2016
INSECT CONTROL GUIDE
for
Agronomic Crops








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CONTENTS

COTTON INSECT MANAGEMENT

Integrated Pest Management

Successful, economical control of cotton insect pests requires using a variety of control methods instead of only one, such as scheduled insecticide use. This approach to insect control is called integrated pest management, or IPM. Current cotton insect control recommendations are based on the IPM concept.

Insecticides are a key part of cotton IPM, but relying only on insecticides is not possible in Mississippi.

The objective of cotton IPM is to use all available, practical, nonchemical methods of suppressing insect populations; to monitor pest populations closely; and, when scouting indicates that pest populations have exceeded economic thresholds, to integrate insecticides in a way that optimizes crop production and minimizes ecosystem disruption.

Because of the number of insect pests that attack cotton and the relatively high unit value of the crop, cotton IPM is quite complex. Management tactics applied against one pest may be favorable or unfavorable to the development of other pests in the system. Also, treatments applied during one part of the season may affect future pest populations or your ability to control those pests at later points during the season or in the following years. An overall cotton IPM program must consider these types of long-term effects. They greatly influence the ability of Mississippi growers to maintain economical cotton production.

There are many aspects of IPM that must be used to manage cotton insect pests effectively. These include using resistant varieties, managing for early crop maturity, using various cultural practices, managing for insecticide resistance, using economic thresholds, scouting thoroughly, and applying insecticides in a timely manner when needed.

Objective

To produce an early high-yielding crop, follow recommended practices for soil preparation, variety selection, planting dates, use of fungicides and herbicides, and protection from insect and mite damage.

To minimize the impact of pests and pest control costs,

a. Scout fields regularly. Make careful counts of insect pest populations.
b. Use all available, practical noninsecticidal IPM tools.
c. Apply insecticides promptly when needed.
d. Use the most cost-efficient insecticide recommended for the target pest. Apply insecticide during the most susceptible stage of development.
e. Follow recommended guidelines for practicing insecticide-resistance management.

Before deciding to treat and before choosing the insecticide, consider such factors as the potential to intensify secondary pest problems and insecticide resistance.

Warning

Information in this guide is provided for educational and planning purposes only. When using agricultural chemicals, you (the user) are responsible for making sure the intended use complies with current regulations and conforms to the product label. Before applying any insecticide, be sure to get current usage information. Read and follow the product label.

Precautions

Before using a pesticide, read the label carefully. Follow the directions. Pay attention to all precautions on the pesticide container label. Observe all regulations on worker protection and pesticide record-keeping. Store pesticides in plainly labeled containers safely away from livestock, pets, and children. Store pesticides in an area where they will not contaminate food or feed.

Resistance

Research indicates most cotton pests are pesticide-resistant. Some pesticides control pests in one area and not another. Excessive use of pesticides will intensify the problem.

Scouting

Proper scouting is the backbone of an effective cotton insect management program. The goal of any scouting program should be to minimize insecticide use and insect control costs by avoiding unnecessary treatments and by timing required treatments properly. Effective scouting requires spending enough time in the field and taking enough samples to make an accurate decision on whether or not treatment is required. Frequency of scouting is critical. During most of the growing season, scout fields thoroughly every 3 to 4 days. Allow enough time in the scouting schedule to allow more frequent "spot checks" when necessary.

Thresholds

Making insect management decisions based on established treatment thresholds rather than applying treatments based on schedules or presence of pests is a proven method of reducing insect management costs. Effective use of thresholds requires frequent, intensive scouting to get accurate estimates of populations of various pest species that may be present in a field.

The term "treatment threshold" means the pest population level at which treatment must be applied to avoid economic loss that would be greater than the cost of the treatment. Thresholds can vary, depending on species of pest present, stage of crop development, yield potential of the crop, cost of the treatment, market price, populations of other pests present, number of beneficial insects, potential for flaring secondary pests, ability to control secondary pests, and other factors. The thresholds recommended in this guide vary according to pest species and stage of crop development, but fixed thresholds cannot fully consider the many other factors that can influence a treatment decision. Although the thresholds recommended in this guide are generally somewhat conservative (quick to treat), factors such as multiple pest species or unusually low fruit retention could indicate a need to reduce thresholds. Factors like high beneficial insect populations, risk of flaring difficult-to-control secondary pests, high treatment costs, or low price potential could indicate a need to use higher thresholds.

Variety Selection

Available varieties have different levels of susceptibility to certain insect pests. Consider insect resistance/tolerance when selecting seed varieties. Some key traits and their general effect on certain insects are as follows:

Early Maturity — Early maturing, short-season varieties are more likely to escape attack/damage from late-season infestations of budworms/bollworms, tarnished plant bugs, etc.

Smooth Leaf — Aphid and whitefly populations tend to be reduced on smooth leaf varieties. Budworms/bollworms tend to deposit fewer eggs than on hairy varieties. The smooth leaf trait may somewhat favor plant bugs.

Okra Leaf — Varieties with okra leaf trait allow improved canopy penetration of foliar insecticide treatments. This trait also has been associated with resistance to whiteflies.

Nectariless — Plant bug populations tend to be lower on nectariless varieties. Also, the nectariless trait tends to reduce egg production capacity of most moth species because of reduced nectar availability. Populations of beneficial insects that help suppress bollworms/budworms are also generally lower in nectariless cotton.

High Glanding — Varieties with the high glanding trait have additional gossypol glands, increasing resistance to budworms/bollworms.

Bt-transgenic Varieties — Dual gene transgenic varieties (Bollgard II and Widestrike) provide better suppression of bollworms and other caterpillar pests than Bollgard cotton did.

Cultural Practices

Cultural practices can affect populations of specific insect pests. Here are effects of some common cultural practices:

Fall Stalk Destruction — Destroying stalks as soon as possible after harvest helps reduce populations of overwintered boll weevils dramatically.

Fall Tillage — Budworms/bollworms overwinter as pupae 1 to 3 inches deep in the soil. Fall tillage destroys some pupae and disrupts exit tunnels, reducing numbers that emerge from overwintering.

Spring Tillage — Destroying weeds and/or cover crops by tillage or herbicide at least 3 weeks before planting minimizes risk of cutworm problems. Tilling in early spring, before April 15, will also destroy many overwintering tobacco budworm and bollworm pupae.

No-till Planting — No-till planting has both negative and positive effects on cotton insect populations. Fields planted no-till are at greater risk for cutworm infestations. They are much more likely to have stand-threatening infestations of occasional early-season seedling pests, such as grasshoppers, false chinch bugs, and a variety of other pests. Scout fields planted no-till very frequently during the first 3 to 4 weeks after emergence. One of the most significant features of no-till production is the establishment of high populations of fire ants. Fire ants will tend and protect certain sucking pests, such as aphids and three-cornered alfalfa hoppers, causing their numbers to be higher in no-till cotton. But fire ants are also very aggressive predators of the eggs, larvae, and pupae of caterpillar pests. The impact of fire ants on caterpillar populations in no-till cotton can be very significant, and it is not unusual for fire ants and other beneficial insects together to suppress caterpillar pests in both Bt and non-Bt fields that are planted no-till. High numbers of snails and negro bugs often occur in no-till fields, but neither of these species has been observed to cause damage to cotton, even when populations are extremely high.

Plant Stand Density — Excessive plant stand density can result in delayed fruit initiation and delayed maturity, increasing exposure to late-season insects.

Early Maturity — Early-maturing crops are more likely to escape attack/damage from late-season infestations of tobacco budworms, bollworms, armyworms, loopers, and other pests. Cultural practices such as excessive nitrogen use, late irrigation, or excessive stand density can result in delayed maturity and increased exposure to late-season insects.

Insecticide Treatment Termination — End insecticide treatments for tobacco budworms, bollworms, and other pests as soon as crop maturity monitoring indicates the crop is reasonably safe from further damage. This step will reduce insecticide use, control costs, and reduce future insecticide resistance.

Border Vegetation Management — Plant bugs can build up on flowering plants growing around field borders. They may move into cotton fields when the flowering plants are destroyed or begin to dry up. Timely mowing of such areas can help reduce available hosts for plant bugs. Mow before cotton is established. Mowing after these weed hosts begin forming flower buds will only force plant bugs into nearby cotton. Wild geranium is an important spring host of tobacco budworms, and controlling it by mowing or displacing it with a non-host plant may help reduce tobacco budworm populations. Caution: do not spray field borders with insecticides. Such use is not labeled and may worsen pesticide resistance.

Biological Control

Mississippi cotton producers are fortunate to have a wide array of naturally occurring biological control agents that play an important role in managing pest populations. Collectively, these biological control agents are the main method of controlling cotton insect pests in Mississippi. Often the full economic value of these biological agents is not recognized or appreciated. Severe outbreaks resulting in high levels of crop loss or unusually high control costs seldom occur unless natural control has been disrupted. Profitable cotton production would not be possible in Mississippi without the help of these biological control agents. These biological agents include predators such as big-eyed bugs, lady beetles, spiders, and minute pirate bugs; parasites such as Cardiochiles, a wasp that parasitizes tobacco budworms; and diseases such as the Neozygites fungal disease, which helps control aphid outbreaks. To gain the maximum economic benefit from the control provided by these natural control agents, growers need to know which species are beneficial, how to identify these species, which pests they attack, what factors enhance their usefulness, when they are most useful, and when they may not provide effective control.

Predators and Parasites

Predators and parasites can often prevent a pest population from reaching treatable levels, and the control they provide is often cheaper, better, and longer-lasting than that provided by insecticides. Be aware of population levels of naturally occurring predators and parasites and recognize that treatment thresholds can often be increased when predator and population levels are high. Certain cultural practices may favor populations of specific predators. (For example, reduced tillage encourages fire ants.) When insecticide treatment is necessary, choose treatments that have minimal impact on populations of certain beneficial insects but still control the target pest.

Pathogens or Diseases

Most species of insect pests are susceptible to one or more known diseases. In some cases, the impact of the disease is relatively subtle and slows population development. In other cases, the disease is quite dramatic, providing quick, almost total control of a pest population that has neared or exceeded damaging levels. Growers should be especially aware of these latter types of diseases because an outbreak of this type can eliminate the need for any insecticide treatment. Two examples of diseases of this type are the Neozygites fungal disease, which attacks cotton aphid populations, and a similar fungal disease, which attacks loopers.

Eradication

When feasible, eradication of a pest can be a highly effective IPM tool. Eradication is seldom feasible for native pests, but it is sometimes possible to eradicate nonnative pests, such as the boll weevil. Since it invaded the state in the early 1900s, the boll weevil has been considered to be a "key pest" of cotton. This is because the early-season insecticide treatments that had to be applied to control boll weevils also destroyed beneficial insects and caused a flare-up of "secondary pests," such as tobacco budworms and cotton aphids. Eradication of the boll weevil eliminates the yield losses and control costs that are directly caused by boll weevils. Eradication also eliminates yield losses and control costs from secondary pest problems that are caused by boll weevil control efforts.

Currently, all cotton in Mississippi is considered weevil-free. **• Promptly alert eradication personnel of any field detections of live boll weevils or weevil-punctured squares.**

Additional Information

In addition to this publication, several other Extension publications on cotton insect biology and management are available at **www.MSUcares.com** or from your county Extension agent.

Publication 1614—Pests, Thresholds, and the Cotton Plant
Publication 1640—Cotton Insect ID Guide
Publication 2294—The Boll Weevil in Mississippi: Gone but Not Forgotten
Publication 2108—Insect Scouting and Management in Bt-Transgenic Cotton
Publication 2302—Biology and Control of Thrips on Seedling Cotton
Cotton Insect Situation Newsletters (call 662-325-2085 for information)

MSU Cotton Entomology website: **MSUcares.com/insects/cotton**

NOTE: The scientific name of the cotton bollworm, formerly *Heliothis zea*, has been changed to *Helicoverpa zea*. However, in this guide the use of *Heliothis* or *Heliothis spp*. continues to refer to both **cotton bollworms** and **tobacco budworms**.

Insecticide Resistance and Resistance Management

Insecticide resistance is the increased tolerance to a particular insecticide by a pest population to the point the insecticide no longer controls effectively. This definition applies to insecticides delivered through transgenic crops as well as to foliar-applied insecticides.

Resistance develops as a result of repeated or continuous exposure of a pest population to a particular insecticide or class of insecticides. Following an insecticide application, the death rate for susceptible insects is considerably higher than the death rate of resistant insects. The numbers of resistant insects increase, and the resistance genes are passed down to the next generation. If the same insecticide or class of insecticide is used against the next generation of pests, the level of resistance increases even more. At first the number of resistant individuals within a population may be really low — 1 in every 10,000 or more — and the pesticide is very effective. However, if you keep using the same insecticide or class of insecticides, the percent of the population made up of resistant insects increases. As a result, that pesticide or pesticide class becomes less efficient, and field failures begin to occur.

High Cost of Resistance: Resistance is costly to cotton producers because it creates the need to increase insecticide rates, shorten treatment intervals, use expensive mixtures of insecticides, or use more costly alternative insecticides to maintain effective control. Reduced control means lower yield, which further reduces profits. Without effective treatment alternatives, outbreaks of resistant pests can result in disastrous levels of crop destruction.

Resistance Management: Insecticide resistance management is a plan of insecticide use that limits exposure of a pest population to a particular class of insecticide chemistry in order to prolong the useful life of that insecticide or class of insecticides. It is important to note that the goal of resistance management is not necessarily to prevent resistance from ever occurring, but to slow the development of resistance.

To be most effective, resistance management must be started before resistance is evident (while the frequency of resistance genes is very low) rather than after resistance is evident in the field (when the frequency of resistance is high). Because most cotton insects can readily move from farm to farm, resistance management efforts are most effective when all producers in a large geographic area practice them.

With foliar insecticides, selection for resistance may occur whenever an insecticide is used, simply because the pests that survive exposure to the treatment are more likely to be resistant. After an insecticide has been applied, the proportion of the pest population that carries genes for resistance to that insecticide is higher. With foliar insecticides, you can delay resistance by not exposing successive generations of pests to insecticides from the same class. Rotating different classes of insecticides against different generations of pests is an effective resistance management tool because insects resistant to one class of chemistry are often susceptible to insecticides from a different class. This provides immediate benefits in terms of improved control and long-term benefits in terms of reduced selection for resistance.

The risk of resistance developing to transgenic control methods is especially high because the toxicant is present throughout the life of the plant, and any target pests that attack the crop are subjected to selection for resistance. With transgenic crops, resistance can be delayed by limiting the planting of crops that express a particular insecticide and by planting significant acreage of non-transgenic crops close to the transgenic crops. The objective is to let nonresistant insects from the non-transgenic crops interbreed with any resistant insects that survive in the transgenic crop.

In past years cotton growers have had difficulty effectively managing resistance because of the limited availability of effective alternative control tools. Mississippi growers are now very fortunate to have a wide array of tools available to control many of the most damaging pests. These include boll weevil eradication, transgenic Bt cotton, and an impressive array of highly effective foliar-applied insecticides. By effectively using all of these tools and avoiding overuse of any single method of control, Mississippi cotton producers have a greater opportunity than ever before to practice resistance management effectively.

Resistance Management Plan, Caterpillar Pests: Growers can optimize their ability to manage resistance to both Bt cotton and foliar-applied insecticides by observing the following precautions:

1) Continue to support boll weevil eradication maintenance and take advantage of the benefits it offers in managing caterpillar pests. These benefits include increased ability to rely on beneficial insects to suppress populations of caterpillar pests and an overall reduction in the number of foliar insecticide treatments required to control caterpillar pests.
2) Plant the crop in a timely manner (April 15 to May 15 is the optimum planting window). Manage the crop to promote early maturity.
3) Plant fields that historically experience heaviest tobacco budworm infestations to Bt varieties.
4) Scout Bt fields for caterpillar pests and treat promptly with supplemental foliar insecticides if you detect damaging levels of caterpillar pests.
5) When non-Bt fields require treatment for caterpillar pests, rotate use of different classes of foliar insecticides against different generations of pests. Do not use the same insecticide or class of insecticides on successive generations of pests.
6) Stop insecticide applications as soon as the majority of the harvestable crop reaches maturity.

Dual gene Bt Cottons (Bollgard II and Widestrike): Currently, the U.S. Environmental Protection Agency does not require the planting of a non-Bt cotton refuge for plantings of Bollgard II and Widestrike.

Resistance Management Plan, Tarnished Plant Bugs and Cotton Aphids:

1) When choosing insecticides for use at planting or as foliar sprays for early-season thrips control, avoid using products that will be used later to control cotton aphids.
2) When choosing insecticides for use against aphids or plant bugs, avoid making repeated applications of the same insecticide or insecticides from the same class against following generations of pests.

Responding to Control Failures

Key considerations and responses following suspected insecticide failures:

1) Don't panic! Do not automatically assume that the presence of live insects following an insecticide application is the result of an insecticide failure.
2) Examine the possible reasons that unsatisfactory control may have occurred. Control decisions should consider a wide range of variables that influence insecticide efficacy and damage potential: species complex, population density and age structure, application timing, insecticide dosage rate, application methods and carriers, treatment evaluation timing, need for multiple applications, environmental conditions, and **levels of insecticide resistance**.
3) **Under continuous pressure, multiple insecticide applications are required to reduce crop damage. Against high, sustained infestations, multiple close-interval (3 to 5 days) applications of recommended economical treatments are often more effective than applications of expensive mixtures at high rates applied at longer intervals.**
4) Selected combinations of insecticides are recommended to manage tobacco budworms at discrete time periods throughout the growing season. Do not use excessive rates of one or more insecticides in these mixtures. Using more than the recommended rate may not improve control.
5) If a field failure is suspected to be due to insecticide resistance, do not reapply the same insecticide. Change to another class of insecticides or use mixtures of insecticides from different classes.
6) Do not apply insecticides to control tobacco budworms beyond the time the major portion of the crop is resistant to insect damage. Protecting fruit that will not be harvested is not cost-effective and further selects for insecticide resistance.

IMPORTANT: The following cotton insect control recommendations include treatment thresholds, insecticides, and suggested rates for specific pests. The **recommendations are divided into three distinct sections based on stage of plant development** (Emergence to First Square, First Square to First Bloom, and After First Bloom). Because important pests, thresholds, and control recommendations depend on stage of plant development, **be sure you are referring to the proper section when using this guide**.

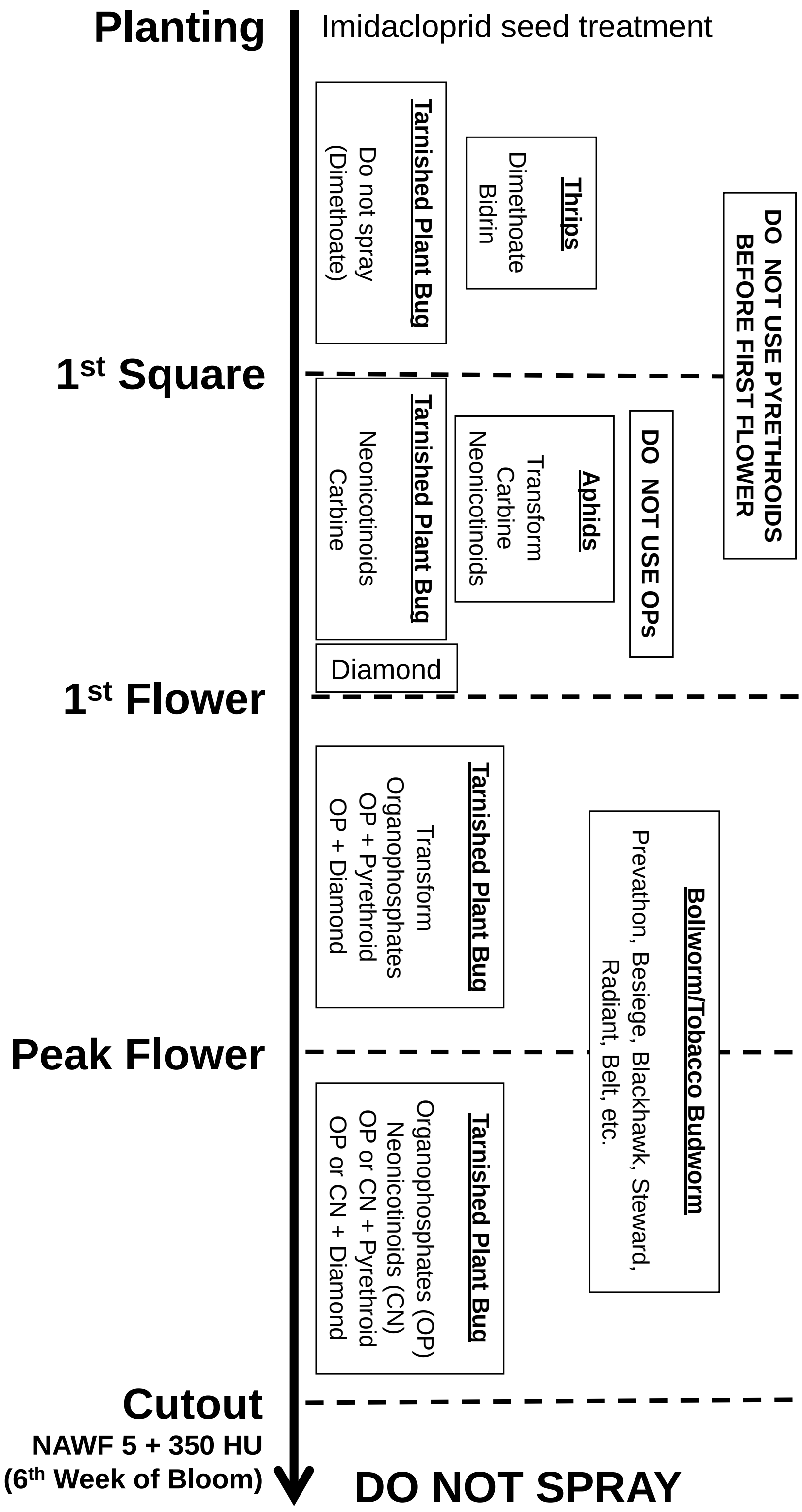
CAUTION: Recommendations of specific insecticides are based on information on the manufacturer's label and performance in a limited number of efficacy trials. Because levels of insecticide resistance, environmental conditions, and methods of application by growers may vary widely, insecticide performance will not always match the safety and pest control standards indicated by experimental data.

Insecticides are listed alphabetically, not in order of their effectiveness. Effectiveness of a particular insecticide can vary greatly from field to field, depending on previous insecticide use, pest species, levels of resistance, and many other factors. Within a group of insecticides recommended for control of a specific pest, there is often considerable variability in cost, effectiveness against the primary target pest, and secondary pests controlled. When selecting insecticides, growers must consider each of these factors as well as the need to rotate among different insecticide classes for resistance management purposes.

Classes of pesticides: Effective resistance management requires rotation among the various classes of available insecticide chemistry. Often when one insecticide in a class fails because of insecticide resistance, other insecticides in the same class will also be ineffective. Selection of an insecticide from a different class will improve the chances of obtaining control. **Growers need to be very aware of the type of insecticide chemistry being used.** Classes of insecticides recommended in this guide are identified by the following abbreviations:

Avermectins – (AV)	Chloro-nicotinyl – (CN)	Organophosphate – (OP)	Pyridine Carboxamide – (PC)
Biologicals – (B)	Insect Growth Regulators – (IGR)	Oxadiazine – (OX)	Spinosyns – (SPN)
Carbamate – (C)	Organochlorine – (OC)	Pyrethroid – (P)	Tetronic Acid – (TA)
Diamides – (D)	METI-Acaricides – (M)	Propargite – (PG)	Fungicide – (F)
Sulfoxiimines – (SX)			

Insecticide Rotation Strategy



Thrips

Insecticide	Amount of Formulation per Acre	Pounds Active Ingredient per Acre	Acres 1 Gallon or 1 Pound Dry Will Treat	Comments
In Furrow				
acephate (OP) Orthene 90S	1.1 lb.	1.0	1	Spray in drill.
aldicarb (C) Temik 15 G	3.5 – 5 lb.	0.53 – 0.75	–	Hill dropped 2 to 4 lb./acre.
imidacloprid (CN) Admire Pro	7.4 – 9.2 oz.	0.26 – 0.33	17 – 14	In-furrow spray directed on or below the seed.
imidacloprid (N) + **fluopyram** (F) Velum Total	14 – 18 oz.	*0.24 – 0.31	9 – 7	*a.i. of imidacloprid in mix.
Seed Treatments				
acephate (OP) Orthene 90S	20 – 32 oz.		–	Per 100 lb. seed depending on seeding rate (Hopper box: 2.5 – 3.5 oz. 90S/Acre).
imidacloprid (CN) Gaucho 600		0.375 mg	–	Per seed. Field tests and lab assays in 2015 indicate possible tolerance building to imidacloprid with tobacco thrips.
Aeris		0.375 mg	–	
Foliar Treatments				
acephate (OP) Orthene 90S	0.22 lb.	0.2	4.5	Pyrethroids and acephate are not recommended for control of thrips. Their use at this time in the season will intensify insecticide resistance problems in tarnished plant bugs and increase the likelihood of flaring spider mites.
dicrotophos (OP) Bidrin 8E	3.2 oz.	0.2	40	Bidrin may only be used before first square and after first bloom.
dimethoate (OP) dimethoate 4EC	6.4 oz.	0.2	20	
spinetoram (SPN) Radiant SC	1.5 – 3 oz.	0.012 – 0.021	85 – 47	Surfactant is recommended with this product.

Cotton plants are most susceptible to injury from **THRIPS** from emergence to the third or fourth leaf stage. Treatment for thrips is seldom necessary on plants that are beyond this stage.

In-furrow insecticides can result in increased susceptibility to seedling diseases. Use a recommended fungicide when using in-furrow insecticide treatments.

These recommendations on in-furrow systemic materials are directed specifically toward insect control. Some in-furrow insecticides, such as aldicarb, also provide nematode control, but most in-furrow insecticides do not control nematodes. See publications about nematode control for information on controlling these non-insect pests. Where Nemacur 15G is used for nematode control, it will suppress thrips.

CAUTION: Several of the systemic thrips insecticides interact with some of the herbicides used on cotton and influence the cotton plants' susceptibility to herbicide injury. For example, the organophosphate insecticides disulfoton (Di-Syston) and phorate (Thimet) are used to "safen" cotton to injury from the herbicide clomazone (Command); however, herbicides containing diuron or fluometuron should not be used on cotton treated with either disulfoton (Di-Syston) or phorate (Thimet) because of the potential for a phytotoxic interaction.

THRESHOLD: Make foliar treatments if thrips numbers reach one per plant on seedling cotton with immatures present.

Cutworms

Insecticide	Amount of Formulation per Acre	Pounds Active Ingredient per Acre	Acres 1 Gallon or 1 Pound Dry Will Treat	Comments
acephate (OP) Orthene 90S	0.88 lb.	0.8 lb.	1.14	
β-cyfluthrin (P) Baythroid XL 1E	0.08 – 1.6 oz.	0.007 – 0.013	160 – 80	
bifenthrin (P) Brigade 2EC Discipline 2EC Fanfare 2EC	 2.6 – 6.4 oz. 2.6 – 6.4 oz. 2.6 – 6.4 oz.	 0.04 – 0.1 0.04 – 0.1 0.04 – 0.1	 49.2 – 20 49.2 – 20 49.2 – 20	
cypermethrin (P) Ammo 2.5EC	1.28 oz.	0.025	100	
deltamethrin (P) Delta Gold 1.5EC	1.1 – 1.6 oz.	0.013 – 0.019	116 – 79	
esfenvalerate (P) Asana XL 0.66EC	5.8 oz.	0.03	22	
gamma-cyhalothrin (P) Declare 1.25	0.77 – 1.02 oz.	0.0075 – 0.01	166 – 125	
λ-cyhalothrin (P) Karate Z 2.08CS	1.28 – 1.96 oz.	0.02 – 0.03	100 – 66.7	
Z-cypermethrin (P) Mustang Max 0.8EC	1.28 – 1.98 oz.	0.008 – 0.012	100 – 64.6	

In no-till or limited-till situations, **CUTWORMS** may become established on existing vegetation and move to emerging cotton seedlings once this vegetation is killed. Risk of cutworm attack can be greatly reduced by destroying all existing vegetation 3 to 4 weeks before planting. Treatment at planting may be warranted in situations where cutworms are already established and vegetation cannot be destroyed 3 to 4 weeks before planting. Pyrethroid insecticides are highly effective against cutworms and can be used in ground treatments applied at planting with limited risk of contributing to increased resistance in tobacco budworms.

