MP144

2018

Insecticide Recommendations for Arkansas

Japanese Beetle
(Popillia japonica)

Lice
(Pediculus humanus)

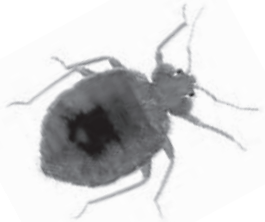
Grasshopper
(Melanoplus differentialis)

Cockroach
(Periplaneta americana)

Potato Beetle
(Lema trilinea)

Mosquito
(Anopheles quadrimaculatus)

Bed Bug
(Cimex lectularius)



Brown Recluse
(Loxosceles reclusa)

Brown Marmorated Stink Bug
(Halyomorpha halys)

House Fly
(Musca domestica)

Tarnished Plant Bug
(Lygus lineolaris)

Corn Earworm
(Helicoverpa zea)

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R = Restricted Use Pesticide

Issued in furtherance of Cooperative Extension work, Acts of May 8 and June 30, 1914, in cooperation with the U.S. Department of Agriculture, Director, Cooperative Extension Service, University of Arkansas. The University of Arkansas System Division of Agriculture offers all its Extension and Research programs and services without regard to race, color, sex, gender identity, sexual orientation, national origin, religion, age, disability, marital or veteran status, genetic information, or any other legally protected status, and is an Affirmative Action/Equal Opportunity Employer.

MP144-5.2M-1-2018RV

INSECTICIDE RECOMMENDATIONS FOR ARKANSAS

INTRODUCTION

Recommendations and products listed in this publication are reviewed annually by the contributing authors. Research on chemical control of insect pests is ongoing as new products are developed and registered for use in the crops and situations presented. The information presented in this publication is taken from tests conducted and recommendations developed in Arkansas and is supplemented by published information from surrounding states. The use of any chemical suggested in this guide should always be preceded by a careful examination of the container label for directions and precautions. Many insecticides have registrations for uses not listed in this publication. They are not included here because of either a lack of space in the publication, their lack of availability for purchase in the state, their inefficiency for the purpose intended or their extremely hazardous nature when a less hazardous chemical will do the job just as well. Rates of insecticides in this publication are presented as recommended rate ranges to provide a flexible guide for product use. Insecticide performance charts in this guide are intended to indicate relative performance of products and not percent control.

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Pesticide Dilution Table
(Amount of pesticide formulation for each one gallon of water)

Pesticide Formulation	Percentage of Actual Chemical Wanted								
	0.0313%	**0.0625%**	**0.125%**	**0.25%**	**0.5%**	**1.0%**	**2.0%**	**3.0%**	**5.0%**
					Wettable Powder (WP)				
15% WP	2 1/2 t	5 t	10 t	7 T	1 cup	2 cups	4 cups	6 cups	10 cups
25% WP	1 1/2 t	1 T	2 T	3 T	8 T	1 cup	2 cups	3 cups	5 cups
40% WP	1 t	2 t	4 t	8 t	5 T	10 T	1 1/4 cups	2 cups	3 1/4 cups
50% WP	3/4 t	1 1/2 t	1 T	2 T	4 T	8 T	1 cup	1 1/2 cups	2 1/2 cups
75% WP	1/2 t	1 t	2 t	4 t	8 t	5 t	10 T	1 cup	2 cups
					Emulsifiable Concentrate (EC)				
10%-12% EC 1 lb actual/gal	2 t	4 t	8 t	16 t	10 T	2/3 pt	1 1/3 pt	1 qt	3 1/4 pt
15%-20% EC 1.5 lb actual/gal	1 1/2 t	1 T	2 T	4 T	7 1/2 T	1/2 pt	1 pt	1 1/2 pt	2 1/2 pt
25% EC 2 lb actual/gal	1 t	2 t	4 t	8 t	5 T	10 T	2/3 pt	1 pt	1 3/4 pt
33%-35% EC 3 lb actual/gal	3/4 t	1 1/2 t	1 T	2 T	4 T	8 T	1/2 pt	3/4 pt	1 1/3 pt
40%-50% EC 4 lb actual/gal	1/2 t	1 t	2 t	4 t	8 t	5 T	10 T	1/2 pt	4/5 pt
57% EC 5 lb actual/gal	7/16 t	7/8 t	1 3/4 t	3 1/2 t	7 t	4 1/2 T	9 T	14 T	1 1/2 cups
60%-65% EC 6 lb actual/gal	3/8 t	3/4 t	1/2 T	1 T	2 T	4 T	8 T	12 T	1 1/2 cups
70%-75% EC 8 lb actual/gal	1/4 t	1/2 t	1 t	2 t	4 t	8 t	5 T	7 1/2 T	13 T

gal = gallon; lb = pound; pt = pint; T = tablespoon; t = teaspoon;
3 level teaspoons = 1 level tablespoon; 2 tablespoons = 1 fluid ounce;
8 fluid ounces or 16 tablespoons = 1 cup; 2 cups = 1 pint; 1 quart = 2 pints or 32 fluid ounces;
1 gallon = 4 quarts or 128 fluid ounces.

POISON CONTROL CENTERS IN ARKANSAS

The United States Environmental Protection Agency has established a Poison Control System throughout the nation. Participating hospitals function on a voluntary basis to provide special emergency aid in case of chemical intoxication. Each Poison Control Center has the capability to determine the toxic constituent of commercial products, respond to calls from physicians or individuals and provide supportive or antidotal treatment.

In a pesticide or poisoning emergency, call 1-800-222-1222. Your call will be directed to the nearest Poison Control Center.

INSECTICIDE APPLICATION

The success of any insecticide treatment depends upon proper application. There are several variables that impact proper application. This material briefly discusses application guidelines such as calibration, tank mixing, agitation, spray volume, drift control and nozzle selection. For more detailed information on most aspects of spray application, contact your county Extension office.

Checklist for Proper Spray Application

If you cannot check all the following (where applicable), perhaps you have a weakness in your sprayer program that can be corrected.

- ☐ Sprayer is calibrated accurately. (**Pages 5 and 6**)
- ☐ Band width is accurately measured and broadcast rates are changed for banding applications. (**Page 6**)
- ☐ Use a minimum screen size of 50 mesh for wettable powders or flowables.
- ☐ Have proper agitation (not just bypass) for powders and flowables. (**Page 9**)
- ☐ Refer to label and precautions in this publication to choose proper spray volume and pressure for insecticide used. (**Page 9**)
- ☐ Use the appropriate style nozzle designed to balance drift control and coverage. (**Pages 7 and 8**)
- ☐ Use nozzles designed to resist wear when applying wettable powders or flowables. (**Page 7**)
- ☐ Properly clean application equipment when switching pesticides and at the end of day. (**Page 10**)

Sprayer Calibration

No single aspect of spray application is as important and as abused as sprayer calibration. There is no way to accurately apply an insecticide without accurately calibrating the sprayer and figuring the tank mix. Using the following method and examples, you can calibrate quickly and easily.

Measuring Travel Speed

Measure a test course in the area to be sprayed or in an area with similar surface conditions. Minimum lengths of 100 and 200 feet are recommended for measuring speeds up to 5 and 10 mph, respectively. Determine the time required to travel the test course. To help ensure accuracy, conduct the speed check with a loaded sprayer and select the engine throttle setting and gear that will be used when spraying. Repeat the above process and average the times that were measured. Use the following equation or the table below to determine ground speed.

$$Speed\ (mph) = \frac{Distance\ (ft) \times 60}{Time\ (seconds) \times 88}$$

Determining Gallons Per Acre (Ounce Method)

1. Check the table below for the proper distance related to the row or nozzle spacing on your sprayer. For broadcast, use nozzle spacing; for band application such as post directed or band behind press wheel, use row spacing. Mark off this distance in the field you will be spraying.

Row or Nozzle Spacing (inches)	Calibration Distance (feet)	Row or Nozzle Spacing (inches)	Calibration Distance (feet)
40	102	28	146
38	107	26	157
36	113	24	170
34	120	22	185
32	127	20	204
30	136	18	227

For row or nozzle spacing's and calibration distances not shown here – any calibration distance (feet) may be determined by the following equation:

$$4080/average\ row\ or\ nozzle\ spacing\ (in\ inches).$$

All rates are given as broadcast rates. For band application, you must adjust the rate by the following formula:

$$\frac{Band\ Width}{Row\ Width} \times Broadcast\ Rate = Band\ Rate$$

2. Attach row conditioner, Triple-K, planter or whatever tool is to be pulled by the tractor when spraying. Engage the tool to the proper depth and use the throttle setting and gear that will be used for spraying. Note the time in seconds on a stopwatch that it takes to drive the calibration distance measured.

3. Catch the nozzle discharge for the noted time in Step 2 in a container graduated in ounces (plastic measuring cup, baby bottle, etc.). If you are using a broadcast boom with nozzles spaced evenly, catch the output from one nozzle for the time measured in Step 2. If more than one nozzle per row is used (directed, insecticide or fungicide rig), catch the spray from each nozzle for the time noted in Step 2. Then combine the amount from all nozzles spraying on a single row.

4. The total discharge measured in ounces is equal to the gallons per acre applied. With a broadcast boom, this is the amount caught from one nozzle. Where you have used row spacing in Step 1, all nozzles directed to that row must be measured to determine the gallons per acre.

5. Check each nozzle to ensure equal spray distribution across the width of the sprayer. Repeat Steps 3 and 4 to ensure that nozzles do not vary more than 10 percent across the width of the sprayer.

Determining Tank Mix

Divide tank refill capacity by the calibrated gallons per acre (determined in Step 4). This is the number of acres the sprayer will cover per refill. Multiply the broadcast rate of insecticide (or band rate) times the acreage per refill to get the amount of insecticide (commercial product) to be put in the tank.

Example 1 – Broadcast Application

A grower will apply Anychem 1 with a broadcast boom having nozzles spaced 20 inches apart while pulling a disk for incorporation.

1. The distance to travel for 20-inch nozzle spacing is 204 feet. Next, measure and flag off 204 feet in the field to be sprayed.
2. Select the desired gear and throttle setting with the disk down. Let's say it takes 20 seconds to cover the 204 feet.
3. Set the pressure to be used and catch the output from one nozzle for 20 seconds (the time required to travel the 204 feet).
4. The output in ounces is the amount applied in gallons per acre. If the nozzle output was 15 ounces in 20 seconds, the sprayer applies 15 gpa.
5. Repeat Step 4 checking each nozzle.

Let's assume you have a 200-gallon tank and wish to apply one pint of Anychem 1 per acre.

$$\frac{200\ gal/refill}{15\ gpa} = 13.3\ acres\ covered\ per\ tank\ (or\ refill)$$

Since you wish to use 1 pt/A, you would use 13.3 pints of Anychem 1 per refill; i.e.,1 pt/A × 13.3 acres = 13.3 pints. [See Note in Example 2.]

Example 2 – Band Behind Planter

A grower will apply Anychem 2 behind his planter with a 14-inch spray band on a 38-inch row.

1. The distance to travel for a 38-inch row is 107 feet.
2. Select the planting speed and travel the measured 107 feet with planter down. Let's say it takes 18 seconds in this example.
3. Set the pressure and catch the output from one nozzle for 18 seconds (the time required to travel 107 feet).
4. The output in ounces is the amount applied in gallons per acre. If the nozzle output was 10 ounces in 18 seconds, the sprayer applies 10 gpa. (This is all on a band.)
5. Repeat Step 4 checking each nozzle.

Let's assume a 400-gallon tank (two 200-gallon saddle tanks) refill capacity and the rate of Anychem 2 50W for your soil is 1 pound/A broadcast. Reduce this rate to a 14-inch band.

$$\frac{14"\ band}{38"\ row} \times \frac{1\ lb}{A} = \frac{0.37\ lb}{A}\ to\ be\ applied\ on\ the\ band$$

$$\frac{400\ gal/refill}{10\ gpa} = 40\ acres\ per\ tank\ refill$$

$$40\ acres \times 0.37\ lb/A = 14.8\ lb\ of\ Anychem\ 2\ 50W\ per\ tank\ refill$$

$$(7.4\ pounds\ in\ each\ 200\text{-}gallon\ saddle\ tank)$$

NOTE: Plan on the amount of water required to refill the tank, not the capacity of the tank itself. For example, if you have the above 200-gallon saddle tanks but you have 50 gallons of spray left in each when you refill, it only takes 300 gallons to refill them.

Therefore:

$$\frac{300\ gal/refill}{10\ gpa} = 30\ acres\ per\ refill$$

$$30\ A/refill \times 0.37\ lb/A = 11\ lb\ of\ Anychem\ 2\ 50W\ per\ refill$$

$$(5.5\ pounds\ in\ each\ of\ the\ two\ tanks)$$

Example 3 – Directed Spray

A grower will apply Anychem 3 + Anychem 4 on a 16-inch band on a 32-inch row using 2 OC-02 nozzles per row (one on each side). **[Step 1]** The distance to travel for a 32-inch row is 127 feet. **[Step 2]** Select speed and drive the 127 feet. Assume it takes 15 seconds. **[Step 3]** Set the pressure and catch each of the two nozzles per row for 15 seconds or time determined in Step 2. **[Step 4]** Add the quantity from the two tips. The amount in ounces is the gallons per acre. Assume 5 ounces per tip for a total of 10; therefore, a 10 gpa output. **[Step 5]** Repeat Step 4 checking the nozzles on each row.

Let's assume two 200-gallon saddle tanks and the broadcast rate is 1 pound Anychem 3 50W + 1 pint Anychem 4 per acre. Reduce the rates for the 16-inch band.

$16/32 \times 1\ lb = 1/2\ lb\ Anychem\ 3$ $16/32 \times 1\ pt = 1/2\ pt\ Anychem\ 4/A$

$$\frac{400\ gal\ tank\ capacity}{10\ gpa} = 40\ acres\ per\ refill$$

$$40\ acres \times 1/2\ lb\ Anychem\ 3 = 20\ lb\ Anychem\ 3$$

$$40\ acres \times 1/2\ pt\ Anychem\ 4 = 20\ pt\ Anychem\ 4$$

$$Put\ 1/2\ this\ amount\ (10\ lb\ Anychem\ 3 + 10\ pt\ Anychem\ 4)\ in\ each\ tank.$$

Nozzle Selection

Insecticides are best applied with the proper nozzle tip design. A balance must be struck for each application between responsible drift control and acceptable coverage. This balance will change depending on controllable factors like the pesticide formulation, pressure, rate and equipment speed. Nozzle manufacturers have made much advancement in spray technology recently. These advancements have set producers up to be more effective, more efficient and more responsible applicators. Next to calibration and proper tank mixing, nozzle selection is key to proper application.

Nozzle Nomenclature

In addition to a company's name, most nozzle tips are coded with important information – often starting with an abbreviation of a nozzle type, next is usually fan angle, then flow rate and finally the tip material composition.

Example – TeeJet AIXR11002 VS is an air induction (AI), extended range (XR), 110° flat fan, size number 02 (0.2 GPM), color coded (V - ISO color coding system) and stainless steel nozzle (S) that is made by Spray Systems Company.

Tip Materials and Durability

Tips are available in a number of materials. Stainless steel, hardened stainless steel, nylon and ceramics offer the best wear characteristics and are often worth the additional cost, especially when using abrasive products like wettable powders. Plastic tips are now available that are imbedded with more durable materials in key locations. These tips offer the durability of stainless steel or ceramic nozzles at a fraction of the cost.

Common Nozzle Spray Patterns

- **Standard Flat-Fan** – common broadcast nozzle, poor drift control and narrow recommended pressure range. ***30-60 psi***
- **Extended Range Flat** – better spray distribution over wider pressure range. Provides some drift control at low pressures (<30 psi). ***15-60 psi***
- **Even Flat-Fan** – used to band rows uniformly. Not a broadcast tip. ***20-60 psi***
- **Off-Center Flat** – used on boom ends to increase uniformity and width of spray swath. Also used for banding under foliage. ***30-115 psi***
- **Twin Orifice Flat** – produces one fan tilted forward and one tilted backward. Improves coverage of contact pesticides but highly drift prone. ***30-60 psi***
- **Hollow Cone** – common in directed contact pesticides because of fine spray pattern and excellent coverage. Very drift prone. ***40-100 psi***

Many of the listed spray patterns offer excellent coverage of both contact and systemic pesticides. Excellent coverage can come with very small spray droplets known as driftable fines. Nozzle manufacturers have worked hard to maintain desired levels of coverage while reducing economic and environmental damage caused by pesticide drift. This work has produced many options of common spray patterns with added drift control technology from which applicators can select. Applicators should select nozzle options carefully to ensure proper coverage while responsibly controlling driftable fines.

Tips for Balancing Drift Control and Coverage

When wind velocity is too high to be practical, the best solution is to park the sprayer. However, there are approaches to compensate for some wind. Spray droplets should always be as large as possible while still obtaining appropriate coverage. This is particularly true in a high drift potential application. One solution is to change tips. Use a larger tip (i.e., an 8005 instead of an 8003), and lower the spray pressure (i.e., go up on the nozzle size and down on the pressure). Also, consider a wider angle tip such as a 11003 instead of an 8003. This allows the nozzle to be adjusted closer to the ground without changing the width of the spray pattern where it contacts the ground. A more recent option is to change your tip design, such as adding tips with air induction, pre-orifice and/or turbulence chamber technology. Coverage can be improved with drift reduction tips by using tips with multiple nozzles facing different angles across the boom.

Air induction style nozzles emit fewer fines and can be a very good tool to avoid drift potential. Air induction tips are typically not as sensitive to droplet size changes as operating pressures increase. This helps avoid small droplet formations when the sprayer is operating at higher speeds and the flow control is increasing pressure to ensure the correct dosage. Some examples of tips that have air induction capabilities are Greenleaf Technologies Air Mix and TurboDrop series; Hypro's Ultra Low Drift (ULD) and Guardian Air (GA) series; and TeeJet Technologies Air Induction (AI) and Turbo Tee Induction (TTI) series.

Pre-orifices meter the flow of pesticide before it reaches the spray orifice. This produces a larger droplet spectrum and helps to reduce the number of drift-prone fines. Examples of tips using pre-orifice technology include Wilger Industries Small Range (SR), Medium Range (MR) and Drift Reduction (DR) tips; TeeJet Technologies Drift Guard (DG), Air Induction (AI), Turbo Tee (TT), Turbo Tee Induction (TTI) and Air Induction Extended Range (AIXR) series; Hypro's Guardian (GRD) and Guardian Air (GA) series; and Greenleaf Technologies Turbo Drop XL (TDXL) series.

Nozzles that use **turbulence chambers** go one step further. This design uses a pre-orifice to meter the pesticide into the turbulence chamber and then out of the final orifice (often a smaller size). These nozzles are designed to produce a larger droplet with more uniform coverage along the boom. Examples of tips using turbulence chamber technology include Hypro's Guardian (GRD) and Guardian Air (GA) series; TeeJet Technologies Drift Guard (DG) and Turbo Tee (TT) series: and Wilger Industries Small Range (SR), Medium Range (MR), and Drift Reduction (DR) tips.

Twin or duo nozzles facing forward and backward across the boom can increase coverage when using drift control tips. Depending on the manufacturer, these will be two nozzles molded into one body or two separate nozzles plumbed together. If used properly, twin nozzle configuration can improve foliar penetration and coverage while using drift control tips. Examples of twin or duo nozzles are TeeJet Technologies Turbo TeeJet Duo Dual Polymer Nozzle and Greenleaf Technologies TurboDrop Asymmetric DualFan Nozzle.

