signify our approval to the exclusion of other products of suitable composition. All chemicals should be used in accordance with directions on the manufacturer's label. Use pesticides safely. Read and follow directions on the manufacturer's label.

pH adjustments should be made for each spray application. Use a digital pH pen for accurate reading. Where needed, add a buffer to water mix, and re-check until pH is between 5.5 and 6.5 before adding insecticide to water. The average pH for Louisiana is 8.3 with a range of 4.6-12.0.

*Professional use only; °Biological; °°IGR; WP = Wettable Powder; EC = Emulsifiable Concentrate
Note: Ultra-Pure oils and Ultra-Fine oils can be used with insecticides to enhance pest management on most ornamentals.
Rates vary with time of year. Do not spray oils during bloom.

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Mosquito Control Products

(Professional Applicators)

MOSQUITO LARVICIDES		
Active ingredient	**Formulation**	**Product Names**
Bacillus thuringiensis isrealiensis	Granules and pellets	Aquabac 200G, Aquabac 400G, Fourstar WSP, Fourstar SBG, Teknar CG, Teknar G, VectoBac GR, VectoBac GS, VectoPrime FG
	Aqueous suspension	Aquabac XT, Teknar SC, Teknar HP-D
	Briquets	Fourstar Briquets (45 and 180 days), Fourstar Sustained release briquettes (45 and 150 day)
Bacillus sphaericus	Granules	VectoLex CG, VectoLex FG, VectoLex WDG, Spheratax SPH
	Water-soluble pouch	VectoLex WSP
***Bacillus thuringiensis isrealiensis* and *Bacilllus sphaericus* combined**	Granules	VectoMax FG or CG, Fourstar CRG, Fourstar MBG,
	Water-soluble pouch	VectoMax WSP
	Briquets	Fourstar Briquets (90 days)
Methoprene (insect growth regulator)	Liquid larvicide	Altosid Liquid Larvicides (SR-5 and SR-20)
	Pellet	Metalarv S-PT, Altosid Pellets, Altosid Pellets WSP
	Briquets	Altosid 30 day Briquet, Altosid XR Briquet
	granules	Altosid XR-G, Altosid SBG-II
Larviciding oils	Monomolecular surface films	Agnique MMF (*discontinued*)
	Petroleum distillates	Cocobear, BVA 2, Kontrol Mosquito Larvicide
Spinosad	Emulsifiable concentrate	Natular 2EC
	Tablet	Natular DT, Natular T30, Natular XRT
	Granule	Natular G, Natular G30

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Mosquito Control Products

Adult Mosquitoes	
Insecticide	**Comments and Application Instructions**
Residual Spray	
Permanone (10% permethrin)	Mix 1.3 fluid ounces per gallon of water
Demand CS (9.7% lamdacyhalothrin)	Mix 0.2 to 0.4 fluid ounce per gallon water.
Suspend SC (4.75% deltamethrin)	Mix 0.75 to 1.5 fluid ounces per gallon of water.
Talstar (7.9% bifenthrin)	Mix 0.1 to 0.21 fluid ounce per gallon of water.
Thermal Fog-Ground	
Fyfanon ULV (95% malathion)	Dilute at rate of 6-8 ounces per gallon of fuel oil. Apply at rate of 80 gallons per hour at 10 mph.
ULV Ground (Nonthermal)	
Fyfanon ULV (95% malathion)	Apply 2.0 to 4.3 fluid ounces per minute at 10 mph.
DeltaGard (Deltamethrin)	Check label for rates and application instructions.
Scourge (Resmethrin 4% + PBO 12%)	Check label for rates and application instructions.
(Resmethrin 18% + PBO 54%)	
Permethrin + PBO (several brand names and formulations[1])	Check labels for rates and application instructions.
Anvil (Sumithrin + PBO)	Check label for rates and application instructions.
Zenivex (Etofenprox, non-ester pyrethroid)	Check label for rates and application instructions.
Pyrethrins + PBO (Pyrenone and MGK products)	Check label for application instructions
Duet (Phenothrin + Prallethrin)	Check label for application instructions
ULV Aerial Application	
Permethrin + PBO (several brand names and formulations[1])	Check labels for application instructions.
Fyfanon ULV (96.5%)	Apply 2.6-3.0 fluid ounces of undiluted product per acre.
Dibrom (87.4% naled)	Apply 0.5-1.0 fluid ounce of undiluted product per acre.
Scourge (Resmethrin 4% + PBO 12%)	Check label for application instructions.
(Resmethrin 18% + PBO 54%)	
Pyrethrins + PBO (Pyrenone and MGK products)	Check label for application instructions.

[1] Aqua-Reslin, Aqua-Kontrol, some Permanone formulations

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Rats and Mice

CAUTION: All rodenticides are toxic to humans and animals to some degree; therefore, exercise care in use of such materials. The manufacturer's directions on the label regarding the use of the material should be followed explicitly. It is recommended that all rodenticides be placed in tamperproof bait stations.

Rodent	Damage	Rodenticides and Treatment	Remarks
Norway rats, roof rats	Consume and contaminate foodstuffs and animal feed. Damage crops in fields prior to harvest and during storage and processing. Rats cause structural damage to buildings by gnawing and burrowing. Rats also may damage wiring, plumbing, and insulation in buildings. Rats may transmit disease to humans and livestock such as marine typhus, leptospirosis, trichinosis, salmonellosis and rat-bite fever.	Talon and Havoc (Brodifacoum) - Treat inside farm buildings and in homes. May be secondarily toxic to small pets. Highly toxic to dogs if eaten accidentally. Place at least 3 ounces of bait wherever rodents are present. Keep bait available at all times.	Remove all food and shelter before treatment begins. Store bulk food in rodent-proof containers. Rat-proof all buildings by sealing all holes and holes and openings larger than 0.5 inch. Sanitation and proper storage help control rats. Supplement preventive control with baiting and traps. Traps may be used where rodenticides cannot be exposed. Placing all rodenticides in tamper-proof bait stations will reduce the hazard of exposure to livestock, pets and small children.
		Rozol (Chlorophacinone) - Same-may be used outdoors; is less hazardous to pets.	
		Maki and Contrac (Bromadiolone) Ramik or Ditrac (Diphacinone) Fastrac (Bromethalin) Zinc or ZP Rodent Bait AG (Zinc Phosphide) - Single dose poison for noncrop areas; toxicant should be used only once for population reduction prior to using other baits.	
House mice	Mice consume and contaminate foodstuffs and animal feed. They can cause damage in feed mills, ware-houses, bakeries, markets, and homes. Mice living in fields may dig up newly planted seed and can cause structural damage to insulation inside walls and attics of buildings. Mice often make nests in electrical appliances and may chew up wiring. Mice can also carry the same diseases as rats.	Havoc and Talon (Brodifacoum)	Effective prevention and control of house mouse damage involves three aspects: rodent-proof construction, sanitation and population reduction using traps and rodenticides. Since mice may hide anywhere and do not move very far from their nests, bait or traps should be placed every 5-10 feet in heavily infested areas. Glue boards and traps may be used to capture mice where poison baits are not acceptable. Placing baits in tamper-proof bait stations will reduce the hazard of exposure to livestock, pets and small children.
		Maki, Contrac (Bromadiolone)	
		Ramik, Ditrac	
		Vengeance – (Bromethalin)	

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Town Ants

Material	Rate of Application	Remarks
Amdro Ant Block (Hydramethylnon)	0.75 pound/colony	These ants are foliage feeders and do not sting. They will strip the foliage off ornamentals, vegetables and trees. The foliage is then chewed and used to grow a fungus that is the primary food source for the ants. Colonies can cover small areas or larger ones — up to 5 or 6 acres.
Christmas tree seedling or pine tree seedling plantations only – **PTM** (Fipronil)	2% dilution of PTM in water. Mix 2.6 oz. of PTM in 125 oz of water. Inject 1.5 fl. oz. of the dilution at least 3 inches below ground into each leaf cutter ant exit hole. Do not apply more than 21 fl. oz. PTM per acre, within 100 feet of water, or to trees grown for pine nuts.	

CBD v. EPA (1:21-cv-00681-CJN) ED_005427A_00029618-00152

Trees (Forest, Shade and Christmas)

Host and Pest	Pesticide	Rate	Remarks
ASH			
Aphids	Arena 0.25G		
	Ultra-Pure Oil	2.0-4.0 gallons/100 gallons	
	Distance IGR	6.0-8.0 ounces/100 gallons	
	Flagship	2.0-4.0 ounces or 4.0-8.0 ounces/100 gallons	
	Orthene TTO/75S	4.0 ounces/100 gallons	Treat foliage when aphids appear; repeat at 7-to 10-day intervals, if needed.
		5.3 ounces/100 gallons	
	Meridian 25WG	2.0-8.5 ounces/100 gallons	
	Talstar 10WP	1.0 tablespoons/gallon or 3.0-8.0 tablespoons/10 gallons	
	Malathion 57% EC	1.5 pints/100 gallons or 1.5 teaspoons/gallon	
	Merit 75WP	1.0 teaspoon/10.0 gallons or 3.5 tablespoons/100 gallons	
	Ultra-Fine Oil	1.0-2.0 gallons/100 gallons	
	Zenith 75	1.6 ounces/300 gallons	
	Insecticidal soap		Entire foliage or affected portion of tree must be soaked to ensure adequate coverage of insects.
Borers	Acelepryn	4.0-32.0 ounces/100 gallons	Selected borers.
	Permethrin SFR	2.0-5.0 quarts/100 gallons	
	Phaser 50WP	1.0-2.0 pounds/100 gallons	Apply in spring when buds begin to break; repeat in 10-14 days; materials may be injected into tunnels and sealed in with mud or clay.
	Astro	2.0-5.0 quarts/100 gallons	
Emerald ash borer	Tree-Age	Follow Label	Trunk injection, mid- to late spring after trees have leafed out; follow directions for tree size.
	Imicide	Follow Label	Trunk injection, mid- to late spring after trees have leafed out; follow directions for tree size.
	Merit 2F	Follow Label	Soil injection or drench, early to mid-spring or mid-fall.
	Merit 75WP	Follow Label	Soil injection or drench, early to mid-spring or mid-fall.
	Xytect 2F	Follow Label	Soil injection or drench, early to mid-spring or mid-fall.
	Xytect 75WSP	Follow Label	Soil injection or drench, early to mid-spring or mid-fall.
	Astro	Follow Label	Trunk, branch and foliage spray; two applications at 4 week intervals; first spray at 45-55 F degree-days.
	Onyx	Follow Label	Trunk, branch and foliage spray; two applications at 4 week intervals; first spray at 45-55 F degree-days.
	Tempo SC Ultra	Follow Label	Trunk, branch and foliage spray; two applications at 4 week intervals; first spray at 45-55 F degree-days.
	Bayer Advanced Tree and Shrub Insect Control	Follow Label	Soil drench, early to mid-spring; available to homeowners.
	Optrol	Follow Label	Soil drench, early to mid-spring; available to homeowners.

*Professional use only, °Biological.
Ultra-Fine Oil or Ultra-Pure Oil can be used with insecticides to enhance control of many tree insects and mites.

CBD v. EPA (1:21-cv-00681-CJN) ED_005427A_00029618-00153

Trees (Forest, Shade and Christmas)

Host and Pest	Pesticide	Rate	Remarks
Caterpillars	Acelepryn	1.0-2.0 ounces/100 gallons	
	Ultra-Fine Oil	1.0-2.0 gallons/100 gallons	
	°Confirm	2.0-8.0 ounces/acre	
	°Conserve SC	0.06 ounce/gallon	
	(Spinosad)	6.0 ounces/100 gallons	
	°Condor XL	0.75-1.75 pints/acre	Caterpillars only.
	Dylox 80%SP	20.0-30.0 ounces/100 gallons	
	(Proxol) LS	2.0-3.0 pints/100 gallons or 2.0-3.0 teaspoons/gallon	
	Ultra-Pure Oil	2.0-4.0 gallons/100 gallons	
	°Crymax	0.5-1.5 pounds/acre	Caterpillars only.
	Marlate 50WP	2.0-3.0 pounds/100 gallons or 2.0 teaspoons/gallon	
	Orthene 97S/TTO	8.0 ounces/100 gallons	
	75S/TTO	10.5 ounces/100 gallons	
	°*Bacillus thuringiensis* (B.t.)		Javelin, Biobit, Thuricide, Foray 48B, Condor, Xentari, and Dipel; follow label.
	°Spintor 2	3.0-8.0 ounces/acre	
	Malathion 57% EC	2.0 pints/100 gallons or 2.0 teaspoons/gal	
	°Dipel	1.0 teaspoon/gal	Use or repeat as needed.
	Imidan 70%	0.75-1.0 pound/100 gallons	Adjust pH to 5.5.
Scales	Arena 0.25G	3.0-3.6 pounds/1,000 square feet	
	Ultra-Pure Oil	2.0-4.0 gallons/100 gallons	
	Flagship	4.0-8.0 ounces/100 gallons	
	Superior oil (60%-70%)	2.0 gallons/100 gallons or 5.0 tablespoons/gal	
	Zenith 75	1.6 ounces/300 gallons	
	Malathion 57% EC	1.0-1.5 pints/100 gallons or 1.0 teaspoon/gal	Apply when crawlers appear; repeat in10 days.
	Ultra-Fine Oil	2.0-5.0 gallons/100 gallons	Dormant in summer.
	Distance IGR	8.0-12.0 ounces/100 gallons	
	Carbaryl	2.0 pounds/100 gallons	
	Carbaryl 50WP	2.0 tablespoons/gal	
	Carbaryl 4F	1.0 quart/100 gallons or 1.0 tablespoons/gal	
	Orthene TTO/75S	10.5 ounces/100 gallons	
	97S	8.0 ounces/100 gallons	
	*Supracide 2E	2.0 pints/100 gallons	
		2.0-4.0 pounds/acre 8-16 (4 ounce packets)	
	Insecticidal soap		Entire foliage or affected portion of tree must be soaked to ensure adequate coverage of insects.
BEECH			
Aphids	Arena 0.25G	3.0-3.6 pounds/1,000 square feet	
	Ultra-Pure Oil	0.7-1.0 gallon/100 gallons	

*Professional use only, °Biological.
Ultra-Fine Oil or Ultra-Pure Oil can be used with insecticides to enhance control of many tree insects and mites.

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Trees (Forest, Shade and Christmas)

Host and Pest	Pesticide	Rate	Remarks
	Ultra-Fine Oil	1.0-2.0 gallons/100 gallons	
	Distance IGR	6.0-8.0 ounces/100 gallons	
	Flagship	2.0-4.0 ounces/100 gallons	
	Orthene TTO/75S	5.3 ounces/100 gallons	
	97S	4.0 ounces/100 gallons	
	Talstar 10 WP	1.0 tablespoon/gallon or 3.0-8.0 tablespoons/10 gallons	
	Malathion 57% EC	1.5 pints/100 gallons or 1.5 teaspoons/gal	
	Meridian 25WG	2.0-8.5 ounces/100 gallons	
	Merit 75WP	1.0 teaspoon/10.0 gallons or 3.5 tablespoons/100 gallons	
	Insecticidal soap		Entire foliage or affected portion of tree must be soaked to ensure adequate coverage of insects.
Lace bugs	Acelepryn	Variable with plant size	Follow label.
	Arena 0.25G	3.0-3.6 pounds/1,000 square feet	
	Ultra-Pure Oil	2.0-4.0 gallons/100 gallons	
	Ultra-Fine Oil	2.0-5.0 gallons/100 gallons	
	Orthene TTO/75S	5.3 ounces/100 gallons	
	97S	4.0 ounces/100 gallons	
	Carbaryl	2.0 pounds/100 gallons	
	Carbaryl 50WP	2.0 tablespoons/gal	
	Carbaryl 4F	1.0 quart/100 gallons or 1.0 tablespoons/gal	
	Malathion 57% EC	1.0 pint/100 gallons or 1.0 tablespoons/gal	
	Merit 75WP	1.0 teaspoon/10.0 gallons or 3.5 tablespoons/100 gallons	
	*Disyston 15G	25.0-27.0 ounces/tree or 2.5 ounces/ inch of trunk diameter	
Caterpillars	Acelepryn	1.0-2.0 ounces/100 gallons	
	Ultra-Pure Oil	2.0-4.0 gallons/100 gallons	
	Ultra-Fine Oil	2.0-5.0 gallons/100 gallons	
	Confirm 2F	2.0-8.0 ounces/acre	
	°Conserve (Spinosad)	0.06 ounce/gal	
		6.0 ounces/100 gallons	
	Orthene TTO/75S	5.3 ounces/100 gallons	
	97S	8.0 ounces/100 gallons	
	°Spintor 2	3.0-8.0 ounces/acre	
	Carbaryl	2.0 pounds/100 gallons	
	Carbaryl 50WP	2.0 tablespoons/gal	
	Malathion 57% EC	2.0 pints/100 gallons or 2.0 teaspoons/gal	
	Imidan 70WP	0.75-1 pound/100 gallons	
	°Crymax	0.5-1.5 pounds/acre	
	°Condor XL	0.75-1.75 pounds/acre	
Scales	Ultra-Pure Oil	2.0-4.0 gallons/100 gallons	

*Professional use only, °Biological.
Ultra-Fine Oil or Ultra-Pure Oil can be used with insecticides to enhance control of many tree insects and mites.

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Trees (Forest, Shade and Christmas)

Host and Pest	Pesticide	Rate	Remarks
	Ultra-Fine Oil	2.0-5.0 gallons/100 gallons	
	Distance IGR	8.0-12.0 ounces/100 gallons	
	Flagship	4.0-8.0 ounces/100 gallons	
	Superior oil	2.0 gallons/100 gallons or	
	60%-70%	5.0 tablespoons/gal	
	Malathion 57% EC	1.0-1.5 pints/100 gallons	Apply when crawlers appear and repeat in 10 days.
	Carbaryl	2.0 pounds/100 gallons	
	Carbaryl 50WP	2.0 tablespoons/gal	
	Carbaryl 4F	1.0 quart/100 gallons or 1.0 tablespoons/gal	
	Orthene TTO/75S	10.5 ounces/100 gallons	
	97S	8.0 ounces/100 gallons	
	Insecticidal soap		Entire foliage or affected portion of tree must be soaked to ensure adequate coverage of insects.
RIVER BIRCH			
Aphids	Arena 0.25G	3.0-3.6 pounds/1,000 square feet	
	Ultra-Fine Oil	0.7-1.0/gal	
	Ultra-Fine Oil	1.0-2.0 gallons/100 gallons	
	Distance IGR	6.0-8.0 ounces/100 gallons	
	Flagship	2.0-4.0 ounces/100 gallons	
	Orthene TTO/75S	5.3 ounces/100 gallons	Treat foliage when aphids appear.
	97S	4.0 ounces/100 gallons	
	Talstar 10WP	1.0 teaspoon/gallon or 3.0-8.0 tablespoons/10 gallons	
	Malathion 57% EC	1.5 pints/100 gallons or 1.5 teaspoons/gal	
	Meridian 25WG	2.0-8.5 ounces/100 gallons	
	*Merit 75WP	1.0 teaspoon/10 gallons or 3.5 tablespoons/100 gallons	
	Insecticidal soap		**Entire foliage or affected portion of tree must be soaked to ensure adequate coverage of insects.**
Scales			Same as ash.
Bronze birch borers			Same as ash.
Sawflies	Orthene	5.3 ounces/100 gallons	
	Ultra-Pure Oil	0.75-1 gallon/100 gallons	
	Ultra-Fine Oil	1.0-2.0 gallons/100 gallons	
	Merit 74WP	1.0 teaspoon/10 gallons or 3.5 tablespoons/100 gallons	
	°Spinosad	2.0 ounces/gallon or 22.0 ounces/100 gallons	
Leafminers	Acelepryn	Variable	Follow label.
	°Conserve SC	0.2 ounce/gallon or 22.0 ounces/ 100 gallons	
	Malathion 57% EC	1.0 quart/100 gallons or 2.0 tablespoons/gal	
	Orthene TTO/75S	5.3 ounces/100 gallons	

*Professional use only, °Biological.
Ultra-Fine Oil or Ultra-Pure Oil can be used with insecticides to enhance control of many tree insects and mites.

CBD v. EPA (1:21-cv-00681-CJN) ED_005427A_00029618-00156

Trees (Forest, Shade and Christmas)

Host and Pest	Pesticide	Rate	Remarks
	97S	4.0 ounces/100 gallons	
	°Spintor 2	3.0-8.0 ounces/acre	
Eastern tent caterpillars	Acelepryn	1.0-2.0 ounces/100 gallons	
Yellowneck caterpillars			
	Ultra-Pure Oil	0.75-1.0 gallons/100 gallons	
	Ultra-Fine Oil	1.0-2.0 gallons/100 gallons	
	Tempo 2	1.0-2.0 ounces/100 gallons	
	Carbaryl	2.0 pounds/100 gallons	Spray foliage and tent as needed in the spring.
	50WP	2.0 tablespoons/gal	
	Confirm 2F	2.0-8.0 ounces/acre	
	°Conserve (Spinosad)	0.06 ounce/gallon	
		6.0 ounces/100 gallons	
	Malathion	2.0 pints/100 gallons or 2.0 teaspoons gallons	
	°Spintor 2	3.0-8.0 ounces/acre	
	Imidan 70WP	0.75-1.0 pound/100 gallons	Adjust pH to 5.5.
	°B.t.		Javelin, Foray, Biobit, Thuricide, Dipel, Crymax, Condor XL; follow label.
	Orthene TTO/75S	5.3 ounces/100 gallons	Spray as needed.
	97S	4.0 ounces/100 gallons	
BOXELDER			
Boxelder aphids	Malathion 57% EC	1.5 pints/1,000 gallons or 1.5 teaspoons/gallon	Treat when insects are present.
Boxelder bugs	Carbaryl	2.0 pounds/100 gallons	Primarily a house pest during warm days in fall, winter and spring; spraying tree trunks and young insects when they appear before home invasion reduces the nuisance.
	Carbaryl 50WP	2.0 tablespoons/gallon	
	Carbaryl 4F	1.0 quart/100 gallons or 1.0 tablespoons/gallon	
CEDAR			
Bagworms	Acelepryn	1.0-2.0 ounces/100 gallons	
	Orthene TTO/75S	1/3 pound/100 gallons	Spray foliage in early June when bags are small; repeat in 10 days; handpick older larvae; spray in late afternoon.
	97S	4.0 ounces/100 gallons	
	Scimitar GS, CS	1.5-5.0 ounces/100 gallons	
	°Spintor 2	3.0-8.0 ounces/acre	
	Battle WP	1.2-4.8 ounces/100 gallons	
	°B.t.		Same as ash.
	Malathion 57% EC	2.0 pints/100 gallons or 2.0 teaspoons/gallon	
	Carbaryl	2.0 pounds/100 gallons	
	Carbaryl 50WP	2.0 tablespoons/gallon	
	Dylox 80% SP	20.0-30.0 ounces/100 gallons	

*Professional use only, °Biological.
Ultra-Fine Oil or Ultra-Pure Oil can be used with insecticides to enhance control of many tree insects and mites.

CBD v. EPA (1:21-cv-00681-CJN) ED_005427A_00029618-00157

Trees (Forest, Shade and Christmas)

Host and Pest	Pesticide	Rate	Remarks
	LS	2.0-3.0 pints/100 gallons or 2.0-3.0 teaspoons/gal	
Mites	Forbid 4F	1.4-4.0 ounces/100 gallons	
	Ultra-Pure Oil	0.75-1.0 gallons/100 gallons	
	Ultra-Fine Oil	1.0-2.0 gallons/100 gallons	
	°Conserve SC(Spinosad)	0.2 fluid ounce/gallon	
		22.0 ounces/100 gallons	
	*Judo	2.0-4.0 ounces/100 gallons	
	Mesurol 75WP	0.5-1.0 pound/acre	
	*Dicofol 35% WP (Kelthane)	1.0-1 1/3 pounds/100 gallons	
		1.5 tablespoons/gallon	
	Talstar 10WP	1.0-2.0 tablespoons/gallon or 3.0-8.0 tablespoons/10 gallons	
CHERRY			
Eastern tent caterpillars	Acelepryn	1.0-2.0 ounces/100 gallons	
	Carbaryl	2.0 pounds/100 gallons	Spray when webs first appear; cut webs out, if practical.
	Carbaryl 50WP	2.0 tablespoons/gallon	
	Carbaryl 4F	1.0 quart/100 gallons or 1.0 tablespoons/gallon	
	Confirm 2F	2.0-8.0 ounces/acre	
	°Conserve (Spinosad)	0.06 ounce/gal	
		6.0 ounces/100 gallons	
	Orthene TTO/75S	1/3 pound/100 gallons	
	97S	4.0 ounces/100 gallons	
	°Spintor 2	3.0-8.0 ounces/acre	
Fall webworms	Confirm 2F	2.0-8.0 ounces/acre	
	Dylox 80% SP	20.0-30.0 ounces/100 gallons	
	(Proxol) LS	2.0-3.0 pints/100 gallons or 2.0-3.0 teaspoons/gallon	
	°Spintor 2 (Spinosad)	3.0-8.0 ounces/acre	
	Malathion 57% EC	2.0 pints/100 gallons or 2.0 teaspoons/gallon	
	°B.t.		Same as ash.
CHINABERRY			
Scales			Same as ash.
Whiteflies	Forbid 4F	2.0-4.0 ounces/100 gallons	
	Ultra-Pure Oil	0.75-1.0 gallon/100 gallons	
	Ultra-Fine Oil	1.0-2.0 gallons/100 gallons	
	Safari	4.0-8.0 ounces/100 gallons	Drench 12-24 ounces/100 gallons water.
	Flagship	4.0-8.0 ounces/100 gallons	
	°°Distance 0.86 EC	6.0-8.0 ounces/100 gallons	
	Meridian 25WG	2.0-8.5 ounces/100 gallons	

*Professional use only, °Biological.
Ultra-Fine Oil or Ultra-Pure Oil can be used with insecticides to enhance control of many tree insects and mites.

CBD v. EPA (1:21-cv-00681-CJN) ED_005427A_00029618-00158

Trees (Forest, Shade and Christmas)

Host and Pest	Pesticide	Rate	Remarks
	Orthene TTO/75S	10.5 ounces/100 gallons	
	97S	8.0 ounces/100 gallons	
	Talstar 10WP	1.0-2.0 tablespoons/gallon or 3.0-8.0 tablespoons/10 gallons	
	*Merit 75 WP	1.0 teaspoon/10 gallons or 3.5 tablespoons/100 gallons	
CYPRESS			
Scales			Same as ash.
Mites	Forbid 4F	1.4-4.0 ounces/100 gallons	
	Ultra-Pure Oil	0.75-1.0 gallons/100 gallons	
	Ultra-Fine Oil	1.0-2.0 gallons/100 gallons	
	Judo	2.0-4.0 ounces/100 gallons	
	*Kelthane 35% WP	1.0-1 1/3 pounds/100 gallons	
	(Dicofol)	1.5 tablespoons/gallon	
	Talstar 10WP	1.0-2.0 tablespoons/gallon or 3.0-8.0 tablespoons/10 gallons	
	*Mesurol 75WP	0.5-1.5 pounds/acre	
DOGWOOD			
Webworms	Acelepryn	1.0-2.0 ounces/100 gallons	
	Carbaryl	2.0 pounds/100 gallons	
	Carbaryl 50WP	2.0 tablespoons/gal	
	Sevin 4F	1.0 quart/100 gallons	
	Orthene TTO/75S	10.5 ounces/100 gallons	
	97S	4.0 ounces/100 gallons	
	*Imidan 70WP	0.75-1.0 pound/100 gallons	Adjust pH to 5.5.
Dogwood borers, dogwood twig borers			Same as ash.
ELM			
Aphids	Arena 0.25G	3.0-3.6 pounds/1,000 square feet	
	Ultra-Pure Oil	0.75-1.0 gallon/100 gallons	
	Ultra-Fine Oil	1.0-2.0 gallons/100 gallons	
	Distance IGR	6.0-8.0 ounces/100 gallons	
	Flagship	2.0-4.0 ounces/100 gallons	
	Talstar 10WP	1.0-2.0 tablespoons/gallon or 3.0-8.0 tablespoons/10 gallons	
	Orthene TTO/75S	5.3 ounces/100 gallons	
	97S	4.0 ounces/100 gallons	
	*Merit 75WP	1.0 teaspoon/10 gallons or 3.5 tablespoons/100 gallons	
	Malathion 57% EC	1.5 pints/100 gallons or 1.5 teaspoons/gal	
	Meridian 25WG	2.0-8.5 ounces/100 gallons	
	Zenith 75	1.6 ounces/300 gallons water	
	Insecticidal soap		Entire foliage or affected portion of tree must be soaked to ensure adequate coverage of insects.
Elm bark beetles	Ultra-Pure Oil	0.75-1.0 gallon/100 gallons	

*Professional use only, °Biological.
Ultra-Fine Oil or Ultra-Pure Oil can be used with insecticides to enhance control of many tree insects and mites.

CBD v. EPA (1:21-cv-00681-CJN) ED_005427A_00029618-00159

Trees (Forest, Shade and Christmas)

Host and Pest	Pesticide	Rate	Remarks
	Ultra-Fine Oil	1.0-2.0 gallons/100 gallons	
	°Conserve SC	0.06 ounce/gallon or 6.0 ounces/ 100 gallons	
Elm leaf beetles	Ultra-Pure Oil	0.75-1.0 gallon/100 gallons	
	Ultra-Fine Oil	1.0-2.0 gallons/100 gallons	
	Carbaryl	2.0 pounds/100 gallons	Spray foliage when larvae first appear about the time leaves are fully expanded; repeat in 2 weeks.
	Carbaryl 50WP	2.0 tablespoons/gal	
	Carbaryl 4F	1.0 quart/100 gallons	
	Scimitar GS, CS	1.5-5.0 ounces/100 gallons	
	Battle WP	1.2-4.8 ounces/100 gallons	
	*Merit 75WP	1.0 teaspoon/gallon or 3.5 tablespoons/100 gallons	
	Zenith 75	1.6 ounces/300 gallons	
	Orthene TTO/75S	10.5 ounces/100 gallons	Do not spray on American elm.
	97S	8.0 ounces/100 gallons	
Caterpillars	Acelepryn	1.0-2.0 ounces/100 gallons	
	Carbaryl	2.0 pounds/100 gallons	Spray foliage and web when web is first noticed.
	Carbaryl 50WP	2.0 tablespoons/gallon	
	Carbaryl 4F	1.0 quart/100 gallons or 1.0 tablespoons/gallon	
	Confirm 2F	2-8 ounces/acre	
	°Conserve (Spinosad)	0.06 ounce/gallon or 6 ounces/ 100 gallons	
	Marlate	2.0 tablespoons/gallon	
	Orthene TTO/75S	10.5 ounces/100 gallons	
	97S	8.0 ounces/100 gallons	
	Dylox 80% SP	20.0-30.0 ounces/100 gallons	
	LS	2.0-3.0 pints/100 gallons or 2.0-3.0 teaspoons/gal	
	°B.t.		Same as ash; follow label.
	*Ficam W	11.0 ounces/100 gallons	
	Tempo 2	1.0-2.0 ounces/100 gallons	
	*Imidan 70WP	0.75-1.0 pound/100 gallons	
	Scimitar GS, CS	1.5-5.0 ounces/100 gallons	
	°Spintor 2 (Spinosad)	3.0-8.0 ounces/acre	
	Battle WP	1.2-4.8 ounces/100 gallons	
Scales			Same as ash.
GUM			
Scales			Same as ash.
Caterpillars			Same as elm.
HAWTHORN			
Aphids	Arena 0.25G	3.0-3.6 pounds/1,000 square feet	
	Ultra-Pure Oil	0.75-1.0 gallon/100 gallons	

*Professional use only, °Biological.
Ultra-Fine Oil or Ultra-Pure Oil can be used with insecticides to enhance control of many tree insects and mites.