Bt Cotton: Bt cotton will not control cutworms.

THRESHOLD: Treat if cutworm infestations threaten to reduce stand below 35,000 plants/acre (3 plants/row foot) in a field or part of a field. Area considered is smallest area a producer will treat. Repeat treatment if needed.

Plant Bugs and Fleahoppers

Insecticide	Amount of Formulation per Acre	Pounds Active Ingredient per Acre	Acres 1 Gallon or 1 Pound Dry Will Treat	Comments
acephate (OP) Orthene 90S	0.55 – 1.1 lb.	0.5 – 1.0	1.8 – 0.9	**Under heavy infestations, use highest labeled rates.** Acephate - Not recommended for control of plant bugs before first bloom. After first bloom: 0.5 – 1.0 lb. ai/A
acetamiprid (CN) Strafer 70WP	3.0 – 3.5 oz.		16 – 7.5	Do not make more than two applications per season.
bifenthrin (P), **abamectin** (AV) Athena	8 – 17 oz	0.13 – 0.15	5.3 – 4.6	
bifenthrin (P) + **imidacloprid** (CN) Brigadier	5.1 – 7.7 oz.		25 – 17	
clothianidin (CN) Belay 2.13	3 – 6 oz.	0.05 – 0.1	43 – 21	
dicrotophos (OP) Bidrin 8E	4 – 8 oz.	0.25 – 0.5	32 – 16	Bidrin may only be used before first square and after first bloom, with a minimum of 14 days between applications.
dicrotophos (OP) + **bifenthrin** (P) Bidrin XPII	8 – 12 oz.		16 – 10	Do not apply prior to bloom.
dimethoate (OP) Dimethoate 4EC	8 – 16 oz.	0.25 – 0.5	16 – 8	
flonicamid (PC) Carbine 50WG	1.7 – 2.8 oz.	0.054 – 0.089	9.4 – 5.7	
imidacloprid (CN) Admire Pro 4.6SC	1.3 – 1.7 oz.	0.047 – 0.062	98 – 75	
imidacloprid (CN) + **β-cyfluthrin** (P) Leverage 360 EC	2.8 – 3.2 oz.		45 – 40	
malathion (OP) Fyfanon ULV 9.9C	11.9 – 15.8 oz.	0.92 – 1.22	10.8 – 8.1	
novaluron (IGR) Diamond 0.83EC	6 – 9 oz.	0.04 – 0.06	21.3 – 14.2	Novaluron (Diamond) acts only on immature plant bugs and should be tank-mixed with a labeled adulticide. Use of Diamond during the third week of squaring or peak migration of adult plant bugs into cotton has shown benefits in protecting yield.
oxamyl (C) Vydate C-LV 3.77	11.2 – 17 oz.	0.33 – 0.5	11.4 – 7.5	
sulfoxaflor (SX) Transform WG	1.5 – 2.25 oz.	0.047 – 0.071	10.7 – 7.1	
thiamethoxam (CN) Centric 40WG	1.5 – 2.5 oz.	0.0375 – 0.0625	10.7 – 6.4	
thiamethoxam (CN) + **λ-cyhalothrin** (P) Endigo ZC	4 – 5.5 oz.		32 – 23	

Organophosphates tank-mixed with pyrethroids have proven to provide effective control of tarnished plant bugs after bloom.

The sweep net is a very effective tool for monitoring adult **PLANT BUG** populations, but the ground cloth is more effective for monitoring nymphs. Thorough scouting requires the use of both the sweep net and ground cloth. Visual scouting is a less reliable method of sampling for plant bugs. Before first bloom, sample fields twice weekly for plant bugs. Treat if populations exceed levels given for the specified growth stage.

Mapping plants to determine percent square retention is an important part of monitoring before first bloom. Plants that are fruiting normally should retain at least 80 percent of the first and second position fruiting sites on the upper five branches. However, there are many factors besides plant bugs that can cause poor square retention. If you notice low square retention or a sudden decline in square retention, intensify sampling for plant bugs to determine if they are the cause. When square retention is lower than 80 percent before first bloom, plant bug thresholds should be lowered accordingly. Note: Research has shown that there is no benefit from maintaining excessively high square retention rates. (Plots with square retention rates in the range of 70 to 85 percent at first bloom often produce slightly higher yields than plots with higher retention rates.) Attempting to maintain excessively high early-season square retention rates through the use of additional insecticide treatments will result in increased costs and increased risks of secondary pest outbreaks.

Avoid automatic/prophylactic-type treatments.

After plants begin to bloom, effective use of the sweep net becomes difficult and more emphasis is placed on drop cloths. When visual scouting, examine randomly selected plant terminals for presence of adults or nymphs, and inside the bracts of squares, blooms, and small bolls for presence of nymphs. **Drop cloths, black in color**, remain very effective for detecting small nymphs throughout the season.

"Dirty blooms," blooms in which many of the anthers are dried and brown, are a sign of established infestations of plant bug nymphs feeding on larger squares. No threshold exists for percent dirty blooms, but if you find them, intensify visual scouting for plant bugs.

Some pyrethroids act against plant bugs and, when applied against budworms/bollworms as the primary target, provide control of low to moderate levels of plant bugs. Do not assume that treatments targeting budworms/bollworms will always provide effective control of plant bugs. Resistance to both pyrethroids and organophosphates has been documented in populations of plant bugs at some locations. Because of insecticide resistance and/or difficulty obtaining adequate coverage in larger cotton, a single application of insecticide may not effectively control heavy established populations of plant bugs.

Plant bug populations are often highest along field borders. This is especially true for field borders next to maturing fields of corn, sorghum, or early-maturing soybeans. In such situations it is often helpful to scout and manage such field borders separately from the remainder of the crop. Such areas may require spot treatments that are not needed on the remainder of the field.

Thresholds: Clouded Plant Bugs: Tarnished plant bug thresholds can be used for clouded plant bugs, but clouded plant bugs should be counted 1.5 times when using sweep net. **Emergence to first square:** Treat if you find one plant-bug-flagged plant and one or more plant bugs per 10 row feet. Multiple applications applied at 4- to 5-day intervals may be required in such cases.

First 2 weeks of squaring: **Drop Cloth:** 1 plant bug/6 row ft **Visual:** 5 bugs/100 terminals **Sweep Net:** 8 bugs/100 sweeps

Third week of squaring through bloom: **Drop Cloth:** 3 bugs/6 row ft **Visual:** 10 bugs/100 plants **Sweep Net:** 15 bugs/100 sweeps
Dirty Squares: 10% dirty squares (medium-sized squares with exposed buds that have been discolored yellow by plant bug feeding)

Bollworms and Budworms

Insecticide	Amount of Formulation per Acre	Pounds Active Ingredient per Acre	Acres 1 Gallon or 1 Pound Dry Will Treat	Comments
Ovicides: **methomyl** (C) Lannate 2.4LV	13.3 oz.	0.25	9.7	Lannate - A minimum of 10 days should elapse between 0.45 lb. methomyl (Lannate) applications. The lower rate of methomyl (0.25-0.33 lb.) may be applied as needed. If reddening of leaves is excessive, stop using the combination or alternate with other insecticides.
Foliar Larvicides: **chlorantraniliprole** (D) Prevathon 0.43	14 – 27 oz.	0.047 – 0.09	9 – 4.7	For Heliothine control (cotton bollworms and/or tobacco budworms), make the first application at rates of .066 – .088 lb. ai per acre. Later applications can be at rates of .044 – .088 lb. ai per acre, depending on pest pressure.
flubendiamide (D) Belt 4SC	2 – 3 oz.	0.0625 – 0.09375	64 – 42.7	Do not apply more than 3 oz. per 5-day interval. Do not apply more than three times per crop season.
indoxacarb (OX) Steward 1.25EC	9.2 – 11.3 oz.	0.09 – 0.11	14 – 11.3	
λ-cyhalothrin (P), **chlorantraniliprole** (D) Besiege	6.5 – 12.5 oz.		20 – 10	21 days PHI.
methomyl (C) Lannate 2.4LV	24 oz.	0.45	5.3	
methoxfenozide (IGR) + **spinetoram** (SPN) Intrepid Edge	4 – 8 oz.		32 – 16	Do not exceed 12 oz. per year.
spinetoram (SPN) Radiant SC	2.8 – 8 oz.	0.022 – 0.0625	46 – 16	
spinosad (SPN) Blackhawk	1.6 – 3.2 oz.	0.036 – 0.072	80 – 40	

Pyrethroid insecticides are not recommended for control of cotton bollworms or tobacco budworms in Mississippi due to widespread resistance and control failures. However, used as an ovicide in Bt cottons, it provides marginal control. See individual product labels for information.

Infestations of **BOLLWORMS AND TOBACCO BUDWORMS** may occur together anytime in the growing season, but these two insects are difficult to distinguish from one another as small larvae. Infestations of small larvae may be mostly bollworms, mostly tobacco budworms, or some combination of the two. Knowing which is the primary species present can greatly influence choice and costs of treatments. Information obtained from moth flushing counts or pheromone trap counts may help you estimate the species composition of an infestation and make treatment choices.

Bt Cotton: Bt-transgenic cotton primarily targets control of tobacco budworms and bollworms and should initially provide good to excellent control of these pests. However, high populations, especially high populations of bollworms, may require treatment in some situations. Bollworms are less susceptible to Bt cotton than are tobacco budworms. Intensify scouting of Bt cotton when high numbers of bollworm moths are present. Scout for larvae in blooms, bolls, and terminal area.

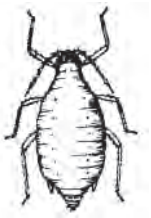
Dual Toxin Bt Cotton: Varieties of Bt cotton that express two Bt toxins are more effective against bollworms than are single toxin Bt cottons. They may still require supplemental treatments because of unusually high insect populations or compromised toxin expression.

CAUTION: Transgenic Bt cotton is available in several varieties. Efficacy of Bt cotton may vary, depending on seed source and variety.

If insecticide resistance is thought to be the cause of a treatment failure, switch to another chemistry immediately. Do not re-treat with a second application of the same class of material.

Thresholds: ***Before bloom:*** Treat when population reaches or exceeds **8 larvae/100 plants**. ***After bloom:*** Treat when counts reach or exceed **4 larvae/100 plants**. ***After cutout:*** Treat when counts reach or exceed **8 larvae/100 plants**. Apply treatments before larvae are a half-inch long.
Bt cotton: Larvae/acre thresholds for Bt cotton are the same as for non-Bt cotton. However, damaged fruit or boll count thresholds are also considered. ***Before bloom:*** Treat when damaged fruit counts exceed 5 percent or the number of larvae about one-eighth inch long exceeds 8 larvae/100 plants. ***After bloom:*** Treat when larvae one-eighth inch long or longer exceed 4 larvae/100 plants (or 8 larvae/100 plants after "cutout"). Regardless of size of larvae, treatment may be warranted if damaged-boll counts exceed 2 percent and significant numbers of larvae are present and continuing to cause damage.

Aphids



Insecticide	Amount of Formulation per Acre	Pounds Active Ingredient per Acre	Acres 1 Gallon or 1 Pound Dry Will Treat	Comments
acetamiprid (CN) Strafer WPS	3.0 – 3.5 oz.	0.13 – 0.15	5.3 – 4.6	Do not make more than two applications per season.
dicrotophos (OP) Bidrin 8E	4.8 – 8 oz.	0.30 – 0.50	26.7 – 16	Aphids may be resistant to dicrotophos in some areas of Mississippi.
flonicamid (PC) Carbine 50WG	1.4 – 2.8 oz.	0.044 – 0.089	11.4 – 5.7	
imidacloprid (CN) Admire Pro 4.6SC	0.9 – 1.7 oz.	0.032 – 0.062	142 – 75	Admire Pro - Two applications of Admire Pro applied at a 7- to 10-day interval may be needed to achieve control of heavy aphid infestations. Admire Pro may not provide adequate control if cotton is under stress from heat, drought, diseases, extreme pest pressure, or when cotton "hardens off" as it begins to mature.
sulfoxaflor (SX) Transform WG	0.75 – 1 oz.	0.023 – 0.031	21.3 – 16	
thiamethoxam (CN) Centric 40WG	2 oz.	0.05	8	There are some areas in Mississippi where aphids may not be controlled with Centric.

In some areas, **APHIDS** may be resistant to some labeled insecticides. The impact of aphids on yield varies greatly, depending on a variety of factors, including number of aphids, duration of infestation, and presence of other stress factors such as drought. In some cases, relatively high populations caused no yield loss. In other cases, research has shown that untreated infestations that peaked as low as 35 aphids per leaf caused yield losses of approximately 45 pounds of lint. Higher yield losses have been recorded from heavier, more prolonged infestations.

Before treating aphids between first square and first bloom, consider ability to obtain control and potential impact on other pest populations, such as the tobacco budworm and beet armyworm.

Efficacy of various recommended chemicals varies by location; therefore, it is advisable to seek current information about what is working locally. (Talk to county Extension agents, Extension specialists, consultants, neighbors, and others.) When selecting aphicides, consider which classes of materials were used on the field earlier during the season, including in-furrow treatments. An aphicide from the least commonly used class may provide best control. Control may be improved by making a second application 4 to 7 days after the initial treatment. Rotating classes of insecticide chemistry used may enhance control.

THRESHOLDS: Consider treatment when spots of high aphid populations are causing heavy localized honeydew accumulation, aphid numbers are increasing over the remainder of the field, and no signs of diseased aphids are present. Under heavy infestations, use highest labeled rates. Important factors to consider before treatment include the following: 1) possibility of a fungal epizootic that will likely occur under high aphid infestation (this usually occurs in early- to mid-July); 2) possibility of control failure with recommended insecticides (control must exceed 80 percent to give benefit); 3) predator and parasite populations that may suppress aphids; 4) presence of additional plant stress factors, such as drought or low plant vigor; 5) need to apply insecticide for control of other pests.

Treatment may be beneficial in avoiding yield reduction when the following conditions exist together: 1) isolated spots occur through the field where heavy aphid infestations cause honeydew-coated plants; 2) aphid numbers are increasing on remaining plants throughout the field; and 3) no indication of aphid fungal disease is present.

When treating aphids, try to get good coverage, particularly to undersides of leaves.

Spider Mites

Insecticide	Amount of Formulation per Acre	Pounds Active Ingredient per Acre	Acres 1 Gallon or 1 Pound Dry Will Treat	Comments
abamectin (AV) Agri-Mek 0.15EC Agri-Mek 0.7SC	10.0 – 16 oz. 2 – 3.5 oz.	0.12 – 0.15 0.12 – 0.15	13 – 5 64 – 37	Resistance reported with abamectin in Mississippi and Louisiana.
bifenthrin (P) Brigade 2EC Discipline 2EC Fanfare 2EC	6.4 oz. 6.4 oz. 6.4 oz.	0.1 0.1 0.1	20 20 20	When using bifenthrin, you'll often need to repeat applications on a 5- to 7- day interval. Bifenthrin has performed more consistently on spider mites mid- to late-season.
bifenthrin (P) + **abamectin** (AV) Athena	8 – 17 oz.		16 – 7.5	
etoxazole (IGR) Zeal 72WSP	0.67 – 1 oz.	0.03 – 0.045	23.88 – 16	
fenpyroximate (M) Portal 0.4EC	12 – 32 oz.	0.4 – 0.1	10 – 4	
propargite (PG) Comite II 6EC	20 – 36 oz.	0.94 – 1.68	6.4 – 3.55	
spiromesifen (TA) Oberon 4SC	3 – 8 oz.	0.94 – 0.25	42.7 – 16	

SPIDER MITE populations often increase during hot and dry conditions. Spider mites often develop around field borders and ditch banks. Henbit and other winter annuals can serve as hosts for spider mites. Removal of winter annuals well in advance of planting may reduce risk of spider mite infestation.

NOTE: If mites are present in the field, applications of acephate and pyrethroids (except bifenthrin) can flare mites when targeting other pests.

*Lower product rates should be used only in early season. Always read the label. Many miticides are restricted to one to two applications per year.

THRESHOLDS: Treatment is essential when 40 to 50 percent or more of plants are infested and populations are increasing.

Loopers

Insecticide	Amount of Formulation per Acre	Pounds Active Ingredient per Acre	Acres 1 Gallon or 1 Pound Dry Will Treat	Comments
chlorantraniliprole (D) Prevathon 0.43	14 – 27 oz.	0.047 – 0.09	9 – 4.7	Labeled as suppression only for soybean loopers.
flubendiamide (D) Belt 4SC	2 – 3 oz.	0.06 – 0.09	42.6 – 64	Do not apply more than 3 oz. per 5-day interval. Do not apply more than three times per crop season.
indoxacarb (OX) Steward 1.25EC	9.22 – 11.26 oz.	0.09 – 0.11	13.88 – 11.37	
λ-cyhalothrin (P), **chlorantraniliprole** (D) Besiege	10 – 12.5 oz.		12 – 10	21 days PHI.
methoxyfenozide (IGR) Intrepid 2F	4 – 10 oz.	0.0625 – 0.16	32 – 12.8	
methoxyfenozide (IGR) **+ spinetoram** (SPN) Intrepid Edge	6 – 8 oz.		21 – 16	Do not exceed 12 oz. per year.
spinosad (SPN) Blackhawk	2.4 – 3.2 oz.	0.054 – 0.072	32 – 12.8	

Two species of **LOOPERS** (cabbage loopers and soybean loopers) occur in cotton. These insects differ in their susceptibility to insecticides and diseases.

DualToxin Bt Cotton: Varieties of Bt cotton that express two Bt toxins are considerably more effective against loopers than are single-toxin Bt cottons. They may still require supplemental treatments because of unusually high insect populations or compromised toxin expression.

Threshold: Treat only when populations threaten premature defoliation.

Beet Armyworms

Insecticide	Amount of Formulation per Acre	Pounds Active Ingredient per Acre	Acres 1 Gallon or 1 Pound Dry Will Treat	Comments
chlorantraniliprole (D) Prevathon 0.43SC	14 – 27 oz.	0.047 – 0.09	9 – 4.7	
flubendiamide (D) Belt 4SC	2 oz.	0.0625	64	
indoxacarb (OX) Steward 1.25EC	9.22 – 11.26 oz.	0.09 – 0.11	13.88 – 11.37	
λ-cyhalothrin (P), **chlorantraniliprole** (D) Besiege	6.5 – 12.5 oz.		20 – 10	21 days PHI.
methoxyfenozide (IGR) Intrepid 2F	4 – 10 oz.	0.0625 – 0.16	32 – 12.8	
methoxyfenozide (IGR) **+ spinetoram** (SPN) Intrepid Edge	4 – 8 oz.		32- – 16	Do not exceed 12 oz. per year.
spinosad (SPN) Blackhawk	2.4 – 3.2 oz.	0.054 – 0.072	53 – 40	

Production of an early crop and preservation of beneficial insects are the most important factors in reducing risks of **BEET ARMYWORM** (BAW) outbreaks. Certain organophosphate and pyrethroid insecticides are particularly damaging to the beneficial insects that help control BAW. Prior to bloom, use short residual organophosphates and other nonpyrethroid materials only when necessary to control other pests. Reserve use of pyrethroids until midseason in order to help minimize reliance on organophosphates at this time. Established populations of BAW can be difficult and expensive to control. Late-season foliage-feeders cause less damage than do midseason fruit-feeders. Cotton nearing maturity can tolerate relatively higher populations without losing yield. When treating BAW, multiple, close-interval applications (3 to 5 days) may be needed against high populations. Apply treatments against hatching to one-fourth inch long larvae. Maximize coverage to undersides of leaves. Increasing spray volume and pressure may improve control when treating by ground.

Threshold: During early to mid-season, if beneficial insect numbers are low and risk factors favorable to development of BAW outbreaks are present, initiate treatment at two to five "hits" (egg masses and/or clusters of small larvae) per 100 feet of row. Treatment thresholds vary greatly depending on time of year and stage of crop when BAW outbreaks occur, plant parts being attacked, and presence or absence of other predisposing factors.

Fall Armyworms

Insecticide	Amount of Formulation per Acre	Pounds Active Ingredient per Acre	Acres 1 Gallon or 1 Pound Dry Will Treat	Comments
acephate (OP) Orthene 90S	1.1 lb.	1.0	0.9	Some pyrethroids may help suppress fall armyworms when applied against newly hatched larvae.
chlorantraniliprole (D) Prevathon 0.43SC	14 – 27 oz.	0.047 – 0.09	9 – 4.7	The growth regulator diflubenzuron (Dimilin) may also be useful in suppressing developing fall armyworm populations (use rate is 0.0625-0.125 lb. ai/a).
flubendiamide (D) Belt 4SC	2 oz.	0.0625	64	
indoxacarb (OX) Steward 1.25EC	9.22 – 11.26 oz.	0.09 – 0.11	13.88 – 11.37	**Do not** apply more than 3 oz. per 5-day interval. **Do not** apply more than three times per crop season.
λ-cyhalothrin (P), **chlorantraniliprole** (D) Besiege	6.5 – 12.5 oz.		20 – 10	21 days PHI.
methomyl (C) Lannate 2.4LV	24 oz.	0.45	5.33	A minimum of 10 days should elapse between 0.45 lb. methomyl (Lannate) applications. The lower rate of methomyl (0.25 – 0.33 lb.) may be applied as needed. If reddening of leaves is excessive, stop using the combination or alternate with other insecticides.
methoxyfenozide (IGR) Intrepid 2F	6 – 10 oz.	0.09 – 0.16	21.3 – 12.8	
methoxyfenozide (IGR) **+ spinetoram** (SPN) Intrepid Edge	4 – 8 oz.		32 – 16	Do not exceed 12 oz. per year.
novaluron (IGR) Diamond 0.83EC	6 – 9 oz.	0.04 – 0.08	21.3 – 14.2	
spinosad (SPN) Blackhawk	2.4 – 3.2 oz.	0.054 – 0.072	53 – 40	

Dual Toxin Bt Cotton: Varieties of Bt cotton that express two Bt toxins are considerably more effective against fall armyworms than are single-toxin Bt cottons but may still require supplemental treatments because of unusually high insect populations or compromised toxin expression.

THRESHOLD: Treat when you find four or more worms per 100 blooms and/or bolls. Time applications against young larvae and maximize coverage deep within the plant canopy by increasing spray volume and pressure.

Banded-winged Whiteflies

Insecticide	Amount of Formulation per Acre	Pounds Active Ingredient per Acre	Acres 1 Gallon or 1 Pound Dry Will Treat	Comments
acephate (OP) Orthene 90S	0.56 – 1.1 lb.	0.5 – 1.0	1.8 – 0.9	Large populations can reduce yield and affect quality. Thorough coverage of foliage is necessary for adequate control. Whiteflies can be difficult to control and can rebound quickly following treatment. Two to three applications at approximately 5-day intervals are usually necessary to control heavy infestations.
spiromesifen (TA) Oberon 4SC	2 – 8 oz.	0.94 – 0.25	42.7 – 16	
thiamethoxam (CN) Centric 40WG	2 – 2.5 oz.	0.05 – 0.0625	8 – 6.4	

THRESHOLD: Apply control when 50 percent or more of the terminals are infested with adults.

Silver Leaf Whiteflies

Insecticide	Amount of Formulation per Acre	Pounds Active Ingredient per Acre	Acres 1 Gallon or 1 Pound Dry Will Treat	Comments
acetamiprid (CN) Strafer 70WPS	3.0 – 3.5 oz.	0.075 – 0.1	5 – 4.6	Begin applications prior to nymphal development.
pyriproxyfen formulation (IGR) Knack 0.86	8.04 – 9.97 oz.	0.054 – 0.067	15.92 – 12.84	When using non-IGR type treatments, you must make repeated applications at 5-day intervals.

Infestations of **SILVER WHITEFLIES** are uncommon but are most likely to occur on cotton grown close to nursery crops or greenhouses. Heavy, prolonged infestations can cause substantial yield loss. This insect is difficult and costly to control.

THRESHOLD: Apply control when 50 percent or more of the terminals are infested with adults.

Stink Bugs

Insecticide	Amount of Formulation per Acre	Pounds Active Ingredient per Acre	Acres 1 Gallon or 1 Pound Dry Will Treat	Comments
acephate (OP) Orthene 90S	0.83 – 1.1 lb.	0.75 – 1.0	1.2 – 0.9	
β-cyfluthrin (P) Baythroid XL1E	1.6 – 2.62 oz.	0.0125 – 0.0205	80 – 49.2	
bifenthrin (P) Brigade 2EC Discipline 2EC Fanfare 2EC	3.84 – 6.4 oz. 3.84 – 6.4 oz. 3.84 – 6.4 oz.	0.06 – 0.10 0.06 – 0.10 0.06 – 0.10	33.7 – 20 33.7 – 20 33.7 – 20	
bifenthrin (P) + **abamectin** (AV) Athena	8 – 17 oz.		16 – 7.5	
bifenthrin (P) + **imidacloprid** (CN) Brigadier	5.1 – 7.7 oz.		25 – 16.6	
bifenthrin (P) + **Z-cypermethrin** (P) Hero 1.24	5.2 – 10.3 oz.		24.6 – 12.4	
dicrotophos (OP) Bidrin 8E	6.4 – 8 oz.	0.4 – 0.5	20 – 16	Bidrin may only be used before first square and after first bloom, with a minimum of 14 days between applications.
dicrotophos (OP) + **bifenthrin** (P) Bidrin XPII	8 – 17 oz.		16 – 7.5	Do not apply prior to bloom.
gamma-cyhalothrin (P) Declare 1.25EC	1.28 – 2.05 oz.	0.0125 – 0.02	100 – 62.4	
imidacloprid (CN) + **β-cyfluthrin** (P) Leverage 360EC	2.8 – 3.2 oz.		45 – 40	
λ-cyhalothrin (P) Karate Z 2.08CS	1.54 – 1.85 oz.	0.025 – 0.03	83.2 – 69.3	
λ-cyhalothrin (P), **chlorantraniliprole** (D) Besiege	6.5 – 12.5 oz.		20 – 10	
thiamethoxam (CN) + **λ-cyhalothrin** (P) Endigo ZC	4 – 5.5 oz.		32 – 23.3	
Z-cypermethrin (P) Mustang Max 0.8EC	2.64 – 3.6 oz.	0.0165 – 0.0225	49.2 – 35.6	

Pyrethroid insecticides are less effective against brown stink bug species.

STINK BUGS usually appear in late season but sometimes occur earlier. These insects feed on squares, blooms, and bolls, but most damage is concentrated on young bolls. High numbers of stink bugs can develop in crops such as corn, sorghum, or early maturing soybeans and then migrate into nearby cotton during late season. Intensify scouting for stink bugs when nearby alternative hosts begin to mature. Scout for stink bugs by randomly pulling and cracking soft, quarter-sized bolls and checking for internal signs of stink bug feeding injury (stained lint, pierced areas or warts on internal boll walls, or damaged seed).

CAUTION: Spined soldier bugs are beneficial stink bugs that sometimes occur in high numbers in fields infested with caterpillar pests. These beneficial insects are often mistaken for brown stink bugs. Be sure of species identification before treating. Stink bugs are difficult to detect. Supplement by scouting for damaged bolls.

Bt Cotton: Stink bugs and clouded plant bugs are more likely to occur in Bt cotton because of the reduction in mid- to late-season treatments targeting budworms/bollworms. Intensify scouting for these pests in Bt cotton.

THRESHOLDS: ***Visual:*** **Average of five or more adults and/or nymphs (one-fourth inch or greater) per 100 plants.** ***Ground Cloth:*** **Average of one bug per 6 feet of row (one-fourth inch or greater)**. ***Damaged Bolls:*** **Treat when 15 to 20 percent or more of the soft, quarter-sized bolls show internal signs of stink bug feeding (damaged seed, stained lint, pierced areas or warts on internal boll walls) and stink bugs are present.**

Boll Weevils

Contact boll weevil eradication personnel immediately to report any fields where you find live boll weevils or squares with boll weevil oviposition punctures!