Quick Reference Guide to Selecting a Nozzle

1. **Read the pesticide label** to find the following information. Some information may not be on the label and should be determined by University of Arkansas Systems Division of Agriculture recommendations or equipment capabilities.

   a. Spray volume (GPA) _____
   b. Droplet classification (for example, coarse) _____
   c. Nozzle type (if listed) _____
   d. Select an appropriate travel speed (mph) _____
   e. Determine boom spacing in inches (W)* _____

2. **Calculate needed nozzle discharge** using the following formula.

$$GPM\ (per\ nozzle) = \frac{GPA \times mph \times W}{5{,}940}$$

   ***W** – Spray width (inch) for single nozzle, band spraying or boomless spraying.
   – For directed spraying, divide row spacing (inch) by the number of nozzles per row.
   – If the "W" term is the width of the band, do not worry about converting for bandwidth, it is inclusive.

3. **Consult a nozzle catalog or website** to select a nozzle**.** Nozzle catalogs will be organized by nozzle type first. Use the information described in this section and the information from the catalog to select a nozzle type. Next, use the recommended droplet classification from the label and the nozzle discharge rate calculated from Step 2 to determine the proper tip size.

   Many nozzles may fit your qualifications. Try to find a nozzle that operates at a lower pressure and allows you to operate comfortably in your droplet classification.

4. Once nozzles are installed, do not forget to **recalibrate your sprayer**.

Another way to quickly and easily obtain a nozzle recommendation is to visit a nozzle manufacturer's website and locate their nozzle selection tool. Simply type in the information that has been identified from **Step 1** and the website will generate a list of appropriate nozzles from which you may select. Nozzle manufacturer URLs and their Nozzle Selection Tools URLs are listed on page 9.

Nozzle Resources

Manufacturers of spray nozzles provide a wealth of information about the selection, setup and use of their products in their catalogs. These include such things as hose flow information and nozzle selection guides. Typically, the guides will show setup criteria and give recommendations for contact and systemic differences. It would be impractical to reprint all of that information here. Manuals or catalogs for the specific product you are using can be obtained from dealers. If you cannot locate a personal copy, each county Extension office usually keeps at least one copy of popular brand item catalogs. The more common way is to access this information over the Internet. Several URL listings are included for some of the more popular manufacturers on page 9.

Nozzle and Tip Companies

Greenleaf Technologies
Phone: 800-881-4832
http://www.greenleaftech.com
greenleaftech.com/dynamic.php?pg=Choosing_the_Right_Nozzle/Nozzle_Calculator

Pentair Hypro Shurflo
Phone: 800-445-8360
http://hypro.pentair.com/en/spray-it

Spray Systems Company - Teejet Technologies
Phone: 630-665-5000
www.teejet.com
http://www.teejet.com/spray_application/nozzles.shtml

Wilger Industries Ltd.
Phone: 877-968-7695 or 731-968-7695
www.wilger.net
http://www.wilger.net/index.php/tip-wizard

Sprayer Tank Agitation

The type of pesticide formulation dictates the need for agitation. Soluble liquids, soluble powders and emulsifiable concentrates require little agitation. Usually the flow from the bypass hose maintains a uniform mixture.

Wettable powders and flowable formulations are only in suspension, and they require vigorous agitation to prevent settling out. Many instances can be cited where insufficient agitation has resulted in undesirable responses. Consider the following when examining the need for agitation in application equipment:

- Insufficient agitation can cost more than the entire sprayer costs.
- Running a bypass hose into the tank is not agitation.
- Agitation can be expected to use more pump capacity than the nozzles require.
- Pre-mixing wettable powders will get pesticides into suspension; insufficient agitation allows them to drop out. Continue agitation until all the spray is distributed.

Spray Volumes

In general, spray volumes should be in the 10 to 20 GPA range for most insecticides. For band applications, a volume equivalent to 1/2 gallon per inch of band is sufficient (i.e., 10 GPA on a 20-inch band). Refer to the comments on each insecticide to note any specific application instructions.

Tips for Proper Mixing

1. See that equipment is clean and in good running condition, free of oil, grease or residue.
2. Be sure to have a shut-off valve installed in the bottom of each tank.
3. Use a 16-mesh suction screen to allow chemicals to circulate through the pump.
4. If there is any question about chemical compatibility, do a jar test first.
5. Always follow label instructions about mixtures. In absence of instructions, use the WALE method.
6. Add chemicals in the W-A-L-E sequence.
    - Wettable powders or water dispersible granules
    - Agitation
    - Liquids (flowable liquids)
    - Emulsifiable concentrates
    - Surfactants and solutions
7. Begin with tank 1/4 full of carrier and start agitation until solution is rolling.
8. W – Add all W and WDG chemicals to solution.
9. A – Get good, strong agitation with a rolling effect on the surface of the carrier. Allow time for good dispersal.
10. L – Next add all L or F while continuing to agitate.
11. E – Finally, add all E or EC.
12. Empty the tank as much as possible before mixing a new batch.

Compatibility Test

Since liquid fertilizers can vary, even within the same analysis, always check compatibility with insecticide(s) each time before use. Be especially careful when using complete suspension or fluid fertilizers, as serious compatibility problems are more likely to occur. Commercial application equipment may improve compatibility in some instances. The following test assumes a spray volume of 25 gallons per acre. For other spray volumes, make appropriate changes in the ingredients. Check compatibility using this procedure:

1. Add 1 pint of fertilizer to each of two 1-quart jars with tight lids.
2. To one of the jars, add 1/4 tsp or 1.2 milliliters of a compatibility agent approved for this use, such as Compex or Unite (1/4 tsp is equivalent to 2 pt per 100 gal spray). Shake or stir gently to mix.
3. To both jars, add the appropriate amount of insecticide(s). If more than one insecticide is used, add them separately with dry insecticides first, flowables next and emulsifiable concentrates last. After each addition, shake or stir gently to thoroughly mix. The appropriate amount of insecticides for this test follows.
4. *Dry Insecticides:* For each pound to be applied per acre, add 1.5 level teaspoons to each jar. *Liquid Insecticides:* For each pint to be applied per acre, add 0.5 teaspoon or 2.5 milliliters to each jar.
5. After adding all ingredients, put lids on and tighten. Invert each jar ten times to mix. Let the mixtures stand 15 minutes and then look for separation, large flakes, precipitates, gels, heavy oily film on the jar or other signs of incompatibility. Determine if the compatibility agent is needed in the spray mixture by comparing the two jars. If either mixture separates but can be remixed readily, the mixture can be sprayed as long as good agitation is used. If the mixtures are incompatible, test the following methods of improving compatibility: (A) slurry the dry insecticide(s) in water before addition or (B) add one-half of the compatibility agent to the fertilizer and the other one-half to the emulsifiable concentrate or flowable insecticide before addition to the mixture.

Application Equipment Cleanout

Equipment cleanout is essential to avoid crop injury from a contaminated sprayer. It is particularly important when changing from wettable powders that are more prone to collect in filters, boom and nozzle bodies. Ensure proper clean-out by disassembling, inspecting and cleaning trouble areas when using these products. Also, many growth regulating herbicides can be particularly destructive to sensitive crops even in extremely small concentrations. Ensure proper cleanout by using proper soaking procedures and always refer to product labels for any clarification.

Following the procedures specified on the pesticide or commercial cleaner label is critical to removing pesticide residue from the sprayer system. Consult labels of the products that were previously in the tank and for the products that will be used for the next application for specific cleaning and mixing/loading instructions.

The University of Arkansas System Division of Agriculture recommends a minimum triple rinse for cleanout of all pesticides regardless of label recommendations.

FORMULATIONS AND CONCENTRATIONS

Aerosols (A) – solid or liquid air suspensions of ultramicroscopic size which remain suspended for long periods.

Baits (B) – a poison or poisons plus some substance which will attract the insect.

Dusts (D) – diluted toxicant with finely ground, dried plant materials or minerals. These include wheat, soybean, walnut shells, talc, clay or sulfur.

Emulsifiable Concentrates (E or EC) – insecticide and an emulsifying agent in a suitable solvent. These are diluted with water to form an emulsion and applied as sprays.

Flowable (F)/Liquid (L) – viscous concentrate of suspended pesticide in water.

Fumigant – substance or mixture of substances which produce gas, vapor, fume or smoke intended to destroy insects, bacteria, rodents or other organisms.

Granules (G) – insecticide attached to an inert carrier of 30- to 60-mesh particle size.

Low Volume (LV)/Concentrated Low Volume (CLV)/Ultra Low Volume (ULV) – formulation containing higher concentration of active ingredient per gallon of formulation that results in a lower volume of formulation per unit area.

Pellet (P or PS) – granular formulation where all of the particles are of the same weight and size.

Ready To Use (RTU) – formulation in a form that requires no mixing before use.

Soluble Powder (SP)/Water Soluble Powders (WSP) – powder formulation that dissolves in water.

Solutions (S) – liquid forms of insecticides that are dissolved in suitable solvents such as petroleum distillates or liquid gas. Oil-based cattle sprays, household sprays and gas-propelled aerosols are examples of insecticide solutions.

Suspension Concentrates (SC) or **Capsule Suspensions (CS)** – particles in suspension.

Water-Dispersible Granules (WDG)/Dry Flowables (DF) – granules of a pesticide formulation that disperse in water to form a spray solution.

Wettable Powders (WP) – dry forms of insecticides in which the toxicant is impregnated or absorbed on powders that can be readily mixed with water because a wetting agent has been added. These form a suspension-type spray that must be kept agitated in a sprayer tank.

TABLE OF WEIGHTS, MEASURES AND DILUTIONS

Weights

28.35 grams = 1 ounce
16 ounces = 1 pound = 453.6 grams
1 gallon water = 8.34 pounds
1 cubic foot water = 62.4 pounds
1 gallon No. 2 fuel oil = 7 pounds
1 gallon kerosene = 6.7 pounds

Volume and Liquid Measure

3 teaspoons = 1 tablespoon = 14.8 cc
2 tablespoons = 1 fluid ounce = 29.6 cc
8 fluid ounces = 16 tablespoons = 1 cup = 236.6 cc
2 cups = 32 tablespoons = 1 pint = 473.1 cc
2 pints = 64 tablespoons = 1 quart = 946.2 cc
4 quarts = 256 tablespoons = 1 gallon = 3785 cc
128 fluid ounces = 1 gallon = 3785 cc

Land Measure

16½ feet = 5½ yards = 1 rod
66 feet = 4 rods = 1 chain
272¼ square feet = 30¼ square yards = 1 square rod
4356 square feet = 16 square rods = 1 square chain
43560 square feet = 160 square rods = 1 acre
43560 square feet = 10 square chains = 1 acre

Length of Row Required for One Acre

Row Spacing	Length or Distance
24 inch	7,260 yards = 21,780 feet
30 inch	5,808 yards = 17,424 feet
36 inch	4,840 yards = 14,520 feet
38 inch	4,585 yards = 13,756 feet
40 inch	4,356 yards = 13,068 feet
42 inch	4,149 yards = 12,446 feet
48 inch	3,630 yards = 10,890 feet

Determining Contents — Standard 55-Gallon Drum

Drum on Side		Drum Upright	
Depth of Liquid in Inches	Volume in Gallons	Depth of Liquid in Inches	Volume in Gallons
1	0.89	1	1.7
2	2.4	2	3.4
3	4.4	3	5.2
4	6.7	4	6.7
5	9.3	5	8.6
6	12.0	6	10.3
7	14.8	7	12.0
8	17.8	8	13.8
9	20.9	9	15.5
10	24.0	10	17.2
11	27.2	11	18.9
12	30.2	12	20.6
13	33.4	13	22.4
14	36.5	14	24.1
15	39.5	15	25.0
16	42.5	16	27.5
17	45.3	17	29.3
18	47.9	18	30.9
19	50.3	19	32.7
19.75	52.0	20	34.4
		21	36.1
		22	37.8
		23	39.6
		24	41.3
		25	43.0
		26	44.8
		27	46.5
		28	48.2
		29	49.9
		30	51.6
		30.19	52.0

Travel Speed Chart

Miles per Hour	Time Required in Seconds to Travel		
	100 Ft	200 Ft	300 Ft
1	68	136	205
2	34	68	102
3	23	46	68
4	17	34	51
5	14	27	41
6	11	23	34
7	10	20	29
8	9	17	26
9	8	15	23
10	7	14	21

1 MPH = 88 feet per minute
1 MPH = 1.466 feet per second

$$\text{Speed in MPH} = \frac{\text{Distance (ft)} \times 60}{\text{Time (seconds)} \times 88}$$

Tables of Dilutions for Liquids and Dusts

1. Equivalent Quantities of Liquid Materials When Mixed by Parts.

Water	Amount of Insecticides for Different Dilutions		
	1-400	1-800*	1-1600
100 gals	1 qt	1 pt	1 cup
50 gals	1 pt	1 cup	1/2 cup
5 gals*	3 T	5 t*	2 1/2 t
1 gal	2 t	1 t	1/2 t

*Example: If a recommendation calls for 1 part of the chemical to 800 parts of water, it would take 5 teaspoonfuls in 5 gallons of water to give 5 gallons of a mixture of 1-800.

2. Equivalent Quantities of Dry Materials (Wettable Powders) for Various Quantities of Water.

Water	Quantity of Material					
100 gals*	1 lb	2 lb	3 lb	4 lb*	5 lb	6 lb
50 gals	8 oz	1 lb	1 1/2 lb	2 lb	2 lb	3 lb
5 gals*	3 T	1 1/2 oz	2 1/2 oz	3 1/4 oz*	4 oz	5 oz
1 gal	2 t	3 t	1 1/2 T	2 T	3 T	3 T

*Example: If a recommendation calls for a mixture of 4 pounds of a wettable powder to 100 gallons of water, it would take 3 1/4 ounces (approximately 6 1/2 teaspoons) to 5 gallons of water to give 5 gallons of spray mixture of the same strength.

Note: Wettable pesticide materials vary considerably in density. Therefore, the teaspoonful (t) and tablespoonful (T) measurements in this table are not exact dosages by weight but are within the bounds of safety and efficiency for mixing small amounts of spray.

3. Equivalent Quantities of Liquid Materials (Emulsion, Concentrates, etc.) for Various Quantities of Water.

Water	Quantity of Material					
100 gals*	1/2 pt	1 pt	2 pts	3 pts	4 pts*	5 pts
50 gals	4 fl oz	8 fl oz	1 pt	24 fl oz	1 qt	2 1/2 pts
5 gals	1 T	1 fl oz	2 fl oz	2 1/2 fl oz	3 fl oz	4 fl oz
1 gal*	1/2 t	1 t	2 t	3 t	4 t*	5 t

*Example: If 4 pints of a liquid concentrate is recommended to 100 gallons of water, 4 teaspoonfuls of the chemical to 1 gallon of water will give a mixture of the same strength.

4. Table of Pounds of Active Ingredients per Gallon, Pounds per Pint of Liquid, and the Number of Pints for Various per Acre Rates.

Pounds of active ingredients in one gallon of commercial product	Pounds of active ingredients per pint*	Pints of commercial product needed each acre to give the following pounds of active ingredient					
		1/4 lb/A	1/2 lb/A	3/4 lb/A	1 lb/A	1 1/2 lbs/A	2 lbs/A
2.00	0.25	1 pt	2 pts	3 pts	4 pts	6 pts	8 pts
2.64	0.33	3/4	1 1/2	2 1/4	3	4 1/2	6
3.00	0.375	2/3	1 1/3	2	2 2/3	4	5 1/3
3.34	0.42	3/5	1 1/5	1 4/5	2 2/5	3 3/5	4 4/5
4.00	0.50	1/2	1	1 1/2	2	3	4
6.00	0.75	1/3	2/3	1	1 1/3	2	2 2/3

*1 pint = 16 liquid ozs. Liquid ounces may be measured with a discarded prescription bottle, liquid measuring cup, or a baby bottle.

5. Table of Available Commercial Materials in Pounds Active Ingredients per Gallon Necessary to Make Various Percentage Concentration Solutions.*

Pounds of active ingredients in one gallon of commercial product	Pounds of active ingredients per pint*	Liquid ounces of commercial product per one gallon solution* to make:				
		1/2%	1%	2%	5%	10%
	liq oz	liq oz	liq oz	liq oz	liq oz	liq oz
2.00	0.25	2.68	5.36	10.72	26.80	53.60
2.64	0.33	2.02	4.05	8.10	20.25	40.50
3.00	0.375	1.78	3.56	7.12	17.80	35.60
3.34	0.42	1.59	3.18	6.36	15.90	31.80
4.00	0.50	1.34	2.68	5.36	13.40	31.80
6.00	0.75	0.89	1.78	3.56	8.90	17.80

*Based on 8.4 pounds per gallon (weight of water)

Field Re-Entry Times for Insecticides

Common Name	Trade Name	Re-entry Period-Hours
abamectin	Agri-Mek, Epi-Mek	12
acephate	Orthene, SpitFire	24
acetamiprid	Intruder, Strafer	12
aldicarb	AgLogic	48
azinphos-methyl	Guthion	7-44 days
bifenthrin	Capture, Discipline, Brigade	12
carbaryl	Sevin	12
chlorantraniliprole	Altacor, Coragen, Prevathon	4
chlorantraniliprole/lambda-cyhalothrin	Besiege	24
chlorpyrifos	Lorsban, Nufos, Warhawk	24
chlorpyrifos/lambda-cyhalothrin	Cobalt Advanced	24
clothianidin	Belay	12
cyfluthrin	Baythroid, Tombstone	12
cyfluthrin/imidacloprid	Leverage	12
cypermethrin	Ammo	12
dicofol	Dicofol, Kelthane	12
dicrotophos	Bidrin, Dicromax	6 days
dimethoate	Dimate	48
disulfoton	Di-Syston	48
emamectin benzoate	Denim	12
endosulfan	Thiodan, Thionex	48
esfenvalerate	Asana XL, Adjourn	12
etoxazole	Zeal	12
fenbutatin oxide	Vendex	48
fenpyroximate	Fujimite, Portal	12
fipronil	Regent	0
flonicamid	Carbine, Beleaf	12
flubendiamide	Belt	12
flupyradifurone	Sivanto	4
gamma-cyhalothrin	Prolex, Proaxis, Declare	24
imidacloprid	Admire, Alias, Couraze, Trimax	12
indoxacarb	Steward, Avaunt	12
lambda-cyhalothrin	Karate, Silencer	24
lindane	Lindane	24
malathion	Atrapa, Fyfanon	12
methomyl	Lannate	2-7 days
methoxyfenozide	Intrepid	4
nucleopolyhedrovirus	Heligen	4
novaluron	Diamond	12
oxamyl	Vydate	48
permethrin	Ambush	12
propargite	Comite	2-20 days
spinetoram	Radiant	4
spinosad	Tracer, Blackhawk, Spintor	4
spiromesifen	Oberon	12
sulfoxaflor	Transform, Closer	24
tebufenozide	Confirm	4
thiamethoxam	Centric, Actara	12
thiamethoxam/lambda-cyhalothrin	Endigo	24
thiodicarb	Larvin	48
zeta-cypermethrin	Mustang Maxx, Respect	12
zeta-cypermethrin+bifenthrin	Hero	12