CBD v. EPA (1:21-cv-00681-CJN) ED_005427A_00029618-00160

Trees (Forest, Shade and Christmas)

Host and Pest	Pesticide	Rate	Remarks
	Ultra-Fine Oil	1.0-2.0 gallons/100 gallons	
	Safari	4.0-8.0 ounces/100 gallons	
	Distance IGR	6.0-8.0 ounces/100 gallons	
	Flagship	2.0-4.0 ounces/gal	
	Malathion 57% EC	1.5 pints/100 gallons or 1.5 teaspoons/gal	
	Meridian 25WG	2.0-8.5 ounces/100 gallons	
	Thiodan 2EC	1.0 quart/100 gallons or 2.0 tablespoons/3 gallons	Do not use near home or treat birch.
	Orthene TTO/75S	5.3 ounces/gallon or 4.0 ounces/100 gallons	
	Meridian 25 WG	2.0-8.5 ounces/100 gallons	
	*Merit 75WP	1.0 teaspoon/10 gallons or 3.5 tablespoons/100 gallons	
	Acelepryn	1.0-2.0 ounces/100 gallons	
	Arena 0.25G	3.0-3.6 pounds/1,000 square feet	
	Ultra-Pure Oil	0.75-1.0 gallon/100 gallons	
	Ultra-Fine Oil	1.0-2.0 gallons/100 gallons	
	Carbaryl	2.0 pounds/100 gallons	Treat when small nymphs appear (May through September); repeat at 7- to 10-day intervals, if needed.
	Carbaryl 50WP	2.0 tablespoons/gallon	
	Carbaryl 4F	1.0 quart/100 gallons or 1.0 tablespoons/gallon	
	Malathion 57% EC	1.0 pint/100 gallons or 1.0 teaspoon/gal	
	*Merit 75WP	1.0 teaspoon/10 gallons or 3.5 tablespoons/100 gallons	
	*Disyston 15G	25.0-27.0 ounces/tree or 2.5 ounces/inch of trunk diameter	
	Orthene TTO/75S	5.3 ounces/100 gallons	
	97S	4.0 ounces/100 gallons	
	Zenith 75	1.6 ounces/300 gallons	
	Insecticidal soap		Entire foliage or affected portion of tree must be soaked to ensure adequate coverage of insects.
Spider mites	Forbid 4F	1.4-4.0 ounces/100 gallons	
	Ultra-Pure Oil	0.75-1.0 gallon/100 gallons	
	Ultra-Fine Oil	1.0-2.0 gallons/100 gallons	
	Judo	2.0-4.0 ounces/100 gallons	
	Conserve SC	0.2 ounce/gallon or 22.0 ounces/ 100 gallons	
	*Dicofol 35% WP	1.0-1 1/3 pounds/100 gallons	Treat when mites are present; repeat at 7- to10-day intervals, if needed.
	(Kelthane)	1.5 tablespoons/gal	
	Floramite	2.0-4.0 ounces/100 gallons	
	*Mesurol 75WP	0.5-1.5 pounds/acre	
	Avid 0.15EC	8.0 ounces/100 gallons	

*Professional use only, °Biological.
Ultra-Fine Oil or Ultra-Pure Oil can be used with insecticides to enhance control of many tree insects and mites.

CBD v. EPA (1:21-cv-00681-CJN) ED_005427A_00029618-00161

Trees (Forest, Shade and Christmas)

Host and Pest	Pesticide	Rate	Remarks
	Tetram 5WDG	16.0-32.0 ounces/acre or 8.0-16.0 ounces	Does not affect adults but will cause sterilization; effective against young mites; can only be used two times a year; to control adults use adulticide; for use in greenhouse, lath and shade house only.
HICKORY			
Twig girdler	Sanitation		Gather and destroy all severed branches in fall or winter.
Caterpillars	Acelepryn	1.0-2.0 ounces/100 gallons	
	Carbaryl	2.0 pounds/100 gallons	Treat when larvae are present.
	Carbaryl 50WP	2.0 tablespoons/gallon	
	Carbaryl 4F	1.0 quart/100 gallons or 1.0 tablespoons/gal	
	°Conserve SC	0.06 ounce/gallon or 6.0 ounces/ 100 gallons	
	Malathion 57% EC	2.0 pints/100 gallons or 2.0 teaspoons/gallon	
	Tempo 2	1.0-2.0 ounces/100 gallons	
	*Imidan 70WP	0.75-1.0 pound/100 gallons	Adjust water pH to 5.5.
	°B.t.		Same as ash. Follow label.
	Scimitar GS, CS	1.5-5.0 ounces/100 gallons	
	°Spintor 2	3.0-8.0 ounces/acre	
	Orthene TTO/75S	5.3 ounces/100 gallons	
	97S	4.0 ounces/100 gallons	
Eriophyid mites	Forbid 4F	1.4-4.0 ounces/100 gallons	
	Ultra-Pure Oil	0.75-1.0 gallon/100 gallons	
	Ultra-Fine Oil	1.0-2.0 gallons/100 gallons	
	*Judo	2.0-4.0 ounces/100 gallons	
	Carbaryl	2.0 pounds/100 gallons	
	Carbaryl 50WP	2.0 tablespoons/gallon	
	Carbaryl 4F	1.0 quart/100 gallons or 1.0 tablespoon/gallon	
	Talstar	0.25-0.5 ounce/1,000 square feet or 10.0-20.0 ounces/acre	
HOLLY			
Southern red Spider mites	Forbid 4F	1.4-4.0 ounces/100 gallons	
	Ultra-Pure Oil	0.75-1.0 gallon/100 gallons	
	Ultra-Fine Oil	1.0-2.0 gallons/100 gallons	
	Judo	2.0-4.0 ounces/100 gallons	
	Avid 0.15EC	8.0 ounces/100 gallons	
	Conserve SC	0.2 ounce/gallon or 22.0 ounces/ 100 gallons	
	Floramite	1/3-2/3 teaspoon/gallon or 2.0-4.0 ounces/100 gallons	
	*Mesurol 75WP	0.5-1.5 pounds/acre	
	Citation	2.66 ounces/100 gallons	

*Professional use only, °Biological.
Ultra-Fine Oil or Ultra-Pure Oil can be used with insecticides to enhance control of many tree insects and mites.

CBD v. EPA (1:21-cv-00681-CJN) ED_005427A_00029618-00162

Trees (Forest, Shade and Christmas)

Host and Pest	Pesticide	Rate	Remarks
Leafminers	Permethrin SFR	4.0-8.0 ounces/100 gallons	
	Avid 0.15EC	0.5 teaspoon/gallon or 8.0 ounces/100 gallons	Apply to leaves when new growth begins; a common pest of American holly sometimes occurring on English holly.
	*Merit 75WP	1.0 teaspoon/10 gallons water or 3.5 tablespoons/100 gallons	
	°Conserve (Spinosad)	0.2/gallon	
		22.0 ounces/100 gallons	
	Zenith 75	1.6 ounces/300 gallons	
JUNIPER			
Bagworms	Acelepryn	1.0-2.0 ounces/100 gallons	
	Permethrin SFR	4.0-8.0 ounces/100 gallons	
	Confirm	2.0-8.0 ounces/acre	
	°Condor XL	0.75-1.75 pints/acre	
	°Dipel	2.0-4.0 tablespoons/gallon	
	Orthene TTO/75SP	1/3 pound/100 gallons	
	97SP	4.0 ounces/100 gallons	
	Dylox 80% SP	20.0-30.0 ounces/100 gallons	
	LS	2.0-3.0 pints/100 gallons or 2.0-3.0 teaspoons/gallon	
	°Spintor 2	3.0-8.0 ounces/acre	
	Scimitar GS, CS	1.5-5.0 ounces/100 gallons	
	Battle WP	1.2-4.8 ounces/100 gallons	
	°Crymax	0.5-1.5 pounds/acre	
	Malathion 57% EC	2.0 pints/100 gallons or 2.0 teaspoons/gallon	
Spider mites	Forbid 4F	1.4-4.0 ounces/100 gallons	
	Ultra-Pure Oil	0.75-1.0 gallons/100 gallons	
	Ultra-Fine Oil	1.0-2.0 gallons/100 gallons	
	°Conserve SC	0.2 ounce/gallon or 22.0 ounces/ 100 gallons	
	Malathion 57%EC	1.5 pints/100 gallons or 1.5 teaspoons/gallon	
	°Mesurol 75WP	0.5-1.5 pounds/acre or 0.5-1.0 teaspoon/gallon	
	Tetram 5WDG	16.0-32.0 ounces/acre or 8.0-16.0 ounces	Does not affect adults but will cause sterilization; effective against young mites; can be used only two times a year; to control adults use adulticide; for use in greenhouse, lath and shade house only.
	Judo	2-4 ounces/100 gallons	
	Vendex 50WP	1.0 quart/100 gallons or 0.5-1.0 teaspoon/gallon	
	Entex 4EC	1.0 quart/100 gallons or 2.0 teaspoons/gallon	
Leafminers	°Spintor (Conserve)	0.2 ounce or 6.0 milliliters/gallon	

*Professional use only, °Biological.
Ultra-Fine Oil or Ultra-Pure Oil can be used with insecticides to enhance control of many tree insects and mites.

CBD v. EPA (1:21-cv-00681-CJN) ED_005427A_00029618-00163

Trees (Forest, Shade and Christmas)

Host and Pest	Pesticide	Rate	Remarks
	°Citation-IGR	2.66 ounces/100 gallons/acre	Dipterous (fly) leafminers.
	Merit 75WP	1.0 teaspoon/10 gallons water or 3.5 tablespoons/100 gallons	
	°Precision-IGR	6.0-8.0 ounces/100 gallons water	Lepidopterous leafminers (azalea-citrus).
Locust Borers			Same as ash.
Locust leafminers	°Conserve SC	0.2 ounce or 6 milliliters/gallon	
	Malathion 57%EC	1.5 pints/100 gallons or 1.5 teaspoons/gallon	
	Merit 75WP	1.0 teaspoon/10 gallons water or 3.5 tablespoons/100 gallons	
LOCUST (HONEY)			
Caterpillars	Acelepryn	1.0-2.0 ounces/100 gallons	
	*Imidan 70WP	0.75-1.0 ounces/100 gallons	Apply as a foliar spray when adults first appear (early summer); repeat twice at 4- to 5-week intervals; adjust water pH to 5.5.
	Orthene TTO/75S	10.5 ounces/100 gallons	
	97S	8.0 ounces/100 gallons	
	°Spintor 2	3.0-8.0 ounces/acre	
	Carbaryl 50WP	2.0 tablespoons/gal	
	Carbaryl 4F	1.0 quart/100 gallons or 1.0 tablespoons/gallon	
	°B.t.		Same as ash. Follow label.
	Dylox 80% SP	20.0-30.0 ounces/100 gallons	
	LS	2.0-3.0 pints/100 gallons or 2.0-3.0 teaspoons/gal	
	Scimitar	1.5-5.0 ounces/100 gallons water	
MAGNOLIA			
Scales			Same as ash.
Leafminer weevils	Imidan 70WP	2.0 pounds/100 gallons water	Water pH 5.5*
MAPLE			
Aphids	Ultra-Pure Oil	0.75-1.0 gallons/100 gallons	
	Ultra-Fine Oil	1.0-2.0 gallons/100 gallons	
	Zenith 75	1.6 ounces/300 gallons	
	Safari	4.0-8.0 ounces/100 gallons	
	Flagship	2.0-4.0 ounces/100 gallons	
	Talstar 10WP	1.0 tablespoons/gallon or 3.0-8.0 tablespoons/10 gallons	
	Orthene TTO/75S	5.3 ounces/100 gallons	
	97S	4.0 ounces/100 gallons	
	Malathion 57% EC	1.5 pints/100 gallons or 1.5 teaspoons/gallon	Malathion may Injure sugar maple. Treat when aphids appear. Repeat at 7- to 10-day intervals if needed. Do not use near home or treat birch.
	Meridian 25WG	2.0-8.5 ounces/100 gallons	
	*Merit 75WP	1.0 teaspoon/10 gallons or 3.5 tablespoons/100 gallons	

*Professional use only, °Biological.
Ultra-Fine Oil or Ultra-Pure Oil can be used with insecticides to enhance control of many tree insects and mites.

CBD v. EPA (1:21-cv-00681-CJN) ED_005427A_00029618-00164

Trees (Forest, Shade and Christmas)

Host and Pest	Pesticide	Rate	Remarks
	Insecticidal soap		Entire foliage or affected portion of tree must be soaked to ensure adequate coverage of insects.
Bladder gall mites or eriophid mites	Forbid 4F	1.4-4.0 ounces/100 gallons	
	Ultra-Pure Oil	0.75-1.0 gallons/100 gallons	
	Ultra-Fine Oil	1.0-2.0 gallons/100 gallons	
	Carbaryl	2.0 pounds/100 gallons	Spray trees at bud break and repeat at 10- to 14-days for three sprays.
	Carbaryl 50WP	2.0 tablespoons/gal	
Borers			Same as ash.
Caterpillars	Acelepryn	1.0-2.0 ounces/100 gallons	
	Malathion 57% EC	2.0 pints/100 gallons or 2.0 teaspoons/gallon	Spray when caterpillars are small.
	Confirm	2.0-8.0 ounces/100 gallons	
	Carbaryl	2.0 pounds/100 gallons	
	Carbaryl 50WP	2.0 tablespoons/gallon	
	°B.t.		Same as ash.
	°Spintor 2	3.0-8.0 ounces/acre	
	Tempo 2	1.0-2.0 ounces/100 gallons	
	*Imidan 70WP	0.75-1.0 pound/100 gallons	Adjust water pH to 5.5.
	Orthene TTO/75S	5.3 ounces/100 gallons	
	97S	4.0 ounces/100 gallons	
MIMOSA			
Mimosa webworms	°Conserve SC	2.0 milliliters/gallon water or 6.0 ounces/100 gallons	
	°Crymax	0.5-1.5 pounds/acre	
	°Condor XL	0.75-1.75 pints/acre	
	Orthene TTO/75S	10.5 ounces/100 gallons	
	97S	8.0 ounces/100 gallons	
	Carbaryl	2.0 pounds/100 gallons	
	Carbaryl 50WP	2.0 tablespoons/gallon	
	Carbaryl 4F	1.0 quart/100 gallons or 1.0 tablespoons/gallon	
	Dylox 80% SP	20.0-30.0 ounces/100 gallons	
	LS	2.0-3.0 pints/100 gallons or 2.0-3.0 teaspoons/gallon	
	Tempo 2	1.0-2.0 ounces/100 gallons	
Scales			Same as ash.
MULBERRY			
Lace bugs	Acelepryn	2.0-4.0 ounces/100 gallons	
	Arena 0.25G	3.0-3.6 pounds/1,000 square feet	
	Malathion 57% EC	1.0 pint/100 gallons or 1.0 tablespoons/gallon	
	*Merit 75WP	1.0 teaspoon/10 gallons or 3.5 tablespoons/100 gallons	

*Professional use only, °Biological.
Ultra-Fine Oil or Ultra-Pure Oil can be used with insecticides to enhance control of many tree insects and mites.

CBD v. EPA (1:21-cv-00681-CJN) ED_005427A_00029618-00165

Trees (Forest, Shade and Christmas)

Host and Pest	Pesticide	Rate	Remarks
Mites	Forbid 4F	1.4-4.0 ounces/100 gallons	
	Ultra-Pure Oil	0.75-1.0 gallon/100 gallons	
	Ultra-Fine Oil	2.5-5.0 ounces/gallon, 1.0-2.0 gallons/100 gallons	
Stinkbugs	Carbaryl	2.0 pounds/100 gallons	
	Carbaryl 50WP	2.0 tablespoons/gallon	
OAK			
Aphids	Arena 0.25G	3.0-3.6 pounds/1,000 square feet	
	Ultra-Pure Oil	0.75-1.0 gallon/100 gallons	
	Ultra-Fine Oil	1.0-2.0 gallons/100 gallons	
	Zenith 75	1.6 ounces/300 gallons	
	Safari	4.0-8.0 ounces/100 gallons	
	Flagship	2.0-4.0 ounces/100 gallons	
	Talstar 10WP	1.0 tablespoons/gallon or 3.0-8.0 tablespoons/10 gallons	
	*Thiodan 2EC	1.0 quart/100 gallons or 2.0 tablespoons/3 gallons	Do not use around the home or on birch.
	Malathion 57% EC	1.5 pints/100 gallons or 1.5 teaspoons/gallon	
	Meridian 25WG	2.0-8.5 ounces/100 gallons	
	*Merit 75WP	1.0 teaspoon/10 gallons or 3.5 tablespoons/100 gallons	
	Orthene TTO/75S	5.3 ounces/100 gallons	
	97S	4.0 ounces/100 gallons	
	Insecticidal soap		Entire foliage or affected portion of tree must be soaked to ensure adequate coverage of insects.
Caterpillars (including buckmoth caterpillars)	Acelepryn	1.0-2.0 ounces/100 gallons	
	Battle	5.0-10.0 ounces/acre	
	Carbaryl	2.0 pounds/100 gallons or	Spray foliage and web when web is first noticed.
	Carbaryl 50WP	2.0 tablespoons/gallon	
	Carbaryl 4F	1.0 quart/100 gallons or 1.0 tablespoons/gallon	
	Confirm 2F	2.0-8.0 ounces/acre	
	*Imidan 70WP	0.75-1.0 pound/100 gallons	Adjust water pH to 5.5.
	Orthene TTO/75S	10.5 ounces/100 gallons	
	97S	8.0 ounces/100 gallons	
	Tempo 2	1.0-2.0 ounces/100 gallons	
	Malathion 57% EC	2.0 pints/100 gallons or 2.0 teaspoons/gallon	
	°B.t.	Same as Ash.	
	Dylox 80% SP	20.0-30.0 ounces/100 gallons	
	LS	2.0-3.0 pints/100 gallons or 2.0-3.0 teaspoons/gallon	
	Scimitar	1.5-5.0 ounces/100 gallons	

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CBD v. EPA (1:21-cv-00681-CJN) ED_005427A_00029618-00166

Trees (Forest, Shade and Christmas)

Host and Pest	Pesticide	Rate	Remarks
Orange-striped oakworms	Acelepryn	1.0-2.0 ounces/100 gallons	
	Battle	5.0-10.0 ounces/acre	
	°Conserve SC	2.0 milliliters/gallon or 6.0 ounces/100 gallons	
	Carbaryl	2.0 pounds/100 gallons water	
	Carbaryl 50WP	2.0 tablespoons/gallon water	
	Carbaryl 4F	1.0 quart/100 gallons water or 1.0 tablespoons/gallon	
	°Crymax	0.5-1.5 pounds/acre	
	°Condor XL	0.75-1.75 pints/acre	
Tent caterpillars	Acelepryn	1.0-2.0 ounces/100 gallons	
	Battle	5.0-10.0 ounces/acre	
	Orthene TTO/75S	10.5 ounces/100 gallons	
	97S	8.0 ounces/100 gallons	
	Carbaryl	2.0 pounds/100 gallons water	Spray when webs are first seen. Repeat at 7- to 10-day intervals, if needed.
	Carbaryl 50WP	2.0 tablespoons/gallon water	
	Carbaryl 4F	1.0 quart/100 gallons water or 1.0 tablespoon/gallon water	
	Confirm 2F	2.0-8.0 ounces/acre	
	°Condor XL	0.75-1.75 pints/acre	
	Malathion 57% EC	2.0 pints/100 gallons or 2.0 teaspoons/gallon	
	°Crymax	0.5-1.5 pounds/acre	
	°Dipel	0.5-1.0 teaspoon/gallon	Spray in early morning or late afternoon.
	°Spintor 2	3.0-8.0 ounces/acre	
	Dylox 80SP (Proxol)	20.0-30.0 ounces/100 gallons	
	Tempo 2	1.0-2.0 ounces/100 gallons	
Gall wasps (Several species on stems and foliage)	Flagship	2.0-4.0 ounces/100 gallons	
	Orthene TTO/75S	1 1/3 pounds/100 gallons	The use of systemic and residual materials early at bud break are suggested to prevent infestations. Sprays should be repeated at monthly intervals for three to four months.
	97S	8.0 ounces/100 gallons	
	Meridian 25WG	2.0-8.5 ounces/100 gallons	
Lace bugs	Acelepryn	2.0-4.0 ounces/100 gallons	
	Arena 0.25G	3.0-3.6 pounds/1,000 square feet	
	Zenith 75	1.6 ounces/300 gallons	
	Orthene TTO/75S	5.3 ounces/100 gallons	
	97S	4.0 ounces/100 gallons	
	Carbaryl	2.0 pounds/100 gallons or	Treat when small nymphs appear (May through September); repeat at 7-to 10-day intervals if needed.
	Carbaryl 50WP	2.0 tablespoons/gal	

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CBD v. EPA (1:21-cv-00681-CJN) ED_005427A_00029618-00167

Trees (Forest, Shade and Christmas)

Host and Pest	Pesticide	Rate	Remarks
	Carbaryl 4F	1.0 quart/100 gallons or 1.0 tablespoons/gallon	
	Malathion 57% EC	1.0 pint/100 gallons or 1.0 teaspoon/gallon	
	*Merit 75WP	1.0 teaspoon/10 gallons or 3.5 tablespoons/100 gallons	
PECAN			
Aphids	*Merit (Provado)	1.0 teaspoon/10 gallons or 3.5 tablespoons/100 gallons	
	Insecticidal soap		Entire foliage or affected portion of tree must be soaked to ensure adequate coverage of insects.
Phylloxera	Malathion 25WP	3.0 pounds/100 gallons	
	*Merit (Provado)	1.0 teaspoon/10 gallons or 3.5 tablespoons/100 gallons	
	Insecticidal soap		Entire foliage or affected portion of tree must be soaked to ensure adequate coverage of insects.
Twig girdler	Sanitation		Gather and destroy all severed branches in fall or winter.
Fall webworm	*Merit (Provado)	1.0 teaspoon/10 gallons or 3.5 tablespoons/100 gallons	Caterpillars only.
Eriophid mites	Forbid 4F	1.4-4.0 ounces/100 gallons	
	Ultra-Pure Oil	0.75-1.0 gallon/100 gallons	
	Ultra-Fine Oil	1.0-2.0 gallons/100 gallons	
	Carbaryl	2.0 pounds/100 gallons	
	Carbaryl 50WP	2.0 tablespoons/gallon	
	Carbaryl 4F	1.0 quart/100 gallons or 1.0 tablespoon/gallon	
Yellowneck caterpillars	Acelepryn	1.0-2.0 ounces/100 gallons	
Walnut caterpillars	Confirm 2F	8.0-16.0 ounces/acre	
	°Spintor 2	3.0-8.0 ounces/acre	
Caterpillars	°Confirm	8.0-16.0 ounces/acre	
	Carbaryl	2.0 pints/100 gallons	
	Malathion 57% EC	2.0 teaspoons/gallon	
SOUTHERN PINE PLANTATIONS AND CHRISTMAS TREES			
Nantucket pine tip moth	Orthene TTO/75S	1.0 pound/100 gallons	Chemical control is usually impractical under forest conditions due to high cost. Spray lawn and high-value trees to coincide with moth emergence. Drench-spray the terminals with high- or low-pressure sprayer depending on size and number of trees; destroy infested tips where practical. Shear and spray Christmas trees one- to three- times at proper intervals to control the Nantucket pine tip moth.
	97S	12.0 ounces/100 gallons	
	°Spintor 2 (Spinosad)	1.0 tablespoons/gallon or	

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CBD v. EPA (1:21-cv-00681-CJN) ED_005427A_00029618-00168

Trees (Forest, Shade and Christmas)

Host and Pest	Pesticide	Rate	Remarks
		3.0-8.0 ounces/acre	
	°Conserve SC	0.2 ounce/gallon or 22.0 ounces/100 gallons	
	Dylox 80% SP	20.0 ounces/100 gallons	
	LS	2.0 pints/100 gallons	
	Astro 3.2EC	4.0-8.0 ounces/100 gallons	
	Confirm 2F	8.0 ounces/acre	
	Proxol 80%SP	20.0 ounces/100 gallons	
	Pounce 3.2EC	4.0-8.0 ounces/acre	Use only late season to prevent scale buildup; Christmas trees only; pH 5.5.
	*Imidan 70WSB	1 1/3 pounds/acre	
	°Dimilin 25W	4.0 ounces/acre	Apply at early stages of instar development preferably at beginning of first and second tip moth generation.
	°Azatin XL	10.0-20.0 ounces/acre	Apply in sufficient water or uniform full coverage of foliage, 10-20 gallons water/acre. Protection of first-year seedling is important to getting straight stem.
Pales weevils, pitch-eating weevils	Arctic 3.2EC	8.0 ounces/100 gallons	Site preparation in the spring prior to winter planting is recommended.
	*Imidan 70WSB	1 1/3 pounds/acre	Water pH 5.5.
		4% dip for young trees	See label.
	Permethrin SFR	2.0-5.0 quarts/100 gallons	
	Duraguard ME	1.2 gallons/100 gallons	
	Orthene TTO/97S	12.0 ounces/100 gallons	
Deodar weevils	*Imidan 70W	1 1/3-1.5 pounds/acre	
	Permethrin SFR	2.0-5.0 quarts/100 gallons	
Coneworms	Orthene TTO/75S	2/3-3/4 pound/100 gallons	Coneworms can be a major problem in stressed or damaged Christmas trees.
	97S	8.0 ounces/100 gallons	
			They attack wounds and breaks in the trunks and stems, girdling and killing trees.
		1.0	
	Duraguard ME	1.2 gallons/100 gallons	
	°Conserve SC	6.0 milliliters/gallon or 22.0 ounces/100 gallons	
	Astro 3.2 EC	4.0-8.0 ounces/100 gallons	
Pine bark aphids	Arena 0.25G	3.0-3.6 pounds/1,000 square feet	
	Safari	4.0-8.0 ounces/100 gallons	
	Flagship	2.0-4.0 ounces/100 gallons	
	Endeavor 50%	10.0 ounces/acre	
	Talstar 10WP	1.0-3.0 tablespoons/gallon or 3.0-8.0 ounces/50 gallons	
	Malathion 57% EC	1.5 pints/100 gallons or 1.5 teaspoons/gallon	
	Meridian 25WG	2.0-8.5 ounces/100 gallons	
	Orthene TTO/75S	5.3 ounces/100 gallons	
	97S	4.0 ounces/100 gallons	
	*Merit 75WP	1.0 teaspoon/10 gallons or	

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CBD v. EPA (1:21-cv-00681-CJN) ED_005427A_00029618-00169

Trees (Forest, Shade and Christmas)

Host and Pest	Pesticide	Rate	Remarks
		3.5 tablespoons/100 gallons	
	Insecticidal soap		Entire foliage or affected portion of tree must be soaked to ensure adequate coverage of insects.
Pine needle Scales	Safari	8.0-12.0 ounces/100 gallons	
	Flagship	4.0-8.0 ounces/100 gallons	
	Malathion 57% EC	4.0 pints/100 gallons water or 4.0 teaspoons/gallon	
	Duraguard ME	1.2 gallons/100 gallons	
	Insecticidal soap		Entire foliage or affected portion of tree must be soaked to ensure adequate coverage of insects.
All pine sawflies	Zenith 75	1.6 ounces/300 gallons	
	Carbaryl	2.0 pounds/100 gallons	Apply when insects or their damage appears Repeat weekly or as needed. MAY BE PHYTOTOXIC ON SOME SPECIES OF PINE. READ LABEL!
	Carbaryl	2.0 pounds/100 gallons	
	Carbaryl 50WP	2.0 tablespoons/gallon	
	Carbaryl 4F	1.0 quart/100 gallons or 1.0 tablespoon/gallon	
	°Conserve SC	0.06 ounce/gallon or 6.0 ounces/ 100 gallons	
	°Spintor 2	3.0-8.0 ounces/acre	
	*Merit 75WP	1.0 teaspoon/10 gallons or 3.5 tablespoons/100 gallons	
	Orthene TTO/75S	10.5 ounces/100 gallons	
	97S	8.0 ounces/100 gallons	
	Malathion 57% EC	2.0 pints/100 gallons or 2.0 teaspoons/gallon	
		0.25-0.5 pounds/100 gallons	
Southern pine beetles	Onyx	0.25-0.5 pounds/100 gallons	Keys to managing bark beetles are maintaining healthy trees and adequate spacing between trees. Trees spaced at least 20 feet apart are rarely attacked by bark beetles. Painting tree trunks white can disrupt their outline and prevent attraction of bark beetles to dark vertical silhouettes. Prompt removal or salvage harvest of infested trees reduces the number of beetles that can infest nearby trees. Insecticides are not a viable option for large infestations in forests, given the protection of immature beetles under the bark of trees and the short time that adults are exposed during dispersal. High-value trees in urban settings or parks can be protected by applying a medium spray of listed materials to the entire trunk, exposed roots and stumps until liquid runs down the trunk. Apply in early spring or when threat of attack exists to prevent infestation. Infested trees can be treated as above when damage occurs but before adult beetles begin to emerge; this treatment will reduce beetle populations and protect uninfested trees but may not save infested trees. Under forest conditions or where the spray will not fall on lawns or shrubbery,