Terminating Insecticide Applications

In a normal, healthy crop, "cutout" is the point when Node Above White Flower averages 5 (NAWF = 5). In other words, cutout is the point when terminal growth slows to the point that the first position white flower is at the fifth node below the first "unfurled" leaf in the terminal. An unfurled leaf is about the size of a quarter. Sample at least ten plants per site from four representative sites per field to determine average NAWF. Begin monitoring NAWF at weekly intervals shortly after first bloom.

Shift to twice weekly monitoring as NAWF counts begin to decline toward five. Begin monitoring daily heat unit (DD60s) accumulation on the day the crop reaches NAWF = 5.

Recent research has shown that growth and development in a normal, healthy crop are such that the last population of bolls that will effectively contribute to yield will be represented by those white blooms that are present at cutout (when the crop reaches NAWF = 5). Research has also shown that when these bolls accumulate 350 to 400 heat units (HU), or DD60s, they have a low probability of sustaining economic damage **from tarnished plant bugs (nymphs or adults) or from budworm/bollworm larvae that emerge after this point**. Therefore, control of tarnished plant bugs and budworms/bollworms can generally be terminated at **NAWF = 5 + 350-400 HU (DD60s)**. Note, however, that threshold populations of larvae hatching before this point in the development of the crop should be controlled. Also note that this guideline for terminating insecticide treatments applies primarily to bollworms and tobacco budworms and tarnished plant bugs.

Control of **stinkbugs** can be terminated at **NAWF = 5 + 450 HU**.

Control of **fall armyworms** can be terminated at **NAWF = 5 + 500-550 HU**.

Leaves help bolls mature, so protect the crop from excessive defoliation from pests such as loopers beyond the point of NAWF = 5 + 350 - 400 HUs.

NOTE: This technique for deciding when to end cotton insect control has not been tested under all weather and crop conditions, especially where early stress or insect damage results in poor square set or any other condition that causes late maturity. Growers and consultants must monitor crop maturity and insect populations carefully **on a field by field basis** and use all available information on crop development and status to decide when to end insecticide treatments. Ask your Extension entomologist or county Extension agent for more about how to use this technique.

Supplemental Information

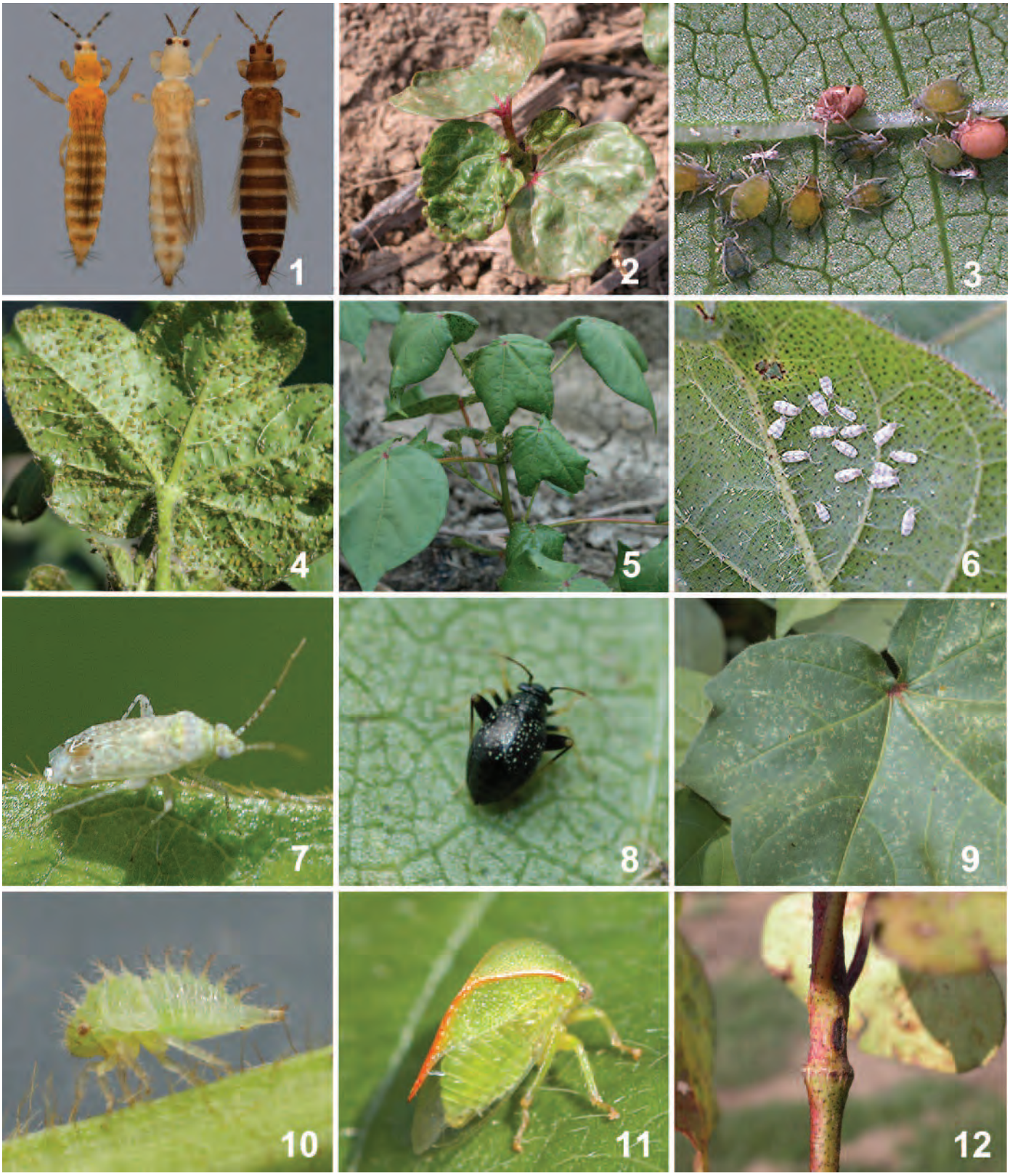
Estimating plants/acre, squares/acre, bolls/acre, etc:

An acre of land is 43,560 square feet. If the crop is planted on 40-inch row centers, there are about 13,070 linear row feet on an acre. If crop is planted on 38-inch row centers, there are about 13,760 linear row feet on an acre. The following technique for estimating numbers of plants (and others) per acre involves making total counts on about 1/1,000 of an acre. Choose four 40-inch lengths of row from four different locations in the field. Count all plants, etc., on these 40-inch units. Add together the individual counts and multiply by 1,000. This gives an estimate of the number of plants, squares, etc., per acre.

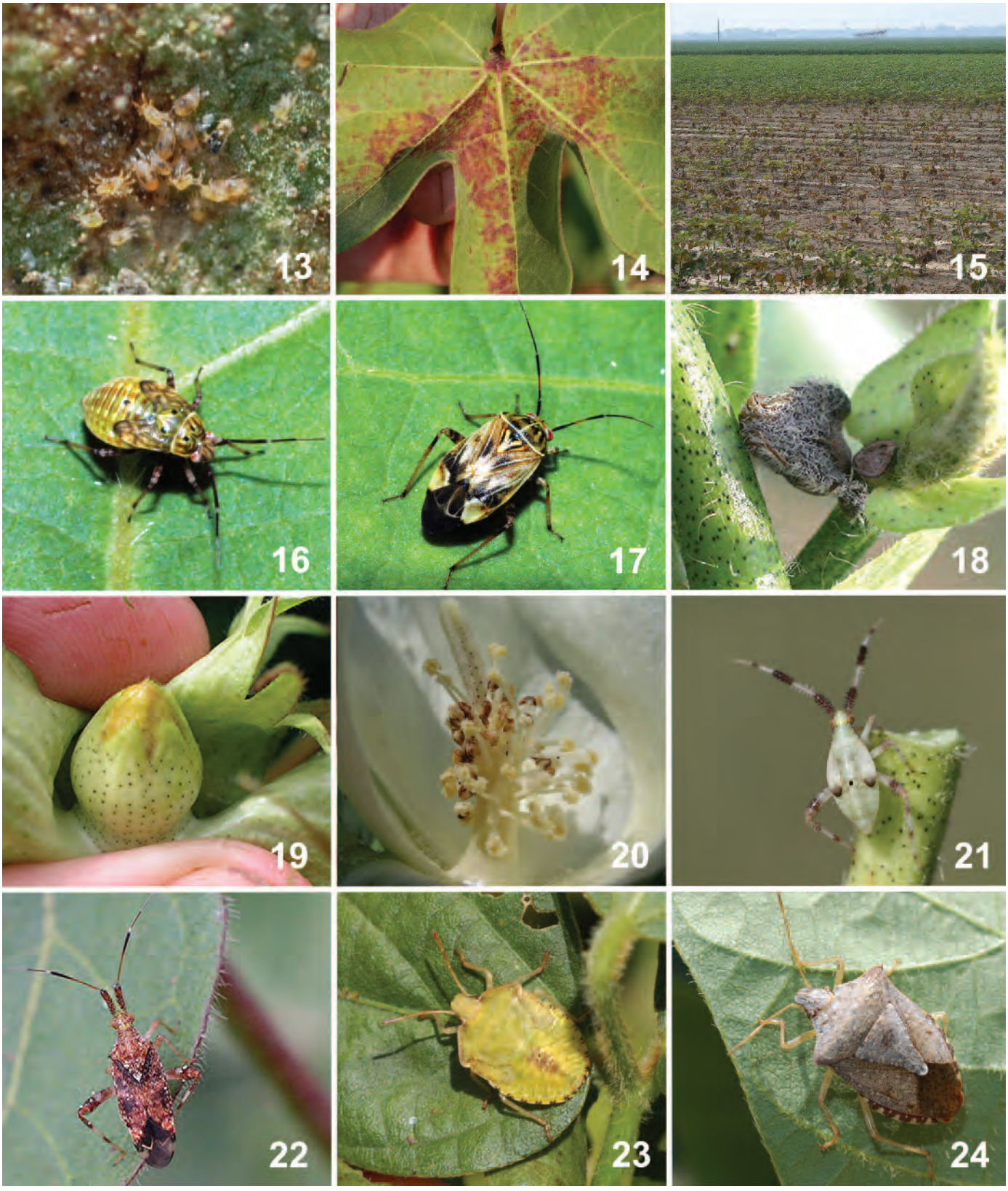
Insect pests to expect at different stages of plant development:

Based on historical data, the following pests could be expected at different stages of plant development. This is a generalized statement; your conditions may be different.

Stage of Plant Development	Major Pests	Occasional Pests
emergence to fourth true leaf	thrips	aphids, cutworms, armyworms, saltmarsh caterpillars, grasshoppers, spider mites
fourth true leaf to first square	none	plant bugs, spider mites, aphids, armyworms, saltmarsh caterpillars, grasshoppers
first square to first bloom	bollworms, plant bugs, tobacco budworms	spider mites, aphids, fleahoppers, armyworms
after first bloom	bollworms, tobacco budworms	aphids, whiteflies, plant bugs, beet armyworms, loopers, spider mites, fall armyworms, stink bugs

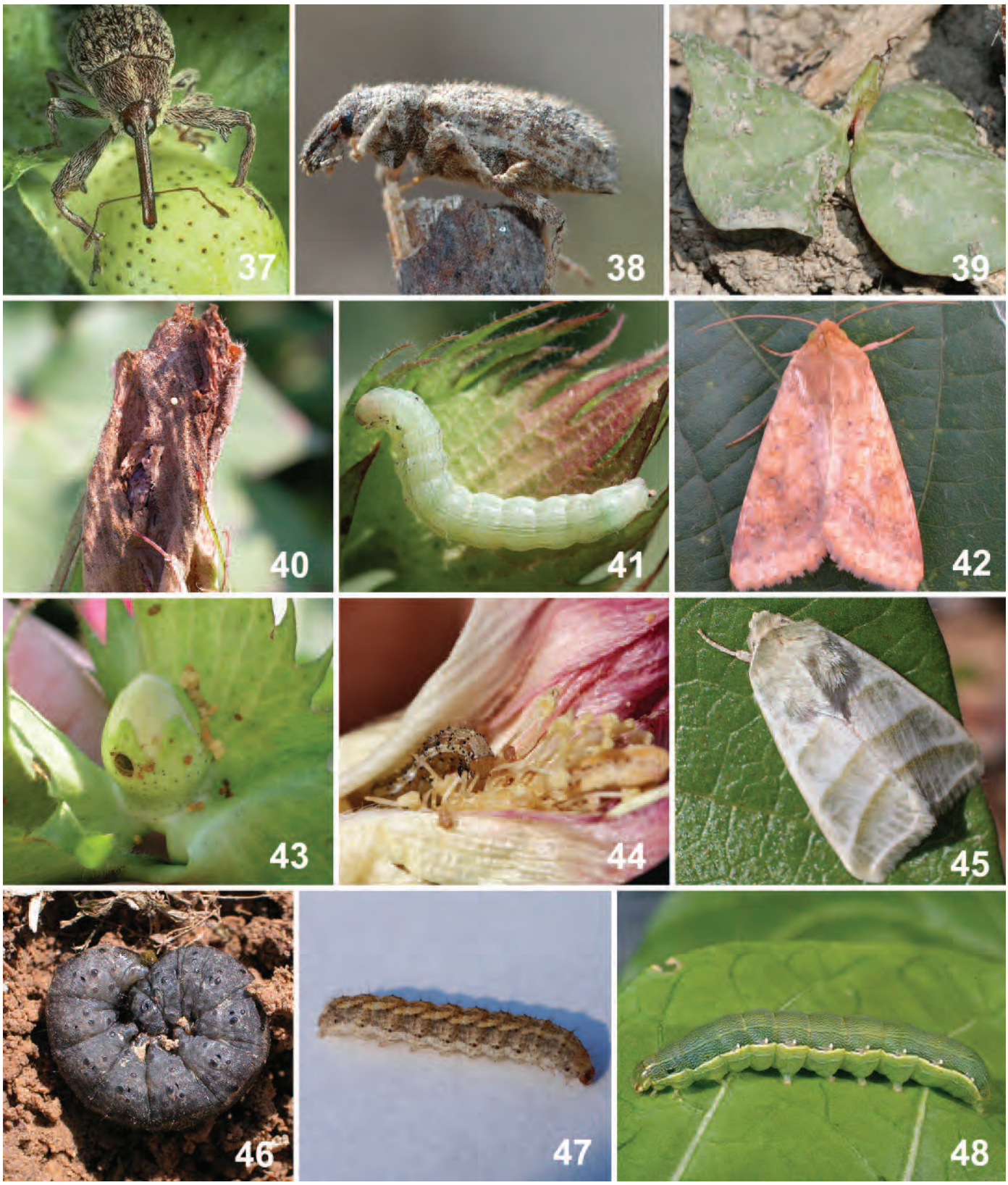


Figures 1-12. From left, eastern, western, and tobacco thrips (1), thrips injury (2), cotton aphid (3), cotton aphid infestation (4), cotton aphid damage (5), bandedwinged whitefly (6), cotton fleahopper (7), garden fleahopper (8), garden fleahopper damage (9), threecornered alfalfa hopper nymph (10), threecornered alfalfa hopper adult (11), threecornered alfalfa hopper damage(12).

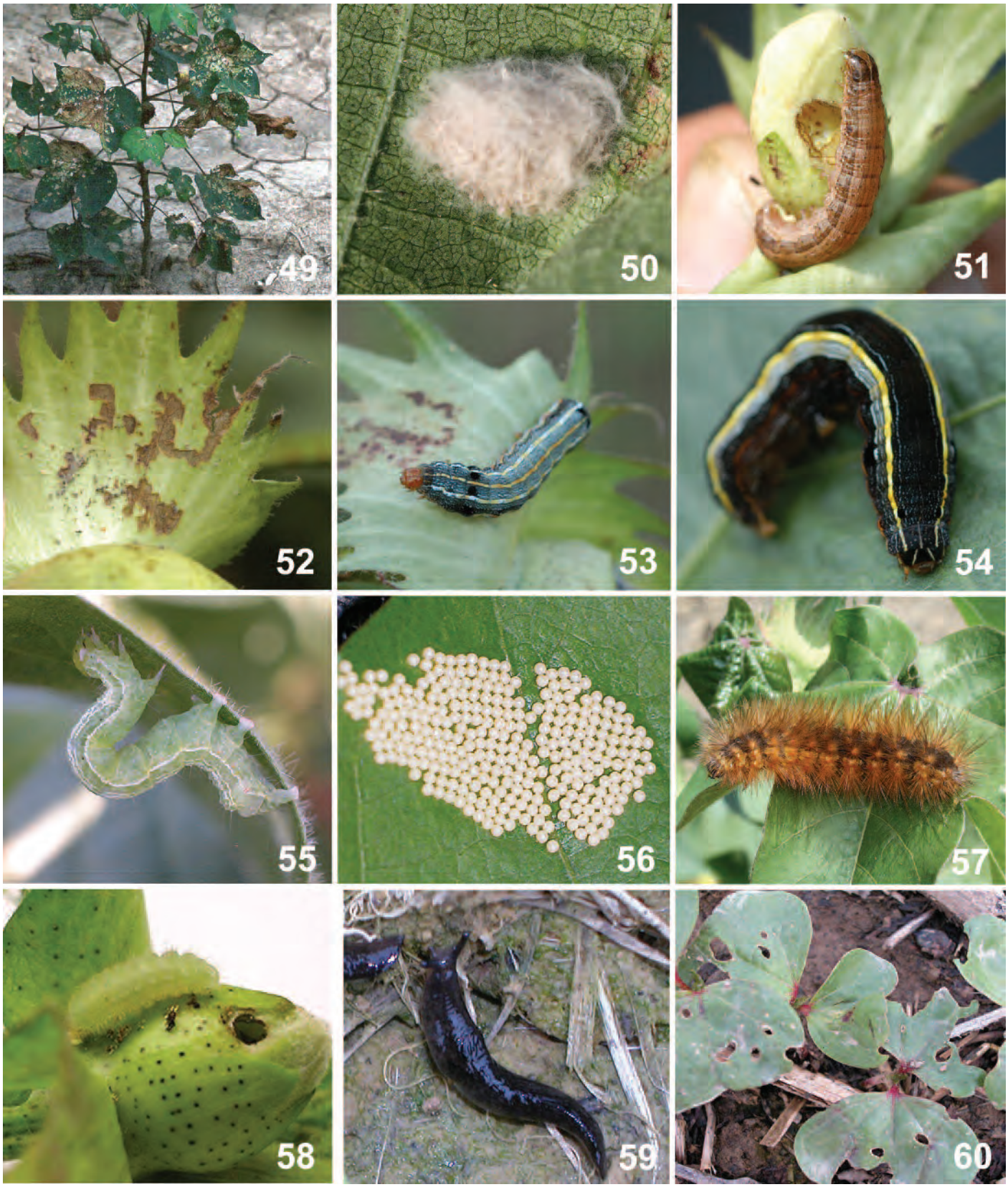


Figures 13-24. Twospotted spider mites (13), twospotted spider mite leaf damage (14), twospotted spider mite severe damage in field (15), tarnished plant bug nymph (16), tarnished plant bug adult (17), tarnished plant bug "blasted square" (18), tarnished plant bug dirty square (19), tarnished plant bug dirty bloom (20), clouded plant bug nymph (21), clouded plant bug adult (22), brown stink bug nymph (23), brown stink bug adult (24).

Figures 25-36. Green stink bug nymph (25), green stink bug adult (26), southern green stink bug nymph (27), southern green stink bug adult (28), stink bug egg mass hatching (29), stink bug external boll damage (30), stink bug internal boll damage (31), leaf footed bug (32), false chinch bug (33), false chinch bug wilting cotton plant (34), flea beetle (35), flea beetle damage (36).



Figures 37-48. Boll weevil (37), vegetable weevil (38), vegetable weevil damage (39), bollworm egg on bloom tag (40), bollworm larva (41), bollworm moth (42), bollworm damaged square (43), bollworm in pink bloom (44), tobacco budworm moth (45), black cutworm larva (46), granulate cutworm larva (47), beet armyworm (48).



Figures 49-60. Beet armyworm damage (49), armyworm egg mass (50), fall armyworm on square (51), fall armyworm bract etching (52), southern armyworm larva (53), yellowstriped armyworm larva (54), soybean looper larva (55), saltmarsh caterpillar egg mass (56), saltmarsh caterpillar larva (57), cotton square borer larva (58), slug (59), slug damage (60).

Variety Selection/Cultural Practices

Currently available varieties of soybeans differ in growth characteristics and the time required for maturity. Variety characteristics can affect susceptibility to insect injury. For example, early-maturing varieties are less likely to be seriously damaged by soybean loopers or velvetbean caterpillars because they often mature before late-season generations of the pests occur. Also, varieties with little pubescence (hairs) on the undersides of leaves are susceptible to potato leafhopper infestations.

Maturity differences can be used to manage some insect pests. For example, planting about 5 percent of the soybean acreage in an area 10 to 14 days earlier than the remainder of the crop will concentrate overwintering bean leaf beetles into these earlier plantings. The early-planted soybeans serve as a trap crop for the adults, and a relatively small amount of insecticide can then be used to prevent their spread into later-planted soybeans. If early-maturing varieties are planted as the trap crop, they will also act as a trap crop for stink bugs during pod development.

Soybeans that do not have a closed canopy at the time of bloom, as often occurs in late plantings and wider row spacings, are more susceptible to bollworm infestations. No-till soybeans are at greater risk to cutworm damage than conventionally tilled soybeans.

The performance of many soybean varieties is tested every year in Mississippi at several locations. The information is published annually as a Mississippi Agricultural & Forestry Experiment Station (MAFES) Information Bulletin – Soybean Variety Trials.

Biological Control

Diseases – In mid- to late-season, naturally occurring diseases (fungi, bacteria, and viruses) of soybean insect pests can be important in control. A full leaf canopy, along with certain environmental conditions, apparently produces a microclimate favorable for insect disease development. Diseases often control armyworms, velvetbean caterpillars, green cloverworms, and soybean loopers. After diseased larvae have died, they may have a whitish mold-like growth covering their body surface, a black coloration with their bodies filled with fluid, or a near normal appearance (depending on the disease).

The presence of diseased worms indicates the population is being reduced naturally. When you find diseased larvae, withhold treatment for a few days to see if the disease will spread to a level that can control the population.

Predators and Parasites – Beneficial predators and parasites are very important in reducing the number of early-season insect pests. For this reason you should protect them to have their full benefit. Predators and parasites can often keep pests from reaching treatable levels. Some early-season insecticide applications to soybeans can severely reduce predators and parasites. Regular scouting of fields is essential in detecting insect pests as well as beneficials.

Sampling for Soybean Insects

To minimize yield loss from insect pests attacking soybeans, you should sample fields at least once per week from emergence through maturity. There are several ways to sample soybeans for insect pests. The ground cloth and the sweep net are the two primary tools. Information you get by using either one of these sampling methods should be supplemented by visual examinations of plants for damage or insects.

Ground cloth – The ground cloth is the most accurate method for sampling insect pests in soybeans. A ground cloth is made of heavy white cloth 3 feet long on each side with a half-inch to three-fourths inch dowel rod attached to each side. To use the ground cloth, you unroll it flat between two rows, then bend the plants on either side over the cloth, and shake them vigorously. The dislodged insects fall onto the cloth, where you can easily count them. You should count any insect that has fallen at the base of the plant to the soil surface. This gives the number of insects per 6 feet of row (3 feet on each side of the cloth). Dividing by 6 gives the number of insects per foot of row.

Most soybean producers in Mississippi have changed their production practice from wide-row to narrow-row or drilled soybeans. Soybeans planted on narrow rows are difficult to sample using a ground cloth. In narrow-row soybeans, a sweep net is the preferred method for sampling.

Sweep net – A sweep net is a heavy cloth or canvas net on a strong 15-inch diameter steel hoop attached to a 3-foot wooden handle. To use it, you walk parallel to a row and swing the net briskly through the top third of the foliage. Each pass of the net through the foliage counts as one sweep and should be made 2½ to 3 feet apart down the row. Be sure to hold the net at an angle that lets dislodged insects fall into the net bag, and pass the net completely through the row. In soybeans planted on 36-inch rows or wider, sweep only one row. In narrow-row soybeans, let the normal arch of a sweep continue through the adjacent row. Then count insects as they are picked or fly from the net. Counts are usually expressed as number per 25 or 100 sweeps.

When to Apply Insecticides for Stem Feeders

The three most common stem-feeding pests are lesser cornstalk borers, cutworms, and three-cornered alfalfa hoppers. Apply insecticide from plant emergence to 10 inches in height when plant stand is being reduced below recommended plant populations. Use Table 1 on page 33 to determine best plant populations for soybeans grown in Mississippi.

Classes of insecticides: Effective resistance management requires rotation among the various classes of available insecticide chemistry. Often when one insecticide in a class fails because of insecticide resistance, other insecticides in the same class will also be ineffective. Selection of an insecticide from a different class will improve the chances of obtaining control. **Growers need to be very aware of the type of insecticide chemistry being used.** Classes of insecticides recommended in this guide are identified by the following abbreviations:

Avermectins – (AV)	Chloro-nicotinyl – (CN)	Organophosphate – (OP)	Pyridine Carboxamide – (PC)
Biologicals – (B)	Insect Growth Regulators – (IGR)	Oxadiazine – (OX)	Spinosyns – (SPN)
Carbamate – (C)	Organochlorine – (OC)	Pyrethroid – (P)	Tetronic Acid – (TA)
Diamides – (D)	METI-Acaricides – (M)		

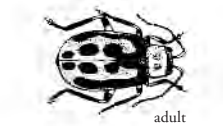
When to Apply Insecticides for Foliage Feeders

Soybean plants can withstand as much as 35 percent foliage loss up to the blooming period. During blooming and when pods begin to form and fill out, any foliage loss of more than 20 percent will decrease yield. After the soybeans are mature and pods have fully expanded, a 35 percent loss of foliage will not usually reduce yield. Once fruiting begins, the soybean plant does not add new leaves, although existing leaves may expand. If plants are near the fruiting stage, don't let more foliage be removed if that will cause total defoliation to be more than 20 percent in pod-set or pod-filling.

It requires four or more foliage-feeding larvae one-half inch long or longer per foot of row to cause 20 percent defoliation. It requires eight or more foliage-feeding larvae one-half inch long or longer per foot of row to cause 35 percent defoliation. Apply insecticides when larval populations are at or above the number required to cause defoliation levels listed for the developmental stage of the plants. Apply insecticide if these defoliation levels have already occurred and larvae are still present.

Often several species of foliage-feeding caterpillars will be in a field at the same time. When several species of foliage-feeding caterpillars are present, treatment is necessary if any combination of foliage-feeding caterpillars meets or exceeds the threshold. Foliage-feeding caterpillars such as loopers, velvetbean caterpillars, and green cloverworms consume roughly the same amount of foliage per caterpillar regardless of species. However, the sweep net conversion ratio is about two times higher for velvetbean caterpillars and green cloverworms than for loopers because they are dislodged from the plant easier than loopers, making the catch efficiency of the sweep net greater for these two pests. Because of this, for a complex of foliage-feeding caterpillars, use a threshold of 300 caterpillars/100 sweeps before bloom, counting each looper twice, and 150 caterpillars/100 sweeps after bloom, counting each looper twice.