COMMON AND TRADE NAMES OF SOME OF THE CHEMICALS MENTIONED IN THIS GUIDE

Common Name	Trade Name	Company	Spray Formulations
abamectin	Varsity, Raid Fire Ant Bait, Zephyr, Agri-Mek, Avid, Epi-Mek, Clinch	Syngenta	0.011% granular bait, 0.15 lb EC, 0.7 SC
	Abba	MANA	0.15 EC
	Abacus	Rotam Agro	0.15 EC
	AbamectinE	Etigra	0.15 EC
	Flora-Mek	Prokoz	0.15 EC
	Reaper	Loveland Products	0.15 EC
	Temprano	Chemtura Corporation	0.15 EC
	Zoro	Cheminova	0.15 EC
acephate	Orthene	Amvac Chemical	15.6% EC, 75 S, 90 S, 97 WDG
	Bracket	Agriliance LLC	90 S, 97 S
acequinocyl	Shuttle	Arysta LifeScience North America Corporation	15.8% SC
acetamiprid	Assail	Cerexagri, Inc., Cerexagri-Nisso LLC	30 SG, 70 WP, 70 WSP
	Intruder	DuPont	70 WSP
	TriStar	Cleary Chemical Corporation	30 SG, 70 WSP
azadirachtin	Azatrol	PBI Gordon Corporation	1.2% EC
	Azatin XL	OHP, Inc.	3.0%
	Debug	Agro Logistics	0.7% EC
	Neemix	Advan LLC	4.5%
	Aza-Direct, Azahar, Ecozin Plus	Gowan Company	1.2%
azinphos-methyl	Guthion, Azinphos-Methyl	Bayer Crop Science, Arysta LifeScience	2 lb EC, 35% WP
Bacillus thuringiensis israelensis	Vectobac	Abbott Laboratories	
	Teknar	Valent U.S.A. Corporation	
Bacillus thuringiensis kurstaki	Crymax WDG, Deliver, Javelin WG	Certis	
	MVP II	Mycogen Corporation	
	Dipel ESNT, Biobit HP	Valent U.S.A. Corporation	
beta-cyfluthrin	Tempo	Bayer Crop Science	1% D, 20% WP, 11.8% SC, 10% WP, 10% WSP
	Bayer Advanced Power Force	Bayer Crop Science	0.05% RTU, 0.05% G
	Bayer Advanced Home Pest Control	Bayer Crop Science	0.05% RTU
	Baythroid XL	Bayer Crop Science	1 EC
bifenazate	Floramite	Chemtura Corporation	22.6% SC, 50% WSP
bifenthrin	Capture, Brigade	FMC Corporation	2 EC, 10% WSB, 1.15 G
	Bifenthrin Pro	BASF Specialty Products	7.9% EC
	Home Defense MAX	Ortho	0.115% G
	Bug-B-Gon MAX	Ortho	0.3% EC
	Onyx	FMC Corporation	23.4% EC
	Talstar	FMC Corporation	7.9% F, 0.2% G
	Sniper, Bisect L	Loveland Products	2 EC, 7.9% EC
	Bifenture, UpStar	United Phosphorus, Inc.	2 EC, 0.2% G, 7.9% SC, 10 DF
	Menace	NuFarm	7.9% F
	Tundra	Agrisolutions	2 EC
	Fanfare	MANA	2 EC
	Bifenthrin, Empower2	Helena	2 EC
	Discipline	Amvac Chemical	2 EC

Common Name	Trade Name	Company	Spray Formulations
buprofezin	Talus	SePRO Corporation	40%
	Applaud, Centaur, Courier	Nichino America	70 DF, 70 WDG, 3.6 SC
carbaryl	Sevin	Bayer Crop Science, Prokoz, Loveland Products	XLR, 4 lb EC, 80 S and 50% WP, 20% B
chlorantraniliprole	Altacor, Coragen, Prevathon, Dermacor	DuPont	35 WG, 1.67 SC, 0.43 SC
chlorantraniliprole + lambda-cyhalothrin	Besiege, Voliam Xpress	Syngenta	1.252 SC
chlorpyrifos	CPF	Direct Ag Source, LLC	4 lb EC, 15% G
	Lorsban, Dursban, Hatchet	Dow AgroSciences, Gowan Company	4 lb EC, 2 lb EC, 15% G, 50 W
	Eraser	Independent Agribusiness Professionals	4 lb EC
	Govern	Tenkoz, Inc.	4 lb EC
	Nufos	Cheminova	4 lb EC
	Pilot	Gharda Chemicals LTD	4 lb EC, 15G
	Vulcan	Makhteshim-Agan of North America	2.5% G
	Whirlwind	Helena	4 lb EC
	Warhawk	Loveland Products	4 lb EC
	Yuma	Winfield Solutions	4 EC
chlorpyrifos + lambda-cyhalothrin	Cobalt Advanced	Dow AgroSciences	
chlorpyrifos-methyl + deltamethrin	Storcide II	Bayer CropScience	2.11 EC
clofentazine	Ovation	Scotts-Sierra Crop Protection Company	42% SC
clothianidin	Celero, Arena	Arysta LifeScience North America	16% WSG, 0.25% G, 0.5% G, 50% WDG
	Poncho	Bayer Crop Science	5 F
	Belay, Clutch, NipsIt Inside	Valent U.S.A. Corporation	2.13 EC, 50 WDG, 5 F
coumaphos	Co-Ral, Checkmite	Bayer Crop Science	4% pour on, 1 lb EC, 25% WP, 5 D
cyfluthrin	Renounce, Tempo	Bayer Crop Science	20 WP
	Decathlon	OHP, Inc.	20 WP
	Bayer Advanced Power Force	Bayer Crop Science	0.75% EC
	Tombstone	Loveland Products	2 EC
cyfluthrin + tebupirimfos	Aztec	Bayer Crop Science, Amvac Chemical	2.1 G, 4.67 G
	Defcon	Helena	2.1 G
cypermethrin	Ammo	FMC Corporation	2.5 EC
	Battery	Agriliance LLC	2.5 EC
	Cyper G-Ag	Direct Ag Source, LLC	2.5 EC
	Cypermethrin	Tenkoz, Inc.	2.5 EC
	Holster	Loveland Products	2.5 EC
	UP-Cyde	United Phosphorus, Inc.	2.5 EC, 2.0 EC
cyromazine	Citation	Syngenta Professional Products	75% WSP
deltamethrin	Battalion	Arysta LifeScience North America	0.5 EC, 1.5 EC
	Centynal	Wellmark International	0.42 EC
	Chipco Choice	Bayer Crop Science	0.1% G
	Chipco FireStar	Bayer Crop Science	0.00015% granular bait
	MaxForce	Bayer Crop Science	0.01% bait station (BS), 0.1% BS, 0.05% BS, 0.0001% gel bait (GB), 0.05% GB
	DeltaDust	Bayer Crop Science	0.05% D
	DeltaGard, Suspend	Bayer Crop Science	0.1% G, 4.75% SC
	Over 'n Out!	GardenTech	0.0103% G
	Top Choice	Bayer Crop Science	0.0143% G
	Delta Gold	AgriSolutions	1.5 EC
	Shooter	Arysta LifeScience	0.05 EC

COMMON AND TRADE NAMES OF SOME OF THE CHEMICALS MENTIONED IN THIS GUIDE

Common Name	Trade Name	Company	Spray Formulations
diazinon	Spectracide	Syngenta	4 and 2 lb EC, 50% WP, 14 G
dichlorvos	DDVP, Vapona	Fermenta Animal Health	4 lb EC, 1.6 lb EC
dicofol	Dicofol, Kelthane	MANA, Dow AgroScience	4 lb EC, 50 WSP
dicrotofos	Bidrin	Amvac Chemical	8 lb EC
dicrotofos + bifenthrin	BidrinXP II	Amvac Chemical	4 lb + 1 lb EC
diflubenzuron	Dimiln	Chemtura Corporation	25 W, 2 L, 4 L
dimethoate	Dimate	Agriliance LLC	4 E
	Dimethoate	Arysta LifeScience, Drexel, Helena, Loveland Products, Gowan, Britz	2.67 EC, 4 EC
dinotefuron	Safari, Venom	Valent U.S.A. Corporation Professional Products	20% SG
	Tenchu	Mitsui Chemicals Agro	20% SG
disulfoton	Di-Syston	Bayer Crop Science	8 lb EC, 15% G
emamectin benzoate	Denim	Syngenta	0.16 lb EC
endosulfan	Thiodan, Endosulfan	UCP, Drexel	3 lb EC
	Thionex	Makhteshim-Agan of North America	3 EC, 50 WP
esfenvalerate	Asana XL	DuPont	1.9 lb EC, 0.66 lb EC
	Adjourn	MANA	0.66 EC
	S-FenvaloStar	LG International	0.66 EC
ethioprop	Mocap	Bayer Crop Science	10, 15 and 20 G, 6 EC
etoxazole	TetraSan, Zeal	Valent U.S.A. Corporation Professional Products	5% WDG, 70 WSP
famphur	Famophos, Warbex	BASF	1% D, 13.2% ready-mix
fenbutatin-oxide	Vendex	DuPont	50% WP, 4 L
fenoxycarb	Award, Logic Fire Ant Bait	Syngenta	1.0% granular bait
fenpropathrin	Tame	Valent U.S.A. Corporation	2.4 EC
fenpyroximate	Portal, Fujimite	Nichino America	5 EC
fipronil	Regent	BASF	4 SC
flubendiamide	Belt	Bayer Crop Science	4 SC
	Tourizmo, Vetica	Nichino America	1.17 EC, 0.33 EC
flupyradifurone	Sivanto	Bayer Crop Science	1.67 SL
gamma-cyhalothrin	Proaxis	UAP-Loveland Products, Inc., TENKOZ, Inc.	0.5 lb
	Prolex	UAP-Loveland Products, Inc., TENKOZ, Inc.	1.5 lb
	Declare	Cheminova	1.5 lb
halofenozide	Mach 2	Dow AgroSciences LLC	1.5% G, 22.3% SC
hexythiazox	Hexygon	Gowan Company	50% DF
hydramethylnon	Amdro, Amdro Pro Fire Ant Bait	BASF	0.73% granular bait
imidacloprid	Provado, Admire, Trimax Pro, Gaucho	Bayer Crop Science	1.6 F, 2 F, 4.44 F, 4 F
	Alias, Pasada	MANA	2 F, 4 F, 75 WSB
	Couraze	Cheminova	1.6 F, 2 F, 4 F
	Prey, Sherpa, Widow, Wrangler	Loveland Products	1.6 F, 2 F, 4 F
	Advise, Concur	AgriSolutions	2 F, 4 F

Common Name	Trade Name	Company	Spray Formulations
imidacloprid	Imida	Etigra	1.6 F, 2 F, 4 F, 5 F
	ImiGold	United Phosphorus, Inc.	0.5 G, 2 F, 70 DF
	Nuprid, Senator	NuFarm	1.6 F, 2 F, 4.6 F, 4 F, 5 FS
	Axcess	BASF	5 FS
indoxacarb	Steward, Avaunt	DuPont	1.25 lb SC, 30% DG
	Advion, Provaunt	DuPont Professional Products	0.045% bait, 0.05% bait, 0.1% bait, 0.22% bait, 0.6% gel, 30% DG
	Spectracide Fire Ant Killer Plus Preventer Bait Once & Done	Spectrum Brands, Inc.	0.016% bait
lambda-cyhalothrin	Battle	Lesco	9.7% EC
	Scimitar, Lamcap	Syngenta Professional Products	9.7% EC, 1 CS
	Spectracide Triazicide Once & Done	Spectrum Brands, Inc.	0.002% RTU, 0.1% G, 0.25% EC
	Jitzu	Fuzion Technologies, LLC	1 EC
	Karate Z, Warrior Z	Syngenta	2.08 CS, 1 CS
	Kendo	Helm Agro US	1 EC, 9.7 CS
	Grizzly Z, Taiga Z, Mystic Z	Agrisolutions	1 CS, 2.08 CS
	Helena Lambda, Lambda-T	Helena	2.08 CS, 1 CS
	Kaiso, Lambda-Cyhalothrin	NuFarm	24 WG, 1 EC
	Lambda-Cy	United Phosphorus, Inc.	1 EC
	LambdaStar	LG International	1 EC
	Silencer, Paradigm	MANA	1 EC
lindane	Kwell Shampoo	Various (FDA regulated)	1% shampoo (by prescription only)
malathion	Malathion, Fyfanon	Cheminova, Helena, Gowan, Arysta	5 lb EC, 8 lb EC, 5% D, 6% D, 25% WP
metaldehyde	Slug and snail bait, Deadline	Several companies	Snarol pellets, etc.
methidathion	Supracide	Syngenta	2 lb EC
methiocarb	Mesurol	Bayer Corporation	2% ready-to-use bait, 75% WP
methomyl	Lannate	DuPont	1.8 lb EC, 90% WS powder, 2.4 LV
methoxyfenozide	Intrepid	Dow AgroSciences LLC	2.0 lb F
methoxyfenozide + spinetoram	Intrepid Edge	Dow AgroSciences LLC	3 F
neem oil	Triact	OHP, Inc.	70%
novaluron	Pedestal, Rimon	Chemtura Corporation	0.83 SC
	Diamond	MANA	0.83 EC
nucleopolyhedrovirus	Heligen	AgRiTech, LLC	50% SC
oxamyl	Vydate C, CLV	DuPont	2 EC, 3.77 EC
permethrin	Ambush, Ectiban	Amvac Chemical	2 lb EC, 5.7% EC, 25 W
	Astro, Pounce	FMC Corporation	36.8% EC, 3.2 EC, 25 WP, 1.5 G
	Atroban	Cooper Chemical Company	11% EC, ear tag
	Permectrin II	Anchor Chemical Company	10% EC
	Permethrin Pro	Micro Flo Company	36.8% EC
	Perm-Up	United Phosphorus, Inc.	25% WP, 36.8% EC
	Arctic	AgriSolutions	3.2 EC
phorate	Thimet, Phorate	BASF, AgriSolutions	15% G, 20% G
phosmet	Imidan, Prolate	Gowan Corporation	50 WP, 4% pour on
pirimiphos-methyl	Actellic	Syngenta	5 E
propargite	Comite, Omite	Uniroyal/Crompton Corporation	6.55 and 6.0 EC, 30% W

COMMON AND TRADE NAMES OF SOME OF THE CHEMICALS MENTIONED IN THIS GUIDE

Common Name	Trade Name	Company	Spray Formulations
propoxur	Baygon	Bayer Crop Science	70% WP, 1.5 EC, 2 B
pymetrozine	Endeavor	Syngenta Professional Products	50% WDG
pyrethrins + rotenone	Pyrellin E.C.	Webb Wright Corporation	0.6% + 0.5% EC
pyriproxyfen	Distance, Esteem, Spectracide Fire Ant Bait	Valent U.S.A. Corporation	0.5%, 0.5% and 0.05% granular bait
S-methoprene	Extinguish Fire Ant Bait	Zoecon	0.5% granular bait
spinetoram	Diacon	Wellmark International	0.8% D, 2.5 SC
	Radiant	DowAgroSciences, LLC	1 SC
spinosad	Conserve	Dow AgroSciences, LLC	11.6% SC
	Contain, Sensat	Bayer CropScience	8.66%
	Tracer, Spintor, Blackhawk, Success, Entrust	Dow AgroSciences, LLC	4 L, 2 L
	Justice Fire Ant Bait	Dow AgroSciences, LLC	0.015% granular bait
	Eliminator Fire Ant Bait	Gro Tec, Inc.	0.1% granular bait
spiromesifen	Oberon	Bayer Crop Science	2 SC, 4 SC
	Judo	OHP, Inc.	45.2%
sulfoxaflor	Closer, Transform	Dow AgroSciences, LLC	2 SC, 50 WG
tebufenozide	Confirm	Dow AgroSciences, LLC	2 F
tefluthrin	Force	Syngenta, Amvac Chemical	3 G
temephos	Abate	BASF	4 lb EC, 5% CG, 2% CG, 1% SG, 15 G
terbufos	Counter	BASF, Amvac	20 G, 15 G
tetrachlorvinphos	Rabon, Ravap	Fermenta Animal Health Company	75% WP, 50% WP, 3% D, 23% EC
thiamethoxam	Centric, Actara, Meridian, Cruiser	Syngenta	25% WG, 40% WG, 0.33% G, 5 FS
	Flagship, Optigard	Syngenta Professional Products	0.22% G, 25% WG, 0.01% gel, 2 SC
	Warden CX	Winfield Solutions	1.9 FS
thiamethoxam + chlorantraniliprole	Voliam Flexi	Syngenta	40 WG
thiamethoxam + lambda-cyhalothrin	Endigo	Syngenta	2.06 ZC
thiodicarb	Larvin	Bayer Crop Science	3.2 lb F
trichlorfon	Dipterex, Dylox, Neguvon, Proxol	Bayer Crop Science	80% SP, 4 lb LS
zeta-cypermethrin	Mustang Maxx	FMC Corporation	0.8 EC
	Respect	BASF	0.8 EC
zeta-cypermethrin + bifenthrin	Hero	FMC Corporation	1.24 EC

B = Bait
CG = Concentrate granules
CS = Capsule suspension
D = Dust
DF = Dry flowable
DG = Water dispersible granules
E = Emulsifiable concentrate
EC = Emulsifiable concentrate
F = Flowable
G = Granules
L = Liquid
LS = Liquid soluble
LV = Low volatile
RTU = Ready to use
S = Solution
SC = Suspension concentrate
SG = Soluble granules
SP = Soluble powder
W = Wettable powder
WDG = Wettable dispersible granules
WDL = Water dispersible liquid
WG = Water dispersible granules
WP = Wettable powder
WSB = Water soluble bags
WSG = Water soluble granules
WSP = Water soluble packet
ZC = Zeon capsule technology

NAMES, CLASSIFICATION, AND TOXICITY OF INSECTICIDES

The following chart will help you identify specific pesticides and give you an indication of their toxicities, as well as their mode of action (IRAC code).

Names — Each generally used name of each pesticide is listed alphabetically in the left-hand column of the chart. Synonyms in general usage are listed in the next column opposite each entry. Trade names are indicated by the superscript "*"; they should be capitalized. Other names are usually not capitalized.

Classes — Most insecticides are classified chemically as:

Class	Primary Site of Action	IRAC CODE
Car. = carbamate	Acetylcholinesterase inhibitor	1A
OP = organophosphate	Acetylcholinesterase inhibitor	1B
OC = organochlorines	GABA-gated chloride channel antagonists	2A
PP = phenylpyrazoles	GABA-gated chloride channel antagonists	2B
SyP = synthetic pyrethroids	Sodium channel modulators	3A
NEO = neonicotinoids	Nicotinic acetylcholine receptor	4A
SX = sulfoximes	Nicotinic acetylcholine receptor agonist	4C
BU = butenolides	Nicotinic acetylcholine receptor agonist	4D
SP = spinosyns	Nicotinic acetylcholine receptor activator	5
AV = avermectins	Chloride channel activators	6
JH = juvenile hormone	Juvenile hormone mimic	7A
FL = flonicamid	Feeding blockers	9C
ET = etoxazole	Mite growth inhibitors	10B
B = bacterial origin	Microbial disruptors	11A, 11B
PRO = propargite	ATP synthase inhibitors	12C
IGR = insect growth regulator	Chitin synthesis inhibitors	15, 16, 17, 18, 20A
MISC = chemistry unclear	Uncertain mode of action	UN
OX = oxadiazine	Sodium channel blocker	22A
Phos. = phosphine	Mitochondrial inhibitors	24A
DM = diamides	Ryanodine receptor	28

Toxicity Categories and LD_{50} Values — When registering pesticides, the Environmental Protection Agency uses acute LD_{50} values to determine the toxicity category and words or symbols that must be placed on the label. For this purpose, the test animals are usually rats, mice, or rabbits, but other mammals are sometimes used.