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CBD v. EPA (1:21-cv-00681-CJN) ED_005427A_00029618-00170

Trees (Forest, Shade and Christmas)

Host and Pest	Pesticide	Rate	Remarks
			insecticide can be mixed in diesel oil instead of water; respray in 30 days as necessary. Failure to soak the entire bole reduces penetration and mortality to insects within the bark.
	Astro	2.0-5.0 quarts/100 gallons	
	Permethrin SFR	2.0-5.0 quarts/100 gallons	
	Tree-Age	Follow Label	Trunk injection, mid- to late spring after trees have leafed out; follow directions for tree size.
Pine aphids	Zenith	1.6 ounces/300 gallons	
	Flagship	2.0-4.0 ounces/100 gallons	
	Orthene TTO/75S	5.3 ounces/100 gallons	
	97S	4.0 ounces/100 gallons	
	Endeavor 50%	10.0 ounces/acre	
	Meridian 25WG	2.0-8.5 ounces/100 gallons	
	Insecticidal soap		Entire foliage or affected portion of tree must be soaked to ensure adequate coverage of insects.
Mites	Forbid 4F	1.4-4.0 ounces/100 gallons	
	Ultra-Pure Oil	0.75-1.0 gallon/100 gallons	
	Ultra-Fine Oil	0.75-2.5 gallons/100 gallons	
	Judo	2.0-4.0 ounces/100 gallons	
	Avid 0.15EC	0.25 teaspoon/gallon	Repeat at 7- to 10-day intervals as needed.
		4.0 ounces/100 gallons	
Pine colaspis	Malathion 57% EC	2.0 pints/100 gallons or 2.0 teaspoons/gallon	Treat when beetles appear usually in May and June.
	Carbaryl 50WP	0.5-1.0 pound/100 gallons or 2 tablespoons/gallon	
	Orthene TTO/75S	5.3-10.5 ounces/100 gallons	
	97S	4.0-8.0 ounces/100 gallons	
Town ants	PTM	Liquid Injection	Make 2% dilution in water and inject 1.5 fluid ounces 3 inches below ground in each town ant exit hole; no more than 21 fluid ounces PTM per acre.
		As per label directions.	
		1gallon-2.6 ounces PTM/125 ounces water	
RED BUD			
Scales			Same as ash.
Caterpillars			Same as mimosa.
SYCAMORE			
Lace bugs	Acelepryn	1.0-2.0 ounces/100 gallons	
	Arena 0.25G	3.0-3.6 pounds/1,000 square feet	
	Zenith	1.6 ounces/300 gallons	
	Orthene OTTO	5.3 ounces/100 gallons	
	Carbaryl	2.0 pounds/100 gallons	Treat when lace bugs are present. Repeat weekly as needed.
	Carbaryl 50WP	2.0 tablespoons/gallon	
	Carbaryl 4F	1.0 quart/100 gallons or 1.0 tablespoons/gallon	

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CBD v. EPA (1:21-cv-00681-CJN) ED_005427A_00029618-00171

Trees (Forest, Shade and Christmas)

Host and Pest	Pesticide	Rate	Remarks
	Merit 75WP	1.0 teaspoon/10 gallons or 3.5 tablespoons/100 gallons	
WILLOW			
Aphids			Same as oak.
Fall webworms			Same as oak.
Tent caterpillars			Same as oak.
Leaf beetles	Carbaryl	2.0 pounds/100 gallons	
	Carbaryl 50WP	2.0 tablespoons/gallon	
Spider mites	Forbid 4F	1.4-4.0 ounces/100 gallons	
	Ultra-Pure Oil	0.75-1.0 gallon/100 gallons	
	Ultra-Fine Oil	0.75-2.5 gallons/100 gallons	
	°Conserve SC	6.0 milliliters/gallon or 22.0 ounces/100 gallons	
	Tetram 5WDG	16.0-32.0 ounces/acre or 8.0-16.0 ounces	Does not affect adults but will cause sterilization; effective against young mites; can be used only two times a year; to control adults use adulticide; for use in greenhouse, lath and shade house only.
Eriophid mites	Forbid 4F	1.4-4.0 ounces/100 gallons	
	Judo	2.0-4.0 ounces/100 gallons	
	Carbaryl	2.0 pounds/100 gallons	
	Carbaryl 50WP	2.0 tablespoons/gallon	
Scales			Same as oak.
YELLOW POPLAR			
Tulip tree scales	Ultra-Pure Oil	0.75-1.0 gallon/100 gallons	
	Ultra-Fine Oil	2.0-5.0 gallons/100 gallons	Dormant in summer.
	(98%)	0.75-2.5 gallons/100 gallons	
	Carbaryl	2.0 pounds/100 gallons	Spray when crawlers are present in July or August. Repeat in 10 days if necessary.
	Carbaryl 50WP	2.0 tablespoons/gallon	
	Carbaryl 4F	1.0 quart/100 gallons or 1.0 tablespoons/gallon	
	Superior oil	3.0 gallons/100 gallons	
	(60%-70%)	8.0 tablespoons/gal	
	Insecticidal soap		Entire foliage or affected portion of tree must be soaked to ensure adequate coverage of insects.
Leafminers	Imidan 70WP	1.5-2.0 pounds/100 gallons	Apply after initial feeding on new growth; water pH 5.5.

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CBD v. EPA (1:21-cv-00681-CJN) ED_005427A_00029618-00172

Vegetables – Commercial

Residues	Federal laws prohibit the sale of food products that contain more than the specifically permitted amounts of pesticide residues. The recommendations in this guide are within these limits, and only insecticides that have been approved at the rates and time intervals specified are included. Disregarding the standards established by the Environmental Protection Agency could result in unnecessary losses and inconveniences. The kind and amount of pesticide present on food products are the responsibility of the food producer. Specific instructions for the safe and effective use of farm chemicals must be given on the container label by law. It is your responsibility to carefully read and follow these label instructions and precautions.
Application checklist	To obtain satisfactory control of vegetable insects: 1. Use one of the insecticides recommended for the particular crop against the particular pest. 2. Use the correct amount of the insecticide. 3. Follow the recommended schedule of applications whenever regular applications are indicated. 4. Use hollow cone nozzles not herbicide nozzles. 5. Set the nozzles about 20 inches from the surface to be sprayed. 6. Use sufficient pressure to obtain a full spray pattern for the nozzle; manufacturer's list recommended psi for each style of nozzle. Excessive pressure will increase drift, decrease deposit and should generally be avoided. Use sufficient spray to cover plants thoroughly especially when fungicides are combined with insecticides. The amount of spray may be increased by slowing the ground speed of the sprayer or by using larger nozzles. Increasing pressure is not recommended.
Dosages and formulations	Dosages of sprayable powders (water soluble or wettable powders) and liquids are given as the amount of formulated product that should be used in 50 gallons of spray. Sufficient spray should be applied to provide thorough coverage of the plants. Granular insecticides commonly used for soil insect control are stated as the formulated product. Rates given are on the basis of a broadcast application unless otherwise stated. Formulations listed are not necessarily all that are available. If another formulation is used convert to the proper dosage using those given in these recommendations as a guide. Most insecticides are available as an emulsifiable concentrate (EC) that is based on solvents and/or oils or as a wettable powder (WP). Wettable powders are safer than emulsions to use on tender foliage. Certain insecticides are available as water soluble (WS) powders and should not be confused with wettable powders. Water soluble powders go into solution while wettable powders merely form suspensions that settle out on standing. Some insecticides are marketed as a flowable. This formulation is generally less toxic to foliage than the standard EC. Whenever possible, the formulations of emulsifiable concentrates have been quoted in pounds of active ingredient per gallon (example: 5 pounds EC). This was done because in many products the percentage of ingredients will vary due to the use of different solvents. Malathion, for example, is 5 pounds EC yet may be formulated anywhere from 55%-57% of active material.
Precautions	Phosphate and carbamate insecticides such as Parathion, Azinphos methyl, Methomyl and Trithion are highly toxic to humans and animals. Take special precautions in handling and applying these chemicals and others of similar nature. Check the label carefully and observe all safety precautions. Wash at once and change clothes if spillage occurs. Bathe promptly after use and wash clothes before re-use. Generally, symptoms of phosphate insecticide poisoning include blurred vision, headache, abdominal cramps and tightness of the chest.
	Note: Take special precautions when mixing Methomyl. Wear a recommended respirator. Do not inhale the dust or powder.
	Warning: Re-entry times for workers entering groves and/or treated fields should be strictly observed. Be sure to check the label for this information.
	pH: Adjust pH before adding insecticide; optimum range 5.5-6.0 for most insecticides. Diazinon needs no adjustment. Test water to adjust. DO NOT JUST ADD BUFFER.
	Spreader Stickers: Needed on waxy leaf plants. May be used on most crops. Overdose will burn foliage.

CBD v. EPA (1:21-cv-00681-CJN) ED_005427A_00029618-00173

Vegetables – Commercial

Insects	Insecticide and Formulations	Rate/A	Cutoff Date	Remarks, Restrictions or Limitations
ARTICHOKE				
Leaf hoppers, Psyllids	Bifenthrin (Capture 2EC)	6.4 ounces	5	Observe label.
	Esfenvalerate (Asana XL)	5.8-9.6 ounces	1	Observe label.
	Permethrin (Ambush, Pounce) 25W	6.4-19.2 ounces	0	Observe label.
	Thiamethoxam (Platinum)	5.0-8.0 ounces	30	Observe label.
BEANS (LIMA AND SNAP)				
Aphids	Bifenthrin (Brigade 2EC)	1.6-6.4 fluid ounces	3	Observe label.
	Imidicloprid (Admire Pro)	7-10 fl. ounces	21	Observe label.
	Lambda-cyhalothrin (Warrior II)	1.28 to 1.92 oz/A	3	Observe label.
	Malathion 5EC	1.0 pint	1	Observe label.
	Malathion 25WP	2.5 pounds	1	Observe label.
	Naled (Dibrom 8EC)	0.5 pint	1	Do not feed treated vines to livestock.
Bean leaf beetles, flea beetles, leaf hoppers	Carbaryl (Sevin) 50WP	2.0 pounds	None	Observe label.
	Carbaryl (Sevin) 80S	1.0 pound	None	Observe label.
	At pod set: begin weekly applications when longest pods are 1 inch long and continue throughout harvest for maximum pod protection. Add an insecticide for control of mites or leafminers as needed.			
Cucumber beetles, Mexican bean beetles	Bifenthrin (Capture 2EC)	2.1-6.4 ounces	3	Observe label.
	Carbaryl (Sevin) 50WP	2.0 pound	None	Observe label.
	Carbaryl (Sevin) 80S	1.25 pound	None	Observe label.
	Esfenvalerate (Asana XL)	5.8-9.6 ounces	3	Observe label.
	Malathion 5EC	1.0 pint	1	Observe label.
	Malathion 25WP	2.5 pounds	1	Observe label.
	Zeta-cypermethrin (various)	1.4-4.3 ounces		Observe label.
Bean leaf beetles, cucumber beetles, earworms, leafhoppers, lima	Bifenthrin (Brigade, Capture 2EC)	2.1-6.4 fluid ounces	3	Observe label.

CBD v. EPA (1:21-cv-00681-CJN) ED_005427A_00029618-00174

Vegetables – Commercial

Insects	Insecticide and Formulations	Rate/A	Cutoff Date	Remarks, Restrictions or Limitations
bean pod borers, stink bugs				
	Carbaryl (Sevin) 50WP	2.0 pounds	None	Observe label.
	Carbaryl (Sevin) 80S	1.25 pounds	None	Observe label.
	Esfenvalerate (Asana XL)	5.8-9.6 ounces	3	Observe label.
	Zeta-cypermethrin (various)	1.4-4.3 ounces		Observe label.
Mites	Bifenazate (Acramite)	16-24 fluid ounces	3	Observe label.
	Bifenthrin (Capture 2EC)	2.1-6.4 ounces	3	Observe label.
Leafminers	Naled (Dibrom 8EC)	0.5 pint	1	Do not feed treated vines to meat or dairy animals.
	Spinetoram (Radiant SC)	C4-8 fluid ounces	3(succulent) 28(dried)	Observe label.
BEET				
Aphids	Imidicloprid (Admire Pro 4.6F soil)	4.4-10.5 ounces	21	Must be applied to soil. May be applied to direct-seeded crops in-furrow at seed or transplant depth. Do not exceed 12 ounces/acre/season.
Armyworms, beet webworms	Spinetoram (Radiant SC)	5-10 fluid ounces	1	Observe label.
Flea beetles or webworms	Carbaryl (Sevin) 80S	0.6 pound	3 (14 if tops are used for food)	Observe label.
	Methomyl (Lannate LV)	0.75-3.0 pints	0 roots, 10 tops	Observe label.
	Methomyl (Lannate SP)	0.25-1.0 pound	0 roots, 10 tops	Observe label.
Leafminers	Spinetoram (Radiant SC)	6.0-10.0 ounces	7	Observe label.
Vegetable weevils	Carbaryl (Sevin) 50WP	0.5 pound	3	Observe label.
	Malathion 5EC	1.0 pint	7	Observe label.
	Malathion 25WP	2.5 pounds	7	Observe label.
BRUSSELS SPROUTS				
Aphids	Acetamiprid (Assail 3OSG)	2-3 ounces	7	Observe label.
	Pymetrozine (Fulfill)	2.75 ounces	7	Observe label.
	Imidicloprid (Admire Pro 4.6F)	4.4-10.5 ounces	21	Observe label.
Diamondback moths, imported cabbage worms, loopers	*Bacillus thuringiensis*			Use maximum rate recommended by manufacturer.
	Bifenthrin (Capture 2EC)	2.1-6.4 ounces	7	Observe label.
	Emamectin benzoate (Proclaim)	2.4-4.8 ounces	7	Observe label.
	Indoxacarb (Avaunt)	3.5 ounces	3	Observe label.

CBD v. EPA (1:21-cv-00681-CJN) ED_005427A_00029618-00175

Vegetables – Commercial

Insects	Insecticide and Formulations	Rate/A	Cutoff Date	Remarks, Restrictions or Limitations
	Methomyl (Lannate LV)	1.5-3.0 pints	3	Observe label.
	Methomyl (Lannate SP)	0.25-1.0 pound	3	Do not use in home plantings.
	Permethrin (Ambush 2EC)	3.26-4.0 ounces	1	Do not apply more than eight applications per season.
	Permethrin (Ambush 25WP)	3.2-6.4 ounces	1	Observe label.
	Permethrin (Pounce 3.2 EC)	2.0-4.0 ounces	1	Observe label.
	Novaluraon (Rimon 0.83EC)	6.0-12.0 fluid ounces	7	Observe label.
	Spinetoram (Radiant SC)	5-10 fl. ounces	1	Observe label.
	Loopers are most difficult to control; watch for loopers on underside of leaf along borders. Treat on a 7-day schedule and change to 5 days for heavy infestations. Use a wetting agent according to manufacturer's instructions. Add *Bacillus thuringiensis* to sprays to increase control.			
	Tebufenozide (Confirm 2F)	6.0-8.0 ounces	7	Observe label.
	Zeta-cypermethrin (various)	2.4-4.3 ounces		Observe label
	Loopers are most difficult to control; watch for loopers on underside of leaf along borders. Treat on a 7-day schedule and change to 5 days for heavy infestations. Use a wetting agent according to manufacturer's instructions. Add Bacillus thuringiensis to sprays to increase control.			
Whiteflies	Acetamiprid (Assail 30SG)	2.5-4.0 ounces	7	Observe label.
	Dinotefuran (Venom 70SG)	1.0-4.0 ounces (foliar)	1	Do not apply more than 6 ounces per season foliar.
		5.0-6.0 ounces (soil)	21	
	Pymetrozine (Fulfill)	2.75 ounces	7	Observe label.
	Spiromesifen (Oberon 2SC)	7-8.5 fluid ounces	21	Observe label.

CBD v. EPA (1:21-cv-00681-CJN) ED_005427A_00029618-00176

Vegetables – Commercial

Insects	Insecticide and Formulations	Rate/A	Cutoff Date	Remarks, Restrictions or Limitations
CABBAGE AND BROCCOLI				
Diamondback moths, imported cabbage worms, loopers,	Bifenthrin (Capture 2EC)	2.1-6.4 ounces	7	Observe label.
	Emamectin benzoate (Proclaim)	2.4-4.8 ounces	7	Observe label.
	Esfenvalerate (Asana XL)	5.8-9.6 ounces	3	Observe label.
	Indoxacarb (Avaunt)	3.5 ounces	3	Observe label.
	Methomyl (Lannate LV)	1.5-3.0 pints	3	Observe label.
	Methomyl (Lannate SP)	0.25-1.0 pound	3	Do not use in plantings.
	Permethrin (Ambush 2EC)	3.2-6.4 ounces	1	Observe label.
	Permethrin (Ambush 25WP)	3.2-6.4 ounces	1	Observe label.
	Permethrin (Pounce 3.2 EC)	2.0-4.0 ounces	1	Observe label.
	Tebufenozide (Confirm 2F)	6.0-8.0 ounces	7	Observe label.
	Zeta-cypermethrin (various)	2.4-4.3 ounces		Observe label
	Loopers are most difficult to control; watch for loopers on underside of leaf along borders. Treat on 7-day schedule and change to 5 days for heavy infestations. Use a wetting agent according to manufacturer's instructions.			
Leafminers, thrips	Spinosad (SpinTor 2SC)	3.0-10.0 ounces	1	Observe label.
Root aphids, root maggots	Diazinon AG500	2.0-3.0 quarts	7-broccoli 21-cabbage	Broadcast just before planting and immediately incorporate into the top 3-4 inches of soil.
Whiteflies	Acetamiprid (Assail 30SG)	2.5-4 ounces	7	Use spreader stick to improve control.
	Dinotefuran (Venom 70SG)	1-4 ounces (foliar)	1	Observe label.
	Spiromesifen (Oberon 2SC)	7.0-8.5 fluid ounces	7	Do not exceed 25.5 fluid ounces per acre per season.
Wireworms	Diazinon AG500	3.0-4.0 quarts	14	
CANTALOUPE				
Aphids	Bifenthrin (Various) 2EC	2.6-6.4 ounce	3	Limit 2 applications after bloom.
	Flonicamide (Beleaf 50SG)	2-2.8 ounce	0	

CBD v. EPA (1:21-cv-00681-CJN) ED_005427A_00029618-00177

Vegetables – Commercial

Insects	Insecticide and Formulations	Rate/A	Cutoff Date	Remarks, Restrictions or Limitations
	Pymetrozine (Fulfill 50WDG)	2.7 ounce	0	Apply before aphids reach damage level. Do not exceed 5.5 ounces per season per acre.
Cucumber beetles, melon worms, pickleworms, squash bugs, squash vine borers	Bifenthrin (Capture 2EC)	5.12-6.4 ounces	3	Observe label.
	Carbaryl (Sevin) 50WP	1.0 pound	None	Observe label.
	Carbaryl (Sevin) 80S	0.6 pound	None	Observe label.
	Esfenvalerate (Asana XL)	5.6-9.8 ounces	3	Observe label.
	Permethrin (Ambush 25W)	6.4-12.8 ounces	3	Observe label.
Cutworms	Diazinon AG500	2.0-4.0 quarts	3	Observe label.
Leafminers	Naled (Dibrom 8EC)	0.25-0.5 pint	1	Observe label.
	Oxamyl (Vydate 10G)	40-60 pounds (broadcast)		Apply within one week of planting.
	Oxamyl (Vydate L) 2EC	2.0-4.0 pints	1	Observe label.
	Permethrin (Pounce 2.5WP)	12.8 ounces	1	Observe label.
	Permethrin (Pounce 3.2EC)	8.0 ounces	1	Observe label.
	Spinetoram (Radiant SC)	5-10 fluid ounces	3	Observe label.
Spider mites	Bifenazate (Acramite 50WS)	.75 – 1.0 pound	3	Observe label.
	Bifenthrin (Capture 2EC)	5.12-6.4 ounces	3	Observe label.
	Permethrin (Ambush 25W)	6.4-12.8 ounces	0	Observe label.
	Abimectin (Agri-Mek) 0.15EC	8-16 ounces	7	Observe label.
	Spiromesifen (Oberon 2 SG)	7-8.5 fl. ounces	7	Observe label.
Wireworms	Diazinon AG500	3.0-4.0 quarts	3	Observe label.
CARROT				
Aphids	Thiamethoxam (Actara 25 WPG)	1.5-3 ounces	7	Observe label.
Armyworms flea beetles, leafhoppers,	Beta-cyfluthrin (Baythroid 2EC)	1.6-2.8 ounces	0	Observe label.
	Carbaryl (Sevin) 50WP	0.5 pound	None	Observe label.
	Carbaryl (Sevin) 80S	0.6 pound	None	Observe label.
	Esfenvalerate (Asana XL)	5.8-9.6 ounces	7	Observe label.
	Malathion 5EC	1.0-1.5 pints	7	Observe label.
	Methomyl (Lannate LV)	1.0-3.0 pints	1	Observe label.
	Methomyl (Lannate SP)	0.33-1.0 pound	1	Observe label.

CBD v. EPA (1:21-cv-00681-CJN) ED_005427A_00029618-00178

Vegetables – Commercial

Insects	Insecticide and Formulations	Rate/A	Cutoff Date	Remarks, Restrictions or Limitations
	Spinetoram (Radiant SC)	3.0-6.0 fluid ounces	3	Radiant will not control leafhoppers; no more than 4 applications per year.
Vegetables weevils	Malathion 5EC	1.0 pint	7	Observe label.
Wireworms	Diazinon AG500	3.0-4.0 quarts	14	Observe label.
CAULIFLOWER				
Aphids	Imidicloprid (Provado 1.6FL)	3.75 ounces	7	Observe label.
	Pymetrozine (Fulfill)	2.75 ounces	7	Observe label.
Diamondback moths, flea beetles, loopers	Esfenvalerate (Asana 1.9EC)	1.7-3.4 ounces	1	Observe label.
	Permethrin (Ambush 2EC)	3.2-6.4 ounces	1	Observe label.
	Permethrin (Ambush 25WP)	3.2-6.4 ounces	1	Observe label.
	Loopers are most difficult to control; watch for loopers on underside of leaf along borders. Treat on a 7-day schedule and change to 5 days for heavy infestations. Use a wetting agent according to manufacturer's instructions. Add *Bacillus thuringiensis* to sprays to increase control.			
Imported cabbage worms	*Bacillus thuringiensis*			Use maximum amount recommended by manufacturer.
	Bifenthrin (Capture 2EC)	2.1-6.4 ounces	7	Observe label.
	Emamectin benzoate (Proclaim)	2.4-4.8 ounces	7	Observe label.
	Indoxacarb (Avaunt)	3.5 ounces	1	Observe label.
	Methomyl (Lannate LV)	0.75-3.0 pints	3	Do not use in home plantings.
	Methomyl (Lannate SP)	0.25-1.0 pound	3	Do not use in home plantings.
	Permethrin (Pounce 2.5WP)	3.2-6.4 ounces	1	Observe label.
	Permethrin (Pounce 3.2EC)	24.0 ounces	1	Observe label.
	Spinetoram (Radiant SC)	5-10 fluid ounces	1	Observe label.
	Tebufenozide (Confirm 2F)	6.0-8.0 ounces	7	Observe label.
	Zeta-cypermethrin (various)	2.4-4.3 ounces		Observe label
Mole crickets	Diazinon AG500	1.0 quart	7	Observe label.
Root maggots	Diazinon AG500	2.0-3.0 pints	7	Observe label.
Whiteflies	Acetamiprid (Assail 30SG)	2.5-4 ounces	7	Observe label.

CBD v. EPA (1:21-cv-00681-CJN) ED_005427A_00029618-00179

Vegetables – Commercial

Insects	Insecticide and Formulations	Rate/A	Cutoff Date	Remarks, Restrictions or Limitations
	Spiromesifen (Oberon 2SC)	7-8.5 ounces		Observe label.
Wireworms	Diazinon AG500	3.0-4.0 quarts	7	Observe label.
COLLARDS AND GREENS				
Aphids	Acetamiprid (Assail 30SG)	2.0-3.0 ounces	7	Observe label.
	Imidicloprid (Admire Pro)	4.4-10.5 ounces	21	Observe label. Will also control flea beetles.
	Malathion 5EC	1.0 pint	7	Observe label.
	Malathion 25WP	2.5 pounds	7	Observe label.
	Pymetrozine (Fulfill)	2.75 ounces	7	Observe label.
	Spirotetramat (Movento 25C)	4.0-5.0 fluid ounces	1	Do not exceed 10 fluid ounces/season.
Caterpillars, loopers	*Bacillus thuringiensis*		0	Use maximum rate recommended by manufacturer. On foliage every 7 days. Apply to both sides of leaves when larvae are small.
	Esfenvalerate (Asana XL)	5.8-9.6 ounces	7	Collards only.
	Emamectin benzoate (Proclaim 5WDG)	2.4-4.8 ounces	14	Observe label.
	Indoxacarb (Avaunt 30WDG)	2.5-3.5 ounces	3	Observe label.
	Permethrin (Ambush 25W)	3.2-6.4 ounces	1	Observe label.
	Permethrin (Pounce 25WP)	3.2-6.4 ounces	1	Observe label.
	Spinetoram (Radiant SC)	5-10 fluid ounces	1	
	Zeta-cypermethrin (various))	2.24-4.0 ounces	1	Observe label.
Flea beetles	Carbaryl (Sevin) 50WP	3.0 pounds	14	Observe label.
Stinkbugs	Acetamiprid (Assail 30SG)	3.0-4.0 ounces	7	Observe label.
	Clothianidin (Belay 2.13SC)	3.4 ounces (foliar) 9.0-12.0 oz. (soil)	21 (foliar)	Soil application at plant only.
Whiteflies	Acetamiprid (Assail 30SG)	2.5-4.0 ounces	7	Observe label.
	Spiromesifen (Oberon 2SC)	7.0-8.5 fluid ounces	7	Observe label.
	Spirotetramat (Movento 2SC)	4.0-5.0 fluid ounces	1	Do not exceed 10 fluid ounces/season.
CUCUMBER				
Aphids	Acetamiprid (Assail 30SG)	2.5-4 ounces	0	Observe label.
	Flonicamide (Beleaf 50SG)	2-2.8 ounces	0	Observe label.
	Pymetrozine (Fulfill)	2.75 ounces	14	Observe label.
	Thiamethoxam (Actara)	2.0-3.0 ounces	None	Observe label.

CBD v. EPA (1:21-cv-00681-CJN) ED_005427A_00029618-00180

Vegetables – Commercial

Insects	Insecticide and Formulations	Rate/A	Cutoff Date	Remarks, Restrictions or Limitations
	Thiamethoxam (Platinum)	5.0-8.0 ounces	30	Observe label.
Cucumber beetles, vegetable weevils	Malathion 5EC	1.0 pint	7	Observe label.
	Methomyl (Lannate LV)	1.5-3.0 pints	1.5 (1-day) > 1.5 (3-days)	Observe label.
	Methomyl (Lannate SP)	0.5-1.0 pound	0.5 (1-day) > 0.5 (3-days)	Observe label.
Leafminers	Abimectin (Agri-Mek) 0.15EC	8.0-16.0 ounces	7	Observe label.
	Naled (Dibrom 8EC)	0.5-0.75 pint	None	Observe label.
	Permethrin (Pounce 3.2 EC)	4.0-8.0 ounces	To harvest	Not more than 1.6 pounds/A.I./acre per season.
	Permethrin (Pounce 25 WP)	6.4-12.8 ounces	To harvest	
	Rynaxypyr (Coragen 1.6SC)	5-7.5 fluid ounces	1	Soil, foliar or drip chemigation.
	Spinetoram (Radiant SC)	6-8 ounces	1	Observe label.
Melon worms, pickleworms, squash bugs, squash vine borers	Bifenthrin (various)	2.6-6.4 ounces	3	Observe label. Limit 19.2 fluid ounces per acre per season; allow 7 days between applications.
	Carbaryl (Sevin) 50WP	1.0 pound	None	Observe label.
	Carbaryl (Sevin) 80S	0.6 pound	None	Observe label.
	Esfenvalerate (Asana XL)	5.8-9.6 ounces	3	Observe label.
	Permethrin (Ambush 25W)	0.1-0.2 pound	None	Observe label.
	Permethrin (Pounce 3.2 EC)	4.0-8.0 ounces	To harvest	Not more than 1.6 pounds
	Permethrin (Pounce 25 WP)	6.4-12.8 ounces	To harvest	Observe label.
	Rynaxypyr (Coragen 1.67SC)	3.5-5 fluid ounces	1	Foliar or drip.
	Spinetoram (Radiant SC)	5.0-10.0 fluid ounces	1	Observe label.
Spider mites	Abimectin (Agri-Mek) 0.15EC	5-16 ounces	7	On foliage as needed; no more than 2 applications.
	Bifenazate (Acramite 50WS)	.75-1 pound	3	Do not exceed 1 application/season.
	Bifenthrin (Brigade) 2EC	2.6-6.4 ounces	7	Observe label.
	Fenpropathrin (Danitol 2.4EC)	10.66 ounces	7	
	Spiromesifen (Oberon 25G)	7-8.5 fluid ounces	7	
EGGPLANT				
Aphids	Imidicloprid (Admire Pro)	1.3-2.2 fluid ounces	0	Observe label. Foliar treatment.
	Malathion 5EC	1.0 pint	3	Observe label.