Bean Leaf Beetles



adult

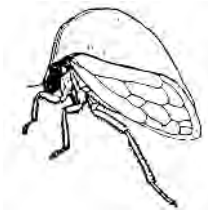
larva

Insecticide	Amount of Formulation per Acre	Pounds Active Ingredient per Acre	Acres 1 Gallon or 1 Pound Dry Will Treat	Comments
acephate (OP)				
Orthene 90S	0.83 – 1.1 lb.	0.75 – 1.0	1.2 – 0.9	Do not harvest for hay or forage. Do not apply within 14 days of harvest. Apply by air at 5-10 GPA and by ground at 10-50 GPA. Maximum AI per acre per season: 1.5 lb.
β-cyfluthrin (P)				
Baythroid XL 1EC	1.6 – 2.8 oz.	0.0125 – 0.22	80 – 45.5	Extremely toxic to fish and aquatic invertebrates. Do not feed green forage within 15 days of harvest. Preharvest interval: 45 days. Maximum AI per acre per season: 0.0875 lb. REI: 12 hours.
bifenthrin (P)				
Brigade 2EC	2.1 – 6.4 oz.	0.033 – 0.10	61 – 20	Do not apply more than one time per 30 day interval.
Discipline 2EC	2.1 – 6.4 oz.	0.033 – 0.10	61 – 20	Do not apply within 18 days of harvest.
bifenthrin (P), **imidacloprid** (CN)				
Brigadier	3.8 – 6.1 oz.		37 – 21	
bifenthrin (P), **Z-cypermethrin** (P)				
Hero 1.24EC	3.8 – 6.1		33 – 21	
carbaryl (C)				Toxic to bees and aquatic invertebrates. Preharvest intervals: 21 days for grain, 14 days for grazing. Maximum AI per acre per season: 6 lb.
Sevin XLR 4L	16 – 32 oz.	0.5 – 1.0	8 – 4	
Sevin 4F	16 – 32 oz.	0.5 – 1.0	8 – 4	Toxic to bees. Pre-harvest interval for grazing: 21 days. Maximum AI per acre per season: 6 lb.
chlorantranilipole (D), **λ-cyhalothrin** (P)				
Besiege	7 – 9 oz.		18 – 14	
esfenvalerate (P)				
Asana XL 0.66EC	5.8 –9.6 oz.	0.03 – 0.05	22 – 13	Do not feed or graze livestock on treated plants. Do not apply within 21 days of harvest. Maximum AI per acre per season: 0.2 lb. REI: 12 hours.
gamma-cyhalothrin (P)				
Declare 1.25EC	0.77 – 1.28 oz.	0.0075 – 0.0125	166.7 – 100	Do not graze or harvest treated soybean forage, straw, or hay for livestock feed. Do not apply within 45 days of harvest. Maximum AI per acre per season: 0.06 lb.
imidacloprid (CN), **β-cyfluthrin** (P)				
Leverage 360	2.85 oz.		45	
λ-cyhalothrin (P)				
Karate Z 2.08CS	0.96 –1.6 oz.	0.015 – 0.025	138 – 83	Do not graze or harvest treated soybean forage, straw, or hay for livestock feed. Do not apply within 45 days of harvest. Maximum AI per acre per season: 0.03 lb.
permethrin (P)				
Ambush 2EC	6.4 oz.	0.1	20	Toxic to fish and aquatic organisms. Do not graze or feed soybean forage to livestock. Preharvest interval: 60 days. Maximum AI per acre per season: 0.4 lb.
Pounce 3.2EC	4 oz.	0.1	32	
thiamethoxam (CN), **λ-cyhalothrin** (P)				
Endigo ZC	3.5 – 4.5 oz.		37 – 28	
Z-cypermethrin (P)				
Mustang Max 0.8EC	2.8 – 4 oz.	0.0175 – 0.025	45.7 – 32	Toxic to aquatic invertebrates. Postharvest interval is 21 days. Maximum AI per acre per season: 0.125 lb.

The **BEAN LEAF BEETLE** adult is about one-fourth inch long and may have three or four pairs of black spots along the inner edge of each wing cover. The outer margin of the wing cover may be banded in black. The color patterns of the adult can vary, but typically they are reddish to yellowish. The adult beetle damages the plant by chewing holes in the leaves and occasionally feeding on stems and pods. Adults spend the winter in or near old bean fields. In the spring, they feed on weeds and are attracted to early-planted soybeans. Adults lay eggs in the soil where newly emerged larvae feed on soybean roots and nitrogen-fixing nodules. The immature stage of the beetle is a slender, white larva about one-half inch long with a dark brown area at each end. CruiserMaxx and Gaucho 600 insecticide seed treatments provide good control approximatley 3 to 4 weeks after planting. **In the Delta region of Mississippi, we have documented pyrethroid resistance in bean leaf beetle populations. Rotate classes of chemistry whenever possible.**

THRESHOLD: If plants are not blooming or filling pods and beetles are present, treat when defoliation reaches 35 percent. If plants are blooming and filling pods and beetles are present, treat when defoliation reaches 20 percent or if 50 percent of the plants have pod feeding prior to R6. Insecticide termination for bean leaf beetle is R6 + 7 days (R6.5).

Three-Cornered Alfalfa Hoppers



Insecticide	Amount of Formulation per Acre	Pounds Active Ingredient per Acre	Acres 1 Gallon or 1 Pound Dry Will Treat	Comments
acephate (OP) Orthene 90S	0.83 – 1.1 lb.	0.75 – 1.0	1.2 – 0.9	Do not harvest for hay or forage. Do not apply within 14 days of harvest. Apply by air at 5-10 GPA and by ground at 10-50 GPA. Maximum AI per acre per season: 1.5 lb.
β–cyfluthrin (P) Baythroid XL 1EC	1.6 – 2.8 oz.	0.0125 – 0.022	80 – 45.5	Extremely toxic to fish and aquatic invertebrates. Do not feed green forage within 15 days of harvest. Preharvest interval: 45 days. Maximum AI per acre per season: 0.0875 lb. REI: 12 hours.
bifenthrin (P), **imidacloprid** (CN) Brigadier	3.8 – 6.1 oz.		37 – 21	
bifenthrin (P), **Z-cypermethrin** (P) Hero 1.24EC	3.8 – 6.1 oz.		33 – 21	
chlorantranilipole (D), **λ-cyhalothrin** (P) Besiege	7 – 9 oz.		18 – 14	
dimethoate (OP) Dimethoate 4EC	16 oz.	0.5	8	Preharvest interval: 21 days.
esfenvalerate (P) Asana XL 0.66EC	5.8 – 9.6 oz.	0.03 – 0.05	22 – 13	Do not feed or graze livestock on treated plants. Do not apply within 21 days of harvest. Maximum AI per acre per season: 0.2 lb. REI: 12 hours.
gamma-cyhalothrin (P) Declare 1.25 EC	0.77 – 1.28 oz.	0.0075 – 0.0125	166.7 – 100	Do not graze or harvest treated soybean forage, straw, or hay for livestock feed. Do not apply within 45 days of harvest. Maximum AI per acre per season: 0.03 lb.
imidacloprid (CN), **β-cyfluthrin** (P) Leverage 360	2.85 oz.		45	
λ-cyhalothrin (P) Karate Z 2.08CS	0.96 – 1.6 oz.	0.015 – 0.025	138 – 83	Do not graze or harvest treated soybean forage, straw, or hay for livestock feed. Do not apply within 45 days of harvest. Maximum AI per acre per season: 0.06 lb.
thiamethoxam (CN), **λ-cyhalothrin** (P) Endigo ZC	3.5 – 4.5 oz.		37 – 28	
Z-cypermethrin (P) Mustang Max 0.8EC	2.8 – 4 oz.	0.0175 – 0.025	45 – 32	Toxic to aquatic invertebrates. Postharvest interval is 21 days. Maximum AI per acre per season: 0.125 lb.

The **THREE-CORNERED ALFALFA HOPPER** is a green triangular-shaped insect about one-fourth inch long. Young hoppers or nymphs are green to light brown, wingless, and covered with spines. They feed around the stem of young plants, girdling the stem near the soil surface. Young seedling plants may lodge from the girdling. When bean pods are set, maturing plants may break over from early seedling damage. Both adults and nymphs will also feed on the petioles of leaves, blooms, and pods. Pod petiole feeding will cause pods to drop to the ground, reducing yield. Soybean plants are most susceptible to main stem girdling when plants are 10 inches or less in height. Once the plant is taller than 10 inches, the main stem is not the preferred feeding site, but the leaf, bloom, and pod petioles may be fed upon. **NOTE:** Often plants that have been girdled and do not lodge will produce normal yields. CruiserMaxx and Gaucho 600 insecticide seed treatments provide good control approximatley 3 to 4 weeks after planting.

THRESHOLD: Plants less than 10 inches tall, treat when plant stand is being reduced below recommended plant population. See Table 1 on page 33. Plants less than 6 inches tall, examine near the soil level for girdling. Bend the plants over, and look for hoppers. Threshold is 50 insects per 25 sweeps when plants are more than 10 inches tall. Insecticide termination for three cornered alfalfa hoppers is when soybeans reach R6.

Cutworms

Insecticide	Amount of Formulation per Acre	Pounds Active Ingredient per Acre	Acres 1 Gallon or 1 Pound Dry Will Treat	Comments
β-cyfluthrin (P) Baythroid XL 1EC	0.8 – 1.6 oz.	0.0065 – 0.0125	154 – 80	Extremely toxic to fish and aquatic invertebrates. Do not feed green forage within 15 days of harvest. Preharvest interval: 45 days. Maximum AI per acre per season: 0.0875 lb. REI: 12 hours.
bifenthrin (P) Brigade 2EC Discipline 2EC	 2.1 – 6.4 oz. 2.1 – 6.4 oz.	 0.033 – 0.10 0.033 – 0.10	 61 – 20 61 – 20	Do not apply more than one time per 30-day interval. Do not apply within 18 days of harvest.
esfenvalerate (P) Asana XL 0.66EC	5.8 – 9.6 oz.	0.03 – 0.05	22 – 13	Do not feed or graze livestock on treated plants. Do not apply within 21 days of harvest. Maximum AI per acre per season: 0.2 lb. REI: 12 hours.
gamma-cyhalothrin (P) Declare 1.25 EC	0.77 – 1.28 oz.	0.0075 – 0.0125	166.7 – 100	Do not graze or harvest treated soybean forage, straw, or hay for livestock feed. Do not apply within 45 days of harvest. Maximum AI per acre per season: 0.03 lb.
λ-cyhalothrin (P) Karate Z 2.08CS Warrior 1EC	0.96 –1.6 oz. 1.92 – 3.2 oz.	0.015 – 0.025 0.015 – 0.025	138 – 83 66.7 – 40	Do not graze or harvest treated soybean forage, straw, or hay for livestock feed. Do not apply within 45 days of harvest. Maximum AI per acre per season: 0.06 lb.
permethrin (P) Pounce 3.2EC Ambush 2EC	 4 oz. 6.4 oz.	 0.1 0.1	 32 20	Toxic to fish and aquatic organisms. Do not graze or feed soybean forage to livestock. Preharvest interval: 60 days. Maximum AI per acre per season: 0.4 lb.
Z-cypermethrin (P) Mustang Max 0.8EC	1.28 – 4 oz.	0.008 – 0.025	100 – 32	Toxic to aquatic invertebrates. Postharvest interval is 21 days. Maximum AI per acre per season: 0.125 lb.

CUTWORMS are rare pests of soybeans. Cutworms damage young soybean seedlings by cutting the plants off at the soil surface. Cutworms are about 1½ inches long when full grown. They hide under debris or clods during the hot part of the day. Cutworms are most active around dusk and dawn. They are often associated with grassy areas in the field. Burndown herbicides should be applied 2 to 3 weeks before planting. This will allow time for larvae already present feeding on winter vegetation to starve before soybean plants emerge.

THRESHOLD: Treat when plant stand is being reduced below the recommended plant population. See Table 1 on page 33. For best results, treat early in the morning or late in the evening when cutworms are active.

Grasshoppers

Insecticide	Amount of Formulation per Acre	Pounds Active Ingredient per Acre	Acres 1 Gallon or 1 Pound Dry Will Treat	Comments
acephate (OP) Orthene 90S	0.28 – 0.56 lb.	0.25 – 0.5	3.6 – 1.8	Do not harvest for hay or forage. Do not apply within 14 days of harvest. Apply by air at 5-10 GPA and by ground at 10-50 GPA. Maximum AI per acre per season: 1.5 lb.
β-cyfluthrin (P) Baythroid XL 1EC	2.0 – 2.8 oz.	0.0155 – 0.022	60 – 45.5	Extremely toxic to fish and aquatic invertebrates. Do not feed green forage within 15 days of harvest. Preharvest interval: 45 days. Maximum AI per acre per season: 0.0875 lb. REI: 12 hours.
bifenthrin (P) Brigade 2EC Discipline 2EC	 2.1 – 6.4 oz. 2.1 – 6.4 oz.	 0.033 – 0.10 0.033 – 0.10	 61 – 20 61 – 20	Do not apply more than one time per 30-day interval. Do not apply within 18 days of harvest.
diflubenzuron (IGR) Dimilin 2L	2 oz.	0.031	64	Apply Dimilin when most of the infesting grasshoppers have reached the second to third nymphal stage. Dimilin will not control adult grasshoppers. Check label for additional comments.
dimethoate (OP) Dimethoate 4EC	16 oz.	0.5	8	Preharvest interval: 21 days
esfenvalerate (P) Asana XL 0.66EC	5.8 – 9.6 oz.	0.03 – 0.05	22 – 13	Do not feed or graze livestock on treated plants. Do not apply within 21 days of harvest. Maximum AI per acre per season: 0.2 lb. REI: 12 hours.
gamma-cyhalothrin (P) Declare 1.25EC	1.28 – 1.54 oz.	.0125 – .015	100 – 83	Do not graze or harvest treated soybean forage, straw, or hay for livestock feed. Do not apply within 45 days of harvest. Maximum AI per acre per season: 0.03 lb.
λ-cyhalothrin (P) Karate Z 2.08CS	1.6 – 1.92 oz.	0.025 – 0.03	83 – 69	Do not graze or harvest treated soybean forage, straw, or hay for livestock feed. Do not apply within 45 days of harvest. Maximum AI per acre per season: 0.06 lb.
Z-cypermethrin (P) Mustang Max 0.8EC	3.2 – 4 oz.	0.02 – 0.025	40 – 32	Toxic to aquatic invertebrates. Postharvest interval is 21 days. Maximum AI per acre per season: 0.125 lb.

The two most common species of **GRASSHOPPERS** attacking soybeans in Mississippi are the redlegged and the differential grasshopper. Grasshoppers are mainly foliage feeders but will feed on pods. Females lay eggs in a cemented pod below the soil surface most often in grassy, undisturbed sites such as roadsides, prairies, field borders, or ditch banks. Nymphs go through five or six instars, depending on the species. Nymphs and adults are damaging. You can tell the difference between grasshopper nymphs and adults by the presence of wing pads (not fully developed wings). Weather is the most important factor influencing population densities. Grasshoppers are more numerous following drought, especially when it lasts for several years in a row. Populations usually build around field borders before spreading into the field.

THRESHOLD: If plants are not blooming or filling pods and grasshoppers are present, treat when defoliation reaches 35 percent. If plants are blooming and filling pods and grasshoppers are present, treat when defoliation reaches 20 percent or if 50 percent of the plants have pod feeding prior to R6. Insecticide termination for grasshoppers is R6 + 7 days (R6.5).

***Mow ditch before crop development to prevent grasshoppers from moving into the crop.**

Green Cloverworms

Insecticide	Amount of Formulation per Acre	Pounds Active Ingredient per Acre	Acres 1 Gallon or 1 Pound Dry Will Treat	Comments
acephate (OP) Orthene 90S	0.83 – 1.1 lb.	0.75 – 1.0	1.2 – 0.9	Do not harvest for hay or forage. Do not apply within 14 days of harvest. Apply by air at 5-10 GPA and by ground at 10-50 GPA. Maximum AI per acre per season: 1.5 lb.
β-cyfluthrin (P) Baythroid XL 1EC	0.8 – 1.6 oz.	0.0065 – 0.0125	154 – 80	Extremely toxic to fish and aquatic invertebrates. Do not feed green forage within 15 days of harvest. Preharvest interval: 45 days. Maximum AI per acre per season: 0.0875 lb. REI: 12 hours.
bifenthrin (P) Brigade 2EC Discipline 2EC	2.1 – 6.4 oz. 2.1 – 6.4 oz.	0.033 – 0.10 0.033 – 0.10	61 – 20 61 – 20	Do not apply more than one time per 30 day interval. Do not apply within 18 days of harvest.
bifenthrin (P), **imidacloprid** (CN) Brigadier	3.8 – 6.1 oz.		37 – 21	
bifenthrin (P), **Z-cypermethrin** (P) Hero 1.24EC	3.8 – 6.1 oz.		33 – 21	
carbaryl (C) Sevin XLR 4L Sevin 4F	16 – 32 oz. 16 – 32 oz.	0.5 – 1.0 0.5 – 1.0	8 – 4 8 – 4	Toxic to bees and aquatic invertebrates. Preharvest intervals: 21 days for grain, 14 days for grazing. Maximum AI per acre per season: 6 lb. Toxic to bees. Pre-harvest interval for grazing: 21 days. Maximum AI per acre per season: 6 lb.
chlorantraniliprole (D) Prevathon 0.43SC	14 – 20 oz.	0.047 – 0.067	9 – 6.4	Preharvest interval is 1 day. Adjuvants such as methylated seed oil (MSO) may be added for improved coverage.
chlorantranilipole (D), **λ-cyhalothrin** (P) Besiege	7 – 9 oz.		18 – 14	
diflubenzuron (IGR) Dimilin 2L	2 – 4 oz.	0.031 – 0.0625	64 – 32	Apply Dimilin when larvae are small (<0.5 inch) to give greater control and minimize insect damage to leaves. Consult label for more details.
esfenvalerate (P) Asana XL 0.66EC	2.9 – 5.8 oz.	0.015 – 0.03	44 – 22	Do not feed or graze livestock on treated plants. Do not apply within 21 days of harvest. Maximum AI per acre per season: 0.2 lb. REI: 12 hours.
flubendiamide (D) Belt 4SC	2 – 3 oz.	0.0625 – 0.094	64 – 43	
gamma-cyhalothrin (P) Declare 1.25 EC	0.77 – 1.28 oz.	0.0075 – 0.0125	166.7 – 100	Do not graze or harvest treated soybean forage, straw, or hay for livestock feed. Do not apply within 45 days of harvest. Maximum AI per acre per season: 0.03 lb.
imidacloprid (CN), **β-cyfluthrin** (P) Leverage 360	2.85 oz.		45	
indoxacarb (OX) Steward 1.25EC	5.6 – 11.3 oz.	0.055 – 0.11	22.8 – 11.5	Toxic to fish, birds, and aquatic invertebrates. Do not feed or graze livestock on treated fields. Postharvest interval: 21 days. Maximum AI per acre per season: 0.44 lb.
λ-cyhalothrin (P) Karate Z 2.08EC	0.96 – 1.6 oz.	0.015 – 0.025	138 – 83	Do not graze or harvest treated soybean forage, straw, or hay for livestock feed. Do not apply within 45 days of harvest. Maximum AI per acre per season: 0.06 lb.
methomyl (C) Lannate 2.4LV	12 – 24 oz.	0.225 – 0.45	10.6 – 5.3	Toxic to fish, aquatic invertebrates, bees and wildlife. Do not graze forage within 3 days and hay within 12 days of last application. Do not apply within 14 days of harvest. Maximum AI per acre per season: 1.35 lb.
methoxyfenozide (IGR) Intrepid 2F	4 – 8 oz.	0.06 – 0.12	32 – 16	Drift and runoff may be toxic to sensitive aquatic vertebrates. Do not apply by air within 150 feet or by ground within 25 feet of surface water. Preharvest interval: 14 days for seed; 7 days for hay or forage. Maximum AI per acre per season: 1 lb. (or 4 applications per acre per season). REI: 4 hours.
methoxyfenozide (IGR), **spinetoram** (SPN) Intrepid Edge	4 – 6.4 oz.		32 – 20	
permethrin (P) Ambush 2 EC Pounce 3.2 EC	6.4 oz. 4 oz.	0.1 0.1	20 32	Toxic to fish and aquatic organisms. Do not graze or feed soybean forage to livestock. Preharvest interval: 60 days. Maximum AI per acre per season: 0.4 lb.
spinetoram (SPN) Radiant 1SC	2 – 4 oz	0.016 – 0.031	64 – 32	Preharvest interval is 28 days.
spinosad (SPN) Blackhawk	1.1 – 2.2 oz.	0.025 – 0.05	116 – 58	Toxic to bees and mollusks. Do not feed treated forage or hay to beef or dairy cattle. Preharvest treatment interval: 28 days. Maximum AI per acre per season: 0.186 lb. REI: 4 hours.
thiamethoxam (CN), **λ-cyhalothrin** (P) Endigo ZC	3.5 – 4.5 oz.		37 – 28	
Z-cypermethrin (P) Mustang Max 0.8EC	2.8 – 4 oz.	0.0175 – 0.025	45.7 – 32	Toxic to aquatic invertebrates. Postharvest interval is 21 days. Maximum AI per acre per season: 0.125 lb.

The **GREEN CLOVERWORM** feeds on soybean foliage. This pest is uniformly pale green with white stripes running along the sides. Green cloverworms have the same looping motion as the soybean looper and look similar, but the body is not tapered toward the head. An identifying characteristic of the green cloverworm is that it has three pairs of abdominal prolegs. When disturbed, this insect becomes very active. It is attacked by a number of predators, parasites, and diseases and rarely requires chemical treatment.

THRESHOLD: IF NO DISEASED WORMS ARE PRESENT

Drop cloth threshold: Prior to bloom, apply insecticide when eight or more worms a half-inch or longer are present per row foot. If plants are blooming and filling pods, apply insecticide when four or more worms a half-inch or longer are present per row foot.
Sweep net threshold: Prior to bloom, treat when 75 worms a half-inch or longer per 25 sweeps are present. After bloom, treat when 38 worms a half-inch or longer per 25 sweeps are present.
Defoliation threshold: Treat when 35 percent foliage loss has occurred and worms a half-inch or longer are present prior to bloom or when 20 percent foliage loss has occurred and worms a half-inch or longer are present after bloom.
Insecticide termination: Terminate insecticide applications for green cloverworms at R6 + 7 days (R6.5).

Soybean Loopers

Insecticide	Amount of Formulation per Acre	Pounds Active Ingredient per Acre	Acres 1 Gallon or 1 Pound Dry Will Treat	Comments
chlorantraniliprole (D) Prevathon 0.43SC	14 – 20 oz.	0.047 – 0.067	9 – 6.4	Preharvest interval is 1 day. Adjuvants such as methylated seed oil (MSO) may be added for improved coverage.
chlorantranilipole (D), **λ-cyhalothrin** (P) Besiege	10 – 12.8 oz.		18 – 14	
flubendiamide (D) Belt 4SC	2 – 3 oz.	0.0625 – 0.094	64 – 43	
indoxacarb (OX) Steward 1.25EC	5.6 – 11.3 oz.	0.055 – 0.11	22.8 – 11.5	Toxic to fish, birds, and aquatic invertebrates. Do not feed or graze livestock on treated fields. Postharvest interval: 21 days. Maximum AI per acre per season: 0.44 lb.
methoxyfenozide (IGR) Intrepid 2F	4 – 8 oz.	0.06 – 0.12	32 – 16	Drift and runoff may be toxic to sensitive aquatic vertebrates. Do not apply by air within 150 feet or by ground within 25 feet of surface water. Preharvest interval: 14 days for seed; 7 days for hay or forage. Maximum AI per acre per season: 1 lb. (or 4 applications per acre per season). REI: 4 hours.
methoxyfenozide (IGR), **spinetoram** (SPN) Intrepid Edge	4 – 6.4 oz.		32 – 20	
spinetoram (SPN) Radiant 1SC	2 – 4 oz.	0.016 – 0.031	64 – 32	Preharvest interval is 28 days.
spinosad (SPN) Blackhawk	1.1 – 2.2 oz.	0.025 – 0.05	116 – 58	Toxic to bees and mollusks. Do not feed treated forage or hay to beef or dairy cattle. Preharvest treatment interval: 28 days. Maximum AI per acre per season: 0.186 lb. REI: 4 hours.

SOYBEAN LOOPERS are migratory insects that fly in from Central and South America each year and infest soybeans mid- to late-season in Mississippi. Soybean loopers are leaf feeders and can cause extensive defoliation when present in high numbers. Soybean loopers generally start feeding in the middle of the plant canopy and move upward. The larva has a characteristic looping movement when crawling. It is light green, with white lines running the length of the body on the sides and top. The body tapers toward the head, and the larva has two pairs of abdominal prolegs. The soybean looper has developed resistance to some insecticides but is often controlled by disease organisms.

THRESHOLD: IF NO DISEASED WORMS ARE PRESENT

Drop cloth threshold: Prior to bloom, apply insecticide when eight or more worms a half-inch or longer are present per row foot. If plants are blooming and filling pods, apply insecticide when four or more worms a half-inch or longer are present per row foot.
Sweep net threshold: Prior to bloom, treat when 38 worms a half-inch or longer per 25 sweeps are present. After bloom, treat when 19 worms a half-inch or longer per 25 sweeps are present.
Defoliation threshold: Treat when 35 percent foliage loss has occurred and worms a half-inch or longer are present prior to bloom or when 20 percent foliage loss has occurred and worms a half-inch or longer are present after bloom.
Insecticide termination: Terminate insecticide applications for soybean loopers at R6 + 7 days (R6.5).

Velvetbean Caterpillars

Insecticide	Amount of Formulation per Acre	Pounds Active Ingredient per Acre	Acres 1 Gallon or 1 Pound Dry Will Treat	Comments
acephate (OP) Orthene 90S	0.83 – 1.1 lb.	0.75 – 1.0	1.2 – 0.9	Do not harvest for hay or forage. Do not apply within 14 days of harvest. Apply by air at 5-10 GPA and by ground at 10-50 GPA. Maximum AI per acre per season: 1.5 lb.
β-cyfluthrin (P) Baythroid XL 1EC	1.6 – 2.8 oz.	0.0125 – 0.022	80 – 45.5	Extremely toxic to fish and aquatic invertebrates. Do not feed green forage within 15 days of harvest. Preharvest interval: 45 days. Maximum AI per acre per season: 0.0875 lb. REI: 12 hours.
bifenthrin (P) Brigade 2EC Discipline 2EC	 2.1 – 6.4 oz. 2.1 – 6.4 oz.	 0.033 – 0.10 0.033 – 0.10	 61 – 20 61 – 20	Do not apply more than one time per 30-day interval. Do not apply within 18 days of harvest.
bifenthrin (P), **imidacloprid** (CN) Brigadier	3.8 – 6.1 oz.		37 – 21	
bifenthrin (P), **Z-cypermethrin** (P) Hero 1.24EC	3.8 – 6.1 oz.		33 – 21	
chlorantraniliprole (D) Prevathon 0.43SC	14 – 20 oz.	0.047 – 0.067	9 – 6.4	Preharvest interval is 1 day. Adjuvants such as methylated seed oil (MSO) may be added for improved coverage.
chlorantranilipole (D), **λ-cyhalothrin** (P) Besiege	7 – 9 oz.		18 – 14	
diflubenzuron (IGR) Dimilin 2L	2 – 4 oz.	0.031 – 0.0625	64 – 32	Dimilin should be applied when larvae are small (<0.5 inches) to give greater control and minimize insect damage to leaves. The lower rate of Dimilin may be used to prevent damage from velvetbean caterpillars when vegetative growth is completed and pod formation begins. Consult label for more details. Toxic to aquatic invertebrates. Do not apply within 21 days of harvest. Do not make more than two applications per season.
esfenvalerate (P) Asana XL 0.66EC	2.9 – 5.8 oz.	0.015 – 0.03	44 – 22	Do not feed or graze livestock on treated plants. Do not apply within 21 days of harvest. Maximum AI per acre per season: 0.2 lb. REI: 12 hours.
flubendiamide (D) Belt 4SC	2 – 3 oz.	0.0625 – 0.094	64 – 43	
gamma-cyhalothrin (P) Declare 1.25EC	0.77 – 1.28 oz.	.0075 – .0125	166.7 – 100	Do not graze or harvest treated soybean forage, straw, or hay for livestock feed. Do not apply within 45 days of harvest. Maximum AI per acre per season: 0.03 lb.
imidacloprid (CN), **β-cyfluthrin** (P) Leverage 360	2.85 oz.		45	
λ-cyhalothrin (P) Karate Z 2.08CS	0.96 –1.6 oz.	0.015 – .025	138 – 83	Do not graze or harvest treated soybean forage, straw, or hay for livestock feed. Do not apply within 45 days of harvest. Maximum AI per acre per season: 0.06 lb.
methomyl (C) Lannate 2.4LV	12 – 24 oz.	0.225 – 0.45	10.6 – 5.3	Toxic to fish, aquatic invertebrates, bees, and wildlife. Do not graze forage within 3 days and hay within 12 days of last application. Do not apply within 14 days of harvest. Maximum AI per acre per season: 1.35 lb.
methoxyfenozide (IGR) Intrepid 2F	4 – 8 oz.	0.06 – 0.12	32 – 16	Drift and runoff may be toxic to sensitive aquatic vertebrates. Do not apply by air within 150 feet or by ground within 25 feet of surface water. Preharvest interval: 14 days for seed; 7 days for hay or forage. Maximum AI per acre per season: 1 lb. AI (or 4 applications per acre per season). REI: 4 hours.
methoxyfenozide (IGR), **spinetoram** (SPN) Intrepid Edge	4 – 6.4 oz.		32 – 20	
permethrin (P) Ambush 2EC Pounce 3.2EC	6.4 oz. 4 oz.	0.1 0.1	20 32	Toxic to fish and aquatic organisms. Do not graze or feed soybean forage to livestock. Preharvest interval: 60 days. Maximum AI per acre per season: 0.4 lb.
spinetoram (SPN) Radiant 1SC	2 – 4 oz	0.016 – 0.031	64 – 32	Preharvest interval is 28 days.
spinosad (SPN) Blackhawk	1.1 – 2.2 oz.	0.025 – 0.05	116 – 58	Toxic to bees and mollusks. Do not feed treated forage or hay to beef or dairy cattle. Preharvest treatment interval: 28 days. Maximum AI per acre per season: 0.186 lb. REI: 4 hours.
thiamethoxam (CN), **λ-cyhalothrin** (P) Endigo ZC	3.5 – 4.5 oz.		37 – 28	
Z-cypermethrin (P) Mustang Max 0.8EC	2.8 – 4 oz.	0.0175 – 0.025	45.7 – 32	Toxic to aquatic invertebrates. Postharvest interval is 21 days. Maximum AI per acre per season: 0.125 lb.