Toxicity Category	Signal Words Required On Label by EPA	ORAL LD_{50} (mg/kg)	DERMAL LD_{50} (mg/kg) 24-Hr. Exposure	Probable Lethal Oral Dose For Adult Humans
I. Highly Toxic	DANGER, POISON, Plus Skull & Crossbones Symbol	0 to 50	0 to 200	A few drops to 1 t
II. Moderately Toxic	WARNING	50 to 500	50 to 2,000	1 t to 2 T
III. Slightly Toxic	CAUTION	500 to 5,000	2,000 to 20,000	1 oz to 1 pt (1 lb)
IV. Low Toxicity	CAUTION	5,000	20,000	1 pt (1 lb) or more

The LD_{50} is the dosage of the chemical at which one-half of the test animals are killed. It is based on the bodyweight of the animal and is expressed in milligrams of the chemical per kilogram of animal (mg/kg). A mg/kg is equivalent to 1 ppm. The lower the LD_{50} value, the higher the toxicity. Although most reported LD_{50} values are for technical material or actual toxicant, they are based on formulated products in some instances. All of these in the charts are for the technical material unless otherwise indicated. The toxicity categories given in the following charts are based on available data and are not necessarily the toxicity categories that would be assigned by EPA for the specific pesticides. Formulated pesticides usually have a higher LD_{50} than the technical material and may not fall in the same toxicity category as the technical material.

The usual ways of administering chemicals are oral (by mouth), dermal (applied to the skin), and inhalation. Inhalation toxicity is expressed as LC_{50} (lethal concentration). It is not as generally used as the other two.

Toxicity may be either acute or chronic. Acute refers to rather quick action from a single exposure, while chronic refers to the toxic effect of many exposures over a period of time.

INSECTICIDES

Insecticide Names	Other Names	Class	Toxicity Category	IRAC CODE	Acute LD_{50} Values for White Rats ORAL (mg/kg)	DERMAL (mg/kg)
Abacus*	abamectin, Agri-Mek*, Abba*, AbamectinE*, Flora-Mek*, Reaper*, Temprano*, Zoro*, Clinch*	AV	II	6	300	>1800
abamectin	Agri-Mek*, Abba*, Abacus*, AbamectinE*, Flora-Mek*, Reaper*, Temprano*, Zoro*, Clinch*	AV	II	6	300	>1800
Abate*	temephos	OP	III	1B	8600-13,000	>4000
Abba*	abamectin, Agri-Mek*, Abacus*, AbamectinE*, Flora-Mek*, Reaper*, Temprano, Zoro*, Clinch*	AV	II	6	300	>1800
acephate	Orthene*, Bracket*	OP	III	1B	866-945	>10,250 (rabbit)
acetamiprid	Intruder*, Assail*, TriStar*, Strafer*, Anarchy*, ArVida*	NEO	III	4A	1,064	>2000
Actara*	thiamethoxam, Cruiser*, Centric*, Flagship*, Meridian*, Platinum*	NEO	III	4A	>5000	>2000
Actellic*	pirimiphos-methyl, Actellifog*	OP	III	1B	>2000	>4592
Adjourn*	esfenvalerate, Asana XL*, S-FenvaloStar*, Zyrate*	SyP	II	3A	458	>2000
Admire*	imidacloprid, Provado*, Merit*, Gaucho*, Advise*, Couraze*	NEO	III	4A	4,350	>5050 (rabbit)
Advantage*	imidacloprid	NEO	III	4A	1732-1943	>2000
AgLogic	aldicarb	Car.	I	1A	0.93	<5.0 (rabbit)
Agri-Mek*	abamectin, Epi-Mek*, Abacus*, AbamectinE*, Flora-Mek*, Reaper*, Temprano*, Zoro*, Abba*, Clinch*	AV	II	6	300	>1800
Agritol*	*Bacillus thuringiensis*	B	IV	11A	Non-toxic to mammals	
aldicarb	AgLogic	Car.	I	1A	0.93	<5.0 (rabbit)
allethrin	Pynamin*	SyP	III	3A	680-1000	>11,200
alpha-cypermethrin	Fastac*	SyP	III	3	210-1050	>5000
Altacor*	chlorantraniliprole, Coragen*, Prevathon*, Dermacor*, GrubEx*, Acelepryn*, Altriset*	DM	II	28	98.11	>5000
Alias*	imidacloprid, Admire*, Provado*, Merit*, Couraze*, Prey*, Sherpa*, Widow*, Wrangler*, Pasada*, Advise*, Imida*, ImiGold*, Nuprid*	NEO	III	4A	4350	>5050 (rabbit)
Altosid*	methoprene, Diacon*	JH	III	7A	>34,600	>3,000 (rabbit)
Aluminum Phosphide*	Phostoxin*, Gastoxin*, Fumitoxin*, Weevil-Cide*, Killz-All*	Phos.	I	24A	20	
Ambush*	permethrin, Pounce*, Arctic*, Perm-Up*	SyP	II	3A	430-4000	>4000
Amdro*	hydramethylnon	IGR	III	20A	>5000	>2000 (rabbit)
Ammo*	cypermethrin, Battery*, UP-Cyde*, Cyper G*, Holster*	SyP	II	3A	247	>2000
Applaud*	buprofezin, Talus*, Centaur*, Courier*	IGR	III	16	>5000	>2000
Arctic*	permethrin, Pounce*, Ambush*, Perm-Up*	SyP	II	3A	430-4000	>4000
arprocarb	Baygon*, propoxur	Car.	II	1A	128	800-1000
Asana XL*	esfenvalerate, Adjourn*, S-FenvaloStar*, Zyrate*	SyP	II	3A	458	>2000
Assail*	acetamiprid, Intruder*, TriStar*, Strafer*, Anarchy*, ArVida*	NEO	III	4A	1064	>2000
Atroban*	permethrin	SyP	II	3A	>4000	>4000
azadirachtin	Azatrol*, Azatin XL*, Neemix*, Azahar*, Ecozin Plus*, Debug*, Ornazin*	MISC	IV	UN	>5000	>2000
Azahar*	azadirachtin, Azatrol*, Azatin*, Neemix*, Ecozin*, Debug*, Ornazin*	MISC	IV	UN	>5000	>2000
Azatrol*	azadirachtin, Azahar*, Azatin*, Neemix*, Ecozin*, Debug*, Ornazin*	MISC	IV	UN	>5000	>2000
azinphos-methyl	Guthion*	OP	I	1B	5-20	220
Aztec*	cyfluthrin + tebupirimfos, Defcon*	SyP + OP	I	3A + 1B	1.3	
Bacillus thuringiensis	Dipel*, Thuricide*, Agritol*, Sok-BT*, Bactur*, Biobit*, MVP II*, Foray*	B	IV	11A	Non-toxic to mammals	
Bacillus thuringiensis var. *israelensis*	Agree*, Xentari*, *Bti*, Bactomos*, Teknar*, Vectobac*, Gnatrol*	B	IV	11A	Non-toxic to mammals	
Battalion*	deltamethrin, DeltaDust*, DeltaGard*, DeltaGold*, Shooter*, Decis*, Over 'n Out!*, TopChoice*, Chipco Choice*, Maxforce*, Centynal*, Chipco Firestar*, Suspend*	Syp	I	3A	42.9	>2000

Insecticide Names	Other Names	Class	Toxicity Category	IRAC CODE	Acute LD_{50} Values for White Rats ORAL (mg/kg)	DERMAL (mg/kg)
Battery*	cypermethrin, UP-Cyde*, Ammo*, Cyper G*, Holster*	SyP	I	3A	257	>2000
Baygon*	propoxur, arprocarb	Car.	II	1A	128	800-1000
Baythroid XL*	beta-cyfluthrin, Tempo Ultra*	SyP	III	3A	647	>2000
Belay*	clothianidin, Poncho*, NipsIt Inside*, Crossfire*	NEO	III	4A	3044	>5000
Beleaf*	flonicamid, Carbine*, Aria*	FL	II	9C	>2000	>2000
Belt*	flubendiamide, Synapse*	DM	II	28	<2000	>4000
Besiege*	chlorantraniliprole + lambda-cyhalothrin, Voliam Xpress*	DM + SyP	III	28 + 3A	180	>2000
beta-cyfluthrin	Baythroid XL*, Tempo Ultra*	SyP	I	3A	647	>5000
Bidrin*	dicrotophos, Inject-A-Cide B*, Dicromax*	OP	I	1B	17-22	224 (rabbit)
Bidrin XP II*	dicrotophos + bifenthrin	OP + SyP	I	1B + 3A	17-22	224 (rabbit)
bifenthrin	Bifenture*, Bisect*, Sniper*, UpStar*, Menace*, Tundra*, Capture*, Talstar*, Brigade*, Fanfare*, Discipline*	SyP	II	3A	375	>2000 (rabbit)
Bifenture*	bifenthrin, Bisect*, Sniper*, UpStar*, Menace*, Tundra*, Capture*, Talstar*, Brigade*, Fanfare*, Discipline*	SyP	II	3A	375	>2000 (rabbit)
Bisect*	bifenthrin, Bifenture*, Sniper*, UpStar*, Menace*, Tundra*, Capture*, Talstar*, Brigade*, Fanfare*, Discipline*	SyP	II	3A	375	>2000 (rabbit)
Blackhawk*	spinosad, Tracer*, Spinto*, Success*, Entrust*, Sensat*, Execute*, Consero*, Contain*	SP	IV	5	5000	>5000
Bracket*	acephate, Orthene*	OP	III	1B	866-945	>10,250 (rabbit)
Brigadier*	bifenthrin + imidacloprid	SyP + NEO	II	3A + 4A	175	>5000
buprofezin	Applaud*, Talus*, Centaur*, Courier*	IGR	III	16	>5000	>2000
Capture*	bifenthrin, Talstar*, Brigade*, Discipline*	SyP	II	3A	275	>2000 (rabbit)
carbaryl	Sevin*	Car.	III	1A	246-283	4000
Carbine*	flonicamid, Beleaf*, Aria*	FL	II	9C	>2000	>2000
Centric*	thiamethoxam, Cruiser*, Actara*, Flagship*, Meridian*, Platinum*	NEO	III	4A	>5000	>2000
chlorantraniliprole	Altacor*, Coragen*, Prevathon*, Dermacor*, GrubEx*, Acelepryn*, Altriset*	DM	II	28	98.11	>5000
chlorpyrifos	Dursban*, Lorsban*, Nufos*, Warhawk*, Whirlwind*, Hatchet*, Yuma*, Eraser*, Govern*, Pilo*, CPF*, Vulcan*, Pyrofos*	OP	II	1B	97-276	2000 (rabbit)
chlorpyrifos-methyl + deltamethrin	Storcide II*	OP + SyP	II	1B + 3A	150	>5000
Clinch*	abamectin, Agri-Mek*, Avid, Epi-Mek*, Zephyr*	AV	II	6	300	>1800
Closer	sulfoxaflor, Transform	SX	IV	4C	>2000	>4000
clothianidin	Poncho*, Belay*, NipsIt Inside*, Arena*, Crossfire*	NEO	III	4A	3044	>5000
Cobalt*	chlorpyrifos + lambda-cyhalothrin	OP + SyP	II	1B + 3A	97-276	>2000
Comite*	propargite, Omite*	PRO	I	12C	600	>5000
Confirm*	tebufenozide	IGR	IV	18	5000	>5000
Consero*	spinosad, Tracer*, Spintor*, Success*, Entrust*, Sensat*, Execute*, Blackhawk*, Contain*	SP	IV	5	5000	>5000
Contain*	spinosad, Tracer*, Spintor*, Success*, Entrust*, Sensat*, Execute*, Blackhawk*, Consero*	SP	IV	5	5000	>5000
Coragen*	chlorantraniliprole, Altacor*, Prevathon*, Dermacor*, GrubEx*, Acelepryn*, Altriset*	DM	II	28	98.11	>5000
Co-Ral*	coumaphos	OP	I	1B	15.5-41	860
coumaphos	Co-Ral*	OP	I	1B	15.5-41	860
Counter*	terbufos	OP	I	1B	4.5-9.0	1.1 (rabbit)
Couraze*	imidacloprid, Provado*, Admire*, Merit*, Alias*, Prey*, Sherpa*, Widow*, Wrangler*, Imida*, Advise*, Pasada*, ImiGold*, Nuprid*	NEO	III	4A	4350	>5050 (rabbit)
Cruiser*	thiamethoxam, Centric*, Warden*, Seed Shield*, Adage*	NEO	III	4A	>5000	>2000
Curacron*	profenofos	OP	I	1B	622	472 (rabbit)
cyfluthrin	Tombstone*, Decathlon*, Renounce*, Tempo*, Optashield*,	SyP	I	3A	1015	>2000 (rabbit)
cyfluthrin + tebupirimfos	Aztez*, Defcon*	SyP + OP	I	3A + 1B	1.3	
Cymbush*	cypermethrin, Ammo*, Battery*, UP-Cyde*	SyP	I	3A	247	>2000
cypermethrin	Ammo*, Cymbush*, Battery*, UP-Cyde*, Cyper G*, Holster*	SyP	I	3A	247	>2000
cyromazine	Larvadex*	IGR	IV	17	3387	>3100

INSECTICIDES

Insecticide Names	Other Names	Class	Toxicity Category	IRAC CODE	Acute LD_{50} Values for White Rats ORAL (mg/kg)	DERMAL (mg/kg)
DDVP*	dichlorvos, dichlorphos, Vapona*	OP	I	1B	56-80	75-107
Decathlon*	cyfluthrin, Tombstone*, Renounce*, Tempo*, Optashield*	SyP	I	3A	1015	>2000 (rabbit)
Declare*	gamma-cyhalothrin, Proaxis*, Prolex*	SyP	III	3A	2250-2646	>5000
Defcon*	cyfluthrin + tebupirimfos, Aztec*	SyP + OP	I	3A + 1B	1.3	
deltamethrin	DeltaDust*, DeltaGard*, Delta Gold*, Shooter*, Over 'n Out!*, Battalion*, Top Choice*, Maxforce*, Chipco Choice*, Centynal*, Chipco FireStar*, Decis*, Suspend*	SyP	I	3A	42.9	>2000
Demon*	cypermethrin	SyP	I	3A	247	>2000
Denim*	emamectin benzoate	AV	I	6	2950	>2000 (rabbit)
Diacon*	S-methoprene*	IGR	III	7A	>34,600	>3000 (rabbit)
Diamond*	novaluron, Pedestal*, Rimon*	IGR	III	15	3914	8,000 (rabbit)
Diazinon*	Spectracide*, Dryzon*	OP	II, III	1B	300-400	3600 (rabbit)
Dibrom*	naled	OP	I	1B	430	1100 (rabbit)
dichlorphos	dichlorvos, Vapona*, DDV*	P*	OP	I	1B	56-80 75-107
dichlorvos	dichlorphos, Vapona*, DDVP*	OP	I	1B	56-80	75-107
dicofol	Dicofol*, Kelthane*	OC	II, III	UN	820-960	1000-1230
Dicromax*	Bidrin*, dicrotophos, Inject-A-Cide B*	OP	I	1B	17-22	224 (rabbit)
dicrotophos	Bidrin*, Inject-A-Cide B*	OP	I	1B	17-22	224 (rabbit)
diflubenzuron	Dimilin*	IGR	III	15	4540	
dimethoate	Dimate*, Dimethoate*	OP	II	1B	215	400-610
Dimilin*	diflubenzuron	IGR	III	15	4540	
dinotefuran	Tenchu*	NEO	IV	4A	>2000	>2000
Dipel ESNT*	*Bacillus thuringiensis*	B	IV	11	Non-toxic to mammals	
Dipterex*	Dylox*, trichlorfon, Neguvon*, Anthion*, Proxol*, GX-130*	OP	III	1B	560-630	2000
disulfoton	Di-Syston*	OP	I	1B	2-10	6-20
Di-Syston*	disulfoton	OP	I	1B	2-10	6-20
Dragnet*	permethrin	SyP	I-III	3A	430-4000	>4000
Dursban*	chlorpyrifos, Lorsban*, Nufos*	OP	II	1B	97-276	2000 (rabbit)
Dylox*	trichlorfon, Dipterex*, Neguvon*, Proxol*	OP	II	1B	560-630	>2000
Ectiban*	permethrin	SyP	II	3A	4000	>4000
Endigo*	thiamethoxam + lambda-cyhalothrin	NEO + SyP	II	4A + 3A	310.2	>2000
endosulfan	Thionex*	OC	I	2A	30-110	359 (rabbit)
Entrust*	spinosad, Tracer*, Spintor*, Success*, Consero*, Sensat*, Execute*, Blackhawk*, Contain*	SP	IV	5	5000	>5000
Epi-Mek*	abamectin, Agri-Mek*, Abba*, Abacus*, AbamectinE*, Flora-Mek*, Reaper*, Temprano*, Zoro*, Clinch*	AV	II	6	300	>1800
Eraser*	chlorpyrifos, Lorsban*, Nufos*, Whirlwind*, Warhawk*, Pilot*, Govern*, CPF*, Vulcan*	OP	II	1B	97-276	2000 (rabbit)
esfenvalerate	Asana XL*, Adjourn*, S-FenvaloStar*	SyP	II	3A	458	>2000 (rabbit)
Execute*	spinosad, Tracer*, Spintor*, Success*, Consero*, Sensat*, Entrust*, Blackhawk*, Contain*	SP	IV	5	5000	>5000
famphur	Warbex*	OP	I	1B	35-62	1460-5093 (rabbit)
Fastac*	alpha-cypermethrin	SyP	III	3	210-1050	>5000
fenpyroximate	Portal*, Fujimite*	MISC.	III	21	810	>5000
fipronil	Regent*, Termidor*	PP	II	2B	336	382 (rabbit)
flonicamid	Carbine*, Beleaf*, Aria*	FL	II	9C	>2000	>2000
Flora-Mek*	abamectin, Agri-Mek*, Abba*, Abacus*, AbamectinE*, Epi-Mek*, Reaper*, Temprano*, Zoro*, Clinch*	AV	II	6	300	>1800
flubendiamide	Belt*, Synapse*	DM	II	28	<2000	>4000
flupyradifurone	Sivanto*	BU	III	4D	>2000	>2000
Fumitoxin*	aluminum phosphide, Phostoxin*	Phos.	I	24A	20	
gamma-cyhalothrin	Proaxis*, Prolex*, Declare*	SyP	III	3A	2250-2646	>5000