CBD v. EPA (1:21-cv-00681-CJN) ED_005427A_00029618-00181

Vegetables – Commercial

Insects	Insecticide and Formulations	Rate/A	Cutoff Date	Remarks, Restrictions or Limitations
	Malathion 25WP	3.5 pounds	3	Observe label.
	Naled (Dibrom 8EC)	0.5 pint	1	Observe label.
	Thiamethoxam (Actara)	2.0-4.0 ounces	None	Observe label.
Colorado potato beetles, flea beetles, horn worms, thrips, tomato fruitworms	Bifenthrin (Capture 2EC)	2.1-6.4 ounces	7	Observe label.
	Carbaryl (Sevin) 50WP	2.0 pounds	None	Observe label.
	Carbaryl (Sevin) 80S	1.5 pounds	None	Observe label.
	Esfenvalerate (Asana XL)	5.8-9.6 ounces	1	Observe label.
	Imidicloprid (Admire 2F)	10.0-24.0 ounces		
	Indoxacarb (Avaunt)	3.5 ounces	3	Observe label.
	Permethrin (Ambush 25WP)	0.1-0.2 pound	3	Observe label.
	Permethrin (Pounce 3.2 EC)	8.0 ounces	3	Observe label.
	Rynaxypyr (Coragen 1.67SC)	3.5-5.0 fluid ounces	1	Foliar or drip chemigation.
	Tebufenozide (Confirm 2F)	6.0-8.0 ounces	7	Observe label.
	Zeta-cypermethrin (various)	2.4-4.3 ounces		Observe label
Spider mites	Abimectin (Agri-Mek 0.15EC)	8.0-16.0 fluid ounces	7	Observe label.
	Bifenazate (Acramite 50WS)	.75-1.0 pound	3	Observe label.
	Fenbutatin-oxide (Vendex 50WP)	2.0-3.0 pounds	3	Observe label.
	Fenpyroximate (Portal 0.4EC)	2 pints	3	Observe label.
	Spiromesifen (Oberon 2SG)	7.0-8.5 fluid ounces	7	Observe label.
Whiteflies	Thiamethoxam (Platinum)	5.0-8.0 ounces	30	Observe label.
	Thiamethoxam (Actara)	2.0-4.0 ounces	0	Observe label.
	Acetamiprid (Assail 30SG)	2.5-4.0 ounces	7	No more than one every 7 days. Do not exceed four applications per season or 7ounces/season.
	Spiromesifen (Oberon 2EC)	7.0-8.5 SC	7	Do not exceed three apps/season
ENGLISH PEA				
Aphids, cabbage loopers, cutworm	Bifenthrin (Capture 2EC)	1.6-6.4 ounces	3	Observe label.
	Esfenvalerate (Asana XL)	5.8-9.6 ounces	1	Observe label.
	Imidicloprid (Admire Pro 4.6F)	1.2 fluid ounces	7	Observe label.

CBD v. EPA (1:21-cv-00681-CJN) ED_005427A_00029618-00182

Vegetables – Commercial

Insects	Insecticide and Formulations	Rate/A	Cutoff Date	Remarks, Restrictions or Limitations
	Malathion 5EC	1.0 pint	3	Observe label.
	Pymetrozine (Fulfill 50WPG)	2.75 ounces	14	Observe label.
IRISH POTATO				
Aphids, caterpillars, Colorado potato beetles, cucumber beetles, flea beetles, flea hoppers, leafhoppers, plant bugs, psyllids	Abimectin (Agri-Mek 0.15EC)	8.0-16.0 ounces	14	Observe label.
	Acetamiprid (Assail 30SG)	1.5-4.0 ounces	7	Observe label.
	Carbaryl (Sevin) 80S	0.6 pound	None	Foliage applications only.
	Esfenvalerate (Asana XL)	5.8-9.6 ounces	1	Observe label.
	Imidicloprid (Admire Pro 4.6F)	1.2 fluid ounces	7	Observe label. Foliar treatment.
	Indoxacarb (Avaunt)	3.5-6.0 ounces	7	Observe label.
	Permethrin (Ambush 25W)	0.05-0.2 pound	7	Observe label.
	Permethrin (Pounce 3.2 EC)	4.0-8.0 ounces	7	Observe label.
	Pymetrozine (Fulfill)	2.75 ounces	14	Observe label.
	Spinetoram (Radiant SC)	6.0-8.0 fluid ounces	7	Observe label.
	Spinosad (Blackhawk 36WG)	1.7-3.3 ounces	3	Observe label.
	Thiamethoxam (Actara)	1.5 ounces	14	Observe label.
	Thiamethoxam (Platinum)	5.0-8.0 ounces	30	Observe label.
Caterpillars	Methomyl (Lannate LV)	0.75-3.0 pints	10	Do not use in home plantings.
	Methomyl (Lannate SP)	0.25-1.0 pound	14	Observe label.
Mites	Abimectin (Agri-Mek 0.15EC)	8.0-16.0 ounces	14	Observe label.
Whiteflies	Imidicloprid (Provado 1.6 F)	3.25 ounces	7	Observe label.
	Pymetrozine (Fulfill)	2.75 ounces	14	Observe label.
	Thiamethoxam (Actara)	1.5 ounces	14	Observe label.
	Thiamethoxam (Platinum)	5.0-8.0 ounces	30	Observe label.
Wireworms	Ethoprop (Mocap 15G)	1.4 pounds per 1,000 ft. row	90	Observe label.
	Fipronil (Regent 4SC)	3.2 fluid ounces	90	In-furrow at planting.

CBD v. EPA (1:21-cv-00681-CJN) ED_005427A_00029618-00183

Vegetables – Commercial

Insects	Insecticide and Formulations	Rate/A	Cutoff Date	Remarks, Restrictions or Limitations
LETTUCE				
Aphids	Acetamiprid (Assail 30SG)	2-4 ounces	7	Do not apply more than 1 every 7 days; do not exceed 4 apps./year.
	Imidicloprid (Admire Pro 4.6F)	1.0-3.0 fluid ounces	7	
	Malathion 5EC	1.0-2.0 pints	7 (head) 14 (leaf)	Observe label.
	Pymetrozine (Fulfill)	2.75 ounces	7	Observe label.
	Spinosad (SpinTor 2SC)	1.5-3.0 ounces	1	Observe label.
	Spirotetramat (Movento 2SC)	4.0-5.0 fluid ounces	3	Do not exceed 10 fluid ounces/season.
Caterpillars	*Bacillus thuringiensis*			Use maximum rate recommended by manufacturer.
	Bifenthrin (Capture 2EC)	2.1-6.4 ounces	7	Observe label.
	Emamectin benzoate (Proclaim)	2.4-4.8 ounces	7	Observe label.
	Indoxacarb (Avaunt)	2.5-3.5 ounces	3	Observe label.
	Permethrin (Ambush 25W)	0.1-0.2 pounds	1	Do not feed refuse leaves to livestock. On leaf lettuce, do not use more than 2 applications per season; head lettuce only.
	Permethrin (Pounce 3.2 EC)	4.0-8.0 ounces	7	
	Permethrin (Pounce 25WP)	6.4-12.8 ounces	1	
	Spinosad (SpinTor 2SC)	1.5-3.0 ounces	1	Observe label.
	Tebufenozide (Confirm)	6.0-8.0 ounces	7	Observe label.
	Zeta-cypermethrin (various)	2.4-4.3 ounces		Observe label
Leafhoppers, leafminers	Abimectin (Agri-Mek 0.15EC)	8.0-16.0 ounces	7	Observe label.
	Bifenthrin (various)	2.6-6.4 ounces	7	
	Imidicloprid (Provado 1.6F)	3.75 fluid ounces	7	Check label for plant-back restrictions.
	Malathion 25WP	2.0-5.0 pounds	7 (head) 14 (leaf)	Observe label.
Wireworms	Diazinon AG500	3.0-4.0 quarts	14	Observe label.
OKRA				
Aphids	Imidicloprid (Admire Pro 4.6F)	1.3-2.2 fluid ounces	0	Observe label.
	Malathion 5EC	1.0 pint	1	Observe label.
	Malathion 25WP	2.5 pounds	1	Observe label.
Beetles, leaf-footed bugs stink bugs	Bifenthrin (Brigade 2EC)	2.6-6.4 ounces	7	Observe label.
	Buprofezine (Courier 40SC)	9-13.6 ounces	1	Observe label.
	Carbaryl (Sevin) 50WP	2.0 pounds	None	Observe label.

CBD v. EPA (1:21-cv-00681-CJN) ED_005427A_00029618-00184

Vegetables – Commercial

Insects	Insecticide and Formulations	Rate/A	Cutoff Date	Remarks, Restrictions or Limitations
	Carbaryl (Sevin) 80S	1.25 pounds	None	Observe label. Sevin will not control stinkbugs.
	Zeta-cypermethrin (various)	2.24-4 ounces	1	Observe label.
Corn earworms	Carbaryl (Sevin) 50WP	2.0 pounds	None	Observe label.
	Carbaryl (Sevin) 80S	1.25 pounds	None	Observe label.
	Spinosad (SpinTor 2SC)	1.5-8.0 ounces	1	Observe label.
ONION, SHALLOT				
Onion thrips, thrips	Acetamiprid (Assail 70WP)	2.1 – 3.4 ounces	7	Observe label.
	Malathion 5EC	0.6 pint	3	Observe label.
	Malathion 25WP	1.5 pounds	3	Observe label.
	Permethrin (Ambush 25W)	9.6-19.2 ounces	1	Observe label.
	Permethrin (Pounce 25WP)	9.6-19.2 ounces	1	Observe label.
	Spinetoram (Radiant SC)	6-8 fluid ounces	1	Observe label.
	Zeta-cypermethrin (various)	2.4-4.3 ounces		Observe label
Onion maggots	Chlorpyrifos (Lorsban 15G)	3.7 ounces/1,000 ft.		Observe label.
		1.1 ounces/1,000 ft.		Observe label.
	Diazinon AG500	2.0-4.0 quarts	14	Observe label.
PARSLEY				
Aphids	Imidicloprid (Admire 4.6F)	7-10 ounces	21	Soil application.
	Imidicloprid (Provado 1.6F)	3.75 ounces	0	Observe label.
	Malathion 5EC	1.0 pint	21	Observe label.
	Pymetrozine (Fulfill)	2.75 ounces	7	Observe label.
Caterpillars, loopers	*Bacillus thuringiensis*		None	Observe label.
	Permethrin (Ambush 25W)	0.4-0.8 pound	1	Observe label.
Flea beetles	Carbaryl (Sevin) 50W	2.0-4.0 pounds	14	Observe label.
	Malathion 5EC	1.0-2.0 pints	21	Observe label.
	Methomyl (Lannate LV)	1.5-3.0 pints	10	Observe label.
	Methomyl (Lannate SP)	0.5-1.0 pounds	10	Observe label.
	Tebufenozide (Confirm 2F)	6.0-8.0 ounces	7	Observe label.
PEPPERS				
Aphids	Imidicloprid (Admire Pro)	7.0-14.0 ounces	21	Soil or foliar application.
	Methomyl (Lannate LV)	1.5-3.0 pints	3	Observe label.

CBD v. EPA (1:21-cv-00681-CJN) ED_005427A_00029618-00185

Vegetables – Commercial

Insects	Insecticide and Formulations	Rate/A	Cutoff Date	Remarks, Restrictions or Limitations
	Methomyl (Lannate SP)	0.5-1.0 pound	3	Observe label.
	Naled (Dibrom 8EC)	0.5 pint	1	Observe label.
	Oxamyl (Vydate L)	2.0-4.0 pints	7-14	Observe label.
	Thiamethoxam (Actara)	2.0-4.0 ounces	0	Observe label.
	Thiamethoxam (Platinum)	5.0-8.0 ounces	30	Observe label.
Flea beetles, hornworms, leaf-footed bugs, tomato fruitworms, yellow-striped armyworms	Bifenthrin (Capture 2EC)	2.1-6.4 ounces	7	Observe label.
	Carbaryl (Sevin) 50WP	2.0 pounds	None	Observe label.
	Carbaryl (Sevin) 80S	1.25 pounds	None	Observe label.
	Methomyl (Lannate LV)	1.5-3.0 pints	3	Observe label.
	Methomyl (Lannate SP)	0.5-1.0 pound	3	Observe label.
	Permethrin (Pounce 3.2 EC)	4.0-8.0 ounces	3	Observe label.
	Spinosad (SpinTor 2SC)	1.5-8.0 ounces	1	Observe label.
	Tebufenozide (Confirm 2F)	6.0-8.0 ounces	7	Observe label.
	Zeta-cypermethrin (various)	2.4-4.3 ounces		Observe label
Leafminers	Abimectin (Agri-Mek) 0.15EC	8.0-16.0 ounces	7	Observe label.
	Cyromazine (Trigard 75WP)	2.66 ounces	0	Observe label.
	Oxamyl (Vydate L)	2.0-4.0 pints	7-14	Observe label.
	Permethrin (Pounce 3.2EC)	4.0-8.0 ounces	3	Observe label.
	Spinosad (SpinTor 2SC)	1.5-8.0 ounces	1	Observe label.
	Zeta-cypermethrin (various)	2.4-4.3 ounces		Observe label
Pepper weevils	Acephate (Orthene) 75S	0.66 pound	7	Do not use on bell peppers. Use in conjunction with pyrethroids.
	Acetamiprid (Assail 30SG)	4.0 ounces	7	
	Bifenthrin (Capture 2EC)	2.1-6.4 ounces	7	Observe label.
	Carbaryl (Sevin) 80S	2.5 pounds	None	Observe label.
	Esfenvalerate (Asana XL)	5.8-9.7 ounces	7	Observe label.
	Permethrin (Ambush 25WP)	6.4-12.8 ounces	3	Bell peppers only.
	Permethrin (Pounce 3.2EC/25WP)	4.0-8.0 ounces	3	Bell peppers only.

CBD v. EPA (1:21-cv-00681-CJN) ED_005427A_00029618-00186

Vegetables – Commercial

Insects	Insecticide and Formulations	Rate/A	Cutoff Date	Remarks, Restrictions or Limitations
	Zeta-cypermethrin (Fury 2EC)	2.4-4.3 ounces		Observe label
	Begin spray application for control of pepper weevil as soon as damage is observed. Spray on 3- to 4-day schedule until control is obtained (usually 3 weeks). Destroy all pepper plants when through harvesting.			
Spider mites	Abimectin (Agri-Mek 0.15EC)	8.0-16.0 ounces	7	Observe label.
	Bifenazate (Acramite 50WS)	.75-1.0 pound	3	No more than 1 app./season; will not control broad mite.
	Bifenthrin (Capture 2EC)	2.1-6.4 ounces	7	Observe label.
	Fenpyroximate (Portal .4EC)	2 pints	3	
	Spiromesifen (Oberon)	7.0-8.5 fluid ounces	7	Do not exceed 3 applications/season.
Vegetable weevils, thrips	Malathion 57EC	1.0 pint	7	Late afternoon and evening spraying is best. Clearing or treating dead lands and ditch banks is effective.
	Imidicloprid (Admire Pro 4.6F)	7.0-14.0 ounces	21	
	Abimectin (Agri-Mek 0.15EC)	8.0-16.0 ounces	7	
	Spinetoram (Radiant SC)	4.0-8.0 ounces	1	Observe label.
Whiteflies	Imidicloprid (Admire 2F)	16.0-32.0 ounces	21	Soil application.
	Imidicloprid (Admire Pro)	1.3-2.2 ounces	0	Foliar application. Minimum interval between foliar applications: 5 days. Do not use more than 6.7 fluid ounces/acre per crop season.
	Pymetrozine (Fulfill)	2.75 ounces	7	Observe label.
	Thiamethoxam (Actara)	2.0-4.0 ounces	None	Observe label.
	Thiamethoxam (Platinum)	5.0-8.0 ounces	30	Observe label.
PUMPKIN				
Aphids, whiteflies	Pymetrozine (Fulfill)	2.75 ounces	7	Observe label.
	Bifenthrin (Brigade 2EC)	2.6-6.4 fluid ounces	3	Observe label.
	Imidicloprid (Admire 2F)	16.0-24.0 ounces	21	Soil application.
	Thiamethoxam (Actara)	2.0-4.0 ounces	None	Observe label.
Cucumber beetles, melon worms, pickleworms, squash bugs, squash vine borers	Carbaryl (Sevin) 50WP	1.0 pound	None	Observe label.
	Carbaryl (Sevin) 80S	0.6 pound	None	Observe label.

CBD v. EPA (1:21-cv-00681-CJN) ED_005427A_00029618-00187

Vegetables – Commercial

Insects	Insecticide and Formulations	Rate/A	Cutoff Date	Remarks, Restrictions or Limitations
	Esfenvalerate (Asana XL)	5.8-9.6 ounces	3	Observe label.
	Permethrin (Pounce 3.2 EC)	8.0 ounces	1	Observe label.
	Permethrin (Ambush 25WP)	6.4-12.8 ounces		Observe label.
	Permethrin (Pounce 25WP)	12.8 ounces	1	Observe label.
	Spinosad (SpinTor 2SC)	4.0-8.0 ounces	3	Observe label.
	Make first application for cucumber beetle when seedlings first crack soil; repeat as needed.			
Spider mites	Abimectin (Agri-Mek 0.15EC)	8.0-16.0 ounces	7	Observe label.
	Bifenazate (Acramite 50WS)	.75-1.0 pound	3	No more than 1 application/season
	Spiromesifen (Oberon 2SG)	7-8.5 ounces	7	No more than 3 applications/season.
RADISHES				
Aphids, dipterous leafminers, flea beetles,	Beta-cyfluthrin (Baythroid)	1.6-2.8 ounces	None	Observe label.
	Carbaryl (Sevin) 50WP	1.0 pound	3	Observe label.
	Carbaryl (Sevin) 80S	0.6 pound	3	Observe label.
	Esfenvalerate (Asana XL)	5.8-9.6 ounces	7	Observe label.
	Imidicloprid (Admire Pro)	1.2 fluid ounces	7	Observe label. Foliar treatment.
	Spinosad (SpinTor 2SC)	3.0-6.0 ounces	7	Observe label.
Root aphids, root maggots	Chlorpyrifos (Lorsban 15G)	3.3 ounces/1,000 linear feet		Observe label.
Wireworms	Chlorpyrifos (Lorsban 4E)	1fluid ounce/1,000 linear feet		Use a minimum of 40 gallons of water/ app. Water based in-furrow planting.
	Diazinon AG500	3.0-4.0 quarts	14	Observe label.
SOUTHERN PEA				
Aphids	Imidicloprid (Admire Pro)	7.0-10.5 fluid ounces	21	Soil or foliar application.
	Malathion 5EC	1.0 pint	1	Observe label.
	Malathion 25WP	2.5 pounds	1	Observe label.
Corn earworms, cowpea curculios, stinkbugs	Bifenthrin (Capture 2EC) Capture 2EC	2.1-6.4 ounces	3	Observe label.
	Carbaryl (Sevin) 50WP	2.0 pounds	None	
	Carbaryl (Sevin) 80S	1.25 pounds	None	Carbaryl should be applied as a spray rather than a dust. Will not control stinkbugs.

CBD v. EPA (1:21-cv-00681-CJN) ED_005427A_00029618-00188

Vegetables – Commercial

Insects	Insecticide and Formulations	Rate/A	Cutoff Date	Remarks, Restrictions or Limitations
	Methomyl (Lannate LV)	0.75-3.0 pints	3	Do not graze or feed treated forage to livestock.
	Methomyl (Lannate SP)	0.25-1.0 pound	3	
	Spinosad (SpinTor 2SC)	3.0-6.0 ounces	3	Observe label.
	Zeta-cypermethrin (various)	2.4-4.3 ounces		Observe label
SPINACH				
Aphids	Acetamiprid (Assail SG)	2.0-4.0 ounces	7	Do not apply more than once every 7 days; do not exceed 5 apps/season.
	Flonicamide (Beleaf 50SG)	2.0-2.8 ounces	0	Observe label.
	Imidicloprid (Admire Pro)	4.4-10.5 fluid ounces	21	Soil or foliar application.
	Malathion 5EC	1.0 pint	7	Observe label.
	Spirotetramat (Movento 2SC)	4.0-5.0 fluid ounces	3	Do not exceed 10 fluid ounces/ season.
Caterpillars, flea beetles, loopers	Indoxacarb (Avaunt 30SG)	2.5-3.5 ounces	3	Observe label.
	Methomyl (Lannate 90SP)	0.5 pound	7	Observe label.
	Permethrin (Pounce 3.2 EC)	4.0 ounces	1	Observe label.
	Permethrin (Ambush 25WP, Pounce 25WP)	6.4 ounces	1	Observe label.
	Spinosad (SpinTor 2SC)	1.5-10.0 ounces	1	Observe label.
	Tebufenozide (Confirm 2E)	6.0-8.0 ounces	7	Observe label.
	Spray on 5- to 7-day schedule or as needed. Apply sufficient spray to cover foliage completely.			
Leafminers	Cyromazine (Trigard 75WP)	2.66 ounces	7	Observe label.
	Spinetoram (Radiant SC)	6.0-10.0 ounces	1	Observe label.
SQUASH (SUMMER AND WINTER)				
Aphids	Acetamiprid (Assail 30SG)	2.5-4.0 ounces	0	
	Bifenthrin (Capture 2EC)	2.6-6.4 fluid ounces	3	Limit 19.22 fluid ounces/season –2 applications post bloom; allow 7 days between applications.
	Pymetrozine (Fulfill 50WDG)	2.75 ounces	0	
Cucumber beetles	Bifenthrin 2EC	2.6-6.4 fluid ounces	3	Limit 19.22 fluid ounces/season – 2 applications post bloom; allow 7 days between applications.
	Imidicloprid (Admire Pro 4.6F)	7.0-10.5 fluid ounces	21	

CBD v. EPA (1:21-cv-00681-CJN) ED_005427A_00029618-00189

Vegetables – Commercial

Insects	Insecticide and Formulations	Rate/A	Cutoff Date	Remarks, Restrictions or Limitations
	Dinotefuran (Venom 70SG)	3.0-4.0 oz. (foliar) 5.0-6.0 oz. (soil)	1 21	
Leafminers	Bifenthrin (Capture 2EC)	5.12-6.4 ounces	3	Observe label.
	Cyromazine (Trigard 75WP)	2.66 ounces	7	Observe label.
	Naled (Dibrom 8EC)	0.5-1.0 pint	None (summer) 1 day (winter)	
	Oxamyl (Vydate L)	2.0-4.0 pints	1	Leafminers only.
	Permethrin (Pounce 3.2 EC)	4.0-8.0 ounces	To harvest	Not more than 1.6 pounds/A.I./acre per season.
	Permethrin (Pounce 25WP)	6.4-12.8 ounces	To harvest	
	Spinetoram (Radiant SC)	6.0-10.0 ounce	1	Observe label.
	Spinosad (SpinTor 2SC)	4.0-8.0 ounces	3	Observe label.
Melon worms, pickleworms, squash bugs, squash vine borers	Carbaryl (Sevin) 50WP	1.0 pound	None	Observe label.
	Permethrin (Pounce 3.2EC)	4.0-8.0 ounces	To harvest	Not more than 1.6 pounds/A.I./acre per season.
	Permethrin (Pounce 25WP)	6.4-12.8 ounces	To harvest	
	Acetamiprid (Assail 30WG)	5.3 ounces	0	Observe label.
	Bifenthrin (Capture 2EC)	5.12-6.4 ounces	3	Observe label.
	Spinosad (SpinTor 2SC)	4.0-8.0 ounces	3	Observe label.
	Methomyl (Lannate LV)	1.5-3.0 pints	3	Observe label.
	Methomyl (Lannate SP)	0.5-1.0 pound	3	Observe label.
	Esfenvalerate (Asana XL)	1.7-3.4 ounces	3	Observe label.
Spider mites	Bifenthrin (Capture 2EC)	5.12-6.4 ounces	7	Observe label.
Whiteflies	Imidicloprid (Admire 2F)	16.0-24.0 ounces	21	Soil application.
	Pymetrozine (Fulfill)	2.75 ounces	7	Observe label.
	Spiromesifen (Oberon 2SC)	7.0-8.5 fluid ounces	7	Do not apply more than 3 apps/season
	Thiamethoxam (Platinum)	5.0-8.0 ounces	30	Observe label.
SWEET CORN				
Corn rootworms, wireworms	Bifenthrin(various)	0.4-8.0 oz./1,000 linear feet/row	0	Apply as 5-7 in T-band over open seed furrow.
	Chlorpyrifos (Lorsban 4E)	4 pints	0	Preplant incorporation treatment.
Cutworms	Beta-cyfluthrin (Baythroid XL)	0.8-1.6 fluid ounces	0	Observe label.
	Bifenthrin (Brigade 2EC)	2.1-6.4 fluid ounces	1	Observe label.
	Esfenvalerate (Asana XL)	4.8 ounces	1	Observe label.

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Vegetables – Commercial

Insects	Insecticide and Formulations	Rate/A	Cutoff Date	Remarks, Restrictions or Limitations
European corn borers, fall armyworms	Bifenthrin(various)	0.4-8.0 oz./1,000 linear feet/row	0	Apply as 5-7 in T-band over open seed furrow.
	Carbaryl (Sevin) 50WP	4.0 pounds	None	Observe label.
	Carbaryl (Sevin) 80S	2.5 pounds	None	Observe label.
	Esfenvalerate (Asana XL)	5.8-9.6 ounces	1	Observe label.
	Flubendiamide (Belt 4SC)	2.0-3.0 ounces		
	Indoxacarb (Avaunt 30DG)	2.5-3.5 ounces	3	For control of European corn borer in whorl stage only. Do not apply more than 14 ounces per acre per crop.
	Permethrin (Ambush 25WP)	6.4-12.8 ounces	1	Observe label.
	Permethrin (Pounce 3.2 EC)	4.0-8.0 ounces	1	Observe label.
	Permethrin (Pounce 25WP)	6.4-12.8 ounces	1	Observe label.
	Rynaxypyr (Coragen 1.67SC)	3.5-5.0 fluid ounces		
	Spinetoram (Radiant SC)	3.0-6.0 ounces	1	Do not apply more than 36ounces per acre per season.
	Spinosad (SpinTor 2EC)	1.5-6.0 ounces	1	Observe label.
	Zeta-cypermethrin (Fury 2EC)	2.4-4.3 ounces	3	Observe label.
	For best control apply to silks when silks first appear on 2-day schedule until silks wilt.			
Seed corn maggots	Diazinon AG500	2.0-4.0 quarts	7	Observe label.
FIELD TOMATO				
Aphids, flea beetles	Acetamiprid (Assail 30SG)	2.0-4.0 ounces	7	Do not apply more than once every 7 days. Do not exceed 5 apps/season.
	Dimethoate 4EC	0.5-1.0 pint	7	Do not exceed rate as leaf damage may occur.
	Flonicamide (Beleaf 50SG)	2.0-2.8 ounces	0	Will not control flea beetles.
	Imidicloprid (Admire Pro 4.6F)	7.0 fluid ounces	21	Short-term protection at planting. May also be applied to transplants in the planting house.
	Pymetrozine (Fulfill 50WDG)	2.75 ounce	0	For aphids only.
	Spirotetramat (Movento 2SC)	4.0-5.0 fluid ounces	1	Do not exceed 10 fl. ounces/ season.
	Thiamethoxam (Platinum 2SC)	5.0-11.0 ounces	30	May be applied to direct-seeded crops. Do not exceed 11ounces/ A/season. Check label for plant-back restrictions for a number of crops.
	Thiamethoxam (Actara 25 WDG)	2.0-3.0 ounces	0	For foliar applications.
Armyworms	Bacillus thuringiensis (Crymax WDG)	0.5-1.5 pounds	0	Start application when larvae are small and continue at 5- to 7-day intervals during periods of infestation.
	Bacillus thuringiensis (Dipel 2X)	0.5-1 pound	0	
	Bacillus thuringiensis (XenTari)	0.5-1 pound	0	

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Vegetables – Commercial

Insects	Insecticide and Formulations	Rate/A	Cutoff Date	Remarks, Restrictions or Limitations
	Emamectin benzoate (Proclaim 5WDG)	2.4-4.8 ounces	7	Apply when larvae are first observed.
	Flubendiamide (Synapse 24% WG)	2.0-3.0 ounces	1	
	Indoxacarb (Avaunt 30DG)	3.5 ounces	3	Do not apply more than 14 oz/A/crop. Minimum interval b/w sprays is 5 days.
	Methoxyfenozide (Intrepid 2F)	4.0-10.0 ounces	1	Use low rates for early-season applications; 6-10 ounces for mid- to late-season applications.
	Rynaxypyr (Coragen 1.67SC)	3.5-5.0 fluid ounces	1	Foliar or drip chemigation. Observe label.
	Spinetoram (RadiantSC)	5.0-10.0 ounces	1	
Cabbage loopers, hornworms, pinworms, tomato fruitworms	Bacillus thuringiensis (Crymax WDG)	0.5-1.5 pound	0	Do not tank-mix *Bacillus thuringiensis* formulations with Dyrene.
	Bacillus thuringiensis (Dipel 2X)	0.5-1 pound	0	
	Beta-cyfluthrin (Baythroid XL)	1.6-2.8 fluid ounces	0	Do not exceed 16.8 fluid ounces per acre per season.
	Bifenthrin (various)	2.6-6.4 fluid ounces	1	
	Emamectin benzoate (Proclaim 5WDG)	2.4 - 4.8 ounces	7	
	Esfenvalerate (Asana XL 0.66 EC)	4.8-9.6ounces	1	
	Fenpropathrin (Danitol 2.4 EC)	10.667 fluid ounces	3	Use a spray volume of 25-120 gallons per acre. Do not exceed 2.667 pints (42.667 fluid oz.) per acre per season.
	Flubendiamide (Synapse 24% WG)	2.0-3.0 ounces	1	
	Gamma-cyhalothrin (Proaxis 0.5EC)	2.56-3.84 fluid oz.	5	
	Indoxacarb (Avaunt 30DG)	2.5-3.5 ounces	3	Do not apply more than 14oz./A/crop. Minimum interval b/w sprays is 5 days.
	Lamda-cyhalothrin (Warrior II)	1.28-1.92 ounces	5	Do not exceed 2.88 pints/A/season. Do not use on cherry tomatoes.
	Methomyl (Lannate 2.4LV)	1.5-3.0 pints	1	Methomyl may cause leafminer infest.
	Methoxyfenozide (Intrepid 2F)	4.0-10.0 ounces	1	Use low rates for early-season applications; 6-10 ounces for mid- to late-season applications.
	Rynaxypyr (Coragen 1.67SC)	3.5-5 fluid ounces	1	Foliar or drip chemigation, observe label. Must be applied uniformly to root zone.
	Spinetoram (Radiant SC)	5.0-10.0 ounces	1	
	Zeta-cypermethrin + bifenthrin (Mustang Max .8EC)	2.24-4.0 ounces	1	
Colorado potato beetles	Acetamiprid (Assail 30SG)	1.5-2.5 ounces	7	For soil, foliar or transplant drench treatment.
	Imidicloprid (Admire Pro 4.6F)	7.0 fluid ounces	21	Foliar or drip chemigation. Observe label.
	Rynaxypyr (Coragen 1.67SC)	3.5-5.0 fluid ounces	1	
	Spinetoram (Radiant SC)	5.0-10.0 ounces	1	
	Thiamethoxam (Actara 25 WDG)	2.0-3.0 ounce	0	For foliar applications.