VELVETBEAN CATERPILLAR larvae vary from light to dull green, with white lines running the length of the body. The lines on the side of the body are usually much broader than those of the green cloverworm or looper. Velvetbean caterpillars have four pairs of abdominal prolegs and are about 1½ inch long when full grown. When disturbed, the velvetbean caterpillar becomes very active and wriggles about like the green cloverworm. Velvetbean caterpillars are voracious feeders, usually starting at the top of the plant and feeding downward causing complete defoliation if not controlled. Velvetbean caterpillars are migratory insects flying in from Central and South America each year. Velvetbean caterpillars are primarily foliage feeders but will feed on petioles, causing pods to drop to the ground after a significant loss of foliage. Velvetbean caterpillars generally are late-season pests of soybeans in Mississippi.

THRESHOLD: IF NO DISEASED WORMS ARE PRESENT

Drop cloth threshold: Prior to bloom, apply insecticide when eight or more worms a half-inch or longer are present per row foot. If plants are blooming and filling pods, apply insecticide when four or more worms a half-inch or longer are present per row foot.
Sweep net threshold: Prior to bloom, treat when 75 worms a half-inch or longer per 25 sweeps are present. After bloom, treat when 38 worms a half-inch or longer per 25 sweeps are present.
Defoliation threshold: Treat when 35 percent foliage loss has occurred and worms a half-inch or longer are present prior to bloom or when 20 percent foliage loss has occurred and worms a half-inch or longer are present after bloom.
Insecticide termination: Terminate insecticide applications for velvetbean caterpillars at R6 + 7 days (R6.5).

Bollworms (Corn Earworms or "Podworms")* and *Tobacco Budworms

Insecticide	Amount of Formulation per Acre	Pounds Active Ingredient per Acre	Acres 1 Gallon or 1 Pound Dry Will Treat	Comments
chlorantranilipole (D) Prevathon 043SC	14 – 20 oz.	0.047 – 0.067	9 – 6.4	Preharvest interval is 1 day. Adjuvants such as methylated seed oil (MSO) may be added for improved coverage.
chlorantranilipole (D), **λ-cyhalothrin** (P) Besiege	7 – 9 oz.		18 – 14	
flubendiamide (D) Belt 4SC	2 – 3 oz.	0.0625 – 0.094	64 – 43	
indoxacarb (OX) Steward 1.25EC	5.6 – 11.3 oz.	0.055 – 0.11	22.8 – 11.5	Toxic to fish, birds, and aquatic invertebrates. Do not feed or graze livestock on treated fields. Postharvest interval: 21 days. Maximum AI per acre per season: 0.44 lb.
methomyl (C) Lannate 2.4LV	12 – 24 oz.	0.225 – 0.45	10.6 – 5.3	Toxic to fish, aquatic invertebrates, bees and wildlife. Do not graze forage within 3 days and hay within 12 days of last application. Do not apply within 14 days of harvest. Maximum AI per acre per season: 1.35 lb. Use .45 lb. AI of methomyl for high populations of corn earworms.
methoxyfenozide (IGR), **spinetoram** (SPN) Intrepid Edge	4 – 6.4 oz.		32 – 20	
spinetoram (SPN) Radiant 1SC	2 – 4 oz.	0.016 – 0.031	64 – 32	Preharvest interval is 28 days.
spinosad (SPN) Blackhawk	1.7 – 2.2 oz.	0.038 – 0.05	75 – 58	Toxic to bees and mollusks. Do not feed treated forage or hay to beef or dairy cattle. Preharvest treatment interval: 28 days. Maximum AI per acre per season: 0.186 lb. REI: 4 hours.

Pyrethroids may not control bollworms. It is recommended to use only the highest labeled rate of pyrethroids + 0.5 – 0.75 lb of acephate to control bollworms in the Delta region.

The **BOLLWORM OR CORN EARWORM**, found on cotton and corn, is commonly referred to as the "podworm" in soybeans. It varies in color from light green to pink, dark brown, or rust, with pale lines running the length of the body. It has four pairs of abdominal prolegs and is about 1¼ inch long when fully grown. The worm usually curls up when knocked to the ground. Infestations occur most often during the reproductive stages of the soybean plant. In high numbers, this insect can cause significant yield loss.

THRESHOLD: Before bloom, treat on 35 percent defoliation level. If you use a drop cloth to detect bollworms, threshold is three worms per foot of row after bloom. With a sweep net, threshold is nine worms per 25 sweeps after bloom. **For dynamic thresholds that account for price received and control costs, use Table 1 below.**
*Bollworms or podworms are difficult to sample with the sweep net. Sweep deeper into the canopy, using extra force; supplement with visual check for pod or bloom feeding.

Table 1. Economic thresholds for corn earworm larvae based on sweep net sampling.

	Larvae/25 sweeps				
	Control Costs ($/acre)[1]				
Crop value ($/bu)	10	15	20	25	30
6	7.4	11.0	14.7	18.4	22.1
7	6.3	9.5	12.6	15.8	18.9
8	5.5	8.3	11.0	13.8	16.5
9	4.9	7.4	9.8	12.3	14.7
10	4.4	6.6	8.8	11.0	13.2
12	3.7	5.5	7.4	9.2	11.0
13	3.4	5.1	6.8	8.5	10.2

Based on early-planted Maturity Group IV soybean varieties with >50 bu/acre yield potential.
[1]Including application costs.

Saltmarsh Caterpillars

Insecticide	Amount of Formulation per Acre	Pounds Active Ingredient per Acre	Acres 1 Gallon or 1 Pound Dry Will Treat	Comments
β-cyfluthrin (P) Baythroid XL 1EC	1.6 – 2.8 oz.	0.0125 – 0.022	80 – 45.5	Toxic to bees. Pre-harvest interval for grazing: 21 days. Maximum AI per acre per season: 6 lb.
bifenthrin (P) Brigade 2EC Discipline 2EC	2.1 – 6.4 oz. 2.1 – 6.4 oz.	0.033 – 0.10 0.033 – 0.10	61 – 20 61 – 20	Extremely toxic to fish and aquatic invertebrates. Do not feed green forage within 15 days of harvest. Preharvest interval: 45 days. Maximum AI per acre per season: 0.0875 lb. REI: 12 hours.
carbaryl (C) Sevin XLR 4L Sevin 4F	48 oz. 48 oz.	1.5 1.5	2.7 2.7	Toxic to bees and aquatic invertebrates. Preharvest intervals: 21 days for grain, 14 days for grazing. Maximum AI per acre per season: 6 lb. Do not apply more than one time per 30-day interval. Do not apply within 18 days of harvest.
chlorantraniliprole (D) Prevathon 0.43SC	14 – 20 oz.	0.047 – 0.067	9 – 6.4	Preharvest interval is 1 day. Adjuvants such as methylated seed oil (MSO) may be added for improved coverage.
chlorantranilipole (D), **λ-cyhalothrin** (P) Besiege	5 – 8 oz.		25.6 – 16	
esfenvalerate (P) Asana XL 0.66EC	2.9 – 5.8 oz.	0.015 – 0.03	44 – 22	Do not feed or graze livestock on treated plants. Do not apply within 21 days of harvest. Maximum AI per acre per season: 0.2 lb. REI: 12 hours.
flubendiamide (D) Belt 4SC	2 – 3 oz.	0.0625 – 0.094	64 – 43	
gamma-cyhalothrin (P) Declare 1.25 EC	0.77 – 1.28 oz.	0.0075 – 0.0125	166.7 – 100	Do not graze or harvest treated soybean forage, straw, or hay for livestock feed. Do not apply within 45 days of harvest. Maximum AI per acre per season: 0.03 lb.
λ-cyhalothrin (P) Karate Z 2.08CS	0.96 –1.6 oz.	0.015 – 0.025	138 – 83	Do not graze or harvest treated soybean forage, straw, or hay for livestock feed. Do not apply within 45 days of harvest. Maximum AI per acre per season: 0.06 lb.
methomyl (C) Lannate 2.4LV	12 – 24 oz.	0.3 – 0.45	8 – 5.3	Toxic to fish, aquatic invertebrates, bees, and wildlife. Do not graze forage within 3 days and hay within 12 days of last application. Do not apply within 14 days of harvest. Maximum AI per acre per season: 1.35 lb. Use .45 lb AI of methomyl on heavy populations of saltmarsh caterpillar.
methoxyfenozide (IGR) Intrepid 2F	4 – 8 oz.	0.06 – 0.12	32 – 16	Drift and runoff may be toxic to sensitive aquatic vertebrates. Do not apply by air within 150 feet or by ground within 25 feet of surface water. Preharvest interval: 14 days for seed; 7 days for hay or forage. Maximum AI per acre per season: 1 lb. (or 4 applications per acre per season). REI: 4 hours.
methoxyfenozide (IGR), **spinetoram** (SPN) Intrepid Edge	4 – 6.4 oz.		32 – 20	
permethrin (P) Ambush 2EC Pounce 3.2EC	6.4 oz. 4 oz.	0.1 0.1	20 32	Toxic to fish and aquatic organisms. Do not graze or feed soybean forage to livestock. Preharvest interval: 60 days. Maximum AI per acre per season: 0.4 lb.
spinetoram (SPN) Radiant 1SC	2 – 4 oz.	0.016 – 0.031	64 – 32	Preharvest interval is 28 days.
spinosad (SPN) Blackhawk	1.7 – 2.2 oz.	0.038 – 0.05	75 – 58	Toxic to bees and mollusks. Do not feed treated forage or hay to beef or dairy cattle. Preharvest treatment interval: 28 days. Maximum AI per acre per season: 0.186 lb. REI: 4 hours.
Z-cypermethrin (P) Mustang Max 0.8E	1.8 – 4 oz.	0.008 – 0.025	100 – 32	Toxic to aquatic invertebrates. Postharvest interval is 21 days. Maximum AI per acre per season: 0.125 lb.

SALTMARSH CATERPILLARS (often called "woolly worms") feed in the larval stage on soybean foliage. Eggs are laid in masses on the soybean leaves. Infestations often start around field borders. You can easily recognize this caterpillar by the thick hair that covers the body. Color may be black, rust, or yellowish-orange. This pest seldom reaches treatable levels, but large numbers can cause extensive defoliation if left untreated.

Threshold: IF NO DISEASED WORMS ARE PRESENT

Defoliation threshold: Treat when 35 percent foliage loss has occurred and worms a half-inch or longer are present prior to bloom or when 20 percent foliage loss has occurred and worms a half-inch or longer are present after bloom.

Insecticide termination: Terminate insecticide applications for saltmarsh caterpillars at R6 + 7 days (R6.5).

Beet Armyworms

Insecticide	Amount of Formulation per Acre	Pounds Active Ingredient per Acre	Acres 1 Gallon or 1 Pound Dry Will Treat	Comments
chlorantranilipole (D) Prevathon 0.43SC	14 – 20 oz.	0.047 – 0.067	9 – 6.4	Preharvest interval is 1 day. Adjuvants such as methylated seed oil (MSO) may be added for improved coverage.
chlorantranilipole (D), **λ-cyhalothrin** (P) Besiege	7 – 9 oz.		18 – 14	
flubendiamide (D) Belt 4SC	2 – 3 oz.	0.0625 – 0.094	64 – 43	Toxic to fish, birds, and aquatic invertebrates. Do not feed or graze livestock on treated fields. Postharvest interval: 21 days. Maximum AI per acre per season: 0.44 lb.
indoxacarb (OX) Steward 1.25EC	5.6 – 11.3 oz.	0.055 – 0.11	22.8 – 11.5	
methoxyfenozide (IGR) Intrepid 2F	4 – 8 oz.	0.06 – 0.12	64 – 32	Drift and runoff may be toxic to sensitive aquatic vertebrates. Do not apply by air within 150 feet or by ground within 25 feet of surface water. Preharvest interval: 14 days for seed; 7 days for hay or forage. Maximum AI per acre per season: 1 lb. (or 4 applications per acre per season). REI: 4 hours.
methoxyfenozide (IGR), **spinetoram** (SPN) Intrepid Edge	4 – 6.4 oz.		32 – 20	Preharvest interval is 28 days.
spinetoram (SPN) Radiant 1SC	2 – 4 oz.	0.016 – 0.031	64 – 32	
spinosad (SPN) Blackhawk	1.7 – 2.2 oz.	.038 – .05	75 – 58	Toxic to bees and mollusks. Do not feed treated forage or hay to beef or dairy cattle. Preharvest treatment interval: 28 days. Maximum AI per acre per season: 0.186 lb. REI: 4 hours.

The **BEET ARMYWORM** prefers to feed on foliage of seedling soybean plants. However, if they are present during fruiting, they will feed on bloom buds, blooms, and small pods. The larva has a small black spot on each side of the second body segment. This small black spot is directly above the second pair of true legs behind the head. The beet armyworm has four pairs of abdominal prolegs and a smooth body. The larvae are about 1¼ inch long when fully grown. They generally curl up when knocked to the ground. Color may vary from grayish-green to near black with pale lines running the length of the body. Beneficial insects and diseases usually control this pest. Beet armyworms are migratory insects that generally attack soybeans in Mississippi mid- to late-season.

Threshold: IF NO DISEASED WORMS ARE PRESENT

Defoliation threshold: Treat when 35 percent foliage loss has occurred and worms a half-inch or longer are present prior to bloom or when 20 percent foliage loss has occurred and worms a half-inch or longer are present after bloom.

Insecticide termination: Terminate insecticide applications for beet armyworms at R6 + 7 days (R6.5).

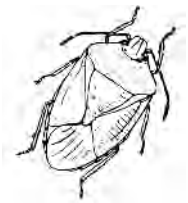
Fall Armyworms

Insecticide	Amount of Formulation per Acre	Pounds Active Ingredient per Acre	Acres 1 Gallon or 1 Pound Dry Will Treat	Comments
acephate (OP) Orthene 90S	0.83 – 1.1 lb.	0.75 – 1.0	1.2 – 0.9	Do not harvest for hay or forage. Do not apply within 14 days of harvest. Apply by air at 5-10 GPA and by ground at 10-50 GPA. Maximum AI per acre per season: 1.5 lb.
β-cyfluthrin (P) Baythroid XL 1EC	1.6 – 2.8 oz.	0.0125 – 0.022	80 – 45	Extremely toxic to fish and aquatic invertebrates. Do not feed green forage within 15 days of harvest. Preharvest interval: 45 days. Maximum AI per acre per season: 0.0875 lb. REI: 12 hours. Do not apply more than one time per 30-day interval. Do not apply within 18 days of harvest.
bifenthrin (P) Brigade 2EC Discipline 2EC	2.1 – 6.4 oz. 2.1 – 6.4 oz.	0.033 – 0.1 0.033 – 0.1	61 – 20 61 – 20	Do not apply more than one time per 30-day interval. Do not apply within 18 days of harvest.
chlorantranilipole (D) Prevathon 0.43SC	14 – 20 oz.	0.047 – 0.067	9 – 6.4	Preharvest interval is 1 day. Adjuvants such as methylated seed oil (MSO) may be added for improved coverage.
chlorantranilipole (D), **λ-cyhalothrin** (P) Besiege	7 – 9 oz.		18 – 14	
flubendiamide (D) Belt 4SC	2 – 3 oz.	0.0625 – 0.094	64 – 43	
gamma-cyhalothrin (P) Declare 1.25 EC	1.28 – 1.54 oz.	0.0125 – 0.015	100 – 83	Do not graze or harvest treated soybean forage, straw, or hay for livestock feed. Do not apply within 45 days of harvest. Maximum AI per acre per season: 0.06 lb.
indoxacarb (OX) Steward 1.25EC	5.6 – 11.3 oz.	0.55 – 0.11	22.8 – 11.5	Toxic to fish, birds, and aquatic invertebrates. Do not feed or graze livestock on treated fields. Postharvest interval: 21 days. Maximum AI per acre per season: 0.44 lb. First and second instars only.
λ-cyhalothrin (P) Karate Z 2.08CS	1.6 – 1.92 oz.	0.025 – 0.03	83 – 69	Do not graze or harvest treated soybean forage, straw, or hay for livestock feed. Do not apply within 45 days of harvest. Maximum AI per acre per season: 0.03 lb.
methoxyfenozide (IGR) Intrepid 2F	4 – 8 oz.	0.06 – 0.12	32 – 16	Drift and runoff may be toxic to sensitive aquatic vertebrates. Do not apply by air within 150 feet or by ground within 25 feet of surface water. Preharvest interval: 14 days for seed; 7 days for hay or forage. Maximum AI per acre per season: 1 lb. (or 4 applications per acre per season). REI: 4 hours.
methoxyfenozide (IGR), **spinetoram** (SPN) Intrepid Edge	4 – 6.4 oz.		32 – 20	
spinetoram (SPN) Radiant 1SC	2 – 4 oz.	0.016 – 0.031	64 – 32	Preharvest interval is 28 days.
spinosad (SPN) Blackhawk	1.7 – 2.2 oz.	0.038 – 0.052	75 – 58	Toxic to bees and mollusks. Do not feed treated forage or hay to beef or dairy cattle. Preharvest treatment interval: 28 days. Maximum AI per acre per season: 0.186 lb. REI: 4 hours.
Z-cypermethrin (P) Mustang Max 0.8EC	3.2 – 4 oz.	0.02 – 0.025	40 – 32	Toxic to aquatic invertebrates. Postharvest interval is 21 days. Maximum AI per acre per season: 0.125 lb.

FALL ARMYWORMS are occasional pests of soybeans that can be extremely damaging if present in high numbers. Fall armyworms will damage all stages of soybeans. In the early stages, they can act similar to cutworms by cutting seedlings off at ground level. Later stages will feed primarily on foliage and pods. The larva has a characteristic inverted "Y" on the head capsule and is brown to dark green. Eggs are laid in masses and are covered with gray scales from the female moth.

THRESHOLD: Treat young soybeans when plant stand is being reduced below the recommended plant population. See Table 1 on page 33. If plants are not blooming or filling pods and larvae are present, apply insecticide if defoliation reaches 35 percent. If plants are blooming and filling pods and larvae are present, apply insecticide if defoliation reaches 20 percent.

Stink Bugs



Insecticide	Amount of Formulation per Acre	Pounds Active Ingredient per Acre	Acres 1 Gallon or 1 Pound Dry Will Treat	Comments
acephate (OP) Orthene 90S	.56 – 1.1 lb.	0.56 – 1.1	0.5 – 1.0	Do not harvest for hay or forage. Do not apply within 14 days of harvest. Apply by air at 5-10 GPA and by ground at 10-50 GPA. Maximum AI per acre per season: 1.5 lb.
β-cyfluthrin (P) Baythroid XL 1EC	1.6 – 2.8 oz.	0.0125 – 0.022	80 – 45.5	Extremely toxic to fish and aquatic invertebrates. Do not feed green forage within 15 days of harvest. Preharvest interval: 45 days. Maximum AI per acre per season: 0.0875 lb. REI: 12 hours.
bifenthrin (P) Brigade 2EC Discipline 2EC	2.1 – 6.4 oz. 2.1 – 6.4 oz.	0.033 – 0.10 0.033 – 0.10	61 – 20 61 – 20	Do not apply more than one time per 30-day interval. Do not apply within 18 days of harvest.
bifenthrin (P), **imidacloprid** (CN) Brigadier	3.8 – 6.1 oz.		37 – 21	
bifenthrin (P), **Z-cypermethrin** (P) Hero 1.24EC	3.8 – 6.1 oz.		33 – 21	
chlorantranilipole (D), **λ-cyhalothrin** (P) Besiege	7 – 9 oz.		18 – 14	
esfenvalerate (P) Asana XL 0.66EC	5.8 – 9.6 oz.	0.03 – 0.05	22 – 13	Do not feed or graze livestock on treated plants. Do not apply within 21 days of harvest. Maximum AI per acre per season: 0.2 lb. REI: 12 hours.
gamma-cyhalothrin (P) Declare 1.25EC	1.28 – 1.54 oz.	0.0125 – 0.015	100 – 83	Do not graze or harvest treated soybean forage, straw, or hay for livestock feed. Do not apply within 45 days of harvest. Maximum AI per acre per season: 0.03 lb.
imidacloprid (CN), **β-cyfluthrin** (P) Leverage 360	2.85 oz.		45	
λ-cyhalothrin (P) Karate Z 2.08CS	1.6 – 1.92 oz.	0.025 – 0.03	83 – 69	Do not graze or harvest treated soybean forage, straw, or hay for livestock feed. Do not apply within 45 days of harvest. Maximum AI per acre per season: 0.06 lb.
thiamethoxam (CN), **λ-cyhalothrin** (P) Endigo ZC	3.5 – 4.5 oz.		37 – 28	
Z-cypermethrin (P) Mustang Max 0.8EC	3.2 – 4 oz.	0.02 – 0.025	40 – 32	Toxic to aquatic invertebrates. Postharvest interval is 21 days. Maximum AI per acre per season: 0.125 lb.

In Mississippi, three species of **STINK BUGS** are commonly found in soybeans: southern green, green, and brown. Adult stink bugs are about one-half inch long. During spring and early summer, they feed and reproduce on a variety of weeds and in home gardens. Stink bugs damage soybeans by piercing the pod hulls and sucking juices from the developing seeds. This type of feeding can result in unfilled pods, severely shrunken seeds, or discolored seeds around the puncture sites. Punctured seeds can cause lower grades and lower germination. Stink bugs lay barrel-shaped eggs in masses on the leaf surface. Emerging nymphs complete five life stages before becoming adults. All stages feed on soybeans, but the fourth and fifth instar nymphs can cause as much damage as the adult stage.

Threshold: If you use a drop cloth, the threshold is one bug per foot of row. If you are using a sweep net, the threshold is nine bugs per 25 sweeps. Count only stink bug nymphs larger than one-fourth of an inch. For redbanded stink bugs, treat when numbers reach six bugs per 25 sweeps or four bugs per 6 feet of row with drop cloth. Brown stink bugs are more difficult to control with pyrethroid insecticides. When soybeans reach the R6 growth stage, treat only on populations of 20 stink bugs per 25 sweeps or higher and terminate stink bug applications at R6 + 7 days (R6.5). Read label to determine the preharvest interval.

Kudzu Bugs

Insecticide	Amount of Formulation per Acre	Pounds Active Ingredient per Acre	Acres 1 Gallon or 1 Pound Dry Will Treat	Comments
acephate (OP) Orthene 90S	0.83 – 1.1 lb.	0.75 – 1.0	1.2 – .9	
bifenthrin (P) Brigade 2EC Discipline 2EC Fanfare 2E	5 – 6.4 oz. 5 – 6.4 oz. 5 – 6.4 oz.	0.078 – 0.1 0.078 – 0.1 0.078 – 0.1	26 – 20 26 – 20 26 – 20	
gamma-cyhalothrin (P) Declare 1.25	1.28 – 1.54 oz.	0.0125 – 0.015	100 – 83	
λ-cyhalothrin (P) Karate 2.08	1.92 oz.	0.031	67	
Z-cypermethrin (P) Mustang Max 0.8EC	4 oz.	0.025	32	

KUDZU BUGS originated in Asia and are an invasive pest of soybeans. Kudzu bugs have piercing-sucking mouthparts and preferentially feed on stems and petioles of soybean plants. Damage is caused when high numbers suck down the general vigor of the plant.

Threshold: During the vegetative stages, treat when kudzu bugs average five bugs per plant. Often, only field borders will require treatment. During the reproductive stages, treat when you average 25 nymphs per 25 sweeps.

Blister Beetles

Insecticide	Amount of Formulation per Acre	Pounds Active Ingredient per Acre	Acres 1 Gallon or 1 Pound Dry Will Treat	Comments
β-cyfluthrin (P) Baythroid XL 1EC	1.6 – 2.8 oz.	0.0125 – 0.022	80 – 45.5	Extremely toxic to fish and aquatic invertebrates. Do not feed green forage within 15 days of harvest. Preharvest interval: 45 days. Maximum AI per acre per season: 0.0875 lb. REI: 12 hours.
carbaryl (C) Sevin XLR 4L Sevin 4F	 16 – 32 oz. 16 – 32 oz.	 0.5 – 1.0 0.5 – 1.0	 8 – 4 8 – 4	Toxic to bees and aquatic invertebrates. Preharvest intervals: 21 days for grain, 14 days for grazing. Maximum AI per acre per season: 6 lb. Toxic to bees. Pre-harvest interval for grazing: 21 days. Maximum AI per acre per season: 6 lb.
gamma-cyhalothrin (P) Declare 1.25EC	1.28 – 1.54 oz.	0.0125 – 0.015	100 – 83	Do not graze or harvest treated soybean forage, straw, or hay for livestock feed. Do not apply within 45 days of harvest. Maximum AI per acre per season: 0.03 lb.
λ-cyhalothrin (P) Karate Z 2.08CS	1.6 – 1.92 oz.	0.025 – 0.03	83 – 69	Do not graze or harvest treated soybean forage, straw, or hay for livestock feed. Do not apply within 45 days of harvest. Maximum AI per acre per season: 0.06 lb.
Z-cypermethrin (P) Mustang Max 0.8EC	2.8 – 4 oz.	0.0175 – 0.025	45.7 – 32	Toxic to aquatic invertebrates. Postharvest interval is 21 days. Maximum AI per acre per season: 0.125 lb.

BLISTER BEETLES feed mainly on the leaves of soybean plants. Blister beetles may be grayish, black, or orange with stripes and are about three-fourths inch long. They are rarely a problem in soybeans, but large numbers can cause extensive defoliation. Some species will congregate in very large numbers within the soybean field, but damage is usually isolated to small patch-like areas. The larvae of the blister beetle can be considered a beneficial insect. First instar larvae are very mobile and search out and feed on grasshopper eggs.

THRESHOLD: If plants are not blooming or filling pods and beetles are present, apply insecticide if defoliation reaches 35 percent. If plants are blooming and filling pods and beetles are present, apply insecticide if defoliation reaches 20 percent.

Table 1. Suggested plant populations for soybeans planted in MS.

Row Width in Inches	Feet of Row per Acre	Plants per Foot of Row	Plants per Acre
40	13,068	8.00	104,544
38	13,756	7.50	103,455
36	14,520	7.00	101,640
30	17,424	6.00	104,544
20	26,136	4.00	104,544
14	37,337	3.50	130,680
12	43,560	3.00	130,680
10	52,272	2.75	143,748
7	74,674	2.25	168,016
6	87,120	2.00	174,240

Table 2. Growth stages of soybeans (from Fehr & Caviness 1977).