Insecticide Names	Other Names	Class	Toxicity Category	IRAC CODE	Acute LD_{50} Values for White Rats ORAL (mg/kg)	DERMAL (mg/kg)
Gaucho*	imidacloprid	NEO	III	4A	609	>2000
Govern*	chlorpyrifos, Lorsban*, Nufos*, Whirlwind*, Warhawk*, Pilot*, Eraser*	OP	II	1B	97-276	2000 (rabbit)
Grizzly*	lambda-cyhalothrin, Karate*, Silencer*, Kendo*, Jitzo*, Paradigm*, Lamcap*, Warrior*	SyP	II	3A	180	>2000
Guthion*	azinphos-methyl	OP	I	1B	11-13	220
halofenozide	Mach II*	IGR	IV	18	2850	>2850
Hatchet*	chlorpyrofos, Dursban*, Lorsban*, Whirlwind*, Warhawk*, Yuma*	OP	II	1B	97-276	>2000 (rabbit)
Heligen	nucleopolyhedrovirus	Misc.	III		>4000	>4000
hydramethylnon	Amdro*	MISC	III	20A	>5000	>2000 (rabbit)
Imida*	imidacloprid, Provado*, Alias*, Couraze*	NEO	III	4A	4350	>5050 (rabbit)
imidacloprid	Admire*, Provado*, Gaucho*, Merit*, Alias*, Couraze*, Imidacloprid*, Prey*, Sherpa*, Widow*, Wrangler*, Pasada*, Advise*, Imida*, ImiGold*, Nuprid*, Axcess*, Concur*, Sativa IM*, Senator*	NEO	III	4A	4350	>5050 (rabbit)
Imidan*	phosmet	OP	II	1B	147-316	>4640 (rabbit)
ImiGold*	imidacloprid, Provado*, Imida*, Alias*	NEO	III	4A	4350	>5050 (rabbit)
indoxacarb	Steward*	OX	III	22A	268	>5000
Intrepid*	methoxyfenozide	IGR	IV	18A	>5000	>2000
Intrepid Edge*	methoxyfenozide + spinetoram	IGR + SP	IV	18A + 5	>5000	>2000
Intruder*	acetamiprid, Assail*, Strafer*, Anarchy*, ArVida*	NEO	III	4A	1064	>2000
Ivermectin*	Ivomec*	AV		6		
Ivomec*	Ivermectin*	AV		6		
Javelin*	*Bacillus thuringiensis*	B	IV	11	Non-toxic to mammals	
Kaiso*	lambda-cyhalothrin, Karate*, Silencer*, Kendo*, Jitzo*, Paradigm*, Lamcap*, Warrior*	SyP	II	3A	180	>2000
Karate*	lambda-cyhalothrin, Silencer*, Warrior*, Kendo, Jitzo, Paradigm, Lamcap*	SyP	II	3A	180	>2000
lambda-cyhalothrin	Karate*, Silencer*, Warrior*, Battle, Scimitar*, Grizzly*, Kendo* Taiga*, Mystic*, Helena lambda*, Lambda-T*, Kaiso*, Lamcap* Lambda-Cyhalothrin*, Lambda-Cy*, LambdaStar*, Paradigm*	SyP	II	3A	180	>2000
LambdaStar*	lambda-cyhalothrin, Karate*, Silencer*, Warrior*	SyP	II	3A	180	>2000
Lambda-T*	lambda-cyhalothrin, Karate*, Silencer*, Warrior*	SyP	II	3A	180	>2000
Lannate*	methomyl	Car.	I	1A	17-24	>5880 (rabbit)
Larvadex*	cyromazine	IGR	IV	17	3387	>3100
Larvin*	thiodicarb	Car.	II	1A	66-120	>2000 (rabbit)
Leverage 360*	beta-cyfluthrin + imidacloprid	SyP + NEO	III	3A + 4A	>1044	>2000
lindane	gamma isomer of BHC	OC	II	2A	88-125	1000
Lorsban*	chlorpyrifos, Dursban*, Nufos*, Warhawk*, Whirlwind*, Hatchet*, Yuma*, Eraser*, Pilot*, Govern*, CPF*, Vulcan*	OP	II	1B	97-276	2000 (rabbit)
Mach II*	halofenozide	IGR	IV	18	2850	>2850
malathion	Fyfanon*	OP	III	1B	1000-1375	4100 (rabbit)
Menace*	bifenthrin	SyP	II	3A	375	>2000 (rabbit)
Merit*	imidacloprid, Admire*, Alias*, Couraze*, Trimax*, Provado*, Prey*, Sherpa*, Widow*, Wrangler*	NEO	III	4A	4350	>5050 (rabbit)
Mesurol*	methiocarb, Slug-Geta*, Bug-Geta*	Car.	II		10-130	5000 (rabbit)
Metaldehyde*	Slug and snail bait, Deadline*, Durham Metaldahyde*	MISC	II, III		630	
methidathion	Supracide*	OP	I	1B	44	200 (rabbit)
methiocarb	Mesurol*	Car.	II		10-130	5000 (rabbit)
methomyl	Lannate*	Car.	I	1A	17-24	5880 (rabbit)
methoprene	Altosid*, Diacon*	IGR	III	7A	>34,600	>3000 (rabbit)
methoxyfenozide	Intrepid*	IGR	IV	18A	>5000	>2000
methoxyfenozide + spinetoram	Intrepid Edge*	IGR + SP	IV	18A + 5	>5000	>2000
methyl parathion	Penncap M*, Methyl*	OP	I	1B	5	50
Mustang Maxx*	zeta-cypermethrin, Respect*	SyP	I	3A	106	>5000
MVP II*	*Bacillus thuringiensis*	B	IV	11	Non-toxic to mammals	

INSECTICIDES

Insecticide Names	Other Names	Class	Toxicity Category	IRAC CODE	Acute LD_{50} Values for White Rats ORAL (mg/kg)	DERMAL (mg/kg)
Mystic Z*	lambda-cyhalothrin, Karate*, Silencer*, Warrior*	SyP	II	3A	180	>2000
naled	Dibrom*	OP	II	1B	430	1100 (rabbit)
Neguvon*	trichlorfon, Dipterex*, Dylox*, GX-130*, Proxol*	OP	III	1B	560-630	>2000
NipsIt Inside*	clothianidin, Poncho*, Belay*, Arena*, Crossfire*	NEO	III	4A	3044	>5000
novaluron	Diamond*, Pedestal*, Rimon*, Mayhem*	IGR	III	15	3914	8000 (rabbit)
nucleopolyhedrovirus	Heligen	Misc.	III		>4000	>4000
Nufos*	chlorpyrifos, Lorsban*, Warhawk*, Whirlwind*, Yuma*, Dursban*	OP	II	1B	97-276	>2000 (rabbit)
Nuprid*	imidacloprid, Provado*, Alias*, Couraze*	NEO	III	4A	4350	>5050 (rabbit)
Oberon*	spiromesifen	MISC	III	23	>2000	>4000
Omite*	propargite, Comite*	MISC	III	12C	2200	
Orthene*	acephate, Bracket*	OP	III	1B	866-945	>2000 (rabbit)
Overtime*	permethrin	SyP	II	3A	4000	4000
oxamyl	Vydate*	Car.	I	1A	5.4	37
paradichlorobenzene	PDB*	OC	III		500-5000	2000 (rabbit)
PDB*	paradichlorobenzene	OC	III		500-5000	2000 (rabbit)
Penncap-M*	microencapsulated methyl parathion	OP	II	1B	>600	>5400
Permectrin II*	permethrin	SyP	II	3A	430-4000	>4000
permethrin	Ambush*, Atroban*, Overtime*, Permectrin II*, Ectiban*, Pounce*, Astro*, Arctic*, Perm-Up*	SyP	II	3A	430-4000	>4000
phorate	Thimet*	OP	I	1A	2-4	20-30 (guinea pig)
phosmet	Imidan*	OP	II	1B	147-316	>4640 (rabbit)
phostoxin	aluminum phosphide, Weevil-Cide*	Phos.	I	24A	20	
Pilot*	chlorpyrifos, Lorsban*, Eraser*, Nufos*, Warhawk*, Whirlwind*	OP	II	1A	97-276	2000 (rabbit)
piperonyl butoxide	Butacide*, Incite*	MISC	III		>7500	
Poncho*	clothianidin, Belay*, Arena*, NipsIt Inside*, Crossfire*	NEO	III	4A	3044	>5000
Portal*	fenproximate, Fujimite*	MISC	III	21	810-1004	>5000
Pounce*	permethrin	SyP	I	3A	439-4000	>4000
Premise*	imidacloprid	NEO	III	4A	4143-4870	>2000
Prey*	imidacloprid, Admire*, Alias*, Provado*, Merit*, Couraze*, Sherpa*, Widow*, Wrangler*	NEO	III	4A	4350	>5050 (rabbit)
Proaxis*	gamma-cyhalothrin, Prolex*, Declare*	SyP	III	3A	2250-2646	>5000
profenofos	Curacron*	OP	I	1B	622	472 (rabbit)
Prolex*	gamma-cyhalothrin, Proaxis*, Declare*	SyP	III	3A	2250-2646	>5000
propargite	Omite*, Comite*	Phos.	III	12C	220-600	>5000
propoxur	Baygon*, arprocarb	Car.	II	1A	128	800-1000
Provado*	imidacloprid, Admire*, Gaucho*, Merit*, Alias*, Couraze*, Prey*, Sherpa*, Widow*, Wrangler*	NEO	III	4A	4350	>5050 (rabbit)
Proxol*	trichlorfon, Dylox*	OP	III	1B	560-630	>2000
pyrethrins	pyrethrum	Pyr.	III	3A	1500	>1800
pyrethrum	pyrethrins	Pyr.	III	3A	1500	>1800
Rabon*	tetrachlorvinphos, Ravap*	OP	III	1B	4000-5000	>2500 (rabbit)
Radiant*	spinetoram	SP	IV	5	>5000	>5000
Ravap*	tetrachlorvinphos, Rabon*	OP	III	1B	4000-5000	>2500 (rabbit)
Regent*	fipronil	PP	II	2B	336	382 (rabbit)
resmethrin	Chryson*, Synthrin*	Pyr.	III	3A	4240	2500 (rabbit)
Sensat*	spinosad, Tracer*, Spintor*, Success*, Consero*, Execute*, Entrust*, Blackhawk*, Contain*	SP	IV	5	5000	>5000
Sevin*	carbaryl	Car.	III	1A	246-283	4000
S-FenvaloStar*	esfenvalorate, Asana XL*, Adjourn*	SyP	II	3A	458	>2000
Sherpa	imidacloprid, Admire*, Alias*, Provado*, Merit*, Couraze*, Prey*, Widow*, Wrangler*	NEO	III	4A	4350	>5050 (rabbit)
Sivanto*	flupyradifurone	BU	III	4D	>2000	>2000
Sniper*	bifenthrin, Brigade*, Discipline*, Fanfare*	SyP	II	3A	347	>2000 (rabbit)

Insecticide Names	Other Names	Class	Toxicity Category	IRAC CODE	Acute LD_{50} Values for White Rats ORAL (mg/kg)	DERMAL (mg/kg)
Spectracide*	diazinon	OP	II, III	1B	300-400	3600 (rabbit)
spinetoram	Radiant*	SP	IV	5	>5000	>5000
spinosad	Tracer*, Spintor*, Blackhawk*, Success*, Contain*, Sensat*, Entrust*, Execute*, Consero*	SP	IV	5	5000	>5000
Spintor*	spinosad, Tracer*, Blackhawk*, Success*, Contain*, Sensat*, Entrust*, Execute*, Consero*	SP	IV	5	5000	>5000
spiromesifen	Oberon*	MISC	III	23	>2000	>4000
Steward*	indoxacarb	OX	III	22A	268	>5000
Storcide II*	chlorpyrifos-methyl + deltamethrin	OP + SyP	II	1B + 3A	150	>5000
Strafer*	acetamiprid, Assail*, Intruder*, Anarchy*, ArVida*	NEO	III	4A	1064	>2000
Success*	spinosad, Tracer*, Spintor*, Blackhawk*, Contain*, Sensat*, Entrust*, Execute*, Consero*	SP	IV	5	5000	>5000
sulfoxaflor	Closer, Transform	SX	IV	4C	>2000	>4000
Supracide*	methidathion	OP	I	1B	44	200 (rabbit)
Synapse*	flubendiamide, Belt*	DM	II	28	<2000	>4000
Taktic*	amitraz	MISC	II	19	400	>1600
Talstar*	bifenthrin	SyP	II	3A	375	>2000 (rabbit)
Tame*	Danitol*, fenpropathrin	SyP	I	3A	68	
tebufenozide	Confirm*, Mach II*	IGR	IV	18A	5000	>5000
temephos	Abate*	OP	III	1B	8600-13,000	>4000
Tempo*	cyfluthrin, Decathlon*, Renounce*, Tombstone*	SyP	I	3A	1015	>2000 (rabbit)
Tempo Ultra*	beta-cyfluthrin, Baythroid XL*	SyP	III	3A	647	>2000
Tenchu*	dinotefuron	NEO	IV	4A	>2000	>2000
terbufos	Counter*	OP	I	1B	4.5-9.0	1.1 (rabbit)
tetrachlorvinphos	Rabon*	OP	III	1B	4000-5000	>2500 (rabbit)
thiamethoxam	Centric*, Cruiser*, Actara*	NEO	III	4A	>5000	>2000
Thimet*	phorate	OP	I	1B	204	20-30 (guinea pig)
thiodicarb	Larvin*	Car.	II	1A	66-120	>2000 (rabbit)
Thionex*	endosulfan	OC	I	2A	30-110	359 (rabbit)
Tombstone*	cyfluthrin, Decathlon*, Renounce*, Tempo*	SyP	I	3A	1015	>2000 (rabbit)
Torpedo*	permethrin	SyP	II	3A	430-4000	>4000
Tourizmo*	flubendiamide + buprofezin, Vetica*	DM + IGR	III	28 + 16	<2000	>2000
Tracer*	spinosad, Spintor*, Sensat*, Contain*, Conserve*, Entrust*, Blackhawk*, Consero*, Success*	SP	IV	5	5000	>5000
Transform	Closer, sulfoxaflor	SX	IV	4C	>2000	>4000
trichlorfon	Dylox*, Dipterex*, Neguvon*	OP	III	1B	560-630	>2000
Tundra*	bifenthrin	SyP	II	3A	347	>2000 (rabbit)
UP-Cyde*	cypermethrin, Ammo*, Battery*, Cyper G*, Holster*	SyP	I	3A	247	>2000
UpStar*	bifenthrin	SyP	II	3A	347	>2000 (rabbit)
Vapona*	dichlorphos, DDVP*, dichlorvos	OP	I	1B	80	107
Vendex*	fenbutatin-oxide	MISC	I	12B	2631	>2000
Vetica*	flubendiamide + buprofezin, Tourizmo*	DM + IGR	III	28 + 16	<2000	>2000
Vydate*	oxamyl	Car.	I	1A	5.4	37
Warbex*	famphur	OP	I	1B	35-62	1460-5093 (rabbit)
Warhawk*	chlorpyrifos, Lorsban*, Whirlwind*, Govern*, Eraser*, Yuma*, CPF*	OP	II	1B	97-276	>2000 (rabbit)
Whirlwind*	chlorpyrifos, Lorsban*, Warhawk*, Govern*, Eraser*, Yuma*, Vulcan*	OP	II	1B	97-276	>2000 (rabbit)
Widow*	imidacloprid, Admire*, Alias*, Provado*, Merit*, Couraze*, Prey*, Sherpa*, Wrangler*	NEO	III	4A	4350	>5050 (rabbit)
Wrangler*	imidacloprid, Admire*, Alias*, Provado*, Merit*, Couraze*, Prey*, Sherpa*, Widow*	NEO	III	4A	4350	>5050 (rabbit)
Yuma*	chlorpyrifos, Lorsban*, Whirlwind*, Warhawk*, Hatchet*, Dursban*	OP	II	1B	97-276	>2000 (rabbit)
Zeal*	etoxazole	ET	III	10B	>5000	>5000
zeta-cypermethrin	Mustang*, Mustang Maxx*, Respect*	SyP	II	3A	106	>5000
Zoro*	abamectin, Agri-Mek*, Epi-Mek*, Abacus*, AbamectinE*, Flora-Mek*, Temprano*, Reaper*, Abba*, Clinch*	AV	II	6	300	>1800

Ecological Characteristics of Some Agricultural Insecticides Commonly Used in Arkansas

Insecticide (common name)	Relative Toxicity[a] to: Fish	Birds	Bees
abamectin (Agri-Mek)	VH	VL	VH
Acephate (Orthene)	VL	M	H
acetamiprid (Intruder)		M	M
aldicarb (Temik)	M	VH	VL
Azadirechtin	H	NT	VL
Azinphosmethyl (Guthion)	VH	H	VH
Bacillus thuringiensis (DiPel)	NT	NT	NT
Bifenthrin (Brigade)	VH	M	VH
Buprofezine (Applaud)	NT	NT	VL
Carbaryl (Sevin)	M	L	VH
Carbofuran (furadan)	H	H	VH
Chlorantraniliprole (Prevathon, Coragen)		VL	L
Chlorpyrifos (Lorsban-Dursban)	VH	H	H
chlorpyrifos-methyl/deltamethrin (Storcide II)		VL	VH
chlothianidin (Belay)	H	L	H
cyfluthrin (Tombstone)	VH	L	VH
cypermethrin (Ammo)	VH	VL	VH
deltamethrin	VH	H	VH
dicofol	VH	M	VL
dicrotophos	M	VH	VH
diflubenzuron	VL	VL	NT
Dimethoate (Cygon)	M	H	M
Dindotefuran (Tenchu)		L	H
disulfoton (Di-Syston)		H	VH
endosulfan (Thionex)	VH	H	M
Esfenvalerate (Asana)	VH	H	L
etoxozole (Zeal)		VL	VL
fenpropathrin (Danitol)	VH	M	VH
fenpyroximate (Portal)		VL	L
fipronil (Regent)		L	VH
Flubendiamide (Belt)		VL	VL
Flonicamid (Carbine)	VL	L	L
Imidacloprid (Trimax, Admire, Alias, etc.)		L	VH
indoxacarb (Steward)		M	H
lambda-cyhalothrin	VH	L	VH
Malathion	M	H	H
metaldehyde		H	L
methiocarb (Mesurol)		H	H
Methomyl (Lannate)	M	H	H
Methoxyfenozide (Intrepid)	M	L	L
novaluron (Diamond)		L	M
oxamyl (Vydate)	M	VH	VH
Permethrin (Ambush, Pounce, etc.)	VH	H	L
Phorate (Thimet)	VH	VH	VL
Phosmet (Imidan)	VH	VH	VL
pirimifos-methyl (Actellic)		H	VH
Propargite (Comite)	VH	L	L
Spinosad (Tracer, Spintor)	L	L	VH
Spiromesifen (Oberon)			L
Tebufenozide (Confirm)	M	L	L
Tefluthrin	VH	H	L
Terbufos (Counter)	VH	M	H
Thiamethoxam (Centric, Cruiser)		L	H
Thiodicarb (Larvin)	M	M	L

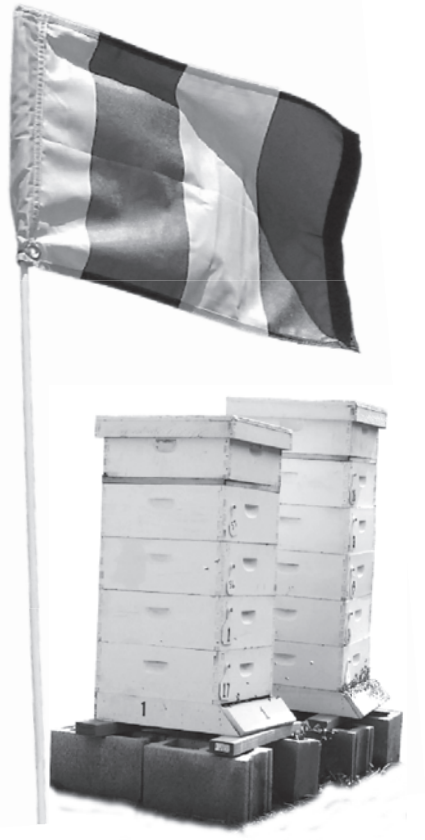
[a]VL=very low; L=low; M=moderate; H=high; VH=very high; NT=no evidence of acute or chronic toxicity.