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Vegetables – Commercial

Insects	Insecticide and Formulations	Rate/A	Cutoff Date	Remarks, Restrictions or Limitations
	Thiamethoxam (Platinum 2SC)	5.0-11.0 ounces	30	May be applied to direct-seeded crops. Do not exceed 11 ounces/ A/season. Check label for plant-back restrictions for a number of crops.
Cutworms	Beta-cyfluthrin (Baythroid XL)	1.6-2.8 fluid ounces	0	Do not exceed 16.8 fluid ounces per acre per season.
	Esfenvalerate (Asana XL 0.66 EC)	4.8-9.6 ounces	1	
	Gamma-cyhalothrin (Proaxis 0.5EC)	2.56-3.84 fl.oz.	5	
	Lamda-cyhalothrin (Warrior II)	1.28-1.92 ounces	5	Do not exceed 2.88 pints/A/season. Do not use on cherry tomatoes.
	Zeta-cypermethrin (various)	3.2-4.0 ounce	1	
Leafminers	Abimectin (Agri-Mek 0.15EC)	8.0-16.0 ounces	7	Do not exceed 48 fluid ounces per acre per season or more than 2 sequential applications.
	Cyromazine (Trigard 75WP)	2.66 ounce	0	See label for plant-back restrictions.
	Spinetoram (Radiant SC)	6.0-8.0 ounces	1	Do not exceed 29 fluid ounces per acre per season.
Spider mites	Abimectin (Agri-Mek 0.15EC)	8.0-16.0 ounces	7	Do not exceed 48 fluid ounces per acre per season or more than 2 sequential applications.
	Bifenazate (Acramite 50WS)	0.75-1.0 pound	3	Do not make more than 1 application per season.
	Spiromesifen (Oberon 2SG)	7.0-8.5 fluid ounces	7	Do not exceed 3 applications per season.
Stinkbugs	Bifenthrin (various)	2.6-6.4 fluid ounces	1	
	Fenpropathrin (Danitol 2.4 EC)	10.667 fluid ounces	3	Use a spray volume of 25-120 gallons per A. Do not exceed 2.667 pints (42.667 fl. oz.) per acre per season.
	Gamma-cyhalothrin (Proaxis 0.5EC)	2.56-3.84 fluid ounces	5	
	Lamda-cyhalothrin (Warrior II)	1.28-1.92 ounces	5	
	Thiamethoxam (Actara 25 WDG)	3.0-5.5 ounces	0	Do not exceed 11oz. /A/season.
	Zeta-cypermethrin + bifenthrin (Mustang Max .8EC)	3.2-4.0 ounces	1	
Thrips	Dimethoate 4EC	0.5-1 pint	7	
	Dinotefuran (Venom 70SG)	1.0-4.0 oz. foliar	1	See comments under Whitefly for app. instructions and restrictions.
		5.0-6.0 ounces soil	21	
	Methomyl (Lannate 2.4LV)	1.5-3 pints	1	On foliage as needed.
	Spinetoram (Radiant SC)	6.0-10.0 ounces	1	Controls thrips on foliage, not in flowers.
Whiteflies	Acetamiprid (Assail 30SG)	2.5-4.0 ounces	7	Do not apply more than once every 7 days. Do not exceed 5 apps./ season.
	Buprofezine (Courier 40 SC)	9.0-13.6 fluid ounces	7	Use sufficient water to ensure good coverage. Do not apply more than 2 per crop cycle; allow 28 days between applications.
	Dinotefuran (Venom 70SG)	1-4oz foliar	1	Do not follow soil apps with apps of other neonicotinoid insecticides (Actara or Venom) Use only one app. method. May also control stink bugs.
		5-6 ounce soil	21	

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Vegetables – Commercial

Insects	Insecticide and Formulations	Rate/A	Cutoff Date	Remarks, Restrictions or Limitations
	Imidicloprid (Admire Pro)	1.3-2.2 fluid ounces	0	Foliar application. Minimum interval between foliar applications: 5 days. Maximum = 6.7 fluid ounces per acre per crop season.
	Imidicloprid (Admire Pro 4.6F Soil)	7.0-10.5 fluid ounces	21	Do not follow soil apps. with apps. of other neonicotinoid insecticides (Actara, Provado or Venom). Residual activity will increase with increasing rates applied. Use higher rate for late-season or continuous infestations. Trickle irrigation will also control aphids and stink bugs.
	Pyrifroxifen (Knack 0.86EC)	8.0-10.0 ounces	14	Do not apply more than 2 apps. per growing season. Do not make apps. closer than 14 days.
	Spiromesifen (Oberon 2SG)	7.0-8.5 fluid ounces	7	Do not exceed 3 applications per season.
	Spirotetramat (Movento 2SC)	4.0-5.0 fluid ounces	1	Do not exceed 10 fl. ounces /season.
	Thiamethoxam (Actara)	3.0-5.5 ounces	0	Actara is for foliar applications.
	Thiamethoxam (Platinum 2SC)	5.0-11.0 ounces	30	Do not follow soil apps. with apps. of other neonicotinoid insecticides (Actara, Provado or Venom). May be applied to direct-seeded crops. Do not exceed 11oz per acre per season. Check label for plant-back restrictions for a number of crops.
Wireworms	Diazinon AG 500	2.0-4.0 quart	0	Broadcast before planting and incorporate. Wireworms may be a problem in fields previously in pasture, corn or soybeans.
TURNIP				
Aphids	Imidicloprid (Admire Pro)	4.4-10.5 ounces	21	Greens only.
	Naled (Dibrom 8EC)	0.5 pint	1	Observe label.
	Malathion 5EC	1.0 pint	7	Observe label.
	Malathion 25WP	2.5 pounds	3	Observe label.
	Pymetrozine (Fulfill)	7.75 ounces	7	Greens only.
Cabbage loopers, diamondback moths	Emamectin benzoate (Proclaim 5WDC)	2.4-4.8 ounces	14	For turnip greens only.
	Esfenvalerate (Asana XL)	5.8-9.6 fluid ounces	7	Observe label.
	Indoxacarb (Avaunt 30WDG)	2.5-3.5 ounces	3	Observe label.
	Spinetoram (Radiant SC)	3.0-6.0 fluid ounces	1	
Caterpillars, flea beetles, loopers	*Bacillus thuringiensis*			Use maximum rate recommended by manufacturer.*
	*Spray on 5- to 7-day schedule. Apply sufficient spray to cover foliage completely.			
	Imidicloprid (Ambush 25W)	3.2-6.4 ounces	1	Observe label.
	Naled (Dibrom 8EC)	0.51 pint	1	Observe label.
	Spinetoram (Radiant IC)	3-6 fl. ounces	1	Observe label.
	Tebufenozide (Confirm 2F)	6.0-8.0 ounces	7	Observe label.
Root maggots	Chlorpyrifos (Lorsban 4E)	1.0 ounce/ 1,000 ft. row		

CBD v. EPA (1:21-cv-00681-CJN) ED_005427A_00029618-00194

Vegetables – Commercial

Insects	Insecticide and Formulations	Rate/A	Cutoff Date	Remarks, Restrictions or Limitations
	Chlorpyrifos (Lorsban 15G)	4.6-9.2 ounces/ 1,000 ft. row		
WATERMELON				
Aphids	Bifenthrin (Brigade 2EC)	2.6-6.4 fluid ounces	3	Observe label.
	Imidicloprid (Admire Pro)	7.0-10.5 ounces	21	Soil or foliar application.
	Naled (Dibrom 8EC)	0.25-0.5 pint	1	Observe label.
	Pymetrozine (Fulfill)	2.75 ounces	7	Observe label.
	Thiamethoxam (Actara)	2.0-4.0 ounces	0	Observe label.
Cucumber beetles	Acetamiprid Assail 30SG	2.5-5.3 ounces	0	
	Dinotefuran (Venom 70 SG)	1.0-4.0 ounces (foliar); 5.0-6.0 ounces (soil)	1	
	Imidicloprid (Admire Pro 4.6F)	7.0-10.5 fluid ounces	21	
Cutworms	Esfenvalerate (Asana XL)	4.8-9.6 ounces	3	
	Permethrin (Various) 25W	12.8 ounces	0	
	Permethrin (Various) 3.2EC	8.0 fluid ounces	0	
Leafminers	Abimectin (Agri-Mek 0.15EC)	8.0-16.0 ounces	21	Observe label.
	Cyromazine (Trigard 75WP)	2.66 ounces	0	Observe label.
	Spinetoram (Radiant SC)	8.0 ounces	3	Observe label.
Melon worms, pickleworms	Bifenthrin (Capture 2EC)	5.12-6.4 ounces	3	Observe label.
	Carbaryl (Sevin) 50WP	1.0 pound	None	Observe label.
	Carbaryl (Sevin) 80S	0.6 pound	None	Observe label.
	Esfenvalerate (Asana XL)	5.8-9.6 ounces	1	Observe label.
	Oxamyl (Vydate L)	2.0-4.0 pints	1	Observe label.
	Permethrin (Pounce 3.2EC)	4.0-8.0 ounces	None	Not more than 1.6 pounds active ingredient per acre per season.
	Permethrin (Pounce 25WP)	6.4-12.8 ounces	None	
	Abimectin (Agri-Mek 0.15EC)	8.0-16.0 ounces	7	
	Bifenazate (Acramite 50WG)	0.75-1.0 pound	3	Observe label.
	Bifenthrin (Brigade 2EC)	2.6-6.4 ounces	3	Observe label.
	Etoxazole (Zeal 72WP)	2.0-3.0 ounces	7	Observe label.
Spider mites	Spiromesifen (Oberon 2SG)	7.0-8.5 fluid ounces	7	Observe label.
Whiteflies	Acetamiprid (Assail 30SG)	2.5-5.3 ounces	0	Observe label.
	Buprofezine (Courier 40SC)	9.0-12.5 fluid ounces	7	Observe label.
	Pymetrozine (Fulfill)	2.75 ounces	7	Observe label.

CBD v. EPA (1:21-cv-00681-CJN) ED_005427A_00029618-00195

Vegetables – Commercial

Insects	Insecticide and Formulations	Rate/A	Cutoff Date	Remarks, Restrictions or Limitations
	Spiromesifen (Oberon 70SC)	7.0-8.5 fluid ounces	7	Observe label.
	Thiamethoxam (Actara)	2.0-4.0 ounces	0	Observe label.

CBD v. EPA (1:21-cv-00681-CJN) ED_005427A_00029618-00196

Vegetables – Commercial

General Pests			
Pest	**Insecticide**	**Rate**	**Restrictions and Limitations**
Blister beetles	Carbaryl	1.0 pound active ingredient per acre	Apply as spot treatment as needed. Observe label.
	Malathion	1.0 pound active ingredient per acre	Apply as spot treatment as needed. Observe label.
Snails, slugs	Metaldehyde bait	10 pounds of 25% bait	Apply to soil around plants. Do not contaminate edible parts. Observe label.

CBD v. EPA (1:21-cv-00681-CJN) ED_005427A_00029618-00197

Vegetables – Commercial Greenhouse Tomatoes

Certain cultural practices play a significant role in reducing or eliminating many insect problems in greenhouses. The following cultural practices will aid in the control of insect pests:

1. Maintain a clean, closely mowed area adjacent to the greenhouse.
2. Dispose of any trash, boards or old plant debris in the area.
3. Keep doors, screens and ventilation fan screens in good repair.
4. Use clean sterile soils, tools, flats and other equipment.
5. At the conclusion of the season remove all plants and any plant debris, clean greenhouse thoroughly and fumigate. (See Insecticide Use Suggestions) "An ounce of prevention is worth a pound of cure."

Chemical Safety in the Greenhouse

When used as recommended on the labels, pesticides are safe and effective. All pesticides are poisonous, however, and if misused, they may be hazardous to humans and animals and also may contribute to the pollution of the environment.

Before using any pesticide, read the label in its entirety. Note any special precautions such as the necessity of wearing special protective clothing when applying the chemical. Follow all safety precautions set forth on the label. The following suggestions will aid in developing safe pesticide-use practices in greenhouses.

1. Become familiar with the use of a pesticide before using it. Know its toxicity and the necessary precautions for its safe use.
2. Keep all safety equipment such as facemasks, respirators and protective clothing on hand and in good working order.
3. When mixing pesticides use a well-ventilated area or mix outdoors. Avoid contact with skin and do not breathe vapors.
4. Do not save used pesticide containers. Dispose of old containers properly.
5. Store all pesticides in a secure place away from pets, children and unknowledgeable persons. Never store pesticides in unmarked containers.
6. Post caution signs during fumigation and after treatment of greenhouse to avoid contact with chemicals.
7. Apply correct dosage of the pesticide. Using less than the correct amount may result in poor control of the pest. Using more than the correct amount may result in excessive residue or damage to plants.
8. Obey specified time intervals between treatments and cutoff dates before harvest. A failure to observe these restrictions may result in excessive residue or damage to plants.
9. The use of certain chemicals may be phytotoxic to some varieties of plants. This should be checked before using a chemical.
10. Special restrictions apply to greenhouses connected to living quarters. Read label restrictions where this applies and follow all restrictions carefully.

Table of Measures	
Liquid:	Weight:
1 level tablespoon = 3 level teaspoonfuls	1 ounce = 28.3 grams
1 fluid ounce = 2 tablespoons = 29.57 milliliters	1 pound = 16 ounces = 454 grams
1 cupful = 8 fluid ounces	1 ton = 2,000 pounds
1 pint = 2 cupfuls = 16 fluid ounces	
1 quart = 2 pints = 32 fluid ounces	
1 gallon = 4 quarts = 128 fluid ounces	

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Vegetables – Commercial Greenhouse Tomatoes

Greenhouse Dilution Tables

Wettable Powders

Number of ounces of wettable powder to use in small sprayers when amount per 100 gallons is known:

100 gallons	10 gallons	5 gallons	2 gallons	1 gallon
0.5 pound	0.8 ounce	0.4 ounce	0.2 ounce	0.1 ounce
1.0 pound	1.6 ounces	0.8 ounce	0.3 ounce	0.2 ounce
2.0 pounds	3.2 ounces	1.6 ounces	0.6 ounce	0.3 ounce
3.0 pounds	4.8 ounces	2.4 ounces	1.0 ounce	0.5 ounce
4.0 pounds	6.4 ounces	3.2 ounces	1.3 ounces	0.6 ounce
5.0 pounds	8.0 ounces	4.0 ounces	1.6 ounces	0.8 ounce

Emulsifiable Concentrates

Number of fluid ounces of emulsifiable concentrate to use in small sprayers when amount per 100 gallons is known:

100 gallons	10 gallons	5 gallons	2 gallons	1 gallon
1 pint	1.6 fluid ounces	0.8 fluid ounce	0.3 fluid ounce	0.2 fluid ounce
1 quart	3.2 fluid ounces	1.6 fluid ounces	0.7 fluid ounces	0.3 fluid ounce
2 quarts	6.4 fluid ounces	3.2 fluid ounces	1.3 fluid ounces	0.6 fluid ounce
1 gallons	12.8 fluid ounces	6.4 fluid ounces	2.6 fluid ounces	1.3 fluid ounces

Mist Blower

Quantity of emulsifiable concentrate (EC) needed to make a 25X concentrate:

If amount per 100 gallons for a high volume spray is:	Use this amount in a 25 gallon mist blower	Use this amount in a 10 gallon mist blower	Use this amount in a 2 gallon mist blower	Use this amount in a 1 gallon mist blower
1 pint	6.25 pints	2.5 pints	8.0 fluid ounces	4.0 fluid ounces
1 quart	6.25 quarts	5.0 pints	1.0 pint	8.0 fluid ounces
2 quarts	3.13 gallons	5.0 quarts	1.0 quart	1.0 pint
1 gallons	6.25 gallons	2.5 gallons	2.0 quarts	1.0 quart

Your county agent can give you further help with dilutions. Visit www.lsuagcenter.com.

CBD v. EPA (1:21-cv-00681-CJN) ED_005427A_00029618-00199

Vegetables – Commercial Greenhouse Tomatoes

Pesticide Recommendations

Insect	Insecticide and Formulation	Amount of Formulation	Re-entry Interval	Preharvest Interval	Precautions and Remarks
Aphid	Imidacloprid (Admire pro) 4.6F	0.6 fl. oz./1,000 plants	12 hours	0	Apply in minimum of 21 gal. water using soil drenches or drip irrigation. Do not apply to immature plants. Make only one application per crop per season.
	Insecticidal Soap (M-Pede) 49EC	2 tbsp./gal. water	12 hours	0	May be used alone or in combination. Acts as an exciter.
	Malathion (various) 10 A 57 EC 25 WP	1lb./50,000 cu.ft. 1qt./100 gal. water 4lb./100 gal. water	12 hours	15 hours 1 day 1 day	
Broad mite, russet mite, spider mite	Bifenazate (Floramite) SC	4-8 fl.oz/100 gal. water 1/4 to 1/2 tsp./gal. water		3 days 3 days	Not for russet mite. For use on tomatoes greater than1 inch diameter at maturity. Not registered on pepper.
	Insecticidal Soap (M-Pede) 49EC	2 tbsp./gal. water	12 hours	0	
	Mineral Oil (Tri Tek)	1 to 2 gal./100 gal water		0	Begin applications when mite populations are low; repeat at weekly intervals.
Caterpillars: armyworm, cabbage looper, catworm, fruitworm	Bacillus Thuringiensis (various)	See label	4 hours	0	
	Chlorfenapyr (Pylon) 2SC	6.5 to 13 oz./100 gal. water or per acre area		0	For use on tomatoes more than 1 inch in diameter at maturity. Do not make more than 2 applications at 5- to 10-day intervals.
	Malathion(various) 10 A 57 EC 25 WP	1lb./50,000 cu.ft. 1qt./100 gal. water 4qt./100 gal. water	12 hours	15 hours 1	Hazardous to honey bees.
	Spinosad Entrust SC	3 fl.oz./100 gal	4 hours	1 day	Do not make more than 2 consecutive applications. Do not apply to seedling tomatoes or peppers grown for transplants.
Cricket, millipede	Malathion (various) 5D	Follow label	12 hours		Apply to soil at base of plants, Do not contaminate fruit.
leafminer	Malathion (Various) 10A	1lb./50,000 cu.ft.	12 hours	15 hours	See aphid.
	Spinosad (Entrust) SC	10 fl.oz/100 gal	4 hours	1 day	Do not apply to seedlings grown for transplants.
Slug	Metaldehyde (various)	Follow label			Apply to soil surface around plants. Do not contaminate fruit.
Thrips	Chlorfenapyr (pylon) 2SC	9.8 to 13 fl.oz./gal. water or per acre area		0	For use on tomatoes more than 1 inch at maturity. Do not make more than 2 applications at 5- to 10- day intervals.

CBD v. EPA (1:21-cv-00681-CJN) ED_005427A_00029618-00200

Vegetables – Commercial Greenhouse Tomatoes

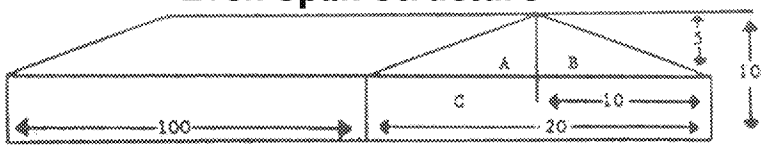
Pesticide Recommendations					
Insect	**Insecticide and Formulation**	**Amount of Formulation**	**Re-entry Interval**	**Preharvest Interval**	**Precautions and Remarks**
	Spinosad (Entrust) SC	5.5 fl. oz./100 gal. water	4 hours	1 day	Do not make more than 2 consecutive applications and do not apply more than 6 times in a 12-month period against thrips. Do not apply to seedlings grown for transplants.
Whitefly	Buprofezin (talus) 40SC	9 to 13.6 oz./100 gal. water or per acre area		1 day	Insect growth regulator that affects immature stages of Whiteflies will not kill adults. For use on tomatoes only.
	Imidacloprid (Admire pro) 4.6F	0.6 fl. oz./1,000 plants	12 hours	0	Apply in minimum of 21 gal water using soil drenches or drip irrigation. Do not apply to immature plants. Make only 1 application per crop per season.
	Insecticidal soap (M-pede) 49EC	2 tbsp./gal. water	12 hours	0	
	Pyrethrins and PBO (pyrenone)	12 oz./20 gal. water		0	May be used alone or tank-mixed with a companion insecticide.
	Pyriproxyfen (distance) 0.86EC	6 fl. oz./100 gal. water		14 days	Insect growth regulator that affects immature stages of whiteflies; will not kill adults.

CBD v. EPA (1:21-cv-00681-CJN) ED_005427A_00029618-00201

Vegetables – Commercial Greenhouse Tomatoes

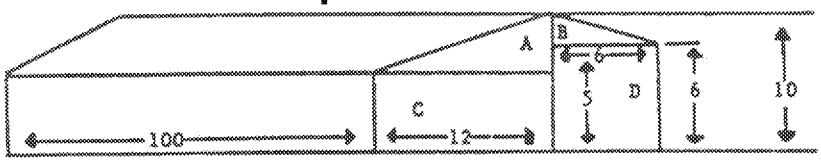
CALCULATION OF GREENHOUSE VOLUME

Even Span Structure



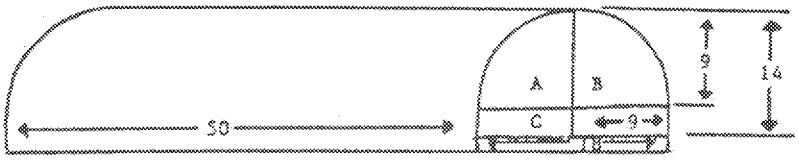
Area A and B = .5(5 x 10) = 25
Area C = 20 x 5 = 100
Total Area = A + B + C = 100 + 25 + 25 = 150
Volume = Length + Total Area = 100 x 150 = 15,000 cu.ft.

¾ Span House



Area A = .5(12 x 5) = 30
Area B = .5(4 x 6) = 12
Area C = 6 x 6 = 36
Total Area = A + B + C + D = 30 + 12 + 60 + 36 = 138 sq.ft.
Volume = Length x Total Area = 100 x 138 = 13,800 cu.ft.

Roundtop Structure



Area A + B = .5(r2) = 127
Area C = 5 c 18 = 90 sq.ft.
Total Area = A + B + C = 127 + 90 = 217
Volume = Length x Total Area = 50 x 217 = 10,850 cu.ft.

CBD v. EPA (1:21-cv-00681-CJN) ED_005427A_00029618-00202

Vegetables – Home Gardens

Crop and Pest	Insecticide and Formulation	Amount per 1 Gallon Water	PHI	REI Hours	Application Procedure
BEANS					
Aphids	Bifenthrin 0.3%	1.5 fluid ounces	3		Wait at least 7 days between applications.
	Imidacloprid	0.5 ounce per quart per 10 sq. ft. (1-ft. x 10 ft.) of vegetable row	21		No more than 1 application per year. Apply to soil shortly after seedlings emerge for season-long control.
	Malathion	2.0 teaspoons	1		Wait at least 7 days between applications.
Beetles	Carbaryl	1.5-3.0 tablespoons	3		Repeat as needed up to 4 times; 7 days between applications.
	Bifenthrin 0.3%	1.5 fluid ounces	3		Wait at least 7 days between applications.
Leafhoppers	Imidacloprid	0.5 ounce per quart per 10 sq. ft. (1-ft. x 10 ft.) of vegetable row	21		No more than 1 application per year. Apply to soil shortly after seedlings emerge for season-long control.
	M-PEDE	3.0 tablespoons	0		
Whiteflies	Bifenthrin 0.3%	1.5 fluid ounces	3		Wait at least 7 days between applications.
	Imidacloprid	0.5 ounce per quart per 10 sq. ft. (1-ft. x 10 ft.) of vegetable row	21		No more than 1 application per year.
BEET					
Webworms, flea beetles	Malathion 57% Carbaryl	2.0 teaspoons 1.5-3.0 tablespoons	7,3	12	Repeat up to 6 times but no more than once every 7 days.
	Imidacloprid	0.5 ounce per quart per 10 sq. ft. (1-ft. x 10 ft.) of vegetable row	21		No more than 1 application per year. Apply to soil shortly after seedlings emerge for season-long control.
BROCCOLI					
Aphids	Malathion 50%	2.0 teaspoons	3		
	Bifenthrin 0.3%	1.5 fluid ounces	7		Wait at least 7 days between applications.
	Imidacloprid	0.5 ounce per quart per 10 sq. ft. (1-ft. x 10 ft.) of vegetable row	21		No more than 1 application per year. Apply to soil shortly after seedlings emerge for season-long control.
Caterpillars	Bt (Dipel, Thuricide)	As recommended on label	0		Use weekly, add wetting agent in sprays.
	Permethrin	2.0 tablespoons	1		Follow label.
	Spinosad	4.0 tablespoons	1		Maximum of 6 applications per season; wait 4 days between applications.
Stink bugs	Carbaryl	3.0-6.0 tablespoons	3		Wait 7 days between applications.
	Bifenthrin	1.5 fluid ounces	7		Wait at least 7 days between applications.
Whiteflies	Imidacloprid	0.5 ounce per quart per 10 sq. ft. (1-ft. x 10 ft.) of vegetable row	21		No more than 1 application per year. Apply to soil shortly after seedlings emerge for season-long control.
CABBAGE					
Aphids	Bifenthrin	1.5 fluid ounces	7		Wait at least 7 days between applications.
	Imidacloprid	0.5 ounce per quart per 10 sq. ft. (1-ft. x 10 ft.) of vegetable row	21		No more than 1 application per year. Apply to soil shortly after seedlings emerge for season-long control.
	Malathion 57% EC	2.0 teaspoons	7	12	Wait at least 7 days between applications.
Caterpillars	Bifenthrin	1.5 fluid ounces	7		Wait at least 7 days between applications.
	Bt (Dipel, Thuricide)	As recommended on label	0		Use weekly until harvest, add wetting agent in sprays.

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Vegetables – Home Gardens

Crop and Pest	Insecticide and Formulation	Amount per 1 Gallon Water	PHI	REI Hours	Application Procedure
	Permethrin	2 tablespoons	1		Follow label.
	Spinosad	4 tablespoons	1		Maximum of 6 applications per season; wait 4 days between applications.
Flea beetles	Carbaryl	1.5-3 tablespoons	3		On foliage, repeat as needed up to 4 times, but no more than once every 7 days.
COLLARDS					
Aphids	Imidacloprid	0.5 ounce per quart per 10 sq. ft. (1-ft. x 10 ft.) of vegetable row	21		No more than 1 application per year. Apply to soil shortly after seedlings emerge for season-long control.
	Malathion 50%	2 teaspoons	7		Apply as necessary; wait 7 days between applications.
Flea beetles	Carbaryl	1.5- 3 tablespoons	14		On foliage as needed; Repeat as necessary up to 4 times, but no more than once every 7 days.
CANTALOUPE					
Aphids	Bifenthrin 0.3%	1.5 fluid ounces	7		Wait at least seven days between applications.
	Imidacloprid	0.5 ounce per quart per 10 sq. ft. (1-ft. x 10 ft.) of vegetable row	21		No more than 1 application per year. Apply to soil shortly after seedlings emerge for season-long control.
	Malathion 57% EC	2.0 teaspoons	3	12	
Beetles	Carbaryl	3.0 tablespoons			
	Bifenthrin 0.3%	1.5 fluid ounces	3		Wait at least 7 days between applications.
	Imidacloprid	0.5 ounce per quart per 10 sq. ft. (1-ft. x 10 ft.) of vegetable row	21		No more than 1 application per year.
	Permethrin	Follow label	0		Follow label.
Caterpillars	Carbaryl	1.5-3.0 tablespoons	3		Do not use Carbaryl for aphid control.
	Bifenthrin 0.3%	1.5 fluid ounces	3		Wait at least 7 days between applications.
	Permethrins	As recommended on label	0		Follow label.
	Spinosad	4 tablespoons	3		Maximum of 6 applications per season; wait 5 days before reapplying.
Caterpillars	Spinosad	4.0 tablespoons	3		Maximum of 6 applications per season; wait 5 days between applications.
CARROT					
Aphids, leafhoppers, vegetable weevils	Malathion 57% EC	2.0 teaspoons	7	12	When insects appear.
CUCUMBER					
Aphids	Bifenthrin	1.5 fluid ounces	3		Wait at least 7 days between applications.
	Imidacloprid	0.5 ounce per quart per 10 sq. ft. (1-ft. x 10 ft.) of vegetable row	21		No more than 1 application per year. Apply to soil shortly after seedlings emerge for season-long control.
	Safer Insecticidal Soap	5.0 tablespoons	0		For suppression, repeat applications may be needed. Repeat at weekly intervals up to 3 times. Do not make more than 3 sequential applications over a 2-week period. Do not apply when temps exceed 90 F.
Cucumber beetles, squash bugs	Bifenthrin	1.5 fluid ounces	3		Wait at least 7 days between applications.