VE – Emergence

VC – Cotyledon

V1 – First trifoliate

V2 – Second trifoliate

V3 – Third trifoliate

V4 – Fourth trifoliate

V (n) – Nth trifoliate (nth node)

R1 – Beginning bloom, one open flower at any node on the main stem.

R2 – Full bloom, open flower at one of the four uppermost nodes on the main stem with a fully developed trifoliate leaf.

R3 – Beginning pod, three-sixteenths inch pod at one of the four uppermost nodes on the main stem with a fully developed trifoliate leaf.

R4 – Full pod, three-fourths inch pod at one of the four uppermost nodes on the main stem with a fully developed trifoliate leaf.

R5 – Beginning seed, one-eighth inch long seed in the pod at one of the four uppermost nodes on the main stem with a fully developed trifoliate leaf.

R6 – Full seed, pod contains a green seed that fills the pod cavity at one of the four uppermost nodes on the main stem with a fully developed leaf.

R7 – Beginning maturity, one normal pod on the main stem that has reached mature pod color, normally brown or tan depending on variety.

R8 – Full maturity, 95 percent of the pods have reached their mature pod color. Five to ten days of drying weather are generally required after R8 before the soybeans have less than 15 percent moisture. This can occur more rapidly in early-planted soybeans in the Midsouth under very hot conditions.

Table 3. Approximate interval in days between successive reproductive growth stages by maturity group (MG) and planting date (PD) under irrigated field conditions at Stoneville, Mississippi.[1]

MG	PD	PD-R1	R1-R2	R2-R3	R3-R4	R4-R5	R5-R6	R6-R7	R7-R8	R1-R8	PD-R8
	month/day					Days					
3.9	3/15	48	3	11	7	7	23	19	13	83	131
3.9	4/15	38	3	14	8	7	24	18	13	87	125
3.9	5/15	34	4	14	9	7	22	16	12	84	118
3.9	6/14	33	4	14	8	7	19	14	9	75	108
3.9	7/04	33	4	13	7	6	17	12	7	66	99
4.4	3/15	53	3	12	8	8	25	20	12	87	140
4.4	4/15	42	4	15	8	8	25	18	13	91	133
4.4	5/15	37	5	15	8	8	23	17	11	87	124
4.4	6/14	36	4	14	8	8	20	14	9	76	112
4.4	7/04	35	4	13	7	7	18	12	7	67	102
4.9	3/15	58	4	13	9	8	26	21	14	95	153
4.9	4/15	47	4	16	9	8	26	19	13	95	142
4.9	5/15	41	5	15	9	8	24	17	11	89	130
4.9	6/14	38	5	14	9	7	20	14	10	79	117
4.9	7/04	37	4	13	7	7	18	12	8	69	106
5.4	3/15	64	4	15	9	10	26	22	14	100	164
5.4	4/15	53	4	16	10	9	26	20	13	98	151
5.4	5/15	46	4	16	10	8	24	18	13	93	139
5.4	6/14	41	5	15	8	8	21	14	9	80	121
5.4	7/4	39	4	14	7	7	18	13	8	71	110
5.9	4/15	58	5	17	11	9	27	20	13	102	160
5.9	5/15	50	5	17	10	8	25	18	11	94	144
5.9	6/14	44	5	16	8	8	22	14	10	83	127
5.9	6/29	42	4	15	8	7	20	13	8	75	117

[1]Data adapted from Zhang et al. (2004) Crop Managment. Data compiled across multiple years (1998 and 2002), resulting in a variety of environmental conditions.

Table 4. Recommended plant populations for Mississippi soybean producers.

Planting date	Recommended **plant** population (plants/acre)	
	Group 4s	Group 5s
Late March to April 5	130,000	120,000
April 5 to April 20	120,000	100,000
Late April to early May	100,000	100,000

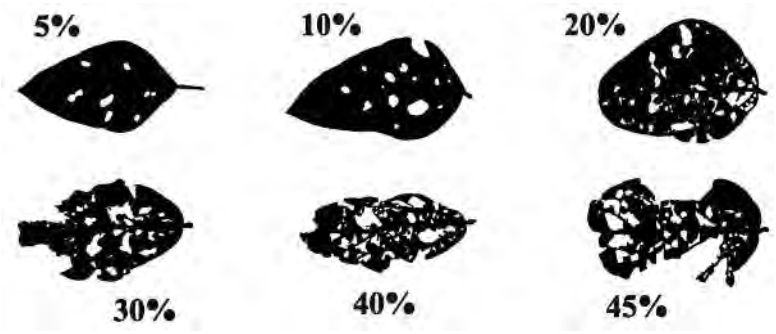
Table 5. Recommended plant populations for narrow row spacings. Final seeding rate based on 85% emergence of planted seed.

Desired # of plants	Seeding rate	Row spacing (inches)							
plants / acre	seed / acre	7.5	8	10	15	18	20	25	30
		seed / ft of row to be planted							
100,000	117,000	1.7	1.8	2.3	3.4	4.1	4.5	5.6	6.8
110,000	129,000	1.9	2.0	2.5	3.7	4.5	5.0	6.2	7.4
120,000	141,000	2.0	2.2	2.7	4.1	4.9	5.4	6.8	8.1
130,000	153,000	2.2	2.4	2.9	4.4	5.3	5.9	7.3	8.8

Table 6. Recommended plant populations for wide-row and twin-row patterns. Final seeding rate based on 85% emergence of planted seed.

Desired # of plants	Seeding rate	Wide-row (inches)		Twin-row*	
plants / acre	seed / acre	38	40	38-inch row	40-inch row
				seed / ft of row to be planted in each row	
100,000	117,000	8.6	9.0	4.3	4.5
110,000	129,000	9.4	9.9	4.7	5.0
120,000	141,000	10.3	10.8	5.2	5.4
130,000	153,000	11.1	11.7	5.6	5.9

Estimating Foliage Loss



Effectively estimating whole plant foliage loss is important in determining economic thresholds. Concise determinations in the field are difficult to make. Following is one procedure that may help in making defoliation estimates more accurate.

1. Study the leaflet photographs that show different foliage losses. Remember the threshold is 35 percent foliage loss for soybeans not blooming or filling pods and 20 percent foliage loss for soybeans blooming or filling pods.
2. Randomly select 10 to 20 leaflets from the middle or upper position of plants within a field.
3. Compare each leaflet with the photographs to the left and score each leaflet collected.
4. Average the scores to find the average foliage loss for the field sampled.
5. Practice this method using several field surveys.

Occasional Pests of Soybeans

Grape colaspis larvae occasionally are present early in the season in soybean fields. Feeding injury may result in stand reduction. Although uncommon, even severe infestations are difficult to detect early enough for chemical control, and replanting is often required.

Potato leafhopper populations are occasionally extremely high in soybean fields. Smooth-leaf varieties are particularly susceptible to potato leafhoppers. Extensive feeding on leaves by this pest may cause leaf discoloration and malformation, often called "hopperburn." Although this is generally insignificant, yields can sometimes be reduced. Approximate thresholds are five to nine per plant before bloom, with smaller plants being more susceptible. Blooming and more mature plants can tolerate larger populations.

Lesser cornstalk borer larvae damage soybeans by boring into the main stem at or just below the soil surface. Seedlings are cut off at the soil surface or may lodge because of extensive tunneling. The larvae are bluish-green and travel on top of the soil in silken tubes. Treatment is usually preventive and based on field history. Preventive treatments of Lorsban 15G applied T-band or in-furrow at planting at 8 oz./1,000 row feet are recommended when the field has a history of this pest. See label for additional details.

Soybean aphids are a new pest to soybeans in Mississippi. Currently soybean aphids have only been found in a few counties in Mississippi. While several species of aphids will feed on soybeans, soybean aphids are the only species that will colonize in very large numbers on soybeans. Soybean aphids, like whiteflies, excrete honeydew while they feed. This honeydew can cover the plant and cause sooty mold. This sooty mold prevents photosynthesis and can cause premature defoliation. Since this is a new pest to Mississippi, there are no current established thresholds. In Midwest states, thresholds are generally 250 aphids per plant. Apparently, there is no value in treating after R6.

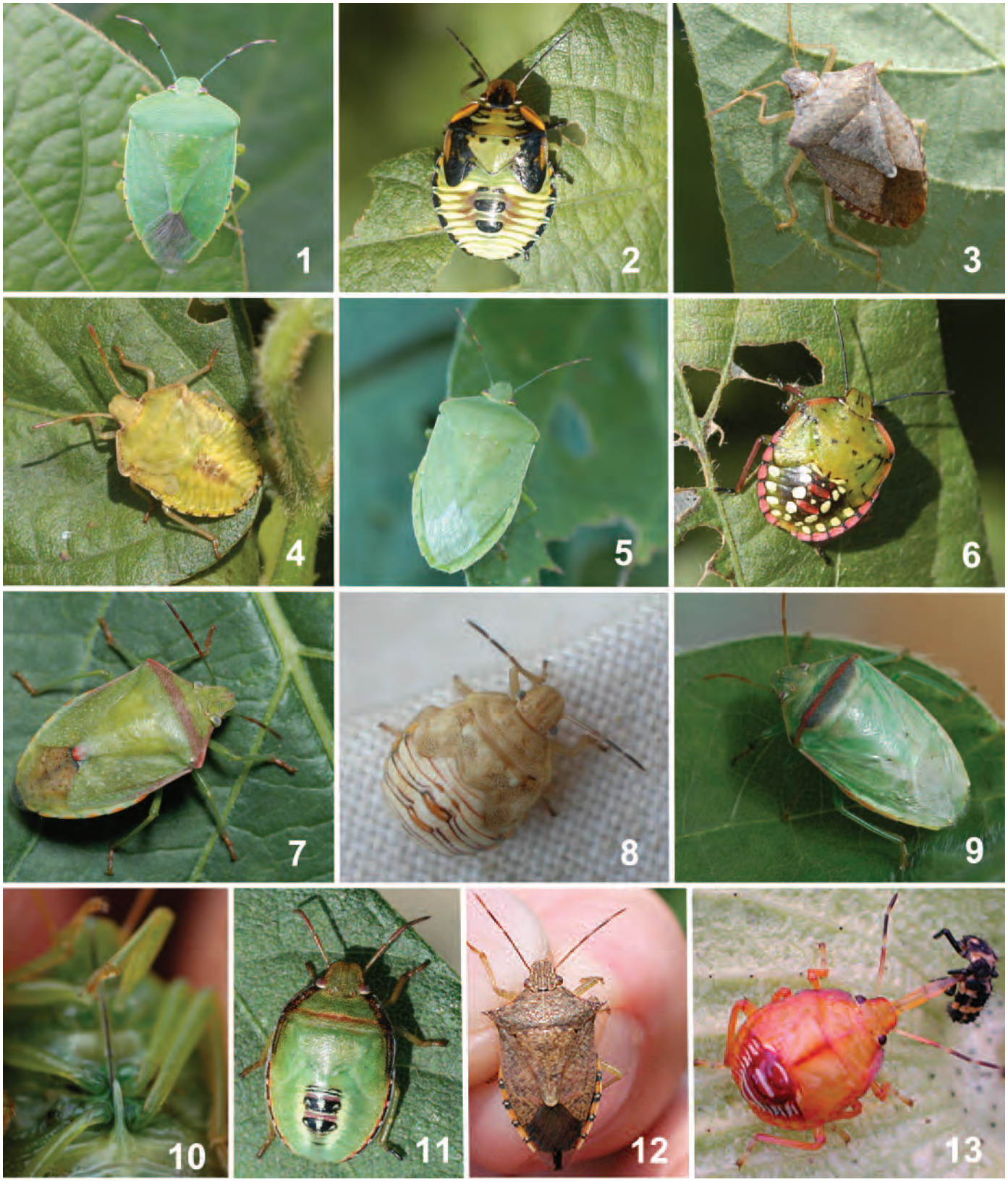
Thrips can occur in high populations on soybeans and are most damaging during periods of drought. Although these populations may delay maturity, they generally do not reduce yields.

Tobacco budworms only occasionally develop high populations in soybeans. Heaviest infestations often occur in areas with the highest concentration of cotton acreage. This insect is very similar in appearance and habits to the bollworm, and you should use the same treatment threshold. Budworms have developed resistance to many insecticides and are more difficult to control.

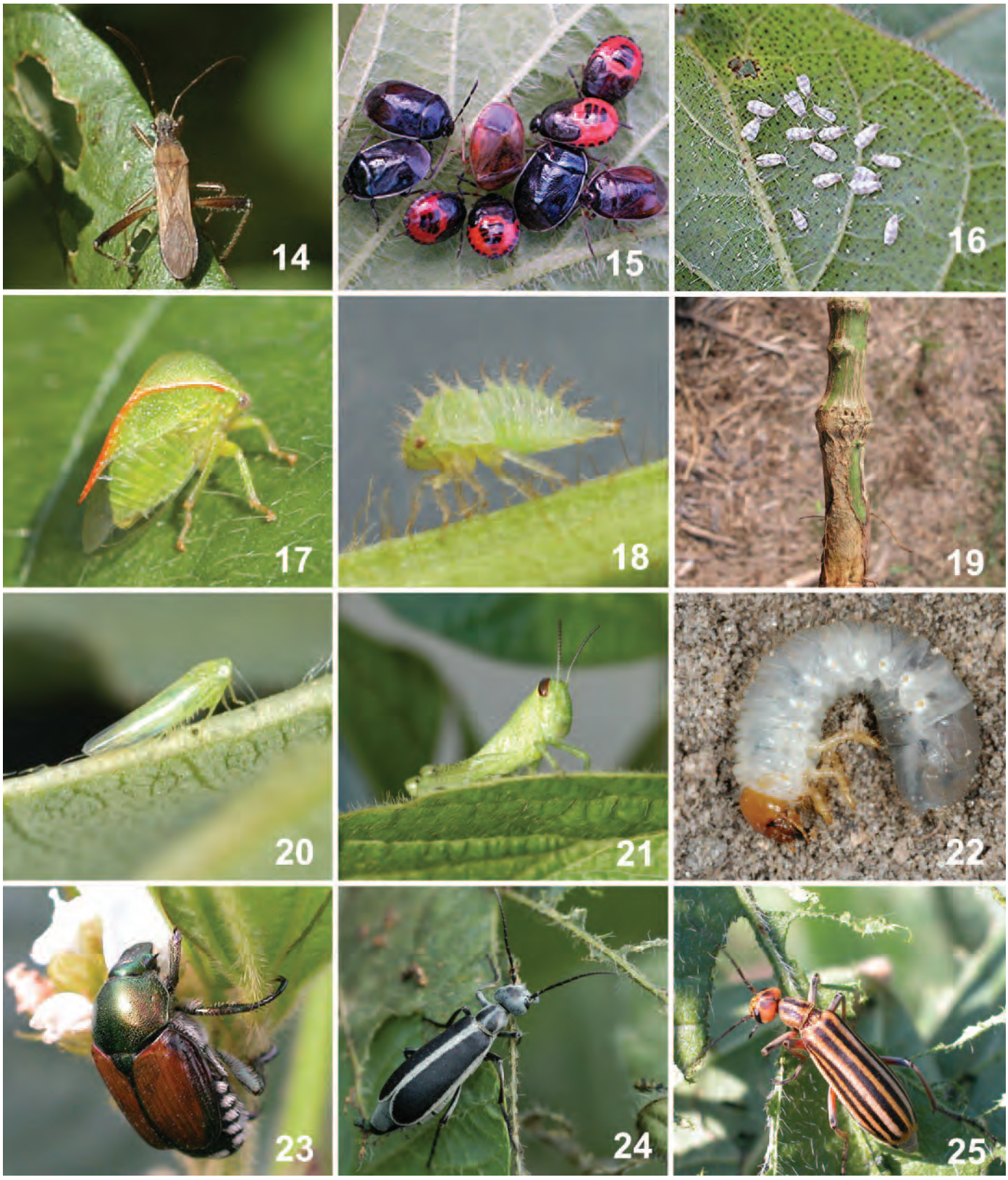
Whiteflies normally do not build damaging populations on soybeans, but in favorable conditions, extremely large populations can occur. Very little direct damage results from whitefly feeding. These insects produce honeydew. A fungus known as sooty mold grows on the honeydew. When this mold covers the leaf surface, it blocks sunlight, which prevents photosynthesis and can cause premature defoliation.

Whitefringed beetles occur in soybeans on the Coastal Plain. Although adults feed on foliage, populations are usually low. Whitefringed beetles are not thought to be of economic importance, but we don't know how much soybean damage they cause.

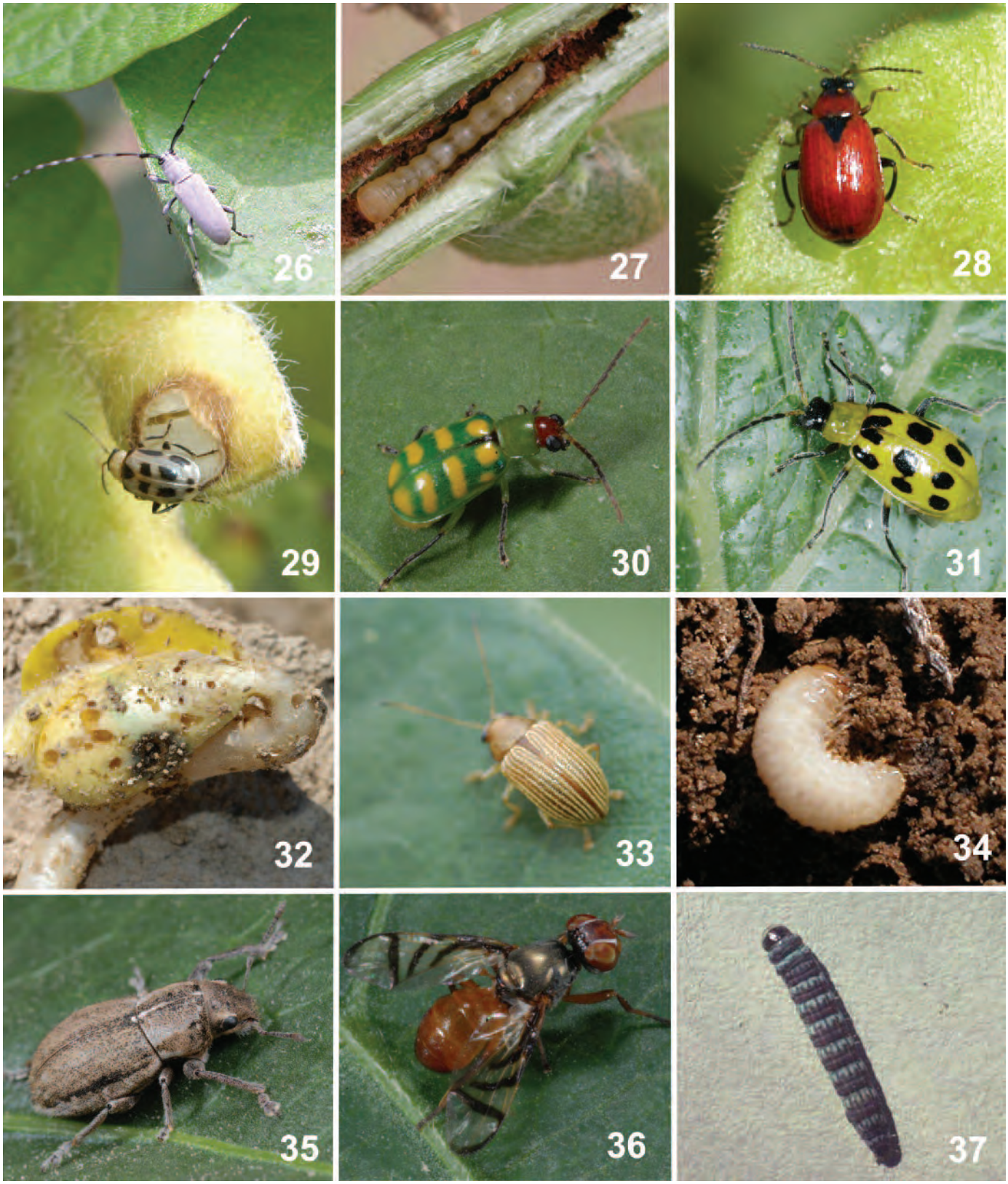
Dectes stem borers are cylindrical, ash-gray beetles with long antennae. The adults are minor foliage feeders and sometimes girdle plants at the soil level. The immature are grubs that tunnel the petioles and main stalk of the plants. We believe that since they tunnel in the pith of the plant, there is no or very little yield loss with these insects, even under extremely heavy infestations.



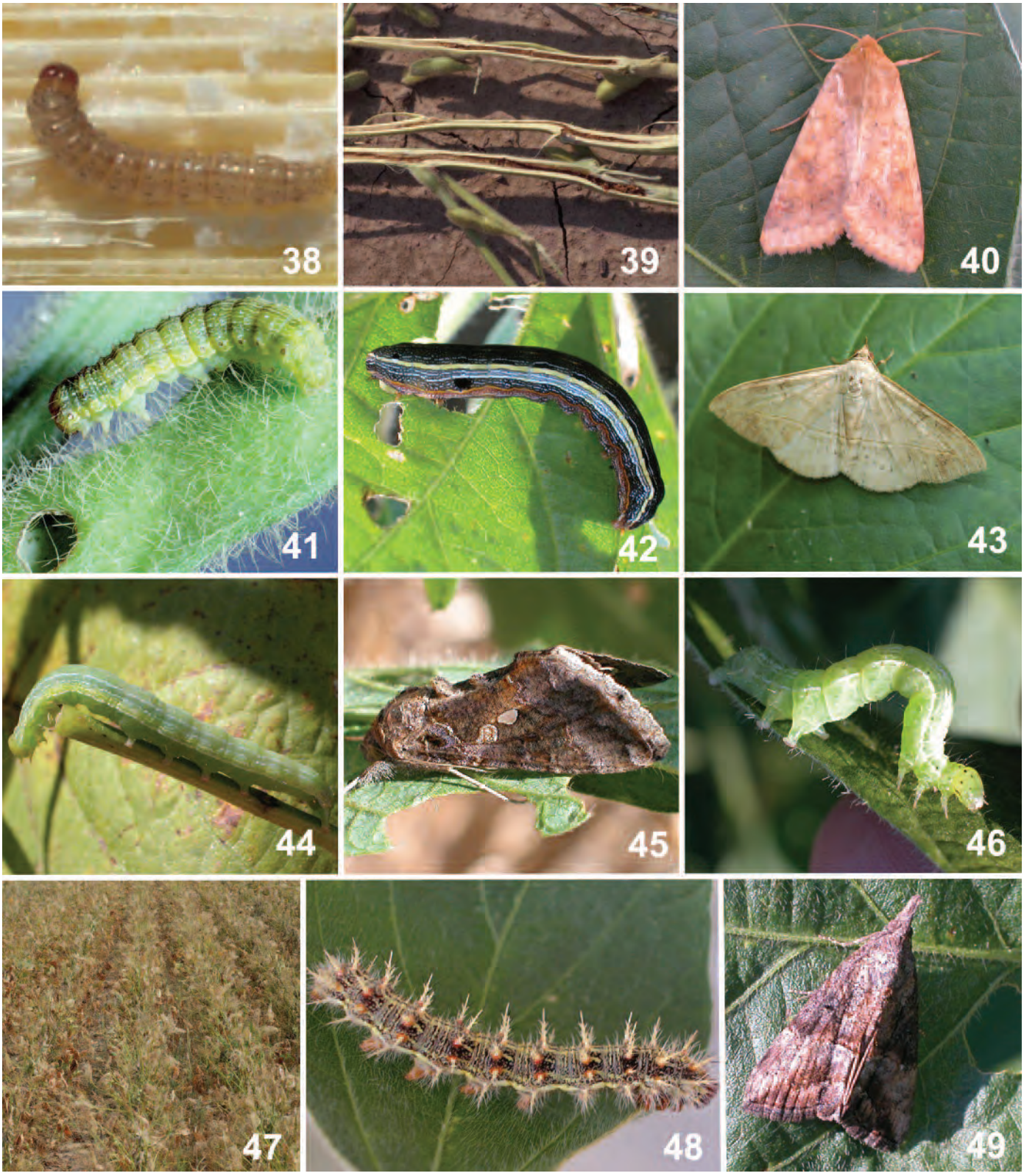
Figures 1-13. Green stink bug adult (1), green stink bug nymph (2), brown stink bug adult (3), brown stink bug nymph (4), southern green stink bug adult (5), southern green stink bug nymph (6), redshoulderd stink bug adult (7), redshoulderd stink bug nymph (8), redbanded stink bug adult (9), redbanded stink bug adult showing characteristic spine on abdomen (10), redbanded stink bug nymph (11), spined soldier bug adult (12), spined soldier bug nymph (13).



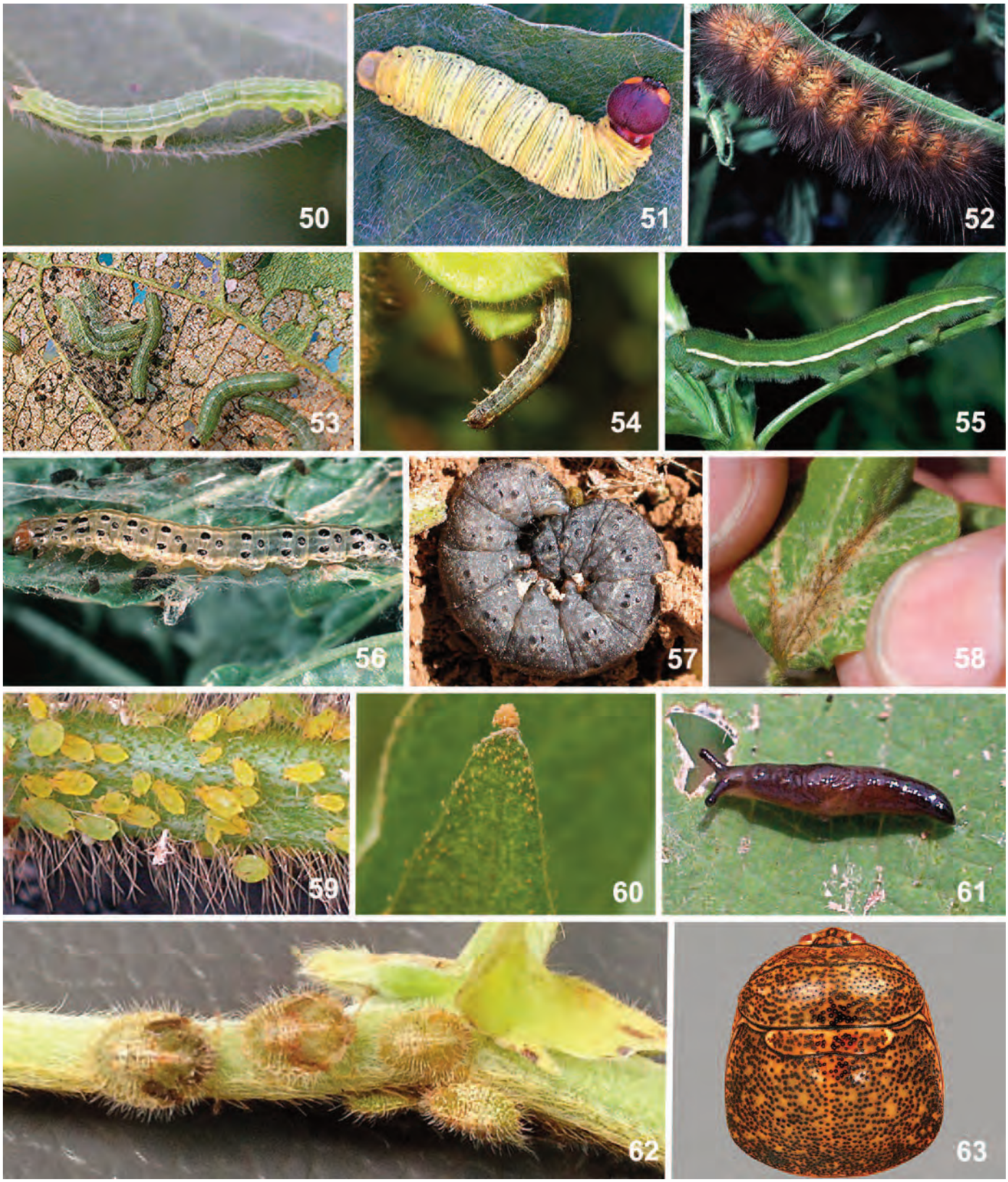
Figures 14-25. Broad-headed bug (14), burrower bug (15), bandedwinged whitefly (16), threecornered alfalfa hopper adult (17), threecornered alfalfa hopper nymph (18), threecornered alfalfa hopper girdled main stem (19), potato leafhopper (20), grasshopper (21), white grub (22), Japanese beetle (23), margined blister beetle (24), striped blister beetle (25).