TRADE NAMES OF GENERIC INSECTICIDES

Active Ingredient	Trade Names
abamectin	Abba, Abacus, AbamectinE, Agri-Mek, Avid, Clinch, Epi-Mek, Flora-Mek, Reaper, Temprano, Varsity, Zephyr, Zoro
acephate	Acephate, Bracket, Orthene, Avatar
acetamiprid	Assail, Intruder, Tristar, Strafer, Anarchy, ArVida
beta-cyfluthrin	Baythroid XL
bifenthrin	Bifenthrin AG, Bifenture, Bisect, Brigade, Capture, Discipline, Empower, Fanfare, Menace, Onyx, Sniper, Talstar, Tundra, UpStar, Wisdom
buprofezin	Applaud, Centaur, Courier, Talus
chlorpyrifos	Chlorpyrifos, Govern, Hatchet, Lock-On, Lorsban, Nufos, Warhawk, Whirlwind, Yuma, Eraser, Pilot, CPF, Vulcan
chlothianidin	Belay, Clutch, Poncho, NipsIt Inside, Arena
cyfluthrin	Decathlon, Renounce, Tempo, Tombstone, Sultrus
cypermethrin	Ammo, Battery, Cypermethrin, Mustang, UP-Cyde, Cyper-G, Holster
deltamethrin	Chipco Choice, Chipco FireStar, DeltaDust, DeltaGard, Delta Gold, Over 'n Out!, Shooter, Top Choice, Battalion, Centynal, Suspend
esfenvalerate	Adjourn, Asana XL, S-FenvaloSta, Zyrate
gamma-cyhalothrin	Declare, Proaxis, Prolex
lambda-cyhalothrin	Battle, Grizzly, Helena Lambda, Kaiso, Karate, Karate Z, Lambda T, Lambda-Cy, Lambda-Cyhalothrin, LambdaStar, Mystic Z, Silencer, Taiga Z, Warrior II, Warrior Z, Kendo, Jitzu, Lamcap, Paradigm, Province, Ravage, Ballista
imidacloprid	Admire, Advise, Advise Max, Alias, Couraze, Couraze Max, Imida E, Imidacloprid, ImiGold, Macho, Merit, Montana, Nuprid, Pasada, Prey, Provado, Provoke, S-Cloprid, Sherpa, Trimax Pro, Widow, Wrangler, Zenith
malathion	Fyfanon, Malathion
permethrin	Actroban, Ambush, Arctic, Astro, Ectiban, Permectrin, Permethrin, Perm-UP, Pounce
pyriproxyfen	Distance, Esteem, Knack, Seize
spinosad	Blackhawk, Conserve, Entrust, SpinTor, Success, Tracer, Contain, Sensat
zeta-cypermethrin	Mustang Maxx, Respect

PROTECTING POLLINATORS FROM PESTICIDES

- Apply pesticides only when and where necessary. Use Integrated Pest Management, incorporating cultural, mechanical, and biological control methods wherever possible.
- Read and follow all product label instructions and requirements. Pay particular attention to the label precautions that indicate specific hazards to bees and other pollinators.
- Be aware of any bee hives in the area that could be affected by application. When spraying is necessary, notify beekeepers in advance, so that they can adequately protect bee hives.
- Use ground equipment instead of aircraft, especially near bee hives.
- Avoid application to crops in bloom where possible. If application is necessary, apply when bees are least likely to be actively foraging (after 3 p.m.).
- Reduce drift and avoid spraying onto non-target areas, including adjacent vegetation that may contain flowers attractive to bees.
- Where possible, leave a border of untreated vegetation between treated areas and areas where wildlife may be present.
- Store and dispose of all pesticides properly.
- If more than one pesticide can provide control, choose the least toxic product and formulation available.



Arkansas Pollinator Stewardship Program

This program seeks to minimize economic loss for both farmers and beekeepers by adequately managing row crop pests while minimizing impact of pesticides on honey bee colonies.

Cooperation and communication is encouraged among beekeepers, farmers and pesticide applicators.

The presence of the yellow and black Bee Aware flags will help to clearly identify locations where honey bees are located near crop areas.

For more information about this program or to obtain flags, contact:

Jon Zawislak, UA Extension Apiculturist
(501) 671-2222, jzawislak@uaex.edu

Gus Lorenz, UA Extension Entomologist
(501) 676-3124, glorenz@uaex.edu

MORE HAZARDOUS FOR BEES

LESS HAZARDOUS FOR BEES

Insecticidal Dusts
- particles cling to bees with pollen grains, may be carried back to the hive and stored with food

ULV Formulations
- highly concentrated, dangerous to bees

Wettable Powders
- often have longer residual activity than other spray formulations; longer REI for humans typically results in greater hazard for bees

Emulsifiable Concentrates
- usually have shorter residual toxicity for bees than wettable powders, safer for bees

Water Soluble Compounds
- generally safest type of spray, dries quickly leaving little residue to be picked up by bees; fine sprays are less dangerous than coarse droplets

Granules
- safest formulation for bees, not always suitable for all pest control situations

RELATIVE TOXICITY OF PESTICIDES TO HONEYBEES

Group 1 – HIGHLY TOXIC. Severe bee losses should be expected if the following pesticides are used when bees are present, if the product is applied near bee hives or if bees forage in the application area within a day after treatment.

Abamectin (Avermectin, Agri-Mek)
Acephate (Orthene)
Aldicarb (AgLogic)
Alpha-cypermethrin (Fastac)
Azinphos-methly (Guthion)
Beta-cyfluthrin (Baythroid XL, Tempo, Leverage)
Bifenthrin (Brigade, Capture, Discipline)
Carbaryl (Sevin)
Carbofuran (Furadan)
Chlorpyrifos (Dursban, Lorsban, Warhawk)
Clothianidin (Belay, Poncho)
Cyfluthrin (Decathlon, Tombstone)
Cypermethrin (Ammo, Cymbush)
Deltamethrin (Battalion, Centynal)
Diazinon (Spectracide)
Dicrotophos (Bidrin)
Dimethoate (Dimate)
Dinotefuran (Safari)
Emamectin benzoate (Denim)
Esfenvalerate (Asana XL, Adjourn)
Fenpropathrin (Danitol, Tame)
Fipronil (Regent, Taurus)
Gamma-cyhalothrin (Declare, Proaxis)
Imidacloprid (Admire, Advise, Alias, Couraze, Trimax, Wrangler)
Indoxacarb (Steward, Avaunt)
Lambda-cyhalothrin (Karate, Silencer, Warrior, Voliam)
Malathion (Fyfanon)
Methidathion (Supracide)
Methiocarb (Mesurol)
Methomyl (Lannate)
Methoprene
Methyl parathion (Penncap-M)
Naled (Dibrom, Trumpet)
Oxamyl (Vydate)
Permethrin (Ambush, Pounce)
Phorate (Thimet)
Phosmet (Imidan)
Pyrethrin
Resmethrin (Scourge)
Sulfoxaflor (Transform, Closer)
Thiamethoxam (Adage, Centric, Endigo, Voliam)
Zeta-cypermethrin (Mustang Maxx, Hero, Stallion)

Group 2 — MODERATELY TOXIC. These pesticides can be used in the vicinity of bees as long as dosage, timing, method of application and conditions are correct. These products should NEVER be applied directly on bees in the field or near bee colony locations (apiaries).

Acetamiprid (Assail, Intruder, Strafer)
Azadirachtin (Neemix, Ecozin)
Beauvaria bassiana
Bifenazate (Acramite, Floramite)
Chlorfenapyr (Phantom, Pylon)
Copper hydroxide (Kocide)(FUNGICIDE)
Coumphaos (Co-Ral)
Cyromazine (Trigard)
Diatomaceous earth
Disulfoton (Di-Syston)
Endosulfan (Thionex)
Ethoprop (Mocap)
Fluvalinate (Mavrik)
Horticultural oil
Novaluron (Diamond)
Primicarb
Pymetrozine (Fulfill)
Pyrethrum
Spinetoram (Radiant)
Spinosad (Blackhawk, Spintor, Tracer)
Spirotetramat (Movento)
Temephos (Abate)
Terbufos (Counter)
Thiacloprid (Calypso)
Thiodicarb (Larvin)

Group 3 — RELATIVELY NONTOXIC. These pesticides can generally be used around bees with a minimum of injury provided that dosage, timing, and method are correct. NEVER apply pesticides directly to bee hives.

Acaricides, Diseases, IGRs and Insecticides

Aldoxycarb (Standak)
Amitraz (Mitac)
Bacillus thuringiensis (Biotrol, Javelin)
B.t. tenebrionis
Chlorantraniliprole (Altacor, Coragen, Prevathon)
Clofentezine (Apollo)
Dicofol (Kelthane)
Diflubenzuron (Dimlin)
Etoxazole (Zeal)
Fenbutatin-oxide (Vendex)
Fenproximate (Fujimite)
Flonicamid (Carbine, Beleaf)
Flubendiamide (Belt, Synapse)
Hexythiazox (Onager, Savey)
Lime sulfur
Metaldehyde bait
Methoxyfenozide (Intrepid)
Nosema locusate fungus (Canning)
Nucleopolyhedrovirus (Heligen)
Propargite (Comite, Omite)
Pyriproxyfen (Esteem, Knack)
Rotenone
Spiromesifen (Oberon)
Tebufenozide (Confirm)

Fungicides

Acibenzolar-S-methly (Actigard)
Azoxystrobin (Quadris)
Benomyl (Benlate)
Bordeaux mixture
Captan
Copper 8-quinolate
Copper sulfate—monohydrated
Cuprous oxide
Cymoxanil (Curzate 60DF)
Cyrodinil (Vangard WP)
Fenhexamid (Elevate 50 WDG)
Fluazinam (Omega 500F)
Mancozeb
Maneb (Manzate)
Nabam (Parzate)
Sulfur
Thiram
Trifloxystrobin (Flint, Stratego, Compass)
Triphenyltin hydroxide (Super Tin)
Ziram (Vancide)
Zoxamide (Gavel, Zing)

RELATIVE TOXICITY OF PESTICIDES TO HONEYBEES

Group 3 — RELATIVELY NONTOXIC. These pesticides can generally be used around bees with a minimum of injury provided that dosage, timing, and method are correct. NEVER apply pesticides directly to bee hives.

Herbicides, Defoliants, Desiccants and PGRs

2,4-D
2,4-DB (Butyrac)
Acetochlor
Alachlor (Lasso)
Ammonium sulfate
Atrazine (Aatrex)
Bentazon (Basagran)
Bromacil (Hyvar)
Clodinafop-propargyl (Discover)
Cloproxydim (Select)
Cloransulam-methyl (First-Rate)
Cyanazine (Bladex)
Cyhalofop-butyl (Clincher)
Dicamba (Banvel)
Dichlobenil (Casoron)
Diflufenzopyr (Distinct)
EPTC (Eptam)
Ethephon (Prep)
Ethalfluralin (Sonalan)
Flufenacet (Axiom DF)
Fluometuron (Cotoran)
Flumioxazin (Valor)
Fluridone (Brake, Sonar)
Fluroxypyr (Starane EC)
Fluthiacet-methly (Athem, Cadet)
Foramsulfuron (Option)
Glyphosate (Roundup)
Imazapyr (Arsenal)
Imazamox (Raptor)
Isoxaflutole (Balance)
Linuron (Lorox)
MCPA (Bonide)
Metribuzin (Sencor, Cloak)
Mesotrione (Callisto)
Paraquat
Picloram (Tordon)
Prohexadone calcium (Apogee PGR, Baseline)
Prometryn (Caparol)
Pronamide (Kerb)
Propanil (Stam F-34)
Quinclorac (Facet)
S-metolachlor (Dual)
Simazine (Princep)
Sodium chlorate (Defol)
Terbacil (Sinbar)
Tribufos (Def, Folex)
Trifluralin (Treflan)

SOYBEAN INSECTICIDE PERFORMANCE RATING, 2018

Rating Scale: 0 = no control 10 = excellent				**Stem Feeders**			**Defoliators**									**Defoliators and Pod Feeders**				**Pod Feeders**		
	Chemistry	**Restricted Entry Interval (hours)**	**Restricted Use (R)**	**Cutworm**	**Kudzu Bug**	**Threecornered Alfalfa Hopper**	**Blister Beetle**	**Garden Webworm**	**Grasshopper**	**Green Cloverworm**	**Saltmarsh Caterpillar**	**Soybean Looper**	**Cabbage Looper**	**Spider Mite**	**Velvetbean Caterpillar**	**Bean Leaf Beetle**	**Beet Armyworm**	**Yellowstriped Fall Armyworm**	**Corn Earworm**	**Green Stink Bug**	**Brown Stink Bug**	**Red Banded Stink Bug**
Admire/Imidacloprid	NEO	12																		3	3	4
Cruiser	NEO	12				7										5						
Gaucho	NEO	12				5										5						
Ambush/Pounce	SyP	12	X			7	6	7	4	8	4	2	6	0	8	3	3	7	4	5	5	
Asana XL/Adjourn	SyP	12	X	8	6	8	7	8	7	9	5	3	7	0	9	3	3	7	5	7	5	
Bacillus thuringiensis	B	4		0		0	0	5	0	8	3	6	6	0	8	0	2	0	2	0	0	
Baythroid XL	SyP	12	X	8	6	8	7	8	6	9	5	3	7	0	9	3	3	7	5	7	5	5
Belay	NEO	12			6											7				7	7	7
Belt	DM	12						9		9	8	8	9				8	9	8			
Besiege	DM+SyP	24	X	8	9	8	7	9	7	9	9	7	9		9	5	9	9	9	7	5	5
Blackhawk	SP	4		7	0	0	0	8	2	9	5	8	9	0	9	3	8	7	8	1	1	
Brigade/Discipline/Fanfare	SyP	12	X	9	9	9	7	7	7	9	6	3	7	8	9	7		8	5	8	8	7
Cobalt Advanced	OP+SyP	24	X	8	8	8	7	8	8	9	5	3	7	4	9	7	5	7	4	7	5	7
Dimethoate	OP	48		0	6	6	5	5	7	3	1	2	2	4	3	8	2	4	2	8	4	
Endigo ZCX	NEO+SyP	24	X	8	9	8	7	8	7	9	5	3	7	0	9	7	3	7	5	8	8	7
Heligen	Misc	4																	7			
Hero	SyP	12	X	9	9	9	7	7	7	9	6	3	7	8	9	6		8	5	8	8	
Intrepid	IGR	4						8		8	8	8	8	0	8		8	8	7			
Intrepid Edge	IGR+SP	4								9	8	8	8		8		8	8	8			
Karate/Silencer/Lambda-Cy/Warrior	SyP	24	X	8	9	8	7	8	7	9	5	3	7	0	9	4	3	7	5	7	5	5
Lannate 2.4 LV	Car	48	X	2		5	5	8	6	9	4	7	7	0	9	6	7	7	8	7	5	
Larvin 3.2 F	Car	48	X	5		2	2	8	5	9	5	8	8	0	9	8	7	7	8	3	2	
Leverage	NEO+SyP	12	X	8	6	8	7	8	7	9	5	3	7	0	9	7	3	7	5	8	7	7
Lorsban/Nufos/Warhawk	OP	24	X	8		4	4	5	8	7	1	3	4	4	7	4	5	5	5	6	4	
Mustang Maxx/Respect	SyP	12	X	8	8	8	7	8	7	9	5	3	7	0	9	5	3	7	5	7	6	5
Orthene/Acephate	OP	24	X		6				8				7			7				8	8	7
Prevathon	DM	4	X					9	8	9	9	7	9		9		9	9	9			
Prolex/Declare	SyP	24	X	8	7	8	7	8	7	9	5	3	7	0	9	4	3	7	4	7	5	
Sevin	Car	12		5	6	3	8	3	7	8	5	1	1	0	8	7	3	6	6	5	4	
Steward	OX	12		9	0	0	0	8	0	9	5	8	9	0	4	2	8	8	8	1	1	

The performance ratings in the chart are for comparison purposes only and are not necessarily a measure of percent control.

Shaded boxes indicate products recommended for specific pests in this guide.

SOYBEAN INSECT CONTROL

Equivalent Economic Threshold Conversion Between Drop Cloth and Sweepnet

Insect	Sampling Method Used at Four Random Areas Per 40 Acres			
	Drop Cloth (at least 8 shakes)	Sweepnet (at least four 25-sweep samples)		
	Number/Foot of Row	Number/25 Sweeps	Number/50 Sweeps	Number/100 Sweeps
Stink bugs – up to R6 growth stage	1	9	18	36
Stink bugs – R6 to R6.5 growth stage (DO NOT treat after R6.5.)	2	18	36	72
Red Banded stink bug – up through R7 (DO NOT treat after R7.)		4	8	16
Soybean looper, cabbage looper, velvetbean caterpillar, green cloverworm, armyworm complex[1]	6	29	58	116
Kudzu bug	4 nymphs	25 nymphs	50 nymphs	100 nymphs

[1]Threshold numbers in association with 40 percent defoliation before bloom and 25 percent after bloom. Number represents medium and large larvae.

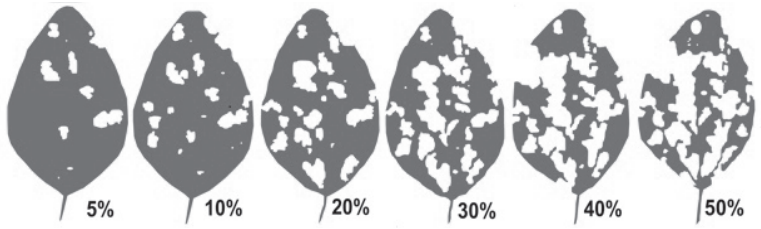
Corn Earworm Dynamic Threshold

The tables below are the result of a collaborative research effort between five states in the Mid-South including three locations in Arkansas. To determine the treatment level, estimate the potential value of the crop and the cost of the insecticide application. For example; if the crop value is $8/bushel and the cost of control is $14/acre, the sweepnet threshold would be 8.6 earworm per 25 sweeps.