CBD v. EPA (1:21-cv-00681-CJN) ED_005427A_00029618-00204

Vegetables – Home Gardens

Crop and Pest	Insecticide and Formulation	Amount per 1 Gallon Water	PHI	REI Hours	Application Procedure
	Carbaryl	3.0 tablespoons	3		Apply late in day to minimize killing pollinating insects.
	Imidacloprid	0.5 ounce per quart per 10 square feet per vegetable row	21		No more than 1 application per year. Apply to soil shortly after seedlings emerge for season-long control.
	Malathion 50%	4.0 teaspoons	1		Apply when needed. Wait at least 7 days between applications.
	Permethrin	As recommended on label	0		Follow label.
EGGPLANT					
Aphids	Bifenthrin	1.5 fluid ounces	7		Wait at least 7 days between applications.
	Imidacloprid	0.5 ounce per quart per 10 square feet per vegetable row	21		No more than 1 application per year.
	Malathion 50% EC	2.0 teaspoons	3		Apply when aphids present and repeat when needed; wait 7 days between applications.
Caterpillars	Bt (Dipel, Thuricide	As recommended on label	0		Use weekly, add wetting agent in sprays.
	Carbaryl 80% S	2.0 tablespoons	12		
	Spinosad	See label	1		
Flea beetles	Bifenthrin	1.5 fluid ounces	3		Wait at least 7 days between applications.
	Carbaryl	1.5-3.0 tablespoons	3		On foliage as needed; no more than once every 7 days.
	Imidacloprid	0.5 ounce per quart per 10 square feet per vegetable row	21		No more than 1 application per year.
	Malathion 50%	1.0 tablespoon	3		Wait at least 7 days between applications.
Spider mites	Malathion	1.0 tablespoon	3		Repeat treatments often as necessary.
	Ultrafine oil	Follow label			
Whiteflies	Bifenthrin	1.5 fluid ounces	7		Wait at least 7 days between applications.
	Imidacloprid	0.5 ounce per quart per 10 square feet per vegetable row	21		No more than 1 application per year. Apply to soil shortly after seedlings emerge for season-long control.
ENGLISH PEA					
Aphids, leafhoppers	Imidacloprid	0.5 ounce per quart per 10 square feet vegetable row	21		No more than 1 application per year. Apply to soil shortly after seedlings emerge for season-long control.
	Malathion 57% EC	2.0 teaspoons	3	12	When insects appear.
IRISH POTATO					
Aphids	Malathion 57% EC	2.0 teaspoons	3	12	When insects appear.
	Imidacloprid	See label	3		Apply to soil immediately at planting for long-term control.
Colorado potato beetles	Permethrin 2.5L	3.0 tablespoons	7		Follow label.
	Spinosad	4.0 tablespoons	7		Maximum of 6 applications per season; wait 7 days before reapplying.
Flea beetles, leafhopper	Carbaryl 80% S	2.0 tablespoons	0	12	
	Malathion 57% EC	2.0 teaspoons	3	12	

CBD v. EPA (1:21-cv-00681-CJN) ED_005427A_00029618-00205

Vegetables – Home Gardens

Crop and Pest	Insecticide and Formulation	Amount per 1 Gallon Water	PHI	REI Hours	Application Procedure
LETTUCE					
Aphids	Bifenthrin 0.3%	1.5 fluid ounces	7		Wait at least 7 days between applications.
	Imidacloprid	0.5 ounce per quart per 10 square feet per vegetable row	21		No more than 1 application per year. Apply to soil shortly after seedlings emerge for season-long control.
	Malathion 50% EC	1.0 tablespoons	14-leaf 7-head	12	When insects appear. Wait at least 7 days between applications.
Caterpillars	Bifenthrin 0.3%	1.5 fluid ounces	7-head		Wait 7 days between applications.
	Bt (Dipel, Thuricide)	As recommended on label	0		Repeat weekly until harvest, add wetting agent to spray.
	Permethrin 2.5%	4.0 tablespoons follow label	1		Apply every 5 to10 days as needed but no more than 10 times (liquid form) per season.
	Spinosad 0.5%	4.0 tablespoons	1		Apply no more than 6 applications per season; wait 4 days between applications.
MUSTARD					
Aphids	Malathion 57% EC	2.0 teaspoons	7	12	
Caterpillars	Bt (Dipel, Thuricide)	Follow label	0		Apply as soon as damage is found; repeat weekly, add wetting agent to spray.
	Carbaryl 5% D	0.75 pound/100 square feet	12		
	Malathion 57% EC	2.0 teaspoons	7	12	When insects appear.
	Spinosad 0.5%	4.0 tablespoons	1		Maximum 6 applications per season; wait 4 days between applications.
Flea beetles	Carbaryl	1.5-3.0 tablespoons	14		Repeat up to 4 times; no more than once every 7 days.
Vegetable weevils	Malathion 57% EC	2.0 teaspoons	3	12	
OKRA					
Aphids	Malathion 50%	2.0 teaspoons	1	12	When insects appear; wait 7 days between applications.
	Imidacloprid	0.5 ounce per quart per 10 square feet per vegetable row	21		No more than 1 application per year. Apply to soil shortly after seedlings emerge for season-long control.
Earworms	Permethrin 2.5% liquid	Follow label	1		Every 5 to 7 days as needed; no more than 10 times per season.
	Carbaryl 80% S	2.0 tablespoons	0	12	
Stinkbugs	Carbaryl 80% S	2.0 tablespoons	0	12	
ONION, SHALLOT					
Thrips	Malathion 50%	1.0 teaspoons	3	12	When insects appear.
PARSLEY					
Aphids	Malathion 57% EC	2.0 teaspoons	21	12	When insects appear.
Beetles	Carbaryl 80% S	2.0 tablespoons	14	12	
Caterpillars	Bt (Dipel, Thuricide)	Follow label	0		Repeat applications weekly
PEPPERS					
Aphids	Malathion 50%	2.0 teaspoons	3	12	When insects appear.
	Bifenthrin	1.5 fluid ounces	7		Wait 7 days between applications

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Vegetables – Home Gardens

Crop and Pest	Insecticide and Formulation	Amount per 1 Gallon Water	PHI	REI Hours	Application Procedure
	Imidacloprid	0.5 ounce per quart per 10 square feet per vegetable row	21		No more than 1 application per year. Apply to soil shortly after seedlings emerge for season-long control.
Caterpillars, armyworms, loopers, leafminers	Cyfluthrin .0003%	Ready to use formula	7		Do not apply more than 6 times during season.
	Cyfluthrin 0.75%	1.0 tablespoons	7		Do not apply more than 6 times during season.
	Permethrin	Follow label	3		No more than 8 applications per season.
	Safer Insecticidal Soap	5.0 tablespoons	0		For suppression; repeat applications may be needed (no more than 3 over a 2-week period).
	Spinosad 0.5%	4.0 tablespoons	1		Maximum of 6 applications per season; wait 4 days between applications.
Pepper weevils, vegetable weevils	Carbaryl 80% S	2.0 tablespoons	1	12	
	Malathion	2.0 teaspoons	3	12	
Whiteflies, thrips	Imidacloprid	0.5 ounce per quart per 10 square feet per vegetable row	21		No more than 1 application per year. Apply to soil immediately after transplants are set for long-term control.
Flea beetles	Carbaryl liquid	1.5-3.0 tablespoons	3		
SQUASH, PUMPKIN					
Aphids	Malathion 50% EC	2.0 teaspoons	3-pumpkin 1-squash	12	When insects appear; wait 7 days between applications; apply when leaves are dry.
	Bifenthrin .3%	1.5 fluid ounces	3		Wait 7 days between applications.
	Safer Insecticidal Soap	5.0 tablespoons	0		For summer squash; for suppression.
Cucumber beetles, flea beetles	Bifenthrin	1.5 fluid ounces	3		Wait 7 days between applications.
	Carbaryl liquid	3.0 tablespoons	3		Repeat applications up to 6 times, but not more often than once every 7 days.
	Permethrin 2.5%	4.0 tablespoons	3		Do not apply liquid more than 8 times per season.
Leafminer	Spinosad 0.5%	4.0 tablespoons	3		Maximum 6 applications season.
Pickleworms, vine borers,	Bifenthrin	1.5 fluid ounces	3		Wait 7 days between applications.
	Carbaryl 22.5% liquid	1.5-3 tablespoons	3		Repeat as necessary up to 6 times, but no more than once every 7 days.
	Permethrin	Follow label	0		No more than 8 times per season.
Squash bugs	Bifenthrin	1.5 fluid ounces	3		Wait 7 days between each application.
	Carbaryl 80% S	2.0 tablespoons	0	12	
	Permethrin	Follow label	0		No more than 8 applications per season.
Whiteflies	Imidacloprid	0.5 ounce per quart per 10 square feet per vegetable row	21		No more than 1 application per year.
SOUTHERN PEA					
Aphids	Imidacloprid	0.5 ounce per quart per 10 square feet per vegetable row	21		No more than 1 application per year.

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Vegetables – Home Gardens

Crop and Pest	Insecticide and Formulation	Amount per 1 Gallon Water	PHI	REI Hours	Application Procedure
	Malathion 50% EC	1.0 tablespoons	3	12	When insects appear.
Earworms, curculio	Carbaryl 80% S	2.0 tablespoons	0	12	
European corn borers	Carbaryl liquid 22.5%	3.0-4.5 tablespoons	3- fresh 21-dried		
	Cyfluthrin 0.75%	1.0 tablespoons	7		Do not apply more than 6 applications per season.
	Spinosad	4.0 tablespoons	3		Maximum 6 applications per season; wait 5 days between applications.
SPINACH					
Aphids	Imidacloprid	0.5 ounce per quart per 10 square feet per vegetable row	21		No more than 1 application per year.
	Malathion 57% EC	2.0 teaspoons	7		When insects appear.
Caterpillars	Bt (Dipel, Thuricide)	3.0 tablespoons	0		Use weekly, add wetting agent in sprays.
	Bifenthrin	See label.	7		
	Cyfluthrin	See label.	0		
SWEET CORN					
Corn earworms, fall armyworms, European corn borers	Bifenthrin 0.3%	1.5 fluid ounces	1		Wait 7 days between applications.
	Carbaryl 80% S	2.0 tablespoons	0	12	Treat silks every other day for earworm.
	Cyfluthrin 0.75%	1.0 tablespoons	0		Do not apply more than 5 times per season.
	Permethrin 2.5% liquid	3.0 tablespoons	1		Apply as needed every 5 days, but no more than 6 times per season.
	Spinosad 0.5%	4.0 tablespoons	1		Maximum of 6 applications per season; wait 3 days between applications.
TOMATO					
Aphids	Bifenthrin	1.5 fluid ounces	1		Wait at least 7 days between applications.
	Imidacloprid	0.5 ounce per quart per 10 square feet per vegetable row	21		No more than 1 application per year. Apply to soil shortly after seedlings emerge or transplants for season-long control.
	Malathion 50% EC	2.0 teaspoons	1	12	When insects appear.
	Safer Insecticidal Soap	5.0 tablespoons	0		For suppression, repeat applications may be required.
Beetles	Bifenthrin 0.3%	1.5 fluid ounces	1		Wait 7 days between applications.
	Carbaryl liquid 22.5%	1.5-3.0 tablespoons	3		Repeat applications up to 7 times, but no more than once every 7 days.
	Permethrin	Follow label	0		No more than 6 times per year.
Cutworms	Carbaryl 22.5% liquid	6.0 tablespoons	3		Mix in enough water to get sufficient coverage of plants and soil around plants. Repeat weekly no more than 5 times per season.
	Cyfluthrin 0.75%	1.0 tablespoons	3		Do not apply more than 5 times per season.
	Permethrin 2.5%	3.0 tablespoons	0		Do not apply more than eight times per season.
Fruitworms, hornworms	Bifenthrin	1.5 fluid ounces	1		Wait 7 days between applications.

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Vegetables – Home Gardens

Crop and Pest	Insecticide and Formulation	Amount per 1 Gallon Water	PHI	REI Hours	Application Procedure
	Bt (Dipel, Thuricide)	Follow label	0		Repeat weekly when insects are present.
	Carbaryl 80% S	2.0 tablespoons	0	12	Weekly–from bloom through harvest.
	Cyfluthrin 0.75 %	1.0 tablespoons	0		Do not apply more than 5 times per season.
	Permethrin 2.5% liquid	3.0 tablespoons	0		No more than 8 times per season.
	Spinosad 0.5%	4.0 tablespoons	1		No more than 6 applications per season; wait 4 days between applications.
Leaf-footed bugs, stink bugs	Bifenthrin	1.5 fluid ounces	1		Wait 7 days between applications.
	Carbaryl 80% S	2.0 tablespoons	0	12	
	Cyfluthrin 0.75%	1.0 tablespoons	0		Do not apply more than 5 times per season.
	Permethrin 0.25%	Follow label	0		Maximum 6 applications/season.
Leafminer	Spinosad 0.5%	4.0 tablespoons	1		No more than 6 applications per season; wait 4 days between applications.
Spider mites	Bifenthrin 0.3%	1.5 fluid ounces	1		Wait 7 days between applications.
Tomato pinworms	Bifenthrin 0.3%	1.5 fluid ounces	1		Wait 7 days between applications.
	Spinosad 0.5%	4.0 tablespoons	1		Maximum 6 applications per season; wait 4 days between applications.
Whiteflies	Bifenthrin 0.3%	1.5 fluid ounces	1		Wait 7 days between applications.
	Safer Insecticidal Soap	5.0 tablespoons	0		No more than 3 applications in 2 weeks. Do not apply when temperature exceeds 90 F.
	Pyrethrin	Follow label	0		Spray underside of leaves; repeated weekly applications needed for control.
	Imidacloprid	0.5 ounce per quart per 10 square feet per vegetable row	21		No more than 1 application per year. Apply to soil for season-long control.
TURNIP					
Aphids	Imidacloprid	0.5 ounce per quart per 10 square feet per vegetable row	21		No more than 1 application per year. Apply to soil when seedlings emerge or immediately after transplants are set for season-long control.
	Malathion 50% EC	2.0 teaspoons	7	12	When insects appear.
Caterpillars	Bt (Dipel, Thuricide)	Follow label		0	Repeat weekly when insects present.
Flea beetles, worms	Carbaryl 80% S	2.0 tablespoons	3 for roots 14 for tops	2	
	Imidacloprid	0.5 ounce per quart per 10 square feet per vegetable row	21		No more than 1 application per year.
WATERMELON					
Aphids	Bifenthrin 0.3%	1.5 fluid ounces	3		Wait 7 days between applications.
	Imidacloprid	0.5 ounce per quart per 10 square feet per vegetable row			No more than 1 application per year. Apply to soil when seedling emerge or immediately after transplants are set for season-long control.
	Malathion 57% EC	2.0 teaspoons	1	12	When insects appear.
Beetles	Carbaryl 80% S	2.0 tablespoons	0	12	Don't use Carbaryl for aphids.

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Vegetables – Home Gardens

Crop and Pest	Insecticide and Formulation	Amount per 1 Gallon Water	PHI	REI Hours	Application Procedure
	Imidacloprid	0.5 ounce per quart per 10 square feet per vegetable row	21		No more than 1 application per year. Apply to soil when seedlings emerge immediately after transplants are set for season-long control.
	Permethrin liquid2.5%	Follow label	0		Do not apply more than 8 times per year.
Thrips	Imidacloprid	0.5 ounce per quart per 10 square feet per vegetable row	21		No more than 1 application per year.
	Spinosad 0.5%	4.0 tablespoons	3		No more than 6 applications per year; wait 5 days between applications.

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Vegetables – Home Gardens

Homeowner Insecticide Products (not a complete list)		
Common Chemical Name	**Trade Name(s) (Examples)**	**Manufacturer/Brand**
***Bacillus thuringiensis* (B.t.)**	Dipel dust	Fertilome
	Dipel dust	Hi-Yield
	BT Worm Killer	Greenlight
	Thuricide	Bonide
	Thuricider HPC	Southern Ag
Bifenthrin	Ortho Bug-B-Gone Max Lawn and Garden Insect Killer	Ortho
Carbaryl	Bayer Complete Insect Killer for Gardens	Bayer Advanced
	Sevin	Spectracide
	Bug B Gone	Ortho
	Sevin	Garden Tech
	Sevin-10	Garden Tech
	Liquid Carbaryl Garden Spray	Ferti-Lome
	5% Carbaryl Garden and Pet Dust	Hi-Yield
Cyfluthrin	Bayer Advanced Garden	Bayer
	PowerForce Multi-Insect	
	Killer, Concentrate	
	Bayer Advanced Lawn and	Bayer
	Garden Multi Insect Killer	
Dimethoate	Cygon	Bonide
	Cygon 2E	Hi-Yield
Imidacloprid	Bayer Advanced	Bayer
	Fruit, Citrus and Vegetable Insect Control Bay Advanced Fruit, Citrus and Vegetable Insect Control	
Malathion	50% Malathion	Greenlight
	Malathion Plus Insect Spray Concentrate	Ortho
	Malathion	Ace
	50% Malathion	Martin's
	Malathion Insect spray	Hi-Yield
	Malathion 50% E.C.	Southern Ag
Oil	Sun-spray Ultra-Fine Oil	Security Products
	Parafin Horticultural Oil	Southern Ag
Permethrin	Bayer Complete Insect Dust for Gardens	Bayer Advanced
	Permethrin Insect Control	Spectracide
	Bug-B-Gone	Ortho
	Permethrin 10%	Martin's
	Indoor/Outdoor Multipurpose Insect Spray	Ferti-Lome
	Vegetable Fruit and Flower Spray	Bonide
	Multipurpose Garden Insect Killer	KGRO
	Vegetable Plus	Martins
Pyrethrin	Tomato and Vegetable	Safer
	Tomato Vegetable Insect Spray	Spectracide

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Vegetables – Home Gardens

Homeowner Insecticide Products (not a complete list)		
Common Chemical Name	**Trade Name(s) (Examples)**	**Manufacturer/Brand**
Spinosad	Lawn and Garden Spray with Spinosad	Greenlight
	Borer Bagworm, Tent caterpillar & Leafminer Spray	Fertilome
	Monterey Garden Insect Spray	Monterey
	Spinosad Landscape and Garden Insecticide	Natural Guard
Neem	Greenlight Neem Concentrate	Greenlight
	Triple Action Neem Oil	Southern Ag
Insecticidal soaps	M-Pede	Dow Agro Sciences
	Insecticidal Soap	Safer
	Insecticidal Soap	Garden Safe
	Tomato Vegetable Insect Killer	Safer

Disclaimer Statement:

The pesticides recommended in this publication were registered for the prescribed uses at time of publication. Pesticide registrations are reviewed continuously. Should registration of a recommended pesticide be canceled, it would no longer be recommended by the LSU AgCenter.

Uses of brand or trade names in this publication are for clarity and information. Such use does not imply approval of the product to the exclusion of others that may be of similar, suitable composition, and it does not guarantee or warrant the standard of any given product. The above list is not a complete list of all products that may be available.

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Vegetables – Organic Gardening

If you desire to be a certified organic gardener, apply to a USDA-accredited certifying agent. The website of the national organic program contains information on organic certification. It maintains a list of allowed and prohibited substances. Visit the website for further information.

Read and follow directions on the insecticide label. Use insecticides only on vegetables for which they are labeled.

Rotenone, which will kill beneficials, is highly toxic to fish and moderately toxic to mammals. It is slow-acting and has a residual of approximately one week. It kills beetles and sucking insects. Pyrethrum will kill lady beetles but has a very low toxicity to mammals. Pyrethrum will kill pests rapidly or not at all. It has a very short residual and should be sprayed directly on the pest. Pyrethrum kills beetles, caterpillars and sucking insects. Insecticidal soaps are not very toxic to beneficials.

Applications may be needed more frequently than once a week. Injury to plants may occur if they are used too frequently.

Insecticidal soaps kill soft-bodied pests, such as aphids, spider mites and whiteflies. Bacillus thuringiensis (Bt) is nontoxic to beneficials and mammals but has a residual of a few days. Bt is effective against various caterpillars. Usually caterpillars quit feeding within an hour of eating Bt. However, they remain on the plant and do not die for a few days. Even though the caterpillars remain on the plant and are not feeding, an additional application is not needed. Bt is most effective when caterpillars are young. Thus, frequent scouting is important. Sulphur may be used to control mites, but if temperatures are high, sulfur may injure plants.

Many of the principles of integrated pest management will be helpful in managing pests in organic gardens. These may include keeping plants healthy, rotating crops, interplanting, intercropping, planting at times to escape pests, planting resistant varieties, controlling pests when they are young, scouting the garden twice a week, correctly identifying the pest problem, controlling weeds, destroying plants after harvest, hand picking and crushing pests, using barriers to keep pests off of plants, spraying plants with water to knock pests off, traps and using beneficial organisms.

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Bacillus thuringiensis applied as a spray

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Bacillus thuringiensis (*Bt*) is a species of bacterium found in the soil. It was isolated in 1901 and named in 1911. It was used as a commercial biological insecticide for the first time in the United States in 1958. *Bt* kills caterpillars, some fly larvae and some beetle larvae but does not kill other organisms. A few strains of *Bt* are available in products used in the United States. *Bt* var. *kurstaki* is toxic to lepidopteran (butterfly, skipper and moth) larvae. *Bt* var. *aizawai* is toxic to wax moth larvae. *Bt* var. *israelensis* is toxic to mosquito, midge, fungus gnats and blackfly larvae. *Bt* var. *galleriae* is toxic to larvae of May or June beetles (white grubs). *Bt* var. *tenebrionis* (or var. San Diego) is toxic to Colorado potato beetle, elm leaf beetle and willow leaf beetle larvae. However, it does not kill all leaf beetles.

Because this insecticide kills larvae of butterflies, moths and skippers (lepidopterans), care should be taken so that nontarget plants are not treated and drift on other plants does not occur. If the product drifts to a nontarget plant with larvae of lepidopterans on them and is eaten by the larvae, then it will kill them. Monarch butterflies feed only on milkweed plants, so they will not be harmed if the insecticide does not come in contact with milkweed plants.

Bt strains are specific to the insects they kill; therefore, identifying the injurious insect is extremely important. The correct strain must be applied to susceptible insects. Applications of *Bt* to insects that are not susceptible will not kill them. It does not kill predators, parasites or bees. *Bt* is most effective against young larvae and usually does not kill insects in the adult or other growth stages. Thus, inspections should be made frequently and applications made while larvae are small. Insects must eat *Bt* for it to be effective, and good coverage of the plant is important. Some insects do not eat the outside of the plant part they attack, so applications of *Bt* on the surface of the plant will not kill them. For example, the pecan nut casebearer (a moth) bites the outside of nutlets and spits it out. This insect eats the inside of nutlets and does not eat the *Bt*.

Bt as a biological insecticide applied to plants is not systemic (moving throughout the plant) or translaminar (moving throughout the leaf) and does not kill on contact. It is not toxic to predators, parasites or pollinators and is listed as an organic insecticide. It is placed in a group of microorganisms that disrupt the midgut membranes of specific insects.

Bt is rapidly deactivated by ultraviolet sunlight. Applications made in the evening and on cloudy or on rainy days last longer. However, heavy rains can wash *Bt* off a plant. Applications become inactivated in one to a few days and may need to be reapplied in three to seven days. Applications for leaf beetles may be effective for only one day. Applications of *Bt* do not result in continuous or long-term insect management, and *Bt* is applied similar to chemical insecticides. Once a solution of *Bt* is prepared, it should be used immediately, especially if the water used to make the solution has a pH greater than 7 (basic).

The effectiveness of *Bt* may be reduced after two or three years of storage. Dry formulations last longer than liquid formulations. *Bt* products should be stored out of sunlight and in cool, dry conditions.

A crystalline toxin and spore are usually produced by *Bt* cells. The toxin is called a delta endotoxin. *Bt* products usually, but not always, contain the toxin and spores of the bacterium. Spores may become bacterial cells inside the insect. Once the insect eats the *Bt*, the delta endotoxin is activated in the insect's gut by enzymes and alkaline conditions of the gut. The endotoxin disrupts the cell walls of the gut, and bacterial cells enter the insect's body. Infected insects stop feeding in a few hours and die in a few hours to weeks — frequently two to three days. Different strains of *Bt* have different endotoxins and kill different insects. The endotoxin is not activated in the gut of humans.

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Commercial Applications of *Beauveria bassiana*

Lori Moshman, Rodrigo Diaz, and Dennis Ring

Beauveria bassiana (Hypocreales: Clavicipitaceae) is an entomopathogenic fungus that occurs naturally in soil. Many strains exist and can vary in host range, pathogenicity (ability to infect a host), and virulence (ability to multiply in the host). The fungus was first isolated in 1835 by Italian scientist Agostino Bassi, who found that it killed and mummified silkworm larvae in what was called *muscardine disease*. The first commercial formulations of *B. bassiana* were developed in 1995 using the strains GHA and ATCC 74040, which are mass produced by fermentation and sold under the trade names BotaniGard, Mycotrol, and Naturalis. Another strain, ANT-03, was isolated in 2000 and marketed in 2013 under the name BioCeres. Additional strains are available commercially for a variety of insect pests.

B. bassiana is a contact insecticide, meaning its spores must physically contact the insect cuticle in order to be effective. It is therefore important to ensure thorough and even coverage when making applications. It is not necessary for the insect to ingest *B. bassiana*, as the fungal spores adhere to the insect and penetrate the body cavity when they germinate. Once inside, secondary metabolites (chemicals) are produced, including the toxin beauvericin and the antibiotic oosporein, which weaken the host's immune system and outcompete intestinal bacteria. White mold may grow out of the insect's body after it has died, but mold growth is not required to achieve control.

As a generalist feeder, *B. bassiana* controls all life stages of leaf-feeding insects, including common pests such as aphids, thrips, whiteflies, mealybugs, caterpillars, beetles and others. Immature stages tend to be more susceptible than adults. Spray formulations can be applied in greenhouse or field settings and on ornamental or edible crops. Efficacy is dependent on climatic conditions; greatest control occurs within 68-86 degrees Fahrenheit and above 60 percent relative humidity. *B. bassiana* is a slow-acting insecticide because spores require time to germinate and penetrate insects. In greenhouses, control may be reached in three to seven days, but it is not uncommon for control to take seven to 10 days in field settings. Repeat applications are recommended every five to seven days until a desired level of control is reached.

A commercial suspension of *B. bassiana* spores has a shelf life of one year when stored at room temperature and longer when stored in the refrigerator. Product should not be stored below 0 degrees Fahrenheit or above 85 degrees Fahrenheir. Spray mixes should be applied as soon as possible after mixing, as spores cannot survive in water for more than 24 hours and are susceptible to degradation from UV light. Spores remain viable for a longer time when applied to leaf undersides or in the evening because of reduced sunlight exposure.

B. bassiana as a biological insecticide is generally not considered systemic (moving throughout the plant) or translaminar (moving throughout the leaf), but in some crops such as corn and cotton the fungus can inhabit the plant as an endophyte (living inside plant tissue without causing disease). In corn, *B. bassiana* has been found to move internally in the plant and provide extended control of European corn borer caterpillars throughout the season.

B. bassiana is considered safe for beneficial insects, although it is recommended to avoid spraying directly in areas where bees are actively foraging. If bees are contacted directly, they can bring fungal spores back to the hive and infect the susceptible brood. *B. bassiana* has no reported phytotoxicity effects and has a zero-day preharvest interval (PHI). Reentry interval (REI) is four to 12 hours depending on the product formulation. Some formulations of *B. bassiana* are approved by the OMRI (Organic Materials Review Institute) for organic pest control. *B. bassiana* may be tank-mixed with other insecticides according to label regulations, but should never be mixed with fungicides.

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Insecticidal soap

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Insecticidal soap is made when a strong alkali is combined with fatty acid animal or plant oils. They are potassium salts of fatty acids. They are used as an insecticide in some cases. The insecticide resistance action committee does not classify insecticidal soaps. Insecticidal soaps that are produced commercially are versions of liquid dish soap that are highly refined. Insecticidal soap mixtures can also be made by individuals; however, the risk of plant injury is much greater. The additives in clothes washing detergents and dry dish soaps are too harsh to use on plants. Additionally, other detergents and soaps are not effective as insecticides.

Insecticidal soaps are effective on small, soft-bodied insects, but they do not kill many beneficial insects or other insects. These products' modes of action include suffocation of the insect, dehydration, removing waxes from the cuticle of the insect and disrupting cellular membranes. Thorough coverage of the plant resulting in contact with the pest is important to kill the pest insects. Soaps may remove debris, honeydew and sooty mold. There is no preharvest interval, they may be used postharvest, and they may have a reentry interval of several hours. There is no residual kill of soaps, and they will not kill insects after they dry. Thus, repeated application may be needed every three to seven days. Repeated applications may result in burn of some plants.

Additionally, some plants are sensitive to soaps and will burn. Plants with hairy leaves tend to be more sensitive to burn from soaps than plants lacking hairy leaves. Under drought conditions, plants such as conifers may be sensitive. Soaps should not be applied to the tender new growth of ornamentals. The bluish color may be lost from the waxy leaf coat of some plants when the wax is washed off. Sensitive plants include gardenias, portulaca, nasturtiums, some tomato varieties, lantana, hawthorn, Easter lilies, sweet pea, plum, crown of thorns, cherry, horse chestnut, maidenhair fern, mountain ash, bleeding heart and Japanese maple. Other plants may be somewhat sensitive, including impatiens, geraniums begonias, azaleas and fuchsias. If plants show signs of browning of the leaf edge or wilting a few hours after treatment with soap, rinse them with clean water. Plants may be tested for sensitivity. This is done by spraying a small area and waiting for 24 hours and inspecting the area for burn. Water-stressed plants should not be treated with insecticidal soaps.

Read and follow the label! Insecticidal soaps are usually applied as a 1 to 2 percent solution (2½ to 5 tablespoons per gallon). Concentrations greater than this will burn plants. Soaps should not be applied in full sun or when temperatures are greater than 85 degrees Fahrenheit. Plants may be more stressed in high temperatures and high humidity, making them more sensitive. Plants may be treated in the early morning or late in the day. Drying conditions will be slower and make the soaps more effective.

It is very important to spray both the upper and lower leaf surface. The effectiveness of soaps is reduced when water is hard. Iron, calcium and magnesium will result in precipitation of fatty acids out of the solution, making the soap ineffective. The soap and water may be mixed in a glass jar, agitated and allowed to stand for 15 minutes. The quality of the water is fine for spraying if the mix remains milky and uniform. If a scum forms on the surface of the water, then distilled water should be used.

Insecticidal soaps are contact insecticides. They are not stomach poisons, are not systemic and do not move through the leaf (translaminar). Even though soaps are considered to have low toxicity, the signal word on insecticidal soap 49.52 CF is warning.

Insecticidal soaps may be used for treating soft-bodied insects. They do not kill many beneficial insects. Coverage of the plant resulting in contact with the pest is extremely important, and there is no residual. Repeat applications may be needed. Caution should be exercised when using soaps because they may burn plants. They may be used with other insecticides and other methods of managing insects as a part of an IPM management plan.

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Pymetrozine

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The xylem and phloem are the two types of transport tissues in vascular plants (higher plants). Water and some nutrients are transported in the xylem up the plant to the leaves. Sugars and other products are transported in the phloem down the plant from the leaves. Insects may feed on the phloem or the xylem. Pymetrozine is transported in the xylem and phloem, providing systemic activity against insects feeding in either of these tissues. This article presents some properties of pymetrozine.

The Insecticide Resistance Action Committee places pymetrozine in group 9B (pyridine azomethine derivatives). Pymetrozine interferes with feeding behavior. The muscles that are used to pull food in the mouth are paralyzed. The stylet (feeding tube) of sucking insects is blocked. Sucking insects remove their stylets from the plant and stop feeding in an hour. The affected insects will remain on the plant, starve and die in two to 10 days. Pymetrozine is active as a systemic in the xylem and phloem, as a translaminar and if eaten. It has some activity as a contact insecticide. Pymetrozine is rainfast because it easily penetrates into the plant.