Figures 26-37. Dectes stem borer adult (26), dectes stem borer larva (27), bean leaf beetle (28), bean leaf beetle feeding on soybean pod (29), banded cucumber beetle (30), spotted cucumber beetle (31), cucumber beetle larval feeding damage (32), grape colaspis adult (33), grape colaspis larva (34), whitefringed beetle (35), soybean nodule fly (36), lesser cornstalk borer (37).



Figures 38-49. European corn borer (38), European corn borer damage, similar to dectes stem borer tunneling (39), corn earworm adult (40), corn earworm larva (41), yellowstriped armyworm (42), velvetbean caterpillar adult (43), velvetbean caterpillar larva (44), soybean looper adult (45), soybean looper larva (46), soybean looper defoliated field (47), painted lady (48), green cloverworm adult (49).



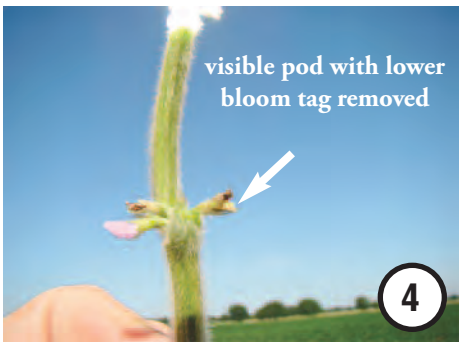
Figures 50-61. Green cloverworm larva (50), silver-spotted skipper (51), saltmarsh caterpillar (52), beet armyworm (53), fall armyworm (54), alfalfa caterpillar (55), garden webworm (56), black cutworm (57), thrips (58), soybean aphid (59), spider mites (60), slug (61), kudzu bug nymphs (62), kudzu bug adult (63).

Guide to Soybean Growth Stages and Growth Stage Predictor

R1: First flower anywhere on the plant.

R2: Flower in the upper (youngest) two nodes.

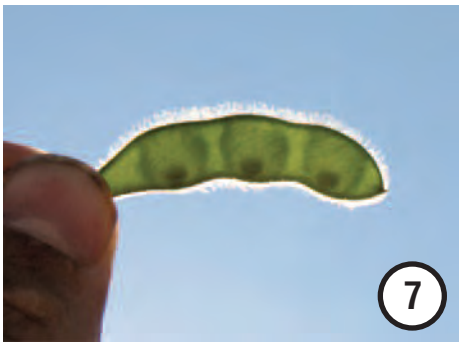
R3: 3/16-inch-long pod in upper four nodes.



R3: 3/16-inch-long pod in upper four nodes.

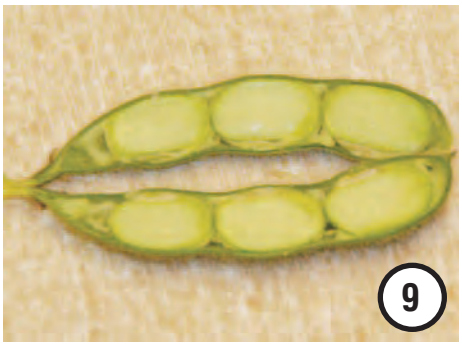
R3.5: ½-inch-long pod in upper four nodes.

R4: ¾-inch-long pod in upper four nodes.



R5: Visible seed in pod of upper four nodes.

R5.5: Beans filling half the space in the pod of upper four nodes.



R6: Beans touching inside pods of upper four nodes.

R6.5: Pod and pod wall beginning to turn mature color.

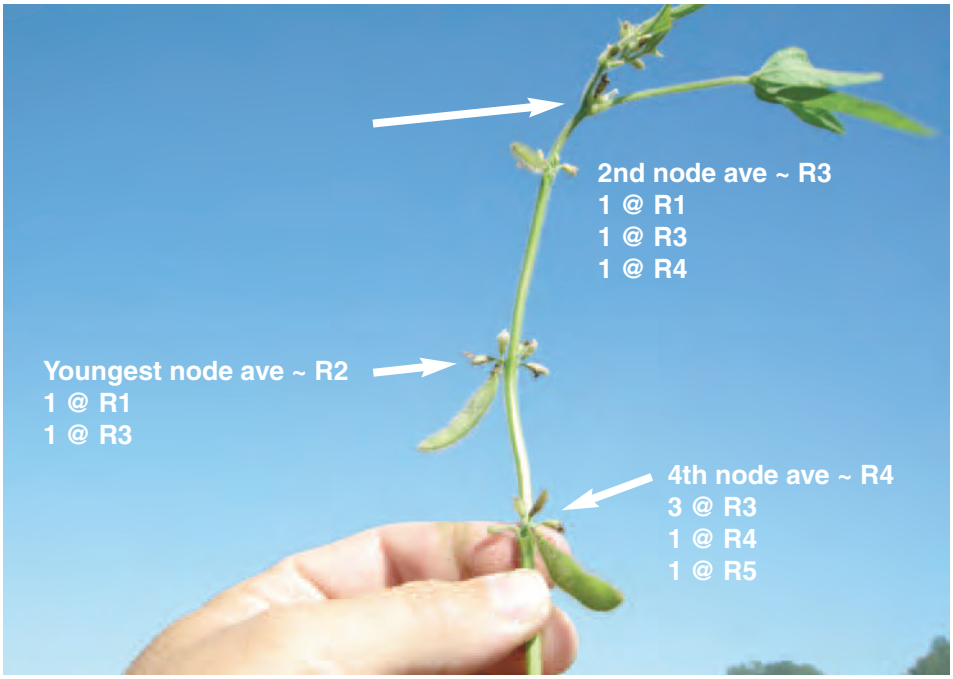
R7: Pod mature in color anywhere on plant.

R8: 50 percent of the pods mature in color and containing mature seed.

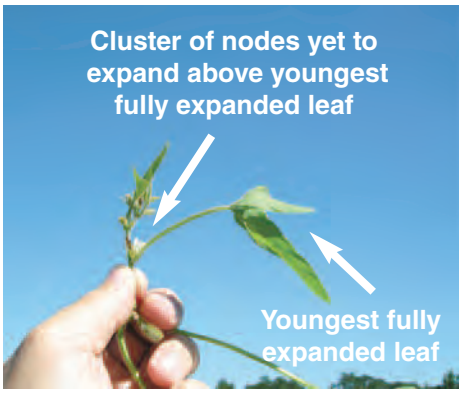
How to Determine Soybean Growth Stage

Concentrate on the youngest (upper) four nodes to determine soybean growth stage. Estimate the average growth stage for the reproductive growth (flowers and pods) on the youngest four nodes. Begin with the youngest fully expanded leaf (see picture 1 right), and estimate growth stage down the next three nodes (see picture 2 below).

Indeterminate varieties (most group 4 varieties and a few group 5 varieties) start reproductive growth toward the bottom of the plant. The reproductive growth progresses from the bottom of the plant upward as the plant produces more nodes.



PICTURE 2 **Avg. growth stage = R3**

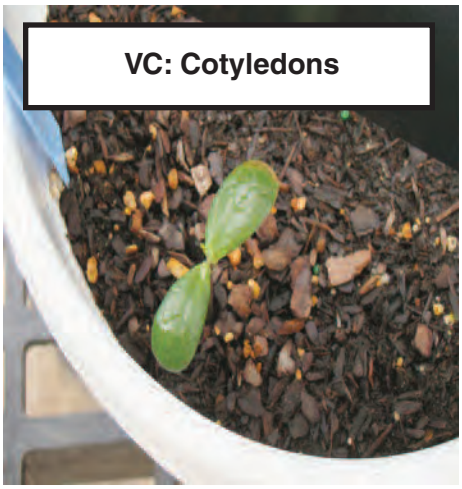


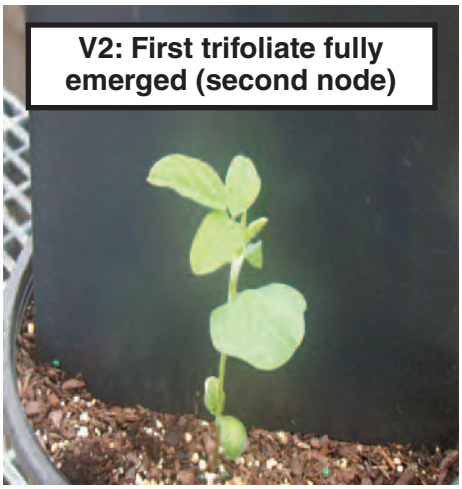
PICTURE 1

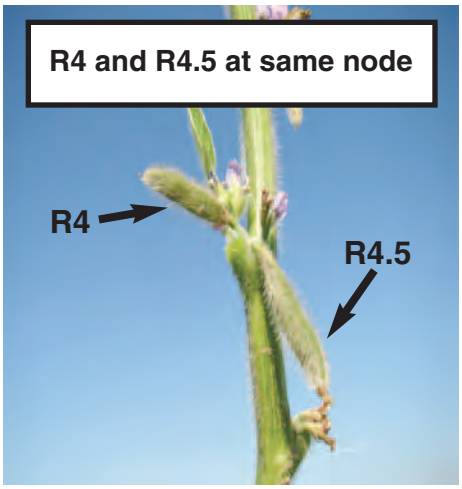
Determinate varieties (most of our group 5 varieties) start reproductive growth uniformly up and down the main stem.

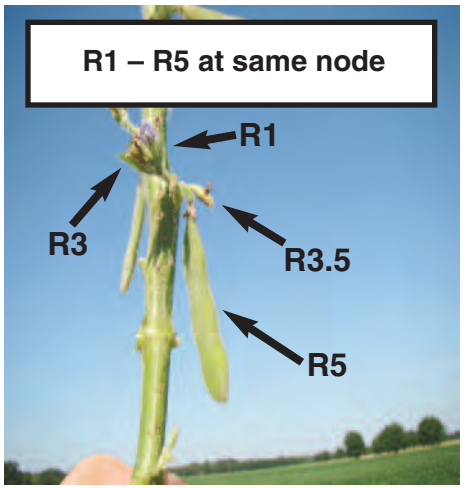
Another way of thinking about this is that it is common to see pods in the R5 growth stage at the bottom of plants and new flowers and pods at the top of indeterminate growth plants. Determinate growth plants have same-sized flowers and pods that grow uniformly up and down the stem.

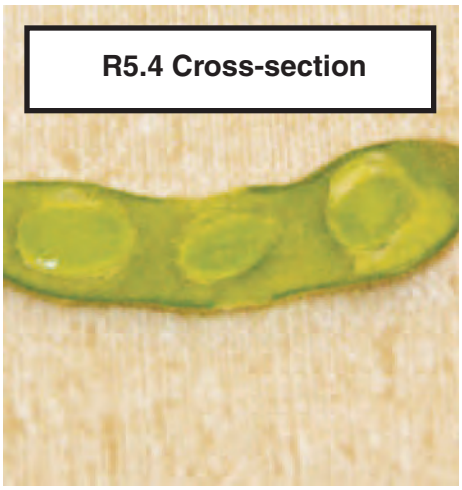
Vegetative and Reproductive Soybean Growth Stages

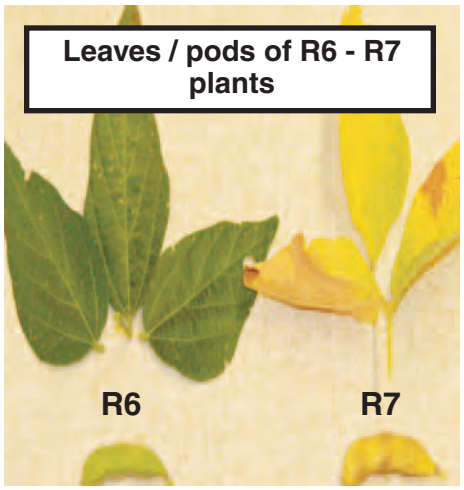


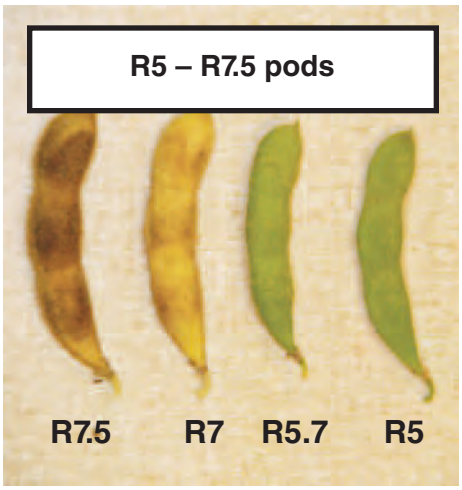












CORN INSECT MANAGEMENT

Managing Corn Insects

A number of insects may attack corn, and some carry diseases. For example, aphids carry maize dwarf mosaic, and leafhoppers carry corn stunt. In some years heavy infestations of insects may drastically reduce yields. In other years insect populations never reach damaging levels. In order to prevent losses due to insect damage, you must know about the pest, its biology, and recommended control methods. The following information contains brief descriptions of insect pests often found in Mississippi corn fields. This information is presented to help you identify insect pests, the resulting damage, current economic thresholds, and control practices.

To minimize the impact of pests and pest control costs,

a. Scout fields regularly. Make careful counts of insect pest populations.
b. Use all available, practical noninsecticidal IPM tools.
c. Apply insecticides promptly when needed.
d. Use the most cost-efficient insecticide recommended for the target pest. Apply insecticide during the most susceptible stage of development.
e. Follow recommended guidelines for practicing insecticide-resistance management.

Before deciding to treat and before choosing the insecticide, consider such factors as the potential to intensify secondary pest problems and insecticide resistance.

Warning

Information in this guide is provided for educational and planning purposes only. When using agricultural chemicals, you (the user) are responsible for making sure the intended use complies with current regulations and conforms to the product label. Before applying any insecticide, be sure to get current usage information. Read and follow the product label.

Precautions

Before using a pesticide, read the label carefully. Follow the directions. Pay attention to all precautions on the pesticide container label. Observe all regulations on worker protection and pesticide record-keeping. Store pesticides in plainly labeled containers safely away from livestock, pets, and children. Store pesticides in an area where they will not contaminate food or feed.

Integrated Pest Management

The best approach for pest control is to combine all available management practices to reduce damage. Proper selection of corn varieties and planting dates, regular scouting for pest infestations, wise use of insecticides, timely harvest, and sanitation of crop residue will reduce the likelihood of insect damage.

Scouting

Regularly scouting corn fields is the best way to find damaging insect populations. Sample at least ten consecutive plants at each of four to five representative sites within a field. Treatment thresholds for many corn pests are much higher than in other crops, such as cotton. Therefore, you can generally check a fairly small number of plants to determine the presence of a particular pest species. If pests are present, step up scouting efforts to determine infestation levels more precisely. Corn is most open to insect injury in the seedling stage. From emergence until plants are approximately 10 inches tall, scout fields every 4 to 5 days. When plants are taller than 10 inches, sample for insect pests every week until crops mature.

Plants less than 6 inches tall: Record the number of plants examined and the number with five or more chinch bugs. Observe plants for signs of feeding or wilting from cutworms or other soil insects. Cutworms often cleanly cut plants off near the soil surface. If cut plants are found, determine whether anticipated stand loss will reduce the plant population below acceptable levels.

Emergence until tassel development: Look for signs of leaf feeding by caterpillars, flea beetles, or other pests on leaves within the whorl. As leaves emerge and unfurl from within the whorl, feeding damage usually appears as small, often regularly spaced holes or long scars on the leaves. Cut plants below the whorl. Check the leaves for worms. Record the species and the average number of worms present per plant.

After tassel development to maturity: Concentrate plant examinations from the tassel to the ear zone of the plant. In late-planted corn, look for second- and third-generation corn borers. Eggs are deposited on the upper and lower leaf surfaces. Look for evidence of recent feeding by small larvae on the leaf surface, at the base of the leaf, or behind the leaf sheath. When there is evidence of a corn borer infestation, randomly select plants from representative areas of the field and examine the stalks and ears. Larvae tunneling in the stalk cannot be controlled with insecticides. Corn earworms, fall armyworms, and corn borers may all be found in the ear, so species identification is important.

Suggested Planting Dates for Corn

South Mississippi:	February 25 – March 15	South-Central:	March 5 – April 10
North-Central:	March 15 – April 20	North Mississippi:	March 20 – April 25

Thresholds

Making insect management decisions based on established treatment thresholds rather than applying treatments based on schedules or presence of pests is a proven method of reducing insect management costs. Effective use of thresholds requires frequent, intensive scouting to get accurate estimates of populations of various pest species that may be present in a field.

Treatment threshold is the pest population level at which treatment must be applied to avoid economic loss that would be greater than the cost of the treatment. Thresholds can vary, depending on species of pest present, stage of crop development, yield potential of the crop, cost of the treatment, market price, populations of other pests present, number of beneficial insects, potential for flaring secondary pests, ability to control secondary pests, and other factors. The thresholds recommended in this guide vary according to pest species and stage of crop development, but fixed thresholds cannot fully consider the many other factors that can influence a treatment decision.

Additional Information

In addition to this publication, you can get several other Extension publications on corn insect biology and management from your county Extension agent.

Information Sheet 864 – Corn Fertilization	Information Sheet 1548 – Corn Plant Population
Information Sheet 1563 – Minimizing Alflatoxin in Corn	Information Sheet 866 – Corn Planting Dates

Insecticide Resistance and Resistance Management

CAUTION: Recommendations of specific insecticides are based on information on the manufacturer's label and performance in a limited number of tests. Levels of insecticide resistance, environmental conditions, and methods of application by growers may vary widely. For this reason, insecticide performance will not always match the safety and pest control standards indicated by experimental data.

Insecticides are listed alphabetically, not in order of their effectiveness. Effectiveness of a particular insecticide can vary greatly from field to field, depending on previous insecticide use, pest species, levels of resistance, and many other factors. A group of insecticides recommended for control of a specific pest will vary in cost, effectiveness against the primary target pest, and secondary pests controlled. When selecting insecticides, growers must consider each of these factors plus the need to rotate among different insecticide classes to limit insecticide resistance problems.

Classes of insecticides: Effective resistance management requires rotation among the various classes of available insecticide chemistry. Often when one insecticide in a class fails because of insecticide resistance, other insecticides in the same class will also be ineffective. Selection of an insecticide from a different class will improve the chances of obtaining control. Growers need to be very aware of the type of insecticide chemistry being used. Classes of insecticides recommended in this guide are identified by the following abbreviations:

Avermectins – (AV)	Chloro-nicotinyl – (CN)	Organophosphate – (OP)	Pyridine Carboxamide – (PC)
Biologicals – (B)	Insect Growth Regulators – (IGR)	Oxadiazine – (OX)	Spinosyns – (SPN)
Carbamate – (C)	Organochlorine – (OC)	Pyrethroid – (P)	Tetronic Acid – (TA)
Diamindes – (D)	METI-Acaricides – (M)		

Bt Corn

Bt is a bacterium that occurs naturally in the soil. Bt, or *Bacillus thruingensis*, produces crystal-like proteins (cry proteins) that can kill certain insects once ingested. Bt corn hybrids express cry proteins. Therefore, Bt corn hybrids are protected from certain insects, depending on what cry protein(s) the plant expresses.

The Bt corn hybrids planted in the Midsouth resist southwestern corn borers, European corn borers, and sugarcane borers. Before 2009, the commercial Bt corn hybrids expressed one protein to protect against lepidopterian pests. In 2009 Bt corn hybrids became available that expressed two proteins to protect against lepidopterian pests, corn earworms, and fall armyworms. In 2010, Bt corn hybrids became available that express multiple proteins to control these pests.

Bt corn hybrids protected against western and northern corn rootworms are of little value in Mississippi. They were developed for use in the Corn Belt and have little or no efficacy on southern corn rootworms.

Refuge requirements for the Bt corn hybrids in cotton-growing regions depend on the number of proteins expressed in the plant. Bt corn hybrids expressing one protein can be planted to only 50 percent of a grower's acreage. Bt corn hybrids expressing two or more proteins can be planted to 80 percent of a grower's acreage. For specific information regarding refuge location and refuge configurations, see your local Extension agent or seed dealer.

Traits and Refuge Requirements for Commercial Hybrids Containing Bt Technology

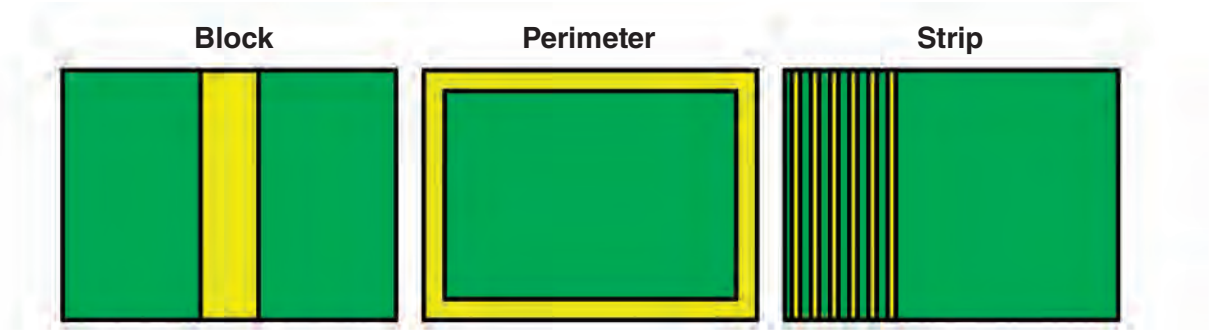
Trademark	Abbreviation	Proteins/Traits	Refuge Requirements	Target Insect Pest(s)
Genuity SmartStax	VT3P/HXX	Cry3Bb1 + RR2 + Cry1A.105 + Cry2Ab2 + Cry34Ab1 + Cry35Ab1 + Cry1F + LL	20%[1]	corn rootworm, corn borer spp., corn earworm, fall armyworm
Genuity VT Triple Pro	VT3P	Cry3Bb1 + RR2 + Cry1A.105 + Cry2Ab2	20%[1]	corn rootworm, corn borer spp., corn earworm, fall armyworm
Genuity VT Double Pro	VTPRR2	Cry1A.105 + Cry2Ab2 + RR2	20%[2]	corn borer spp., corn earworm, fall armyworm
Roundup Ready Corn 2	RR2	RR2	0%	---
Herculex Rootworm	CRW (HXRW)	Cry34Ab1 + Cry35Ab1 + LL + RR2	20%[1]	corn rootworm
Herculex I	Bt (HX1)	Cry1F + LL + RR2	50%[2]	corn borer spp., fall armyworm
Herculex Xtra	CRW (HXRW)+Bt(Hx1)	Cry34Ab1 + Cry35Ab1 + Cry1F + LL + RR2	50%[1]	corn rootworm, corn borer spp., fall armyworm
Agrisure CB/LL/GT	CB/LL/GT	Cry1Ab + glufosinate tolerance + glyphosate tolerance	50%[2]	corn borer spp.
Agrisure CB/LL/RW	CB/LL/RW	Cry1Ab + modified Cry3A + glufosinate tolerance	50%[1]	corn rootworm, corn borer spp.
Agrisure 3000GT	CB/LL/RR/RW/GT	Cry1Ab + modified Cry3A + glufosinate tolerance + glyphosate tolerance	50%[1]	corn rootworm, corn borer spp.
Agrisure Viptera 3110	CB/LL/Viptera/GT	Cry1Ab + Vip3A + glufosinate tolerance + glyphosate tolerance	20%[2]	corn borer spp., corn earworm, fall armyworm
Agrisure Viptera 3111	CB/LL/RW/Viptera/GT	Cry1Ab + modified Cry3A + Vip3A + glufosinate tolerance + glyphosate tolerance	20%[1]	corn rootworm, corn borer spp., corn earworm, fall armyworm
Optimum Intrasect	YGCB/HX1/LL/RR2	Cry1Ab+Cry1F + LL + RR2	20%[2]	corn borer spp., fall armyworm
Optimum Leptra	HX1/YGCB/Viptera/LL/RR2	Cry1F + Cry1Ab + Vip3A + glyfosinate tolerance + glyphosate tolerance	20%[2]	corn borer spp., corn earworm, fall armyworm
Optimum TRIsect	RW/HX1/LL/RR2	Modified Cry3A + Cry1F + LL + RR2	50%[1]	corn rootworm, corn borer spp., fall armyworm
Agrisure 3122	RW/CB/LL/HX1/HXRW/GT	Modified Cry3A + Cry1Ab + Cry1F + Cry34Ab1 + Cry35Ab1 + LL + RR2	20%[1]	corn rootworm, corn borer spp., fall armyworm
Agrisure Viptera 3220	CB/LL/GT/Viptera/HX1	Cry1Ab + Vip3A + glufosinate tolerance + glyphosate tolerance + Cry1F	20%[2]	corn borer spp., corn earworm, fall armyworm
Agrisure GT	GT	glyphosate tolerance	0%	---

[1]Within field or adjacent to field. [2]Within field, adjacent to field, or up to ½ mile away. Examples of refuge deployment options are illustrated on the following page.

Refuge Deployment Options

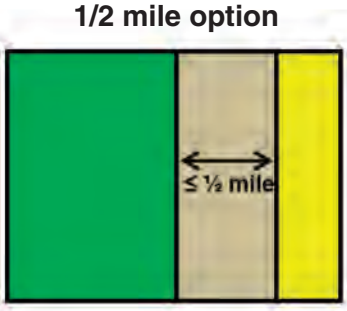
When both rootworm and caterpillar traits are present in a hybrid, growers are required to follow refuge requirements and deployment strategies that satisfy the criteria for both. For example, if a field is planted to a hybrid that has a single caterpillar trait (requires 50% refuge up to ½ mile away) and a single rootworm trait (requires 20% refuge within field or adjacent to the field) the total refuge for that field has to be 50%. There are several ways that this can be accomplished. The entire 50% refuge can be planted within the field or adjacent to the field. Another possibility is that 20% of the refuge may be planted within the field or adjacent to the field and the remaining 30% within ½ mile of the field. Examples of refuge deployment options are illustrated here.

Blended refuge corn products (refuge, i.e., non-Bt seed mixed with Bt) may be encountered. This refuge strategy was developed for the Midwest. If these products are planted, a separate structured refuge (as in the examples below) is still required.



Within field deployment configurations. All must be at least four rows wide.

Adjacent to field deployment configurations. All must be at least four rows wide.



Non-adjacent deployment configuration. Must be at least four rows wide.