Crop value ($/bu)	Larvae/25 sweeps						
	Control costs ($/acre)						
	8	10	12	14	16	18	20
6	6.5	8.2	9.8	11.4	13.1	14.7	16.3
7	5.6	7.0	8.4	9.8	11.2	12.6	14.0
8	5.0	6.1	7.4	8.6	9.8	11.0	12.3
9	5.0	5.4	6.5	7.6	8.7	9.8	10.9
10	5.0	5.0	5.9	6.9	7.8	8.8	9.8
12	5.0	5.0	5.0	5.7	6.5	7.4	8.2
13	5.0	5.0	5.0	5.3	6.0	6.8	7.5
15	5.0	5.0	5.0	5.0	5.2	5.9	6.5

Crop value ($/bu)	Larvae/row foot						
	Control costs ($/acre)						
	8	10	12	14	16	18	20
6	0.9	1.1	1.3	1.5	1.7	2.0	2.2
7	0.7	0.9	1.1	1.3	1.5	1.7	1.9
8	0.7	0.8	1.0	1.1	1.3	1.5	1.6
9	0.6	0.7	0.9	1.0	1.2	1.3	1.4
10	0.6	0.7	0.8	0.9	1.0	1.2	1.3
12	0.6	0.6	0.7	0.8	0.9	1.0	1.1
13	0.6	0.6	0.6	0.7	0.8	0.9	1.0
15	0.6	0.6	0.6	0.6	0.7	0.8	0.9

Defoliation Levels on Soybean Leaves



SOYBEAN INSECT CONTROL

Insect	Insecticide	Formulation/Acre	Lb ai/Acre	Acres/Gallon	Application/Comments	Minimum Days From Last Application to Harvest
STEM FEEDERS						
Cutworm Treat when infestation threatens to reduce stand to less than 4-6 plants per row foot.	beta-cyfluthrin (**R**) Baythroid XL 1 EC	0.8-1.6 oz	0.007-0.013	80-160		21
	bifenthrin (**R**) Brigade 2 EC *(See Generic Insecticides)*	2.1-6.4 oz	0.033-0.1	20-61	DO NOT apply more than 0.3 lb ai of Brigade per season. DO NOT apply again for 30 days.	18
	cyfluthrin (**R**) Tombstone 2 EC *(See Generic Insecticides)*	0.8-1.6 oz	0.013-0.025	80-160		45
	carbaryl Sevin XLR or 4F	1.0-1.5 qt	1.0-1.5	2.7-4.0		21
	chlorpyrifos (**R**) Lorsban 4 E *(See Generic Insecticides)*	1-2 pt	0.5-1.0	4-8		28
	esfenvalerate (**R**) Asana XL 0.66 EC *(See Generic Insecticides)*	5.8-9.6 oz	0.03-0.05	13-22		21
	gamma-cyhalothrin 1.25 (**R**) Prolex/Declare CS	0.77-1.28 oz	0.0075-0.0125	100-167		45
	lambda-cyhalothrin (**R**) Warrior II 2.08 CS *(See Generic Insecticides)*	0.96-1.6 oz	0.015-0.025	80-133		30
	indoxacarb Steward 1.25 SC	5.6-11.3 oz	0.055-0.11	11.5-22.8		21
	thiodicarb (**R**) Larvin 3.2 F	1.25-1.9 pt	0.5-0.75	4.3-6.4	DO NOT feed forage, hay or straw treated with Larvin. Use minimum 3 gal by air,15 gal by ground finish spray.	28
	zeta-cypermethrin 0.8 EC (**R**) Mustang Maxx	1.28-4.0 oz	0.008-0.025	32-100		21
Kudzu Bug Treat when 4 nymphs per row foot or 25 nymphs per 25 sweeps are found.	acephate (**R**) Orthene/Acephate 97 S	0.75-1.0 lb	0.73-0.97			14
	bifenthrin (**R**) Brigade 2 EC *(See Generic Insecticides)*	6.4 oz	0.1	20		18
	lambda-cyhalothrin (**R**) Warrior II 2.08 CS *(See Generic Insecticides)*	1.92 oz	0.03	67		30
	gamma-cyhalothrin 1.25 (**R**) Prolex/Declare CS	1.28-1.54 oz	0.0125-0.015	83-100		45
	zeta-cypermethrin 0.8 EC (**R**) Mustang Maxx	4.0 oz	0.025	32		21
	zeta-cypermethrin + bifenthrin (**R**) Hero 1.24 EC	6.4-10.3 oz	0.062-0.1	12.4-20	DO NOT apply more than 0.4 lb ai of Hero per season. DO NOT apply again for 30 days.	21

Insect	Insecticide	Formulation/Acre	Lb ai/Acre	Acres/Gallon	Application/Comments	Minimum Days From Last Application to Harvest
Threecornered Alfalfa Hopper Economic damage is unlikely when plants are greater than 10" tall. Damage usually occurs when plants are less than 10" tall. Apply when 50% of the plants are girdled or if fewer than 4-6 ungirdled plants per row foot remain in conventional rows, 30" to 38" and hopper nymphs are still present.	beta-cyfluthrin (**R**) Baythroid XL 1 EC	1.6-2.8 oz	0.013-0.022	45-80		21
	clothianidin Belay 2.13 EC	3-6 oz	0.05-0.1	21.3-42.7		21
	cyfluthrin (**R**) Tombstone 2 EC *(See Generic Insecticides)*	1.6-2.8 oz	0.025-0.044	46-80		45
	esfenvalerate (**R**) Asana XL 0.66 EC *(See Generic Insecticides)*	5.8-9.6 oz	0.03-0.05	13-22		21
	gamma-cyhalothrin 1.25 (**R**) Prolex/Declare CS	0.77-1.28 oz	0.0075-0.0125	100-167		45
	lambda-cyhalothrin (**R**) Warrior II 2.08 CS *(See Generic Insecticides)*	0.96-1.6 oz	0.015-0.025	80-133		30
	lambda-cyhalothrin+ chlorantraniliprole (**R**) Besiege 1.252	5.0-8.0 oz	0.049-0.08	16-25.6	DO NOT graze or feed hay to livestock. DO NOT exceed 20 fl oz per acre per season.	30
	imidacloprid Gaucho 600 Senator 600 Axcess 5 FS	 1.6 oz/100 lb seed 1.6 oz/100 lb seed 1.6 oz/100 lb seed			Seed treatment. DO NOT graze or feed livestock on forage or hay.	
	thiamethoxam Cruiser 5 FS Warden CX	 1.28 oz/100 lb seed 3.38 oz/100 lb seed			Seed treatment	
	zeta-cypermethrin 0.8 EC (**R**) Mustang Maxx	2.8-4.0 oz	0.0175-0.025	32-45.7		21
	zeta-cypermethrin + bifenthrin (**R**) Hero 1.24 EC	4.0-10.3 oz	0.04-0.1	12.4-32	DO NOT apply more than 0.4 lb ai of Hero per season. DO NOT apply again for 30 days.	21
DEFOLIATORS **Blister Beetle** Before bloom, treat when 40% defoliation occurs. After bloom, treat when 25% defoliation occurs.	beta-cyfluthrin (**R**) Baythroid XL 1 EC	1.6-2.8 oz	0.013-0.022	45-80		21
	bifenthrin (**R**) Brigade 2 EC *(See Generic Insecticides)*	2.1-6.4 oz	0.033-0.1	20-61	DO NOT apply more than 0.3 lb ai of Brigade per season. DO NOT apply again for 30 days.	18
	carbaryl Sevin XLR or 4F	1-2 pt	0.5-1.0	4-8		21
	cyfluthrin (**R**) Tombstone 2 EC *(See Generic Insecticides)*	1.6-2.8 oz	0.025-0.044	45.7-80		45

Insect	Insecticide	Formulation/Acre	Lb ai/Acre	Acres/Gallon	Application/Comments	Minimum Days From Last Application to Harvest
DEFOLIATORS						
Blister Beetle (cont.)	gamma-cyhalothrin 1.25 (**R**) Prolex/Declare CS	 1.25-1.54 oz	0.0125-0.015	 83-100		45
Before bloom, treat when 40% defoliation occurs. After bloom, treat when 25% defoliation occurs.	lambda-cyhalothrin (**R**) Warrior II 2.08 CS *(See Generic Insecticides)*	 1.6-1.92 oz	0.025-0.03	 67-80		30
	lambda-cyhalothrin + chlorantraniliprole (**R**) Besiege 1.252	 8.0-10.0 oz	0.08-0.098	 12.8-16	DO NOT graze or feed hay to livestock. DO NOT exceed 20 fl oz per acre per season.	30
	zeta-cypermethrin 0.8 EC (**R**) Mustang Maxx	 2.8-4.0 oz	0.0175-0.025	 32-45.7		21
	zeta-cypermethrin + bifenthrin (**R**) Hero 1.24 EC	 4.0-10.3 oz	0.04-0.1	 12.4-32	DO NOT apply more than 0.4 lb ai of Hero per season. DO NOT apply again for 30 days.	21
Defoliating Caterpillars (Garden Webworm, Green Cloverworm, Saltmarsh Caterpillar, Cabbage Looper, Velvetbean Caterpillar, Silver-Spotted Skipper) Before bloom, treat when 40% defoliation occurs. After bloom, treat when 25% defoliation occurs. Treatment for defoliators can be terminated at R6.5 growth stage.	acephate (**R**) Orthene/Acephate 90 S Orthene/Acephate 97 S	 0.83-1.1 lb 0.75-1.0 lb	0.75-1.0		Acephate is not labeled for garden webworm, saltmarsh caterpillar or silver-spotted skipper. DO NOT apply more than 1.5 lb ai acephate per season.	14
	Bacillus thuringiensis	Check label.				
	beta-cyfluthrin (**R**) Baythroid XL 1 EC	 1.6-2.8 oz	0.013-0.022	 45-80	Rate can be dropped to 0.8 oz for green cloverworm.	21
	bifenthrin (**R**) Brigade 2 EC *(See Generic Insecticides)*	 2.1-6.4 oz	0.033-0.1	 20-61	DO NOT apply more than 0.3 lb ai of Brigade per season. DO NOT apply again for 30 days.	18
	carbaryl Sevin XLR or 4F	 1-3 pt	0.5-1.5	 2.7-8.0		21
	chlorpyrifos (**R**) Lorsban 4 E *(See Generic Insecticides)*	 1-2 pt	0.5-1.0	 4.0-8.0	Lorsban is not labeled for cabbage looper, garden webworm or silver-spotted skipper. Rate can be lowered to 0.5 pt for green cloverworm or velvetbean caterpillar.	28
	cyfluthrin (**R**) Tombstone 2 EC *(See Generic Insecticides)*	 1.6-2.8 oz	0.025-0.044	 45.7-80		45
	esfenvalerate (**R**) Asana XL 0.66 EC *(See Generic Insecticides)*	 2.9-5.8 oz	0.015-0.03	 22-44	For cabbage looper, raise rate to 5.8-9.6 oz. Asana XL is not labeled for garden webworm or silver-spotted skipper.	21
	flubendiamide Belt 4 SC	 2-3 oz	0.0625-0.0937	 42.7-64	DO NOT apply more than 6 oz of Belt per acre per season.	14

Insect	Insecticide	Formulation/Acre	Lb ai/Acre	Acres/Gallon	Application/Comments	Minimum Days From LastApplication to Harvest
Defoliating Caterpillars (Garden Webworm, Green Cloverworm, Saltmarsh Caterpillar, Cabbage Looper, Velvetbean Caterpillar, Silver-Spotted Skipper)	gamma-cyhalothrin 1.25 (**R**) Prolex/Declare CS	0.77-1.28 oz	0.0075-0.0125	100-166	Higher rate of 1.28-1.54 oz/acre required for garden webworm and silver-spotted skipper.	45
	indoxacarb Steward 1.25 SC	5.6-11.3 oz	0.055-0.11	11.5-22.8	Rate for green cloverworm, saltmarsh caterpillar and cabbage looper can be lowered to 4.6 oz. Will provide suppression of velvetbean caterpillar. Steward is not labeled for silver-spotted skipper.	21
	lambda-cyhalothrin (**R**) Warrior II 2.08 CS *(See Generic Insecticides)*	0.96-1.6 oz	0.015-0.025	80-133	For garden webworm and silver-spotted skipper, raise rate to 1.6-1.92 oz/acre.	30
	lambda-cyhalothrin + chlorantraniliprole (**R**) Besiege 1.252	5.0-10.0 oz	0.049-0.098	12.8-25.6	DO NOT graze or feed hay to livestock. DO NOT exceed 20 fl oz per acre per season. Use 8-10 oz for silver-spotted skippers.	30
	methomyl (**R**) Lannate 2.4 LV	0.75-1.5 pt	0.225-0.45	5.3-10.6	Lannate is not labeled for garden webworm.	14
	methoxyfenozide Intrepid 2 F	4-8 oz	0.0625-0.125	16-32	Intrepid is not labeled for silver-spotted skipper.	14
	methoxyfenozide + spinetoram Intrepid Edge 3F	4-6.4	0.094-0.15	20-32	DO NOT make more than 4 applications per year.	28
	permethrin (**R**) Ambush 2.0 E Pounce 25 W	3.2-12.8 oz 3.2-12.8 oz	0.05-0.2	20-40	Use higher rates for garden webworm. Not labeled for silver-spotted skipper.	60
	spinosad Blackhawk	1.1-2.2 oz	0.025-0.05		Blackhawk is not labeled for garden webworm or silver-spotted skipper. Raise rate to 1.7-2.2 oz for saltmarsh caterpillar. DO NOT apply more than 8.3 oz of Blackhawk per year. DO NOT feed treated forage to meat or dairy animals.	28
	thiodicarb (**R**) Larvin 3.2 F	10-30 oz	0.25	12.8	Larvin is not labeled for garden webworm or silver-spotted skipper. For cabbage looper, raise rate to 18-30 oz.	28
	zeta-cypermethrin 0.8 EC (**R**) Mustang Maxx	2.8-4.0 oz	0.0175-0.025	32-45.7	For saltmarsh caterpillar and silver-spotted skipper, the rate can be lowered to 1.28 oz. Raise rate to 3.2-4 oz for cabbage loopers.	21
	zeta-cypermethrin + bifenthrin (**R**) Hero 1.24 EC	4.0-10.3 oz	0.04-0.1	12.4-32	DO NOT apply more than 0.4 lb ai of Hero per season. DO NOT apply again for 30 days. For green cloverworm and silver-spotted skipper, rate can be dropped to 2.6-6.1 oz.	21

Insect	Insecticide	Formulation/Acre	Lb ai/Acre	Acres/Gallon	Application/Comments	Minimum Days From Last Application to Harvest
DEFOLIATORS						
Grasshopper Before bloom, treat when 40% defoliation occurs. After bloom, treat when 25% defoliation occurs.	beta-cyfluthrin (**R**) Baythroid XL 1 EC	2.0-2.8 oz	0.016-0.022	45-64		21
	bifenthrin (**R**) Brigade 2 EC *(See Generic Insecticides)*	2.1-6.4 oz	0.033-0.1	20-61	DO NOT apply more than 0.3 lb ai of Brigade per season. DO NOT apply again for 30 days.	18
	chlorantraniliprole Prevathon 0.43	8-20 oz	0.027-0.067	6.4-16	Make no more than 4 applications per year. For best results, add MSO at 1% v/v.	1
	chlorpyrifos (**R**) Lorsban 4 E *(See Generic Insecticides)*	0.5-1.0 pt	0.25-0.5	8-16		28
	cyfluthrin (**R**) Tombstone 2 EC *(See Generic Insecticides)*	2.0-2.8 oz	0.031-0.044	68-80		45
	diflubenzuron (**R**) Dimilin 2L	2 oz	0.031	64	Apply Dimilin when majority of grasshoppers have reached the 2nd to 3rd nymphal stage. Dimilin is not effective against adults.	21
	dimethoate Dimethoate 4 E	1 pt	0.5	8		21
	esfenvalerate (**R**) Asana XL 0.66 EC *(See Generic Insecticides)*	5.8-9.6 oz	0.03-0.05	13-22		21
	gamma-cyhalothrin 1.25 (**R**) Prolex/Declare CS	1.28-1.54 oz	0.0125-0.015	83-100		45
	lambda-cyhalothrin (**R**) Warrior II 2.08 CS *(See Generic Insecticides)*	1.6-1.92 oz	0.025-0.03	67-80		30
	lambda-cyhalothrin + chlorantraniliprole (**R**) Besiege 1.252	8.0-10.0 oz	0.08-0.098	12.8-16	DO NOT graze or feed hay to livestock. DO NOT exceed 20 fl oz per acre per season.	30
	zeta-cypermethrin 0.8 EC (**R**) Mustang Maxx	3.2-4.0 oz	0.02-0.025	32-40		21
	zeta-cypermethrin + bifenthrin (**R**) Hero 1.24 EC	2.6-6.1 oz	0.025-0.06	21-49.2	DO NOT apply more than 0.4 lb ai of Hero per season. DO NOT apply again for 30 days.	21

Insect	Insecticide	Formulation/Acre	Lb ai/Acre	Acres/Gallon	Application/Comments	Minimum Days From Last Application to Harvest
Soybean Looper Before bloom, treat for 40% defoliation and loopers present. After bloom, treat for 25% defoliation plus 6-8 worms per row foot. Terminate treatment when soybeans reach R6.5 growth stage.	*Bacillus thuringiensis*	Check label.			*Bacillus thuringiensis* works effectively against insecticide-resistant or susceptible populations of soybean loopers and requires 3-4 days to kill larvae.	
	flubendiamide Belt 4 SC	2-3 oz	0.0625-0.0937	42.7-64	DO NOT apply more than 6 oz of Belt per acre per season.	14
	indoxacarb Steward 1.25 SC	5.6-11.3 oz	0.055-0.11	11.5-22.8		21
	lambda-cyhalothrin + chlorantraniliprole (**R**) Besiege 1.252	10.0 oz	0.098	12.8	DO NOT graze or feed hay to livestock. DO NOT exceed 20 fl oz per acre per season.	30
	methomyl (**R**) Lannate 2.4 LV	1.5-3 pt	0.45-0.9	2.7-5.3		14
	methoxyfenozide Intrepid 2 F	4-8 oz	0.0625-0.125	16-32		14
	methoxyfenozide + spinetoram Intrepid Edge 3F	4-6.4 oz	0.094-0.15	20-32	DO NOT make more than 4 applications per year.	28
	spinosad Blackhawk	1.1-2.2 oz	0.025-0.05		DO NOT apply more than 8.3 oz of Blackhawk per year. DO NOT feed forage to meat or dairy animals.	28
	thiodicarb (**R**) Larvin 3.2 F	1.1-1.9 pt	0.45-0.75	4.3-7.1	DO NOT feed forage, hay or straw treated with Larvin.	28
Spider Mites	abamectin Agri-Mek 0.7 S	1.75-3.5 oz	0.01-0.019	36.6-73		7
	bifenthrin (**R**) Brigade 2 EC *(See Generic Insecticides)*	5.12-6.4 oz	0.08-0.1	20-25	DO NOT apply more than 0.3 lb ai of Brigade per season. DO NOT apply again for 30 days.	18
	chlorpyrifos (**R**) Lorsban 4 E *(See Generic Insecticides)*	1 pt	0.5	8	Two applications may be needed for control. Control is best using higher volumes. Total spray 15-20 gal per acre. Treat when spider mites are numerous.	28
	dimethoate Dimethoate 4 E	1 pt	0.5	8		21
DEFOLIATORS and POD FEEDERS						
Bean Leaf Beetle Before bloom, treat when 40% defoliation occurs. After bloom, treat when 25% defoliation occurs and beetles are present. Terminate treatment when soybeans reach R6.5 growth stage.	acephate (**R**) Orthene/Acephate 90 S Orthene/Acephate 97 S	0.83-1.1 lb 0.75-1.0 lb	0.75-1.0		DO NOT apply more than 1.5 lb ai of acephate per season.	14
	beta-cyfluthrin (**R**) Baythroid XL 1 EC	1.6-2.8 oz	0.013-0.022	45.7-80		21
	bifenthrin (**R**) Brigade 2 EC *(See Generic Insecticides)*	2.1-6.4 oz	0.033-0.1	20-61	DO NOT apply more than 0.3 lb ai of Brigade per season. DO NOT apply again for 30 days.	18