Sucking insects such as planthoppers, leafhoppers, aphids and whiteflies are killed by pymetrozine, and all life stages that suck sap from the plant are affected. This insecticide exhibits low toxicity on beneficials (including bees) and mites. It should not be applied to actively foraging bees or flowering weeds.

The translaminar activity of pymetrozine allows the material to move through the leaf from one surface to the other. However, thorough coverage is recommended when an application of pymetrozine is made. Cross-resistance between pymetrozine and neonicotinoids (class 4) has been observed.

In summary, pymetrozine is systemic and is translocated in both the xylem and phloem. It also shows activity when eaten and as a translaminar. It has some contact activity. Pymetrozine is effective against life stages of sucking insects that are feeding on the plant. This insecticide is useful in insecticide resistance management. Products containing pymetrozine include Fulfill and Endeavor.

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Spirotetramat

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Vascular plants (higher plants) have transport tissues as opposed to nonvascular plants that do not have conducting tissues. There are two types of transport tissues in vascular plants: xylem and phloem. The xylem transports water and some nutrients up the plant to the leaves. The phloem transports sugars and other products down the plant from the leaves. Insects may feed on the phloem or the xylem. The majority of systemic insecticides are transported in the xylem to the leaves. Spirotetramat is transported in both the xylem and phloem, providing systemic activity against insects in both the xylem and phloem. This article presents some properties of spirotetramat.

The Insecticide Resistance Action Committee places spirotetramat in group 23 (tetronic and tetramic acid derivatives). Spirotetramat interferes with fat synthesis and the development of immature insects and is slow acting. It has little activity against adult insects. It is active as a systemic in both the xylem and phloem, as a translaminar and if eaten. Spirotetramat has limited contact activity.

After application of spirotetramat to leaves, it penetrates the leaf and is translocated down the plant to the roots and up the plant to developing shoots. This movement allows the insecticide to manage insects that are hiding under plant parts and are difficult to contact with an insecticide. The movement also allows the insecticide to manage feeding below ground on the roots and protect growing plant parts. The translaminar activity of spirotetramat allows the material to move through the leaf from one surface to the other. Thus, good coverage with the insecticide is less important but good coverage with and insecticide is always recommended.

Spirotetramat is effective against aphids, mealy bugs, psyllids, scales (soft and armored), whiteflies and some thrips. Cross-resistance to other groups of insecticides is not known. Thus, this insecticide is very useful in managing resistance by rotating groups of insecticides applied to insects.

Spirotetramat is much more active against immature insects than adult insects. It is up to 30 times more active against first instar nymphs of green peach aphid than adult aphids. However, adult aphids give birth to fewer nymphs. Once immature insects eat spirotetramat they die in two to five days. Spirotetramat should be applied when numbers of insects are low and in the early stages of the infestation. For scales applications should be made at the crawler stage.

Spirotetramat is harmless to slightly harmful to beneficials such as hoverfly larvae, spiders, predatory bugs, wasp parasites, ladybird beetles and lacewings. Spirotetramat is potentially toxic to bee larvae, and if exposure of bees will occur, applications should be made only in early morning or late evening to protect bees. Applications should not be made to bees in the field.

In summary, spirotetramat is a systemic insecticide that is translocated in both the phloem and xylem. It is useful in managing hidden insects and those on roots and on growing shoots. It also shows translaminar and oral activity. It is most effective against immature insects. Several sucking insects are managed by spirotetramat. It is useful in insecticide resistance management. It is harmless to slightly toxic to predators, and parasites and bees should not be exposed to spirotetramat. Products containing spirotetramat include Kontos and Movento.

CBD v. EPA (1:21-cv-00681-CJN) ED_005427A_00029618-00218

Azadirachtin

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Azadirachtin is a naturally occurring chemical found in the seeds of the neem tree *Azadirachta indica*, A. Juss (Sapindales: Meliaceae). Humans have been using it as an insecticide for many years. It does not have an Insecticide Resistance Action Committee number because the mode of action is not known.

Azadirachtin is an anti-feedant. It stops some insects from eating and interferes with egg laying, molting and mating of some insects, resulting in death. It repels adults and larvae and sterilizes adults. After eating azadirachtin insects may not die for two to seven days. The insect may have a life process interrupted or starve to death. It is systemic and a stomach poison. The systemic activity is less when the pH is greater than 7, and it exhibits low water solubility. This chemical shows activity on gnats, whiteflies, flies, aphids, Japanese beetles, moth larvae, caterpillars, thrips, mealybugs and mites. The residual activity is seven to 10 days.

Azadirachtin is safe for predators, parasites and pollinators, but it would be toxic to butterfly and moth larvae eating the leaves. It is not rainfast and should be applied on dry days. This chemical is considered organic. The activity of azadirachtin is best when temperatures are above 70 degrees Fahrenheit

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Flonicamid

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Flonicamid is a synthetic insecticide that was discovered in 1992 by the Ishihara Sangyo Kaisha Ltd. company. Its discovery occurred when it was noticed that some derivatives of trifluoromethylpyridine would kill aphids. Flonicamid is a chordotonal organ modulator in the insecticide resistance action committee group 29. Chordotonal organs are stretch receptors that allow arthropods and insects to detect the position of their antennae. Disruption of these organs interferes with movement, hearing and balance, causing the insect to stop feeding. Initially, flonicamid was put in insecticide resistance action committee group 9C. However, it was found that flonicamid acts on a different protein than the insecticides in group 9C. Thus, it was placed in its own group. The protein that flonicamid works on is unknown. The flow of potassium into cells is blocked.

After exposure to flonicamid, insects are killed by starvation and dehydration. The insect attaches its head to the plant but is unable to feed on the sap or secrete saliva. Feeding may end in as little as one hour after the insecticide is eaten and death will occur in two to five days depending on environmental conditions, amount of insecticide eaten and the plant fed on. Honeydew production is reduced and some aphids stagger in an hour after eating the insecticide.

Flonicamid kills nymphs and adults, is systemic and transported in the xylem and translaminar (moving through leaf tissue). Foliage growing after application of flonicamid will not have insecticide in it and is not protected. This insecticide may kill insects as a stomach or contact insecticide but works faster when it is eaten by the insect.

Flonicamid works on sucking insects including aphids, thrips, mealybugs, whiteflies, leafhoppers, plant bugs and plant hoppers. It is not known to kill pollinators, bees, caterpillars, predators or parasites but will kill predatory thrips. It is not effective on chewing insects or mites.

Plants should be sprayed to wetness, and the residual is two to three weeks. This insecticide is not rainfast and should be applied when there is no forecast of rain for 24 to 48 hours, the longer period without rain the better. The preharvest interval ranges from zero to 40 days depending on the plant to which application is made. Read the label for restricted entry interval, but it may be at least 12 hours. Read the label to determine distances to maintain away from waterways. Cross resistance to other classes of insecticides and phytotoxicity has not been reported, and it is not rapidly degraded by UV sunlight. A small number of plants should be sprayed to test for phytotoxicity before applications are made to a large number of plants. Flonicamid is stable at pH levels ranging from 4 to 7 but breaks down when pH is greater than 7.5.

Flonicamid should not be exposed to high temperatures and should be stored at room temperatures. It has a long shelf life and may be stored for a long time under cool, dry conditions. The following products contain flonicamid: Aria, Beleaf, Carbine, and Turbine.

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Prevention of the Movement of Insect Pests by Humans

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The movement of insect pests by humans is an ongoing phenomenon that is becoming increasingly problematic. New pests are being introduced in the country and then spread by humans unintentionally. To be sure, insects will spread by themselves, but movement by humans accelerates this process greatly. Insects may be moved by humans when plant material or animals are moved with or without vehicles. Additionally, insects may be moved when products are shipped from county to country.

This is a call for the public and businesses to become more involved in reducing the movement of pests by humans. When any plant is moved, use excessive measures to prevent the movement of pests. Before moving potted plants long distances, drench the soil with products containing a systemic insecticide. That will kill insects in the soil and travel up the xylem into the leaves. It will not go down the phloem in most cases. The xylem transports water and some nutrients up the plant to the leaves. The phloem transports sugars and other products down the plant from the leaves. Spray the plant with malathion or a pyrethroid mixed with an insecticidal soap. That will kill insects on the surface of the plant. Make sure all the above-ground parts of the plant are covered with insecticide. If you miss a spot, you have moved the insect. Use caution not to burn the plant with the soap.

Spraying a plant even when you don't see the pest seems to be against integrated pest management practices; however, moving pests to a new area is even greater violation of integrated pest management practices. Make sure animals are not infested with arthropods before moving them. Follow all quarantine procedures. Remind other people to make sure they are not moving pests. This comes at a cost, but the costs of moving a pest to a new area are vastly greater. For example, the emerald ash borer has been introduced in the United States. This insect is expected to drive all species of ash trees native to North America to extinction. Different insect pests may require different methods to prevent their movement based on their biology. Nurseries must abide by applicable regulations and laws. They must also consider the wishes of their customers when selling plants. Businesses are strongly encouraged to implement procedures to reduce the movement of insects. This will increase costs to businesses, but failing to do so will result in the greater costs of living with and managing new insect pests that did not previously exist in the country. In summary, this is a call for the public and business to become much more involved in preventing the spread of insect pests.

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Biological Control of Giant Salvinia Using the Salvinia Weevil

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Giant salvinia (*Salvinia molesta*) is an invasive species of aquatic fern native to southeastern Brazil. The plant has light green leaves that bear dense egg-beater shaped trichomes (leaf hairs) on the upper surface. Giant salvinia does not have true roots, but modified leaves that absorb nutrients from the water column. Thick salvinia mats choke waterways, prevent boat access and disturb freshwater ecosystems. Fragments of the mat break off and reproduce vegetatively by growing new shoots, which float freely on the water surface. Over time, plant mats affect water quality by reducing sunlight and dissolved oxygen, which negatively impacts native submersed (growing underwater) vegetation as well as fish, arthropods and waterfowl. Giant salvinia has been spreading throughout Louisiana and other Gulf Coast states since 1998. Currently, it inhabits nearly every parish in Louisiana.

The salvinia weevil (*Cyrtobagous salviniae*) is a Brazilian beetle that is an effective biological control agent of giant salvinia. The salvinia weevil's host range is limited exclusively to plants in the genus *Salvinia*, making it safe to release. Smaller than a sesame seed, this shiny black weevil spends its whole life associated with giant salvinia plants. Adults feed on growing tips and lay eggs in small crevices on the plant. Larvae feed on all parts of the plant, even burrowing inside the rhizome (underwater stem) to intercept the flow of nutrients from the "roots" to the growing tips. Feeding injury from the weevil causes salvinia mats to yellow, then turn brown and eventually sink. Once the mat sinks, native submersed vegetation can repopulate the area, restoring the habitat for other freshwater species.

Salvinia weevils are mass-reared by the LSU AgCenter in outdoor ponds and are released annually into public and private waters to manage giant salvinia. Salvinia weevils are a tropical to subtropical species, therefore their distribution is limited to areas with mild winters. In south Louisiana, weevils can control infestations in a period of several months to a year once they reach population densities of 40-60 adult weevils per kilogram of giant salvinia. In northern parts of the state, weevils experience colder winters and suffer high overwinter mortality compared to those in the southern parts of the state. Because of this, weevil population growth is slower and cannot keep up with the growth rate of the giant salvinia plant mat.

Annual weevil releases are frequently necessary to restore portions of the population lost during the winter and to increase the spatial distribution of the weevil. Monitoring is an essential tool for understanding how the weevil population is responding to its environment. Estimating weevil population density by taking periodic samples of the plant mat can inform aquatic plant managers whether the weevils are doing their job, if more releases are necessary or if they need to integrate biological control with other methods, such as mechanical and chemical control. Monitoring can also help managers identify new infestations and take early action before the infestation becomes severe. The best time to release salvinia weevils is in the spring before the plant mat begins to grow vigorously. This helps the weevils maintain spatial control over the plant mat and gives the population the longest amount of time to feed and reproduce before winter approaches.

For more information, see the LSU AgCenter's giant salvinia website: www.lsuagcenter.com/giantsalvinia.

Additionally, see the air potato management website at www.lsuagcenter.com/airpotato.

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Special Notice: Chlorpyrifos Registration Loss

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The registration for Chlorpyrifos (Lorsban) may be withdrawn or restricted in the near future. This notice was written Sept. 10, 2019. Chlorpyrifos is included in this guide as a single active ingredient and in combination with other active ingredients. Once this active ingredient is no longer registered, it will no longer be considered an option for managing insects. Follow all applicable laws regarding this active ingredient.

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Host Plant Resistance

The interactions of crop-eating pests with their crop hosts are complex and have many facets. Plants possess many traits that influence these interactions and thereby enable them to defend themselves against the attacks of pests. Plant resistance may be defined as the sum of heritable (inherited by offspring from a parent) plant traits that reduce the negative impacts of plant-eating pests. The defensive traits of crop plants include traits that reduce colonization (initial infestation) of the crop by the pest (antixenotic traits), traits that reduce the ability of the pest to grow and reproduce on the crop (antibiotic traits), and traits that allow the plant to recover and compensate for injury (tolerance traits). Different genotypes (genetic makeups) of crop plants can differ in their inherent resistance to plant-eating pests because they differ in their expression of these antixenotic, antibiotic or tolerance traits. Because these traits are heritable, high-yielding crop varieties with greater inherent resistance to pests can be developed through selective breeding. Usually, the resistance expressed by these varieties is not complete — in other words, resistant varieties are usually not immune to (unaffected by) crop pests but rather suffer lower injury than more susceptible varieties under the same numbers of pests. These resistant varieties can serve as very useful components of integrated management programs, not only because they are inherently less susceptible to pests but also because the use of resistant varieties is usually compatible with other management tactics, such as biological control or insecticides. Varieties of many of Louisiana's most important crop plants with resistance against important insect pests are developed and available for use as components of management programs. For example, sugarcane varieties with partial resistance against stem-boring pests and wheat varieties with high levels of resistance against Hessian fly have been developed. The use of these resistant varieties is highly advisable when available because their use is cost effective and reduces the amount of insecticide needed to manage pests. The availability and effectiveness of pest-resistant crop varieties are described in various crop-specific production guides issued by the LSU AgCenter.

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How to Mix Insecticides

1. **How to mix wettable powder for spraying:**
   If you have 50 percent Carbaryl wettable powder and want to make 50 gallons of spray containing 0.5 percent Carbaryl, use the following formula: (water weighs 8.345 pounds/gallon)

   $$\frac{\text{Gallons desired x weight of water x desired concentration}}{\text{\% active ingredient in insecticide used}} = \text{pounds of wettable powder}$$

   $$\frac{50 \text{ gallons} \times 8.345 \times 0.5}{50} = 4.17 \text{ pounds}$$

   4.17 pounds of the 50 percent Carbaryl will be to make 50 gallons of 0.5 percent Carbaryl.

2. **How to mix emulsifiable concentrate for spraying:**

   If you have 50 percent Malathion emulsifiable concentrate and want to make 2 percent spray, use the following formula:

   $$\frac{\text{\% insecticide}}{\text{Desired concentration}} = \frac{50}{2} = 25$$

   The correct dilution is 1 part of the Malathion to 25 parts of water.

3. **How to mix dusts:**
   If you have 25 percent Malathion dust and want to make 100 pounds of dust containing 5 percent Malathion, use the following formula:

   $$\frac{\text{Desired concentration x 100 pounds}}{\text{\% active ingredient in insecticide used}} = \text{factor}$$

   $$\frac{5 \times 100}{25} = 20$$

   20 pounds of the Malathion dust should be added to 80 pounds diluents to make 100 pounds of 5 percent dust.

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Insecticide Dilution Tables

Table I: Insecticide - amount of formulated materials to use to provide the indicated active ingredient.

Formulation	0.25 pound/ acre	0.50 pound/ acre	0.75 pound/ acre	1.0 pound/ acre	1.25 pounds/ acre	1.5 pounds/ acre	2.0 pounds/ acre
1% Dust	25.0 pounds	50.0 pounds	75.0 pounds	100.0 pounds	125.0 pounds	150.0 pounds	200.0 pounds
5% Dust	5.0 pounds	10.0 pounds	15.0 pounds	20.0 pounds	25.0 pounds	30.0 pounds	40.0 pounds
10% Dust	2.5 pounds	5.0 pounds	7.5 pounds	10.0 pounds	12.5 pounds	15.0 pounds	20.0 pounds
25% WP	1.0 pound	2.0 pounds	3.0 pounds	4.0 pounds	5.0 pounds	6.0 pounds	8.0 pounds
40% WP	2/3 pound	1.25 pounds	1 7/8 pounds	2.5 pounds	3 1/6 pounds	3.75 pounds	5.0 pounds
50% WP	0.5 pound	1.0 pound	1.5 pounds	2.0 pounds	2.5 pounds	3.0 pounds	4.0 pounds
75% WP	1/3 pound	2/3 pound	1.0 pound	1 1/3 pounds	1 2/3 pounds	2.0 pounds	2 2/3 pounds
1 pound/gal. ec	1.0 quart	2.0 quarts	3.0 quarts	4.0 quarts	5.0 quarts	6.0 quarts	8.0 quarts
1.5 pounds/gal. ec	2/3 quart	1 1/3 quarts	2.0 quarts	2 2/3 quarts	3 1/3 quarts	4.0 quarts	5 1/3 quarts
2 pounds/gal. ec	1.0 pint	1.0 quart	3.0 quarts	2.0 quarts	5.0 pints	3.0 quarts	2.0 quarts
4 pounds/gal. ec	0.5 pint	1.0 pint	1.5 pints	1.0 quart	2.5 pints	3.0 pints	2.0 quarts
6 pounds/gal. ec	1/3 pint	2/3 pint	1.0 pint	1 1/3 pints	1 2/3 pints	2.0 pints	2 2/3 pints
8 pounds/gal. ec	0.25 pint	0.5 pint	0.75 pint	1.0 pint	1.25 pints	1.5 pints	2.0 pints

EXAMPLE: You wish to apply an insecticide at the rate of 1 pound (active ingredient) per acre and you purchase an emulsifiable concentrate formulation containing 2 pounds (active ingredient) per gallon. From the table above, you find that 2 quarts of the formulation are needed per acre to provide the desired dosage.

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Insecticide Dilution Tables

The tables below provide a quick reference to determine the amount of insecticide to mix with different amounts of water to obtain the same concentration of spray.

Example: 1 cup of liquid insecticide in 100 gallons of water makes the same concentration of spray as 4 tablespoons in 25 gallons of water.

Table II: For use with liquid insecticide.

Amount of Water Used		Amount of Liquid Insecticide		
100 gallons	1 cup	1 pint	1 quart	2 quarts
50 gallons	0.5 cup	1 cup	1 pint	1 quart
25 gallons	4 tablespoons	0.5 cup	1 cup	1 pint
2.5 gallons	1.5 teaspoons	2.5 teaspoons	5 teaspoons	10 tablespoons
1 gallon	0.5 teaspoon	1.0 teaspoon	2 teaspoons	4 teaspoons

Table III: For use with wettable powder insecticides.

Amount of Water Used		Amount of Wettable Powder Insecticide		
100 gallons	1 pound	2 pounds	3 pounds	5 pounds
50 gallons	0.5 pound	1 pound	1.5 pounds	2.5 pounds
25 gallons	0.25 pound	0.5 pound	0.75 pound	1.25 pounds
3 gallons	2 tablespoons	3 tablespoons	5 tablespoons	8 tablespoons
1 gallon	2 teaspoons	1 tablespoon	1.5 tablespoons	2.5 tablespoons

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Insecticide Dilution Tables

Table IV: Read across from the insecticide formulation you have and down from the concentration of the insecticide you want in the spray. The amount of insecticide to mix with 1 gallon of water to make that concentration is indicated at the point the lines meet.

	Concentration of Actual Chemical Wanted in the Spray Solution								
Insecticide Formulation	**0.0313%**	**0.0625%**	**0.125%**	**0.25%**	**0.5%**	**1.0%**	**2.0%**	**3.0%**	**5.0%**
WETTABLE POWDER (WP)									
15% WP	2.5 teaspoons	5.0 teaspoons	10.0 teaspoons	7.0 tablespoons	1.0 cup	2.0 cups	4.0 cups	6.0 cups	10.0 cups
25% WP	1.5 teaspoons	3.0 teaspoons	6.0 teaspoons	12.0 teaspoons	8.0 tablespoons	1.0 cup	2.0 cups	3.0 cups	5.0 cups
40% WP	1.0 teaspoon	2.0 teaspoons	4.0 teaspoons	8.0 teaspoons	5.0 tablespoons	10.0 tablespoons	1.25 cups	2.0 cups	3.25 cups
50% WP	0.75 teaspoons	1.5 teaspoons	3.0 teaspoons	6.0 teaspoons	4.0 tablespoons	8.0 tablespoons	1.0 cup	1.5 cups	2.5 cups
75% WP	0.5 teaspoon	1.0 teaspoon	2.0 teaspoons	4.0 teaspoons	3.0 teaspoons	5.0 tablespoons	10.0 tablespoons	1.0 cup	2.0 cups
EMULSIFIABLE CONCENTRATE (EC)									
10%-12% EC 1 pound actual/gal	2.0 teaspoons	4.0 teaspoons	8.0 teaspoons	16.0 teaspoons	10.0 tablespoons	2/3 pint	1 1/3 pints	1.0 quart	3.25 pints
15%-20% EC 1.5 pounds actual/gal	1.5 teaspoons	3.0 teaspoons	6.0 teaspoons	12.0 teaspoons	7.5 teaspoons	0.5 pint	1.0 pint	1.5 pints	2.5 pints
25% EC 2 pounds actual/gal	1.0 teaspoons	2.0 teaspoons	4.0 teaspoons	8.0 teaspoons	5.0 tablespoons	10.0 tablespoons	2/3 pint	1.0 pint	1.75 pints
33%-35% EC 3 pounds actual/gal	0.75 teaspoon	1.5 teaspoons	3.0 teaspoons	6.0 teaspoons	4.0 tablespoons	8.0 tablespoons	0.5 pint	0.75 pint	1 1/3 pints
40%-50% EC 4 pounds actual/gal	0.5 teaspoon	1.0 teaspoon	2.0 teaspoons	4.0 teaspoons	8.0 teaspoons	5.0 tablespoons	10.0 tablespoons	0.5 pint	4/5 pint
57% EC 5 pounds actual/gal	7/16 teaspoon	7/8 teaspoon	1.75 teaspoons	3.5 teaspoons	7.0 teaspoons	0.5 tablespoons	9.0 tablespoons	14.0 tablespoons	1.5 cups
60%-65% EC 6 pounds actual/gal	3/8 teaspoon	0.75 teaspoon	0.5 tablespoons	1.0 tablespoons	2.0 tablespoons	4.0 tablespoons	8.0 tablespoons	12.0 tablespoons	1.5 cups
70%-75% EC 8 pounds actual/gal	0.25 teaspoon	0.5 teaspoon	1.0 teaspoon	2.0 teaspoons	4.0 teaspoons	8.0 teaspoons	5.0 tablespoons	7.5 tablespoons	13.0 tablespoons

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Calibration of Cotton Insecticide Sprayers

Based on 60 GPA

Gallons Per Acre									
MPH	X3 Hollow Cone Nozzles Nozzles Per Row			X4 Hollow Cone Nozzles Nozzles Per Row			X6 Hollow Cone Nozzles Nozzles Per Row		
	1	2	3	1	2	3	1	2	3
3.0	3.1	6.2	9.3	4.0	8.0		6.0		
3.5	2.7	5.4	8.1	3.5	7.0	10.5	5.2	10.4	
4.0	2.3	4.6	6.9	3.0	6.0	9.0	4.5	9.1	
4.5	2.1	4.2	6.3	2.7	5.4	8.1	4.0	8.2	
5.0	1.8	3.6	5.4	2.4	4.8	7.2	3.6	7.3	
5.5		3.2	4.8	2.2	4.4	6.6	3.3	6.6	9.9
6.0		2.8	4.2	2.0	4.0	6.0	3.0	5.9	8.9
6.5		2.7	4.0	1.8	3.6	5.4	2.7	5.5	8.2
7.0		2.6	3.9		3.4	5.1	2.5	5.1	7.6
10.0		1.8	2.7		2.4	3.5	1.8	3.7	5.5

Step I. **Determine approximate speed**: Measure distance in feet the sprayer will travel in 20 seconds and divide by 30.
Example: 120 feet in 20 seconds 120/30 = 4 mph

Step II. **Use chart:** Read to the right of mph on the above chart.
Example: Rate of application of 2 x 3 nozzles per row at 4 mph is 4.6 gallons per acre.

Step III. **Insert correct nozzle size in boom.**

Step IV. **Adjust pressure regulator** for 60 pounds with boom valve open.

Step V. **Add insecticides to tank.** To determine the acres per tankful, divide tank capacity by rate of application per acre.
Example: 100-gallon tank will cover 20 acres when you apply 5 gallons per acre; or 100 divided by 5 equals 20 acres per tankful; add insecticides for 20 acres.

Step VI. **Adjust boom height** to give even coverage of the cotton plant. On 40-inch rows using 2 nozzles per row, adjust boom approximately 16 inches above cotton; on 50-inch rows using 3 nozzles per row, adjust boom approximately 10 inches above cotton.

(See suggested nozzle arrangement for cotton insect sprayers.)

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Common, Trade, and Chemical Names of Selected Insecticides

Common Name	Trade Name	Chemical Name	IRAC Classification	Company
abamectin	Abba Agri-Mek Avid Zephyr	a mixture of avermectin B1a (10E,14E,16E,22Z)-(1R,4S,5′S,6S,6′R,8R,12S,13S,20R,21R,24S)-6′-[(S)-sec-butyl]-21,24-dihydroxy-5′,11,13,22-tetramethyl-2-oxo-(3,7,19-trioxatetracyclo[15.6.1.14,8.020,24]pentacosa-10,14,16,22-tetraene)-6-spiro-2′-(5′,6′-dihydro-2′H-pyran)-12-yl 2,6-dideoxy-4-O-(2,6-dideoxy-3-O-methyl-α-L-arabino-hexopyranosyl)-3-O-methyl-α-L-arabino-hexopyranoside and avermectin B1b (10E,14E,16E,22Z)-(1R,4S,5′S,6S,6′R,8R,12S,13S,20R,21R,24S)-21,22-dihydroxy-6′-isopropyl-5′,11,13,22-tetramethyl-2-oxo-(3,7,19-trioxatetracyclo[15.6.1.14,8.020,24]pentacosa-10,14,16,22-tetraene)-6-spiro-2′-(5′,6′-dihydro-2′H-pyran)-12-yl 2,6-dideoxy-4-O-(2,6-dideoxy-3-	6	AMVAC Syngenta Syngenta Syngenta
acephate	Orthene Surrender Fate OTTO Address	O,S-Dimethyl acetylphosphoramidothioate	1B	AMVAC
acetamiprid	Intruder Tristar	N-[(6-chloro-3-Pyridy) methyl] –n2-Cyanogen -n- methylacetamidine	4A	Gowan Nufarm
allethrin	Pynamin	(RS)-3-allyl-2-methyl-4-oxocyclopent-2-enyl(1RS)-cis-trans chrysanthemate; also referred to as allyl homolog of cinerin I.	3A	Sumitomo Chemical Co. Ltd.
amitraz	Taktic	N-methylbis(2,4-xylyliminomethyl)amine	19	InTerveT, Inc.
aluminum phosphide	Phostoxin	aluminum phosphide (AlP)	24A	Degesch America
Bacillus sphaericus	VectoLex	Serotype (H-5a5b)	11	Valent BioSciences Corp.
Bacillus thuringiensis	Biobit Condor Crymax DiPel Javelin Thuricide XenTari	Spores and crystalline delta-endotoxin as A.I. which are produced by *Bacillus thuringiensis* spp. *kurstaki*, Serotype H-3a3bin fermentation.	11A	Valent USA Certis USA Certis USA Valent USA Certis USA OHP Inc. Valent USA
Bacillus thuringiensis	VectoBac	Crystalline delta-endotoxin as A.I. (produced by fermentation of *Bacillus thuringiensis* spp. *israelensis*, Serotype H-14)	11	Valent BioSciences Corp.
beta-cyfluthrin	Baythroid Tempo Ultra	cyano(4-fluoro-3-phenoxyphenyl)methyl 3-(2,2- dichloroethenyl-2 2-dimethylcyclopropanecarboxylate (CAS 9Cl)	3A	Bayer Corp. Bayer Corp.
bifenazate	Floramite	hydrazine carboxylic acid, 2-(4-methoxy-[1'1-biphenyl]-3-yl)-1 methylethyl ester (CA)	25	OHP Inc.
bifenthrin	Brigade Capture Discipline Fanfare Talstar	[1α,3α-(Z)]-(±)-(2 methyl[1,1′-biphenyl]-3-yl)methyl 3-(2-chloro-3,3, 3-trifluoro-1-propenyl)-2,2-dimethyl-cyclopropanecarboxylate(CAS)	3A	FMC FMC AMVAC Adama FMC
bifenthrin + imidacloprid	Brigadier	(2-methyl[1,1′-biphenyl]-3-yl)methyl (1R,3R)-rel-3-[(1Z)-2-chloro-3,3,3-trifluoro-1-propen-1-yl]-2,2-dimethylcyclopropanecarboxylate and (2E)-1-[(6-chloro-3-pyridinyl)methyl]-N-nitro-2-imidazolidinimine	3A + 4A	FMC
buprofezin	Applaud Talus	2-tert-butylimino-3-isopropyl-5-phenyl-1,3,5-thiadiazinan-4-one	18	Corteva SePRO

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Common, Trade, and Chemical Names of Selected Insecticides