Insect	Insecticide	Formulation/Acre	Lb ai/Acre	Acres/Gallon	Application/Comments	Minimum Days From Last Application to Harvest
DEFOLIATORS and POD FEEDERS						
Bean Leaf Beetle (cont.)	carbaryl		0.5			21
	Sevin XLR or 4F	1 pt		8		
Before bloom, treat when 40% defoliation occurs. After bloom, treat when 25% defoliation occurs and beetles are present. Terminate treatment when soybeans reach R6.5 growth stage.	clothianidin		0.05-0.11		DO NOT apply Belay within 45 days after planting seed treated with neonicotinoid seed treatments (imidacloprid, thiamethoxam). DO NOT apply at intervals less than 7 days apart. DO NOT graze or feed forage to livestock.	21
	Belay 2.13	3-6 oz		21.3-42.7		
	cyfluthrin (**R**)		0.025-0.044			45
	Tombstone 2 EC *(See Generic Insecticides)*	1.6-2.8 oz		45.7-80		
	dimethoate		0.5			21
	Dimethoate 4 E	1 pt		8		
	esfenvalerate (**R**)		0.03-0.05			21
	Asana XL 0.66 EC *(See Generic Insecticides)*	5.8-9.6 oz		13-22		
	gamma-cyhalothrin 1.25 (**R**)		0.0075-0.0125			45
	Prolex/Declare CS	0.77-1.28 oz		100-167		
	lambda-cyhalothrin (**R**)		0.015-0.025			30
	Warrior II 2.08 CS *(See Generic Insecticides)*	0.96-1.6 oz		80-133		
	imidacloprid				Gaucho and Cruiser will suppress early-season bean leaf beetles.	
	Gaucho 600	1.6 oz/100 lb seed				
	Axcess 5 FS	1.6 oz/100 lb seed				
	Senator 600	1.6 oz/100 lb seed				
	thiamethoxam					
	Cruiser 5 FS	1.28 oz/100 lb seed				
	Warden CX	3.38 oz/100 lb seed				
	methomyl (**R**)		0.3-0.45			14
	Lannate 2.4 LV	1-1.5 pt		5.3-8		
	zeta-cypermethrin 0.8 EC (**R**)		0.0175-0.025			21
	Mustang Maxx	2.8-4.0 oz		32-45.7		
	zeta-cypermethrin + bifenthrin (**R**)		0.04-0.1		DO NOT apply more than 0.4 lb ai of Hero per season. DO NOT apply again for 30 days.	21
	Hero 1.24 EC	4.0-10.3 oz		12.4-32		
Armyworm Complex (Yellowstriped, Fall and Beet Armyworm) Before bloom, treat when 40% defoliation occurs and an active population.	beta-cyfluthrin (**R**)		0.013-0.022		PYRETHROIDS (Baythroid, Brigade, Tombstone, Prolex, Declare, Karate, Mustang Maxx, Hero) are not effective against beet armyworm. DO NOT USE.	21
	Baythroid XL 1 EC	1.6-2.8 oz		45.7-80		
	bifenthrin (**R**)		0.033-0.1		DO NOT apply more than 0.3 lb ai of Brigade per season. DO NOT apply again for 30 days.	18
	Brigade 2 EC *(See Generic Insecticides)*	2.1-6.4 oz		20-61		
	chlorantraniliprole		0.047-0.067		Make no more than 4 applications per year.	1
	Prevathon 0.43	14-20 oz		6.4-9.14		

SOYBEAN INSECT CONTROL

Insect	Insecticide	Formulation/Acre	Lb ai/Acre	Acres/Gallon	Application/Comments	Minimum Days From Last Application to Harvest
Armyworm Complex (Yellowstriped, Fall and Beet Armyworm)	cyfluthrin (**R**) Tombstone 2 EC *(See Generic Insecticides)*	1.6-2.8 oz	0.025-0.044	45.7-80	PYRETHROIDS (Baythroid, Brigade, Tombstone, Prolex, Declare, Karate, Warrior, Mustang Maxx, Hero) are not effective against beet armyworm. DO NOT USE.	45
	flubendiamide Belt 4 SC	2-3 oz	0.0625-0.0937	42.7-64	DO NOT apply more than 6 oz of Belt per acre per season.	14
	gamma-cyhalothrin 1.25 (**R**) Prolex/Declare CS	1.28-1.54 oz	0.0125-0.015	83-100		45
	lambda-cyhalothrin (**R**) Warrior II 2.08 CS *(See Generic Insecticides)*	1.6-1.92 oz	0.025-0.03	69-83		30
	lambda-cyhalothrin + chlorantraniliprole (**R**) Besiege 1.252	8.0-10.0 oz	0.08-0.098	12.8-16	DO NOT graze or feed hay to livestock. DO NOT exceed 20 fl oz per acre per season.	30
	indoxacarb Steward 1.25 SC	4.6-11.3 oz	0.045-0.11	11.3-27.8		21
	methomyl (**R**) Lannate 2.4 LV	1-1.5 pt	0.3-0.45	5.3-8		14
	methoxyfenozide Intrepid 2 F	4-8 oz	0.0625-0.125	16-32		14
	methoxyfenozide + spinetoram Intrepid Edge 3F	4-6.4	0.094-0.15	20-32	DO NOT make more than 4 applications per year.	28
	spinosad Blackhawk	1.67-3.3 oz	0.038-0.075		DO NOT apply more than 8.3 oz of Blackhawk per year. DO NOT feed treated forage to meat or dairy animals.	28
	thiodicarb (**R**) Larvin 3.2 F	0.6-1.9 pt	0.25-0.75	4.3-12.8		28
	zeta-cypermethrin 0.8 EC (**R**) Mustang Maxx	3.2-4.0 oz	0.02-0.025	32-40		21
	zeta-cypermethrin + bifenthrin (**R**) Hero 1.24 EC	4.0-10.3 oz	0.04-0.1	12.4-32	DO NOT apply more than 0.4 lb ai of Hero per season. DO NOT apply again for 30 days.	21

Insect	Insecticide	Formulation/Acre	Lb ai/Acre	Acres/Gallon	Application/Comments	Minimum Days From Last Application to Harvest
DEFOLIATORS and POD FEEDERS						
Corn Earworm and Tobacco Budworm Before bloom, treat when 40% defoliation occurs. After bloom, use threshold table on page 109.	**Synthetic Pyrethroids**					
	beta-cyfluthrin (**R**) Baythroid XL 1 EC	1.6-2.8 oz	0.013-0.022	45.7-80	DO NOT use synthetic pyrethroids on populations of tobacco budworm. Tobacco budworm is resistant to this chemistry.	21
	bifenthrin (**R**) Brigade 2 EC *(See Generic Insecticides)*	2.1-6.4 oz	0.033-0.1	20-61	DO NOT apply more than 0.3 lb ai of Brigade per season. DO NOT apply again for 30 days.	18
	cyfluthrin (**R**) Tombstone 2 EC *(See Generic Insecticides)*	1.6-2.8 oz	0.025-0.044	45.7-80	In recent years, pyrethroids have shown reduced efficacy and can be expected to provide poor to moderate control. Consider tank-mixing another chemistry when using a pyrethroid.	45
	gamma-cyhalothrin 1.25 (**R**) Prolex/Declare CS	0.77-1.28 oz	0.0075-0.0125	100-167		45
	lambda-cyhalothrin (**R**) Warrior II 2.08 CS *(See Generic Insecticides)*	1.28-1.92 oz	0.02-0.03	67-100		30
	esfenvalerate (**R**) Asana XL 0.66 EC *(See Generic Insecticides)*	5.8-9.6 oz	0.03-0.05	13-22		21
	permethrin (**R**) Ambush 2.0 E Pounce 25 W	6.4-12.8 oz 6.4-12.8 oz	0.1-0.2	10-20	Permethrin: DO NOT graze treated areas or harvest for forage or hay. DO NOT make more than 2 applications per season.	60
	zeta-cypermethrin 0.8 EC (**R**) Mustang Maxx	2.8-4.0 oz	0.0175-0.025	32-45.7		21
	zeta-cypermethrin + bifenthrin (**R**) Hero 1.24 EC	4.0-10.3 oz	0.04-0.1	12.4-32	DO NOT apply more than 0.4 lb ai of Hero per season. DO NOT apply again for 30 days.	21
	Carbamates					
	carbaryl Sevin XLR or 4F	1-3 pt	0.5-1.5	2.7-8		21
	methomyl (**R**) Lannate 2.4 LV	0.75-1.5 pt	0.225-0.45	5.3-10.7		14
	thiodicarb (**R**) Larvin 3.2 F	10-16 oz	0.25-0.4	8-12.8		28
	Other Chemistry					
	nucleopolyhedrovirus Heligen	1-1.6 oz		80-128	Apply before reaching economic threshold targeting small larvae. Applications to large larvae often result in poor control. Larvae stop feeding within 1-3 days and die within 3-9 days.	0
	chlorantraniliprole Prevathon 0.43	14-20 oz	0.047-0.067	6.4-9.14	Make no more than 4 applications per year.	1

Insect	Insecticide	Formulation/Acre	Lb ai/Acre	Acres/Gallon	Application/Comments	Minimum Days From Last Application to Harvest
Corn Earworm and Tobacco Budworm	**Other Chemistry**					
	flubendiamide Belt 4 SC	 2-3 oz	0.0625-0.0937	42.7-64	DO NOT apply more than 6 oz of Belt per acre per season.	14
	indoxacarb Steward 1.25 SC	 5.6-11.3 oz	0.055-0.11	 11.5-22.8		21
	lambda-cyhalothrin + chlorantraniliprole (**R**) Besiege 1.252	 8.0-10.0 oz	0.08-0.098	 12.8-16	DO NOT graze or feed hay to livestock. DO NOT exceed 20 fl oz per acre per season.	30
	methoxyfenozide + spinetoram Intrepid Edge 3F	 4-6.4	0.094-0.15	 20-32	DO NOT make more than 4 applications per year.	28
	spinosad Blackhawk	 1.67-2.2 oz	0.038-0.05		DO NOT apply more than 8.3 oz of Blackhawk per year. DO NOT feed treated forage to meat or dairy animals.	28
ROOT FEEDER **Grape Colaspis**	chlothianidin NipsIt Inside 5 FS	 1.28 oz/100 lb seed				
	imidacloprid Gaucho 600 Axcess 5 FS Senator 600	 1.6 oz/100 lb seed 1.6 oz/100 lb seed 1.6 oz/100 lb seed			A seed treatment can be beneficial in areas where grape colaspis has historically been a problem.	
	thiamethoxam Cruiser 5 FS Warden CX	 1.28 oz/100 lb seed 3.2 oz/100 lb seed				
POD FEEDERS **Green Stink Bug, Southern Green Stink Bug, Red Shouldered Stink Bug** Treat when an average of 1 stink bug per row foot is found using a shake sheet or 9 stink bugs per 25 sweeps up to R6 growth stage. Double threshold (18 per 25 sweeps) from R6 to R6.5 growth stage and terminate sprays after R6.5, keeping application-to-harvest interval restrictions in mind.	acephate (**R**) Orthene/Acephate 90 S Orthene/Acephate 97 S	 0.56-1.1 lb 0.50-1.0 lb	0.5-1.0		DO NOT apply more than 1.5 lb ai acephate per season.	14
	beta-cyfluthrin (**R**) Baythroid XL 1 EC	 1.6-2.8 oz	0.013-0.022	 45.7-80		21
	bifenthrin (**R**) Brigade 2 EC *(See Generic Insecticides)*	 2.1-6.4 oz	0.033-0.1	 20-61	DO NOT apply more than 0.3 lb ai of Brigade per season. DO NOT apply again for 30 days.	18
	clothianidin Belay 2.13	 3-6 oz	0.05-0.1	 21.3-42.7	DO NOT apply Belay treatments less than 7 days apart. DO NOT apply more than 12 oz per acre.	21
	cyfluthrin (**R**) Tombstone 2 EC *(See Generic Insecticides)*	 1.6-2.8 oz	0.025-0.044	 45.7-80		45
	esfenvalerate (**R**) Asana XL 0.66 EC *(See Generic Insecticides)*	 5.8-9.6 oz	0.03-0.05	 13-22		21

Insect	Insecticide	Formulation/Acre	Lb ai/Acre	Acres/Gallon	Application/Comments	Minimum Days From Last Application to Harvest
POD FEEDERS **Green Stink Bug, Southern Green Stink Bug, Red Shouldered Stink Bug** (cont.) Treat when an average of 1 stink bug per row foot is found using a shake sheet or 9 stink bugs per 25 sweeps up to R6 growth stage. Double threshold (18 per 25 sweeps) from R6 to R6.5 growth stage and terminate sprays after R6.5, keeping application-to-harvest interval restrictions in mind.	gamma-cyhalothrin 1.25 (**R**) Prolex/Declare CS	 1.28-1.54 oz	0.0125-0.015	 83-100		45
	lambda-cyhalothrin (**R**) Warrior II 2.08 CS *(See Generic Insecticides)*	 1.6-1.92 oz	0.025-0.03	 67-80		30
	lambda-cyhalothrin + chlorantraniliprole (**R**) Besiege 1.252	 8.0-10.0 oz	0.08-0.098	 12.8-16	DO NOT graze or feed hay to livestock. DO NOT exceed 20 fl oz per acre per season.	30
	zeta-cypermethrin 0.8 EC (**R**) Mustang Maxx	 3.2-4.0 oz	0.02-0.025	 32-40		21
	zeta-cypermethrin + bifenthrin (**R**) Hero 1.24 EC	 4.0-10.3 oz	0.04-0.1	 12.4-32	DO NOT apply more than 0.4 lb ai of Hero per season. DO NOT apply again for 30 days.	21
Brown Stink Bug Treat when an average of 1 stink bug per row foot is found using a shake sheet or 9 stink bugs per 25 sweeps up to R6 growth stage. Double threshold (18 per 25 sweeps) from R6 to R6.5 growth stage and terminate sprays after R6.5, keepng application-to-harvest interval restrictions in mind.	acephate (**R**) Orthene/Acephate 90 S Orthene/Acephate 97 S	 0.56-1.1 lb 0.5-1.0 lb	0.5-1.0		DO NOT apply more than 1.5 lb ai acephate per season.	14
	bifenthrin (**R**) Brigade 2 EC *(See Generic Insecticides)*	 2.1-6.4 oz	0.033-0.1	 20-61	DO NOT apply more than 0.3 lb ai of Brigade per season. DO NOT apply again for 30 days.	18
	clothianidin Belay 2.13	 4-6 oz	0.05-0.1	 21.3-42.7	DO NOT apply Belay treatments less than 7 days apart. DO NOT apply more than 12 oz per acre.	21
	lambda-cyhalothrin + thiamethoxam (**R**) Endigo ZC 2.06	 4.0-4.5 oz	0.064-0.07	 28.4-32		30
Redbanded Stink Bug Treat when an average of 4 stink bugs per 25 sweeps.	acephate (**R**) Orthene/Acephate 90 S Orthene/Acephate 97 S	 1.1 lb 1.0 lb	1.0		DO NOT apply more than 1.5 lb ai acephate per season. DO NOT tank mix acephate with sodium chlorate. Tank mixing with sodium chlorate may result in explosion of fire.	14
	bifenthrin (**R**) Brigade 2 EC *(See Generic Insecticides)*	 6.4 oz	0.1	 20	DO NOT apply more than 0.3 lb ai of Brigade per season. DO NOT apply again for 30 days.	18
	clothianidin Belay 2.13	 4-6 oz	0.07-0.1	 21.3-32	DO NOT apply Belay treatments less than 7 days apart. DO NOT apply more than 12 oz per acre.	21

Insect	Insecticide	Formulation/Acre	Lb ai/Acre	Acres/Gallon	Application/Comments	Minimum Days From Last Application to Harvest
Redbanded Stink Bug	lambda-cyhalothrin + chlorpyrifos (**R**) Cobalt Advanced	24-38 oz	0.5-0.76	3.4-5.3	DO NOT tank mix Cobalt Advanced with sodium chlorate. Tank mixing with sodium chlorate may result in explosion of fire.	30
	lambda-cyhalothrin + thiamethoxam (**R**) Endigo ZC 2.06	4.0-4.5 oz	0.064-0.07	28.4-32		30
	beta-cyfluthrin + imidacloprid (**R**) Leverage 360	2.8 oz	0.066	45.7		21
	Tank Mix Options With Bifenthrin					
	acephate (**R**) Orthene 97S	0.5 lb	0.5		Tank mix Orthene, Belay or Imidacloprid with 5.12 fl oz of bifenthrin (Brigade 2EC or generic) per acre. Tank mixes have proven to give superior control.	18
	clothianidin Belay 2.13	3 oz	0.05	42.7		21
	imidacloprid (**R**) Imidacloprid 4F Imidacloprid 2F	1.5 oz 3 oz	0.047	85.3 42.7		21 21
Multiple Species	beta-cyfluthrin + imidacloprid (**R**) Leverage 360	2.8 oz	0.066	45.7	For control of multiple pests including but not limited to bollworm, bean leaf beetle, aphids, grasshoppers, threecornered alfalfa hopper, saltmarsh caterpillar, blister beetle, cabbage looper, velvetbean caterpillar, green cloverworm, yellowstriped armyworm, thrips, kudzu bug and stink bugs.	21
	lambda-cyhalothrin + chlorpyrifos (**R**) Cobalt Advanced	6-38 oz	0.012-0.76	3.4-21.3		30
	lambda-cyhalothrin + thiamethoxam (**R**) Endigo ZC 2.06	2.5-4.5 oz	0.04-0.07	28.4-51.2		30
	acetamiprid + bifenthrin (**R**) Justice 1.8 EC	2.5-5.0 oz	0.035-0.07	25.6-51.2	DO NOT apply again for 30 days.	30
	zeta-cypermethrin + bifenthrin + imidacloprid (**R**) Triple Crown 2.25	3.5-4.8 oz	0.061-0.084	33-36.6	DO NOT apply again for 30 days.	21
	lamda-cyhalothrin + chlorantraniliprole (**R**) Besiege 1.252	5.0-10.0 oz	0.049-0.098	12.8-25.6	DO NOT graze or feed hay to livestock. DO NOT exceed 20 fl oz per acre per seaon.	30
	methoxyfenozide + spinetoram Intrepid Edge 3F	4-6.4 oz	0.094-0.15	20-32	DO NOT make more than 4 applications per year.	28