Common Name	Trade Name	Chemical Name	IRAC Classification	Company
carbaryl	Sevin	1-napthyl methylcarbamate	1A	GardenTech
chlorantraniliprole	Acelepryn Coragen Prevathon	3-bromo-N-[4-chloro-2-methyl-6-[(methylamino)carbonyl]phenyl]-1-(3-chloro-2-pyridinyl)-1H-pyrazole-5-carboxamide	28	DuPont Dupont FMC Corp
chlorfenapyr	Intrepid Phantom Pylon 2SC	4-bromo-2-(4-chlorophenyl)-1-(ethoxymethyl)-5-(trifluoromethyl)-1H-pyrrole-3-carbonitrile	13	BASF
chlorpyrifos	Dursban Pro Lorsban Nufos	O,O-diethyl O-(3,5,6-trichloro-2-pyridinyl)phosphorothioate	1B	Corteva Corteva FMC Corp
clothianidin	Arena Belay Poncho	(E)-1-(2-chloro-1,3 thiazo)-5-ylmethyl)-3-methyl-2 nitroguanidine	4A	Valent Valent Bayer
coumaphos	Co-Ral	O,O-diethyl O-(3-chloro-4-methyl-2-oxo2H-1-enzopyuran 7-yl-phosphorothioate	1B	Bayer Corp.
coumpahos + diazinon	Co-Ral Plus	O,O-diethyl O-(3-chloro-4-methyl-2-oxo2H-1-enzopyuran 7-yl-Phosphorothioate + O,O,Diethyl O-(2-isopropyl-6-methyl-4-pyrimidinyl)	1B	Bayer Corp.
cyromazine	Citation	N-cyclopropyl-1,3,5-triazine-2,4,6-triamine	17	Syngenta
diazinon	Optimizer Patriot	O,O,Diethyl O-(2-isopropyl-6-methyl-4-pyrimidinyl)	1B	Y-Tex Corp. Bayer Corp
diazinon + chlorpyrifos	Warrior (ear tag)	O,O,Diethyl O-(2-isopropyl-6-methyl-4-pyrimidinyl)	1B	Y-Tex
dichlorvos	Nuvan Vapona	2,2-dichlorovinyl dimethyl phosphate (IUPAC)	1B	AMVAC Bayer Corp
dicofol	Kelthane	2,2,2-trichloro-1,1-bis(4-chlorophenyl)ethanol(IUPAC)	3	Corteva
dicrotophos	Bidrin	(E)-2-dimethylcarbamoyl-1-methylvinyl dimethyl phosphate (IUPAC)	1B	AMVAC
diflubenzuron	Vigilante	N-[(4-Chlorophenyl)amino]carbonyl-2,6-Difluorobenzamide	15	Chemtura Corp.
dimethoate	Cygon Cygon 2E	O,O-dimethyl S-(N-methylcarbamoylmethyl	1B	Bonide Hi-Yield
dioxathion	Del-Tox	2,3-p-dioxanedithion-S,S-bis-(O,O-diethyl phosphrodithioate)	1B	AgrEvo
disulfoton	Di-Syston	O,O-diethyl S-[2-(ethylthio)ethyl]phosphorodithioate (CAS)	1B	Bayer Corp.
endosulfan	Phaser	6,7,8,9,10,10-herachloro-1,5,5a,6,9,9a- hexahydro-6,9-methano-2,4,3-benzodioxathiepin 3-oxide (IUPAC)	2A	Aventis CropScience
eprinomectin	Eprinex	(4"R)-4"-(Acetylamino)-4"-deoxy-avermectin B1	6	Merck Agvet
esfenvalerate	Asana XL	(S)-α-cyano-3- phenoxybenzyl) (S)-2-(4-chlorophenyl)3- methylbutyrate (IUPAC); (S)-cyano(3-phenoxyphenyl)methyl (S)-4-chloro-α(1-methylethyl)benzeneacetate (CAS)	3A	Dupont
etoxazole	Zeal	2-(2,6-difluorophenyl)-4-[4-(1,1-dimethylethyl)-2-ethoxyphenyl]-4,5-dihydrooxazole	10B	Valent USA
fenbutatin-oxide	Vendex	hexakis(2-methyl-2-phenylproply)distannoxane(CAS)	12B	UPI
fenoxycarb	Award Logic	(ethyl [2-4 phenoxyphenoxy ethyl] carbamate)	7B	Syngenta Syngenta
fenthion	Spotton	O,O-Dimethyl O-[3-methyl-4-(methylthio)phenyl]phosphorothioate	1B	Bayer Corp.
fipronil	Ceasefire Chipco Choice Regent	[5-amino-1-(2,6-dichloro-4-trifluoromethyl)phenyl-4-(1,R,S)-(trifluoromethyl)su-1-H-pyrasole-3-carbonitrile]	2B	Bayer

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Common, Trade, and Chemical Names of Selected Insecticides

Common Name	Trade Name	Chemical Name	IRAC Classification	Company
	Over 'n Out Termidor Top Choice			BASF
flonicamid	Carbine	N-cyanomethyl-4-(trifluoromethyl) nicotinamide	9C	FMC
flubendiamide	Belt	*N2*-[1,1-dimethyl-2-(methylsulfonyl)ethyl]-3-iodo-*N1*-[2-methyl-4-[1,2,2,2-tetrafluoro-1-(trifluoromethyl)ethyl]phenyl]-1,2-benzenedicarboxamide	28	Bayer CropScience
gamma-cyhalothrin	Prolex	Cyclopropanecarboxylic acid, 3-(2-chloro-3,3,3-trifluoro-1-propenyl)- 2,2-dimethyl,cyano(3-phenoxyphenyl) methyl ester	3A	Pytech
halo fenozide	Mach 2	N-tert-butyl-N'-(4-chlorobenzoyl)benzohydrazide; benzoic acid, 4-chloro-2 benzoyl-2- (1,1-dimethylethyl) hydrazide	18	Corteva
hydramethylnon	Amdro	Tetrahydro-5, 5-dimethyl-2 (1H)-pyrimidinone [3-[4(trifluoromethyl)phenyl]-1-[2-[4-(trifluoromethyl)phenyl]etheny]-2-propenylidene]hydrazone	20A	AMBRANDS
imidacloprid	Admire Gaucho Marathon Merit Premise	1-(6-chloro-3-pyridin-3-ylmethyl)-N-nitroimidazolidin-2-ylidenamine (IUPAC)	4A	Bayer Corp Bayer Corp OHP Inc. Bayer Corp Bayer Corp
imidacloprid + beta cyfluthrin	Leverage	(2E)-1-[(6-chloro-3-pyridinyl) methyl]-N-nitro-2-imidazolidinimine + cyano(4-fluoro-3-pheno xyphenyl)methyl 3-(2,2-dichloroethenyl)-2,2-dimethyl cyclopropanecarboxylate	3A + 4A	Bayer Corp
insecticidal soap	M-PEDE Safer	potassium salts of fatty acids	unknown	Gowan Safer
indoxacarb	Advion Steward	(S)-methyl 7-chloro-2,5-dihydro-2-[{(methoxy-carbonyl){4trifluoromethoxy)phenyl}amino}-carbonyl}indeno{1,2-e}[1,3,4}oxadiazine-4a-(3H)-carboxylate	22A	DuPont FMC Corp.
isofenphos	Oftanol	1-methylethyl 2[(ethoxy)(1methylethyl)amino] phosphinothioyl oxy benzoate (CAS)	1B	Bayer Corp.
lambda-cyhalothrin	Battle Commodore Karate Z Saber Warrior T	α-cyano-3-phenoxybenzyl 3-(2-Chloro-3,3,3- trifluoroprop-1-enyl)-2,2-dimethylcyclopropane-carboxylate	3A	Lesco Syngenta Syngenta Merck Syngenta
lambda-cyhalothrin + PBO	Saber Extra (ear tag)	α-cyano-3-phenoxybenzyl 3-(2-Chloro-3,3,3-trifluoroprop-1-enyl)-2,2-dimethylcyclopropane-Carboxylate	3A	Merck
lambda-cyhalothrin +thiamethoxam	Endigo	Combination of lambda-cyhalothrin and thiamethoxam (premix): [1α(S),3α(Z)]-(±)-cyano-(3-phenoxyphenyl)methyl-3-(2-chloro-3,3,3-trifluoro-1-propenyl)-2,2-dimethylcyclopropanecarboxylate and 3-[(2-chloro-5-thiazolyl)methyl]tetrahydro-5-methyl-N-nitro-4H-1,3,5-oxadiazin-4-imine	3A + 4A	Syngenta
malathion	Fyfanon	diethyl (dimethoxythiophosphorylthio)succinate	1B	Cheminova, Inc.
mancozeb	Dithane	coordination product of zinc ion, manganese ethylene bisdithiocarbamate related to both maneb and zineb	M3	Corteva
methamidophos or acephate-met	Monitor	O,S-Dimethyl phosphoramidothioate(IUPAC, CAS)	1B	Tomen Agro, Inc.

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Common, Trade, and Chemical Names of Selected Insecticides

Common Name	Trade Name	Chemical Name	IRAC Classification	Company
methidathion	Supracide	S-2,3-dihydro-5-methoxy-2-oxo1,3,4-thiadiazol-3-ylmethyl O, O-dimethyl-phosphorodithioate(IUPAC)	1B	Gowan Company
methiocarb	Slugger	3,5-dimethyl-4-(methylthio)phenyl methylcarbamate (CAS)	1A	OR-CAL
methomyl	Lannate	S-methyl N-[(methylcarbamoyl)oxy]thioacetimidate (CAS 8CI)	1A	DuPont
methoxyfenozide	Intrepid	Benzoic acid, 3-methoxy-2-methyl, 2-(3,5-dimethylbenzoyl)-2-(1,1-dimethyethyl) hydrazide	18	Corteva
methyl chloroform	Formula 683	1,1,1-trichloroethane (IUPAC)	unknown	Malter International
mineral oil	TriTek	mineral oil	unknown	Brandt
methyl parathion	Methyl 4EC	O,O-dimethyl O-(4-nitrophenyl)phosphorothioate	1B	Cheminova Inc.
naled	Dibrom Trumpet	1,2-dibromo-2,2-dichloroethyl dimethyl phosphate	1B	AMVAC AMVAC
novaluron	Diamond	*N*-[[[3-chloro-4-[1,1,2-trifluoro-2-(trifluoromethoxy)ethoxy]phenyl]amino]carbonyl]-2,6-difluorobenzamide	15	Adama
oxamyl	Vydate	S-methyl N′ N′-dimethyl-N-(methylcarbamoyloxy)-1-thio-oxamimidate(IUPAC)	1A	DuPont
oxydemeton-methyl	Metasystox-R	S-[2-(Ethylsulfinyl)ethyl]O,O-dimethyl phosphorothioate	1B	Bayer Corp.
permethrin	Ambush Astro DeLice Permanone Pounce	3-phenoxybenzyl (1RS)-cis, trans-3-(2,2- dichlorovinyl)-2,2-dimethylcyclopropanecarboxylate (IUPAC)	3A	Syngenta FMC Coopers Bayer Corp FMC
phorate	Thimet	O,O-Diethyl S-[(ethylthio)methyl]phosphorodithioate (CAS)	1B	Amvac Chemical
phosmet	Imidan	S-[(1,3-dihydro-1,3-dioxo-2H-isoindol-2-yl)methyl]O,O-dimethyl phosphorodithioate(CAS 9CI)	1B	Gowan Company
propargite	Comite	sulfurous acid,2[4(1,1-dimethyl-ethyl)phenoxy]cyclohexy1-2- propanyl sulfite (CAS 9C1)	12C	Uniroyal Chemical/ Crompton Corp.
profenofos	Curacron	O-(4-bromo-2-chlorophenyl)O-ethyl S-propyl phosphorothiate(IUPAC	1B	Syngenta
propoxur	Baygon	2-(1-methylethoxy)phenyl methylcarbamate(CAS)	1A	Bayer Corp.
pyriproxyfen	Distance	(2-[1-methyl-2-(4-phenoxyphenoxy)ethoxy]pyridine)	7C	Nufarm
pyrethrin	Pyrethrin	Pyrethrin (natural product)	3A	several
s-methoprene	Altosid Extinguish	isopropyl (E,E)-(RS)-11-methoxy-3,7,11-trimethyl-dodeca-2,4- dienoate (IUPAC)	7A	Wellmark International Phoenix Environmental Design
s-methoprene, + hydromethylnon	Extinguish Plus	(s)-methoprene[isopropyl (2E, 4E, 7S)-11-methoxy-2,7,11- trimethyl-2,4-dodecadienoate] + tetrahydro-5, 5-dimethyl-2 (1H)-pyrimidinone [3-[4(trifluoromethyl)phenyl]-1-[2-[4-(trifluoromethyl)phenyl]etheny]-2-propenylidene]hydrazone	7A	Phoenix Environmental Design
spinetoram	Radiant	Mixture of spinetoram-J and spinetoram-L	5	Corteva
spinosad/spintor	Conserve SC Entrust	Spinosyn A and Spinosyn D	5	Corteva

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Common, Trade, and Chemical Names of Selected Insecticides

Common Name	Trade Name	Chemical Name	IRAC Classification	Company
	Success Tracer			
spiromesifen	Forbid 4F Oberon	2-oxo-3-(2,4,6-trimethylphenyl)-1-oxaspiro[4,4]non-3-en-4-yl3, 3 dimethylbutanoate	23	Bayer Corp Bayer Corp
tebufenozide	Confirm Mimic	N-tert-butyl-N′-(4-ehylbenzoyl)-3,5-dimethylbenzo-hydrazide (IUPAC);3,5-dimethylbenzoic acid 1-(1,1-dimehtylethyl)-2-(4-ethylbenzoyl)hydrazide(CAS 9CI)	18	Corteva Bayer
tefluthrin	Force	(2,3,5,6-tetrafluoro-4-methylphenyl)methyl-(1a,3a)-(Z)-3-(2-chloro-3,3,3-trifluoro-1-propenyl)-2,2-dimethylcyclopropanecarboxylate	3A	Syngenta
temephos	Abate	O,O′ -(thiodi-4,1-phenylene) O,O, O' O'-tetramethyl phosphorothioate	1B	BASF Corp.
terbufos	Counter	S-[(1,1-Dimethylethyl thio)methyl]O,O-diethyl phosphorodithioate (CAS)	1B	AMVAC
tetrachlorvinphos	Rabon	2-chloro-1-(2,3,5 trichlorophenyl) dimethyl phosphate vinyl	1B	Bayer Livestock
tetrachlorvinphos + dichlorvos	Ravap	(Z)-2-chloro-1-(2,4,5-trichlorophenyl) vinyl dimethyl phosphate + 2,2-dichlorovinyl dimethyl phosphate (IUPAC)	1B	Bayer Livestock
thiamethoxam	Centric Meridian	3-[(2-chloro-5-thiazolyl)methyl]tetrahydro-5-methyl-N-nitro-4H-1,3,5-oxadiazin-4-imine	4A	Syngenta Syngenta
thiodicarb	Larvin	Dimethyl N,N-[thiobis(methylimino)carbonyloxy]bis (ethanimidothioate) (IUPA)	1A	Aventis CropScience
tralomethrin	Scout X-Tra	(1R, 3S) 3 [(1′RS)(1′,2′,2′,2′,-tetrabromoethyl)]-2,2-dimethylcyclopropanecarboxylic acid (S)-α-cyano-3-phenoxybenzyl ester (CAS)	3A	Aventis CropScience
trichlorfon	Dipterex Dylox (Proxol)	dimethyl (2,2,2-trichloro-1-hydroxyethyl)phosphonate (CAS)	1B	Nufarm Bayer Corp
zeta-cypermethrin	Mustang	□-Cyano(3-phenoxyphenyl)methyl (±)-cis-trans3-(2,2 dichloroethenyl)-2,2-dimethylcyclopropane carboxylate (CAS)	3A	FMC Corp
zeta-cypermethrin + bifenthrin	Hero Mustang Max	α-Cyano(3-phenoxyphenyl)methyl (±)-cis-trans3-(2,2 dichloroethenyl)-2,2-dimethylcyclopropane carboxylate (CAS) + [1α,3α-(Z)]-(±)-(2 methyl[1,1′-biphenyl]-3-yl)methyl 3-(2-chloro-3,3, 3-trifluoro-1-propenyl)-2,2-dimethyl-cyclopropanecarboxylate(CAS)	3A	FMC Corp

NOTE: This list is presented for information only. No endorsement is intended for products mentioned nor is criticism meant for products not mentioned.

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Biological Control of Crapemyrtle Bark Scale

Giovana Matos Franco, Rodrigo Diaz and Yan Chen, Department of Entomology, LSU AgCenter

Crape myrtles (*Lagerstroemiae* spp.) are one of the most popular ornamental trees in southeastern United States. This is largely because of their beautiful flowers, bark, climate adaptation and relatively easy maintenance. However, in the past years a new pest was first detected in Texas, the crapemyrtle bark scale (*Acanthococcus lagerstroemiae* [Hemiptera, Acanthococcidae], hereafter referred as CMBS). CMBS is native to Asia and can be recognized by white circles along the branches. The first life stage of the scale is called crawler, and crawlers are responsible for their spread. Crawlers will settle in the branch and will start feeding on the tree's sap. The adults have sexual dimorphism, the males turn into pupae and then hatch as winged small insects. Meanwhile, the females stay as immotile scales. Once they mate, the females produce eggs that stay protected under a layer of wax until they hatch. The scale can colonize different parts of the trees causing direct and indirect injury. Direct injury occurs because of its sucking sap behavior, leading to branch dieback, and indirect is because of honeydew excretion, which provide substrate to black sooty mold that will cover the leaves. These injuries lead to a reduction in the size of the panicles and unpleasant appearance of the tree. CMBS can also feed on beautyberry (*Callicarpa americana*), pomegranate (*Punica granatum*), henna tree (*Lawsonia inermis*), narrow-leaf heimia (*Heimia salicifolia*) and winged-lythrum (*Lythrum alatum*).

In Louisiana, several beneficial insects are found on crapemyrtle trees. They are mainly responsible for pollination and biological control. As biological control agents, they eat or parasitize the pests, leading them to death. Parasitoids have been found parasitizing the CMBS in the U.S., but not in Louisiana. Therefore, the key biological control agents against the CMBS are predators such as ladybeetles, pirate bugs and lacewings. However, only the pirate bugs and lacewings can be purchased. Avoiding unnecessary pesticide application will decrease natural enemy mortality and prevent rapid growth of CMBS. To protect the ladybeetles, consider products with low impact to non-targets and follow product's label.

Predators of CMBS are the ladybeetles, *Chilocorus* sp. and *Hyperaspis bigeminata*, the minute pirate bug, *Orius insidiosus,* and lacewings, *Chrysoperla* sp. The *Chilocorus* sp. ladybeetles are black with two orange spots in the wings. Its body size can vary between 0.16 and 0.24 inches long, the larvae is also black with spine-looking structures around the body. The *H. bigeminata* ladybeetle is also black with orange spots on the wings and two other spots on the front part of the body. Its body size can vary from 0.09 to 0.13 inches, and the larvae is pink with a white wax coverage. Both ladybeetles can be observed during the day feeding on the scales from late spring until early fall. The minute pirate bug is a small (around 0.08 inches) and black. The nymphs can be from yellow to orange and, as the adults, have piercing-sucking mouthparts that can be used to feed on different kind of pests, including CMBS. Adult lacewings are small (up to 0.8 inches) green or pale, winged, and with long antenna that feed on pollen or honeydew. The larvae are as small as 0.04 inches when they hatch, have long mandibles that resemble pincers and are active predators of several small insects and mites. These natural enemies are largely distributed through the United States and play a key role preventing scale's outbreaks.

CMBS can be managed by washing the trunk and reachable limbs with a soft brush and mild solution of dishwashing soap and water. This will remove many of the female scales and egg masses. Washing will also remove much of the black mold that builds up on the bark of infested trees. However, washing the trees can be time consuming and not feasible in areas with many crapemyrtles. Therefore, studies are being carried to assess which are the best pesticide product to control the CMBS.

For more information, see the LSU AgCenter crapemyrtle bark scale website (http://www.lsuagcenter.com/crapemyrtle).

For managing resources, see LSU AgCenter crapemyrtle bark scale management updates (http://www.lsuagcenter.com/articles/page1508343389870).

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Flubendiamide

Dennis Ring, LSU AgCenter

Flubendiamide was developed by Nihon Nohyaku Co. Ltd. and is classified in group 28 by the insecticide resistance action committee and is a ryanodine receptor modulator. Ryanodine receptors are important in the release of calcium from cells into the cytoplasm. Flubendiamide works on the ryanodine receptors in muscles causing calcium channels to remain partially open. Calcium flow is uncontrolled in muscle cells and calcium levels in the muscle cells are depleted, resulting in contraction and paralysis. Larvae exposed to flubendiamide stop feeding within minutes, regurgitate, become lethargic, may show contractions of the muscles, and die within a few hours to a few days depending on the amount of the insecticide the larva eats. Flubeniamide is fast acting, and larvae may become paralyzed and die in a few hours after eating this insecticide. The insecticide kills larvae.

Flubendiamide is not systemic, but it is translaminar, moving in leaves. It is a stomach poison and must be eaten. Flubendiamide kills the larvae of butterflies, moths and skippers. Flubendiamide is not phytotoxic and has a residual of about two weeks. Additional applications should be made shortly after the two weeks of residual.

This insecticide is selective, killing butterfly, moth and skipper larvae and works best on small larvae. It usually does not kill beneficial insects, such as predators of parasites, and shows a very low toxicity to bees, resulting in no harm to them. It has been shown to be moderately harmful to lady beetles. It is an organic insecticide.

Flubendiamide is best taken in the leaves when the humidity is low. High moisture will make it harder for flubendiamaide to penetrate the leaves, resulting in the insecticide being more easily broken down by ultraviolent sunlight and washed off by rain. It dries and absorbs in the plant, quickly making it rainfast and not washed off by rain. The preharvest interval is three to 14 days depending on the crop plant sprayed. Flubendiamide will be degraded if overexposed to ultraviolent sunlight but is not degraded by ultraviolet sunlight unless it is exposed to large amounts of ultraviolet sunlight.

This insecticide will be broken down by reacting with water and is broken down the quickest at pHs of 4 and 9.2. It is broken down the slowest in water with a pH of 6 to 7. This is the pH range of the water at which it should be mixed and applied.

Flubendiamide should not be stored at temperatures greater than 100 degrees Fahrenheit. This product may start to lose effectiveness after it has been stored 30 days. Belt is an insecticide containing the active ingredient flubendiamide.

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Potential management options for the Roseau cane scale, including biological control via parasitoid wasps

Leslie Aviles, Keyla Pruett and Rodrigo Diaz

Roseau cane (*Phragmites australis*) is a dominant plant in the lower Mississippi River Delta. This emergent wetland reed develops thick rhizomes underground, and they are the primary source of propagation. Stems of Roseau cane can grow taller than 9 feet in ideal conditions; however, the rhizomes constitute about two-thirds of the total plant biomass. Roseau cane provides essential services that benefit the environment and economy in the Mississippi River Delta. Those services include but are not limited to the sequestration of carbon, retention of sediments, reduction of wave action, and protection of wildlife habitat and human infrastructure from erosion and storm events. In the fall of 2016, Roseau cane die-back, characterized by premature senescence and reduced cane growth was reported by concerned landowners in Plaquemines Parish.

Hundreds of scale insects were observed on heavily infested cane stems retrieved from die-back sites. These insects were identified as *Nipponaclerda biwakoensis* (Hemiptera: Aclerdidae), commonly known as the Roseau cane scale, which is native to Asia. On stems of Roseau cane, the scale can be found between the leaf sheath and the stem. The life cycle of this scale begins with a crawler, which is the only life stage able to walk. It can also disperse via animals or wind. Once the crawler settles on the stem, it becomes a pale-colored, oval-shaped nymph. This nymph develops a waxy layer along the edges of its body and sheds its legs (**Fig. 1**). The nymph begins to suck fluids from the cane stem and gradually matures. Adult male scales of this species are flightless and are incredibly small when compared to females, which can grow to more than 15/64 of an inch long. Females become darker in coloration as they mature. Mature females can be distinguished from nymphs by the presence of hundreds of tiny eggs, which can be observed under a scope. Once mature, those eggs will emerge from the female as crawlers and start the cycle anew.

Since the discovery of the Roseau cane scale in the Mississippi River Delta in 2016, several studies have emerged to understand the role of the scale and other stressors in the cane die-back. A host range study found that the Roseau cane scale can only develop on Roseau cane; however, crawlers were able to survive for limited periods on California bulrush (*Schoenoplectus californicus*) and smooth cordgrass (*Spartina alterniflora*). Greenhouse experiments demonstrated that the scale cannot develop on corn (*Zea mays*), sorghum (*Sorghum bicolor*), rice (*Oryza sativa*), sugarcane (*Saccharum officinarum*), Jamaica swamp sawgrass (*Cladium jamaicense*), giant cutgrass (*Zizaniopsis miliacea*), para grass (Urochloa mutica), maidencane (*Panicum hemitomon*), seashore paspalum (*Paspalum vaginatum*), giant reed (*Arundo donax*) and annual wild rice (*Zizania aquatica*). Current studies focus on whether plant resistance among different varieties of Roseau cane could be a management option. In the scale's native range, Chinese farmers cut, burn and flood Roseau cane to reduce pest populations and remove potential overwintering sites.

To combat infestations in Louisiana, a landowner's most effective allies are the scale's natural enemies: parasitoid wasps. As part of their life cycle, parasitoid wasps lay their eggs inside of a host. Those eggs then develop into larvae, which eat their host, a process that kills it, and then emerge as adults. In Louisiana, there are three species of parasitoid wasps that target the Roseau cane scale, *Astymachus japonicus, Neastymachus japonicus* (**Fig. 2**), and *Boucekiella depressa*. These wasps are smaller than the width of a grain of rice and are difficult to identify with the unaided eye.

In 2018, a study found that these wasps were responsible for 18% to 56% of adult scale mortality. Parasitism rates were seasonal: Fewer scales were parasitized in the cooler seasons compared to the summer and late fall, where parasitism rates increased with the growing scale populations. The use of insecticides is not recommended to control the scale. The scale inhabits the space between the Roseau cane's stem and leaf sheath, which insecticides have difficulty penetrating, therefore reducing the efficacy of insecticides. Instead, these insecticides may negatively impact parasitoid populations. Parasitoid wasps that have emerged from scales move to new locations to find scales to parasitize and are more likely to come into contact with insecticides.

For more information, please visit the LSU AgCenter Roseau cane die-back website: www.lsuagcenter.com/roseaucane.

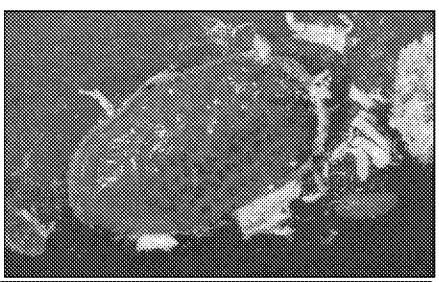

Figure 1. Mature female Roseau cane scale (top) with visible eggs inside. Smaller male (bottom) is also depicted below the female.

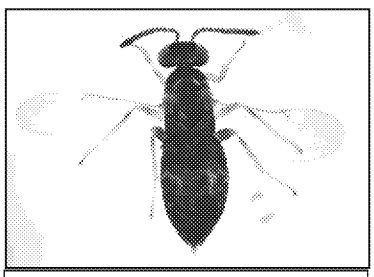

Figure 2. Image of *Neastymachus japonicus*, a small parasitoid wasp of the Roseau cane scale.

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Worker Protection Standard (WPS)

The Environmental Protection Agency (EPA) Agricultural Worker Protection Standard (WPS) is aimed at reducing the risk of pesticide poisoning and injury among agricultural workers and pesticide handlers. Pesticide applicators must comply with this rule when using agricultural use pesticide products that reference the Worker Protection Standard, 40 CFR 170. In 2015, the EPA made major revisions to the Worker Protection Standard (WPS).

The LSU AgCenter has worked to provide an updated WPS Train-the-Trainer program that has been approved by the EPA. In Louisiana those employers that want to train their own workers and handlers must be certified applicators and go through the new WPS Train-the-Trainer program with the LSU AgCenter. All workers and handlers must now be trained on an annual basis. If you went through a WPS Train-the-Trainer program prior to November of 2016, then you will have to attend a new WPS Train-the-Trainer program. Once you have completed that program, WPS Trainer will be added to the back of your pesticide certification card and you will then be able to go to your normal recertification meeting to have that category recertified.

Training dates and locations can be found at www.lsuagcenter.com/pesticide.
If you would like to participate in a WPS Train-the-Trainer Program, please email kbrown@agcenter.lsu.edu.

As part of the revised rule there are a few things that need to be pointed out:

- Workers and handlers must be trained every 12 months.
- WPS trainers must go through the new EPA-approved Train-the-Trainer Program (See information above).
- Workers and handlers must be trained by using EPA-approved training materials
- No longer using the card system for records of training. You must maintain the following information:
    - Trained worker's printed name and signature.
    - Date of the training.
    - Information identifying which EPA-approved training materials were used.
    - The trainer's name and qualification to train.
    - The worker or handler employer's name.
- The LSU AgCenter has created a form that you are welcome to use. If you would like to download training verification form for WPS.
- Must retain records of training of workers and handlers for two years.
- Maintain the following information at a central location:
    - New safety poster https://npsecstore.com/collections/posters.
    - Application records.
    - Emergency medical contact information.
    - SDS (safety information).
- When using a pesticide that requires a respirator, employers must:
    - Have an employee medically evaluated by a physician or other licensed health care professional.
    - Have employee go through an annual fit test for each type of respirator required by the pesticide product label.
    - Have the employee participate in annual training on how to properly use the respirator(s).
    - Maintain records for two years of the completion of the above requirements.

The How to Comply Manual is a great reference guide and can be ordered at npsecstore.com.

To get more information about the WPS revised rule you will need to refer to the final rule at https://www.epa.gov/pesticide-worker-safety/agricultural-worker-protection-standard-wps.

Where to get updated information:

- www.lsuagcenter.com/pesticide
- https://npsecstore.com/ (where to get the new poster)
- http://pesticideresources.org/stage//index.html (where to get EPA approved training materials)

This section was revised September 2019 by Kim Brown.

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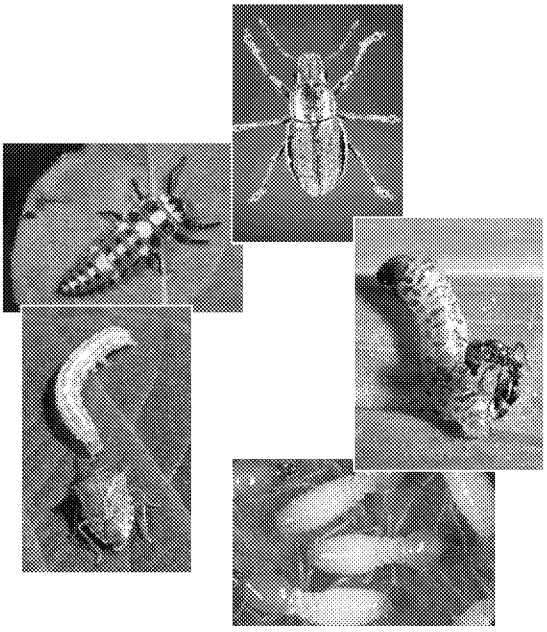

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