Relative Efficacy of Corn Seed Treatments for Control of Seedling Insect Pests

Common Name, Trade Names	Rate	Relative Efficacy of the Seed Treatment[1]											
		Corn Billbug	White Grubs	Wire-worms	Seed-corn Maggot	Cut-worm[2]	Sugar-cane Beetle	Southern Green Stinkbug	Brown Stinkbug	Chinch Bug	Southern Corn Rootworm[2]	Western Corn Rootworm	Lesser Cornstalk Borer
clothianidin													
Poncho 250 or Acceleron[3]	0.25 mg a.i./ kernel	NL	F	G	G	P-F	F	F	NL	G	E	NL	G, NL
Poncho 500 or Acceleron with Poncho VOTiVO[4]	0.50 mg a.i./ kernel	F	G	G	E	P-F	G	G	NL	G-E	E	P,NL	G, NL
Poncho 1250 or Acceleron[3]	1.25 mg a.i./ kernel	G	E	E	E	F-G	G	G	G, NL	E	E	G	E, NL
thiamethoxam													
Cruiser Extreme 250[3]	0.25 mg a.i./ kernel	NL	F	G	E	P	P	P	NL	F	G-E, NL	NL	G, NL
Cruiser Extreme 500[3] or Avicta Complete Corn[4]	0.5 mg a.i./ kernel	NL	G	G	E	P	P	F	NL	F	E	NL	G, NL
Cruiser Extreme 1250[3]	1.25 mg a.i./ kernel	G	E	E	E	F	P	G	NL	G	E	P	E, NL
imidacloprid													
Gaucho 600, Imida E-AG 5 FST, Senator, Imidacloprid 5, Attendant 600	0.60mg a.i./ kernel[5]	NL	G	G	E	P, NL	P,NL	P,NL	NL	F	G, NL	NL	NL
Latitude[3]	3.5 oz./cwt	NL	F, NL	G	G	NL	NL	NL	NL	F, NL	G, NL	NL	NL
Concur[3]	1.5 oz./ 42 lb. seed	NL	F	G	G	NL	NL	NL	NL	F, NL	G, NL	NL	NL
permethrin													
Kernel Guard Supreme[3] or Kickstart VP[3]	1.5 oz./ 42 lb. seed	NL	F, NL	P?	F	NL	NL	NL	NL	NL	NL	NL	NL

[1]E = highly effective, G = effective, F = inconsistent results, P = not effective, based on trials in the Southeastern U.S.; L = insect is on the label for this product; NL = insect is not on the label for this product. In this case, it is best to assume that the product is ineffective against that particular pest, unless there is specific knowledge to the contrary about product efficacy in the Southeast.
[2]In the Southeast, several species of cutworms overwinter as medium- to large-sized larvae. They may be capable of cutting considerable numbers of seedlings before they eat a lethal dose of the insecticide. Black cutworm, the cutworm that appears on the label of most of these products, has a different life cycle in which eggs are laid in the spring, so that black cutworm larvae will be small if they have hatched out by the time the corn is planted. Southern corn rootworm larvae are a seedling pest, not a midseason pest like western corn rootworm larvae.
[3]Product name as marketed includes fungicides.
[4]Product name as marketed includes fungicides and a nematicide. Avicta Complete Corn contains the nematicide abamectin, Acceleron with VOTiVO contains the nematicide *Bacillus firmus* I-1582.
[5]Other rates for this active ingredient are available. See label.
This table is published in the Alabama Cooperative Extension System Corn IPM Guide, which is part of the Alabama Pest Management Handbook Vol. 1, http://www.aces.edu/pubs/docs/A/ANR-0500-A/. It is revised annually.

Relative Efficacy of Selected Bt Corn Products

Traits/Brands	Primary Target Pests	Corn borers	Cutworms	Corn earworms	Fall armyworms	Western corn rootworms
YieldGard Corn Borer, Agrisure CB/LL	Corn borers	Excellent	Poor	Fair	Fair-Good	None
Herculex I	Corn borers	Excellent	Good	Poor	Good	None
YieldGard VT Triple	Corn borers, corn rootworms	Excellent	Poor	Fair	Fair-Good	Excellent
Herculex XTRA	Corn borers, corn rootworms	Excellent	Good	Poor	Good	Excellent
Genuity VT Pro	Corn borers, other caterpillar pests	Excellent	Poor	Very Good	Excellent	None
Genuity VT Triple Pro	Corn borers, corn rootworms, other caterpillar pests	Excellent	Poor	Very Good	Excellent	Excellent
Genuity SmartStax	Corn borers, corn rootworms, other caterpillar pests	Excellent	Good	Very Good	Excellent	Excellent
Agrisure Viptera	Corn borers, other caterpillar pests	Excellent	Good	Excellent	Excellent	None unless stacked with rootworm resistance

Parts of this table are courtesy of Auburn University Publication 2009IPM-428 (Insect, Disease, Nematode, and Weed Control Recommendations for 2009).

Pests Belowground

Southern Corn Rootworms, Seedcorn Maggots, Sugarcane Beetles, Lesser Corn Stalk Borers, Corn Billbugs, White Grubs, Wireworms, Cutworms

Most insects that attack plants at or beneath the soil surface are most damaging to corn in the seedling stage. Although many of these insects may damage older plants, seedling corn is the most likely to be injured. Many late-season pests can usually be avoided by early planting. Early planting reduces the chances of insect infestations and increases yield potential. A major factor in corn insect pest management is controlling soil insects that threaten corn stands and overall plant health. The occurrence of soil insects is often spotty. But certain factors, such as reduced tillage, no-till corn, and fields with a history of soil insects warrant the use of insecticides or seed treatments at planting. The use of these products is justified when the potential for infestation is high and when rescue treatments offer less control. These products are used for prevention.

Southern Corn Rootworms

The adult southern corn rootworm is also known as the twelve-spotted cucumber beetle. Adults are found on many plants throughout the growing season. Females deposit their eggs at the base of the plants. Upon hatching, the larvae move into the root zone and begin feeding. The larva is about one-half inch long when full sized. It has three pairs of small legs just behind the head and brownish patches on the head and tail end.

Damage: Larvae damage corn seedlings by feeding on and tunneling inside the roots. Larvae may also bore inside the stem just above the roots to feed on the crown of the plants, eventually killing the bud. Damaged plants often wilt, and you can find evidence of rootworm feeding if you dig up the plant and examine the root system. Severe feeding and root pruning may cause plants to lodge. This is often called "goose necking."

Control: Pre-emergence insecticides are recommended when planting after a legume crop. Treated seed will also offer control of southern corn rootworms.

Threshold: Treatment is preventive. See the table on page 50 for products used to control/suppress belowground pests.

Seedcorn Maggots

The seedcorn maggot is the larval stage of a fly. It feeds on decaying organic matter in the soil. Larvae are less than one-fourth inch long, pale white, and they lack legs or an obvious head.

Damage: This pest attacks the germinating seed planted in cool, wet weather or corn planted to fields with freshly decaying vegetation. Heavy infestations will reduce stands and cause stunting of the plants.

Control: Damage can be prevented with the use of soil insecticides at planting or seed treatments.

Threshold: Treatment is preventive. See the table on page 50 for products used to control/suppress belowground pests.

Sugarcane Beetles

This insect occurs sporadically from year to year. This beetle is black and about one-half inch long. When this pest is abundant, it can destroy stands in isolated fields. Control of this pest has been inconsistent with soil insecticides.

Damage: The sugarcane beetle feeds on the stem at or slightly below the soil surface. Feeding damage appears as a ragged hole in the base of the stem.

Control: The use of soil insecticides at planting or seed treatments may suppress sugarcane beetle infestations.

Threshold:: Treatment is preventive. See the table on page 50 for products used to control/suppress belowground pests.

Lesser Cornstalk Borers

Infestations of lesser corn stalk borers occur most often during dry weather conditions in sandy soils. Sometimes silken tubes containing larvae can be found attached to plants when they are dug up for inspection. Larvae are slender and greenish, and usually wiggle violently when disturbed.

Damage: Larvae damage the corn plant by boring into the base of the stem. Damage can cause deadheart and may greatly reduce stands. Plants that experience deadheart die or are severely stunted and never produce a harvestable ear.

Control: The use of soil insecticides at planting or seed treatments offer control/suppression of infestations.

Threshold: Treatment is preventive. See the table on page 50 for products used to control/suppress belowground pests.

Corn Billbugs

The larvae of billbugs (snout-beetles) feed on roots and bore into the stems of corn plants.

Damage: Feeding by the adults will appear as a row of holes across the leaf when it unfurls.

Control: Soil insecticides at planting or seed treatments offer some control/suppression of infestations.

Threshold: Treatment is preventive. See the table on page 50 for products used to control/suppress belowground pests.

White Grubs

White grubs are the larvae of May or June beetles. They are C-shaped and white to cream in color. Adult beetles lay their eggs in grass or sod.

Damage: The damage caused by white grubs is similar to that of corn rootworm larvae.

Control: Soil insecticides at planting or seed treatments offer some control/suppression of infestations.

Threshold: Treatment is preventive. See the table below for products used to control/suppress belowground pests.

Wireworms

Wireworms are the larval stages of click beetles. The larvae are elongated, slender, and usually brown. Depending on species, larvae may take 2 to 5 years to mature. This pest is often difficult to control in fields that were fallow or in pasture before being planted in corn. Large larvae in the field at planting are the most destructive.

Damage: Wireworm larvae feed on the seeds and roots and will bore into the underground portion of the plants. This boring may lead to deadheart, a condition that severely stunts or kills the plant.

Control: Soil insecticides at planting or seed treatments offer some control/suppression of infestations.

Threshold: Treatment is preventive. See the table below for products used to control/suppress belowground pests.

Belowground Pests of Corn

Insecticide	Amount of Formulation per Acre	Application and Comments
Seed Treatments		
clothianidin (CN) Poncho 250	0.25 mg ai/ kernel	**Commercially treated seed.**
Poncho 500	0.5 mg ai/ kernel	
imidacloprid (CN) Gaucho 600	0.64 mg ai/ kernel	Can be applied on-farm or treated commercially.
thiamethoxam (CN) Cruiser 5FS	0.25 mg ai/ kernel	**Commercially treated seed.**
In Furrow, Banded, or T-Banded		
bifenthrin (P) Capture LFR	0.2 – 0.4 oz./1,000 row ft.	Applied in-furrow, T-banded, or banded.
chlorpyrifos (OP) Lorsban 15G	8 oz. /1,000 row ft.	**Recommended use as T-band application.** Lorsban 15G is compatible with all ALS inhibitor herbicides applied in accordance with the label.
phorate (OP) Thimet 20G	4.5 – 6.0 oz./1,000 row ft.	**Do not use for in-furrow application.** Banded: Place granules in a 7-inch band over the row or directly behind the planter shoe in front of or behind the press wheel and lightly incorporate. Accent® herbicide and Beacon® herbicide may be applied after **banded** applications of Thimet 20G Lock'n Load.
phosphorothioate (OP) Aztec 2.1G	6.7 oz. /1,000 row ft.	Apply as a 3- to 4-inch band.
tefluthrin (P) Force 3G	3 – 4 oz./1,000 row ft.	Banded: Place granules in a 7-inch band directly behind planter shoe in front of or behind press wheel. Do not apply product as a band or T-band unless it can be incorporated into the top 1 inch of soil using tines, chains, or other suitable equipment.
terbufos (OP) Counter 15G	6 – 8 oz. /1,000 row ft.	**In-furrow treatment only. ALS-inhibiting herbicides should not be used if Counter 15G has been applied at the time of planting. See product label for additional information.**

Cutworms

Insecticide	Amount of Formulation per Acre	Pounds Active Ingredient per Acre	Acres 1 Gallon or 1 Pound Dry Will Treat	Application and Comments
In Furrow, Banded, or T-Banded				
chlorpyrifos (OP) Lorsban 15G	8 oz./1,000 row ft.			**Only provides cutworm control when T-banded.** Lorsban 15G is compatible with all ALS inhibitor herbicides applied in accordance with the label.
phosphorothioate (OP) Aztec 2.1G	6.7 oz./1,000 row ft.			Apply as a 3- to 4-inch band.
tefluthrin (P) Force 3G	3 – 4 oz./1,000 row ft.			Banded: Place granules in a 7-inch band directly behind planter shoe in front of or behind press wheel. Do not apply product as a band or T-band unless it can be incorporated into the top 1 inch of soil using tines, chains, or other suitable equipment.
Foliar Sprays				
β-cyfluthrin (P) Baythroid XL 1EC	0.8 – 1.6 oz.	0.007 – 0.013	160 – 80	
bifenthrin (P)				For best control, direct sprays toward base of the plants. Apply with a minimum of 15 gallons of water per acre.
Bifenture EC	2.1 – 6.4 oz	0.033 – 0.1	61 – 20	
Brigade 2EC	2.1 – 6.4 oz.	0.033 – 0.1	61 – 20	
Discipline 2EC	2.1 – 6.4 oz.	0.033 – 0.1	61 – 20	
Fanfare 2EC	2.1 – 6.4 oz.	0.033 – 0.1	61 – 20	
chlorpyrifos (OP) Lorsban 4E	1 – 2 pt.	0.5 – 1.0	8 – 4	Lorsban may not work as well if the top of soil is dry and crusty. Some incorporation may be necessary. **Do not spray liquid Lorsban formulations in-furrow. They can injure corn.**
cyfluthrin (P) Tombstone 2E	0.8 – 1.6 oz.	0.013 – 0.025	160 – 80	
esfenvalerate (P) Asana XL 0.66EC	5.8 – 9.6 oz.	0.03 – 0.05	22 – 13	
gamma-cyhalothrin (P) Declare 1.25EC	0.77 – 1.28 oz.	0.0075 – 0.0125	166 – 100	CEW rate is 0.77 – 1.28 oz./ac or 0.0075 – 0.0125 lb. ai/ac for cutworms.
λ-cyhalothrin (P)				
Karate Z 2.08	0.96 – 1.60 oz.	0.015 – 0.025	133 – 80	
Lambda-Cy 1EC	1.92 – 3.20 oz.	0.015 – 0.025	66.7 – 40	
Silencer 1EC	1.92 – 3.20 oz.	0.015 – 0.025	66.7 – 40	
permethrin (P)				
Ambush 2EC	6.4 – 12.8 oz.	0.1 – 0.2	20 – 10	
Pounce 3.2EC	4 – 8 oz.	0.1 – 0.2	32 – 16	
Z-cypermethrin (P) Mustang Max 0.8EC	1.28 – 2.8 oz.	0.008 – 0.0175	100 – 45.7	
bifenthrin (P) + **Z-cypermethrin** (P) Hero 1.24EC	2.1 – 6.1 oz.	0.025 – 0.06	61 – 21	
chlorantranilipole (D), **λ-cyhalothrin** (P) Besiege	5 – 10 oz.		25.6 – 12.8	

Several species of **CUTWORMS** attack corn seedlings. The black cutworm is the most common pest from this group. Depending on species, most cutworms overwinter in the soil as larvae or pupae. The female moths tend to deposit their eggs in low places or areas of the fields that have been flooded. Eggs may be deposited alone or in small clusters on the leaves and stems of young plants. *Bt* corn hybrids vary in their efficacy against cutworms. Transgenic hybrids containing the Cry1F protein are rated GOOD in terms of cutworm control.

Damage: Depending on growth stage, larvae of the cutworm feed one of three ways. Young larvae (first and second instars) feed on the leaf surface, giving it a scuffed appearance. Late second and third instars eat holes in the leaves. Larger larvae move into the soil and feed by cutting plants at the soil surface.

Control: Seedbed preparation and weed control help control cutworms. Cutworm infestations are rare in fields kept weed-free by cultivation or herbicides 2 to 3 weeks before planting.

Threshold: Treat with foliar sprays if populations threaten to reduce stands below acceptable levels. Infestations causing 5 percent or greater "cutting" of seedling corn generally justify treatment with insecticides.

Chinch Bugs

Insecticide	Amount of Formulation per Acre	Pounds Active Ingredient per Acre	Acres 1 Gallon or 1 Pound Dry Will Treat	Application and Comments
Seed Treatments				
clothianidin (CN) Poncho 250	0.25 mg ai/kernel			**Commercially treated seed.**
imidacloprid (CN) Gaucho	0.64 mg ai/ kernel			Can be applied on farm or treated commercially.
thiamethoxam (CN) Cruiser 5FS	0.25 – 0.5 mg ai/kernel			**Commercially treated seed.**
In Furrow, Banded, or T-Banded				
chlorpyrifos (OP) Lorsban 15G	8 oz./1,000 row ft.			Lorsban 15G is compatible with all ALS inhibitor herbicides applied in accordance with the label.
tefluthrin (P) Force 3G	4 – 5 oz./1,000 row ft.			Suppression only. **Banded:** Place granules in a 7-inch band directly behind planter shoe in front of or behind press wheel. Do not apply product as a band or T-band unless it can be incorporated into the top 1 inch of soil using tines, chains, or other suitable equipment.
terbufos (OP) Counter 15G	6 – 8 oz./1,000 row ft.			Controls early-season light to moderate populations of chinch bugs. Do not exceed 8.7 lb. Counter 15G per acre. **Banded:** Place granules in a 7-inch band over the row, in front of the press wheel and incorporate evenly into top 1 inch of soil. **In-furrow:** Place granules directly in the seed furrow behind the planter shoe. ALS-inhibiting herbicides SHOULD NOT be used if Counter 15G has been applied at planting.
Foliar Sprays				
β-cyfluthrin (P) Baythroid XL 1EC	1.6 – 2.8 oz.	0.013 – 0.022	80 – 45.7	
bifenthrin (P)				For best control, direct sprays toward base of the plants. Apply with a minimum of 15 gallons of water per acre.
Bifenture 2EC	2.1 – 6.4 oz.	0.033 – 0.1	61 – 20	
Brigade 2EC	2.1 – 6.4 oz.	0.033 – 0.1	61 – 20	
Discipline 2EC	2.1 – 6.4 oz.	0.033 – 0.1	61 – 20	
Fanfare 2EC	2.1 – 6.4 oz.	0.033 – 0.1	61 – 20	
carbaryl (C) Sevin XLR 4L	32 – 64 oz.	1 – 2	4 – 2	
chlorantranilipole (D), **λ-cyhalothrin** (P) Besiege	5 – 10 oz.		25.6 – 12.8	
chlorpyrifos (OP) Lorsban 4E	16 – 32 oz.	0.5 – 1.0	8 – 4	**DO NOT apply by air in Mississippi.**
cyfluthrin (P) Tombstone 2EC	1.6 – 2.8 oz.	0.025 – 0.044	80 – 45.7	
esfenvalerate (P) Asana XL 0.66EC	5.8 – 9.6 oz.	0.03 – 0.05	22 – 13	
gamma-cyhalothrin (P) Declare 1.25EC	1.54 oz.	0.015	83	CEW rate is 1.54 oz./ac or 0.015 ai/ac for chinch bugs.
λ-cyhalothrin (P)				
Karate Z 2.08CS	1.92 oz.	0.03	66.7	
Lambda-Cy 1EC	3.84 oz.	0.03	33	
Silencer 1EC	3.84 oz.	0.03	33	
Z-cypermethrin (P) Mustang Max 0.8EC	3.2 – 4.0 oz.	0.02 – 0.025	40 – 32	
bifenthrin (P) + **Z-cypermethrin** (P) Hero 1.24EC	4.0 – 10.3 oz.	0.04 – 0.10	32 – 12.4	

The adult **CHINCH BUG** is about one-fifth of an inch long and black with white patches on the wings. Nymphs are reddish-orange with a white band across their backs. Later instar nymphs turn darker and resemble adults as they mature. Chinch bugs overwinter on wild grasses and move into fields to feed on young plants. This pest is more likely to cause problems in dry years. Seedling plants are most susceptible to injury.

Damage: Adults and nymphs damage the plant by piercing the plant and sucking the plant juices. Extensive feeding causes plants to wilt; seedlings may die. Plants that survive heavy infestations are stunted and will develop slowly.

Control: Soil-applied insecticides and seed treatments provide control/suppression of chinch bugs. When you use foliar-applied insecticides, thorough coverage is essential.

Threshold: Count both adults and nymphs when scouting for this pest. Look for chinch bugs at the base of the plant and behind the leaf sheaths. Treatments are recommended for plants that are up to 6 inches tall when 20 percent or more of the plants have five or more chinch bugs per plant. Plants that are growing and healthy and taller than 6 inches can tolerate higher populations of chinch bugs.

Stink Bugs

Insecticide	Amount of Formulation per Acre	Pounds Active Ingredient per Acre	Acres 1 Gallon or 1 Pound Dry Will Treat	Application and Comments
Foliar Sprays				
β-cyfluthrin (P)				
Baythroid XL 1EC	1.6 – 2.8 oz.	0.013 – 0.022	80 – 45.7	
bifenthrin (P)				
Bifenture 2EC	2.1 – 6.4 oz.	0.033 – 0.010	61 – 20	
Brigade 2EC	2.1 – 6.4 oz.	0.033 – 0.010	61 – 20	
Discipline 2EC	2.1 – 6.4 oz.	0.033 – 0.010	61 – 20	
Fanfare 2EC	2.1 – 6.4 oz.	0.033 – 0.010	61 – 20	
bifenthrin (P) **+ Z-cypermethrin** (P)				
Hero 1.24EC	4.0 – 10.3 oz.	0.04 – 0.10	47 – 32	
cyfluthrin (P)				
Tombstone 2EC	1.6 – 2.8 oz.	0.025 – 0.044	80 – 45.7	
gamma-cyhalothrin (P)				
Declare 1.25EC	1.02 – 1.54 oz.	0.01 – 0.015	125 – 83	
λ-cyhalothrin (P)				
Karate Z 2.08CS	1.28 – 1.92 oz.	0.02 – 0.03	100 – 66.7	
Lambda-Cy 1EC	2.56 – 3.84 oz.	0.02 – 0.03	50 – 33	
Silencer 1EC	2.56 – 3.84 oz.	0.02 – 0.03	50 – 33	
λ-cyhalothrin (P), **chlorantraniliprole** (D)				
Besiege	5 – 10 oz.		25.6 – 12.8	
Z-cypermethrin (P)				
Mustang Max 0.8EC	2.72 – 4.0 oz.	0.017 – 0.025	32 – 12.4	
Z-cypermethrin (P), **chlorpyrifos** (OP)				
Stallion	3.75 – 11.75 oz.		34.1 – 10.9	

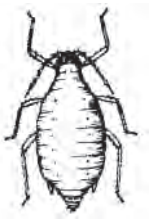
Several species of **STINK BUGS** occasionally attack corn and cause extensive damage. Stink bugs can be found feeding in the whorl of young plants or on developing ears before silking. Populations of stink bugs are often higher following mild winters.

Damage: Damage from stink bugs feeding on seedling and whorl stage corn may cause the whorl to turn yellow or even kill the plant. Feeding during ear development (about 2 weeks before silking) may result in total ear loss or what is called "cow-horned" ears. Stink bugs also feed on the developing ears, piercing the shuck to feed on individual kernels.

Control: When you use foliar-applied insecticides, thorough coverage is essential.

Threshold: Treat corn shorter than 2 feet tall when 10 percent of the plants have one or more stink bugs present. For protection during ear development (before silking), treat when 5 percent of plants have stink bugs at or before ear shoot development. Treatments are not recommended for stink bug control at or beyond the silking stage. Pyrethroids are less effective on brown stink bugs.

Aphids



Insecticide	Amount of Formulation per Acre	Pounds Active Ingredient per Acre	Acres 1 Gallon or 1 Pound Dry Will Treat	Application and Comments
Seed Treatments				
clothianidin (CN) Poncho 250	0.25 mg ai/kernel			**Commercially treated seed.**
imidacloprid (CN) Gaucho 600	0.64 mg ai/kernel			Can be applied on-farm or treated commercially.
thiamethoxam (CN) Cruiser 5FS	0.25 mg ai/kernel			**Commercially treated seed.**
Foliar Sprays				
bifenthrin (P)				
Bifenture 2EC	2.1 – 6.4 oz.	0.033 – 0.10	61 – 20	
Brigade 2EC	2.1 – 6.4 oz.	0.033 – 0.10	61 – 20	
Discipline 2EC	2.1 – 6.4 oz.	0.033 – 0.10	61 – 20	
Fanfare 2EC	2.1 – 6.4 oz.	0.033 – 0.10	61 – 20	
esfenvalerate (P) Asana XL 0.66EC	5.8 – 9.6 oz.	0.03 – 0.05	22 – 13	
gamma-cyhalothrin (P) Declare 1.25EC	1.02 – 1.54 oz.	0.01 – 0.015	125 – 80	
λ-cyhalothrin (P)				
Karate Z 2.08CS	1.28 – 1.92 oz.	0.02 – 0.03	100 – 66.7	
Lambda-Cy 1EC	2.56 – 3.84 oz.	0.02 – 0.03	50 – 33	
Silencer 1EC	2.56 – 3.84 oz.	0.02 – 0.03	50 – 33	
Z-cypermethrin (P) Mustang Max 0.8EC	2.72 – 4.0 oz.	0.017 – 0.025	47 – 32	Control may vary depending on species and host-plant relationships.
bifenthrin (P) + **Z-cypermethrin** (P) Hero 1.24EC	4.0 – 10.3 oz.	0.025 – 0.10	32 – 12.4	

APHIDS (plant lice) are soft-bodied insects that feed by sucking plant juices. The corn leaf aphid is the most common aphid found in corn, but several other species may also occur.

Damage: Aphids can be found in clusters on the leaves or in the whorl. Heavy infestations may cause sticky "honeydew" on leaves.

Control: Beneficial insects usually control aphid populations in the field. Insecticide treatments are seldom warranted. Aphids are parasitized by small parasitoid wasps and are susceptible to a fungal disease. Parasitized aphids are usually brown and larger than other aphids in the colony.

Threshold: Very young corn plants (shorter than 3 inches) may require treatment when an average of 10 or more corn leaf aphids are present. Control measures are not typically recommended because infestations rarely cause yield reductions.

Corn Earworms/ Armyworms

Insecticide	Amount of Formulation per Acre	Pounds Active Ingredient per Acre	Acres 1 Gallon or 1 Pound Dry Will Treat	Application and Comments
Foliar Sprays				
chlorantraniliprole (D) Prevathon	14 – 20 oz.	0.047 – 0.067	9 – 6	
flubendiamide (D) Belt 4SC	2 – 3 oz.	0.063 – 0.094	64 – 43	
λ-cyhalothrin (P), **chlorantraniliprole** (D) Besiege	5 – 10 oz.		25.6 – 12.8	
methomyl (C) Lannate 90SP	12 – 24 oz.	0.225 – 0.45	11 – 5	
spinetoram (SPN) Radiant SC	3 – 6 oz.	0.023 – 0.047	42.7 – 21.3	Except yellow-striped armyworms.
spinosad (SPN) Blackhawk (for corn earworm)	2.2 – 3.3 oz.	0.05 – 0.074	7.3 – 4.8	
Blackhawk (for fall armyworm)	1.67 – 3.3 oz.	0.038 – 0.074	9.6 – 4.8	

Pyrethroids may not control bollworms. It is recommended to use only the highest labeled rate of pyrethroids.

CORN EARWORMS and **FALL ARMYWORMS** are common pests that feed in the whorl before tassel. It is very important to identify the species present in the field properly because some products recommended for corn earworms will not control fall armyworms. Choose an insecticide effective against the complex of caterpillars when both species are present and control is necessary. Corn earworm larvae vary greatly in color, from light green or pink to dark brown with alternating light and dark stripes running lengthwise on the body. The surface of the larva is covered with small thorn-like projections (hairs). The fall armyworm has a darker head capsule with a prominent white inverted Y. This is a distinguishing characteristic of the fall armyworm.

Damage: Corn plants can tolerate considerable amounts of damage from whorl-feeding caterpillars. Populations seldom build to damaging levels unless corn is planted after the recommended planting dates. Feeding by heavy, sustained infestations may lead to deadheart and can reduce yield.

Control: Timely planting is the preferred method of management. Plants in the seedling to early-whorl stage are the most susceptible to damage. Check plants in this early-whorl stage regularly if planted after April 25. Whorl-feeding insects are in a protected area, and the use of adequate spray volume is critical to get control. Apply insecticides in a minimum of 15 gallons of spray volume per acre. Set nozzles to spray directly in the whorl. Aerial application will not give good control of worms feeding in the whorl. Several of the new Bt corn technologies are effective at controlling corn earworms and fall armyworms in corn ears. However, reinfestation levels can vary greatly, and the impact of corn earworm and fall armyworm ear feeding has not been fully investigated.

Threshold: Treatments are warranted when you detect an average of one or more larvae per plant from emergence to mid-whorl stage. It is not considered economical to treat for corn earworms or fall armyworms in the ear.

European Corn Borers

Insecticide	Amount of Formulation per Acre	Pounds Active Ingredient per Acre	Acres 1 Gallon or 1 Pound Dry Will Treat	Application and Comments
Foliar Sprays				
β-cyfluthrin (P)				
Baythroid XL 1EC	1.6 – 2.8 oz.	0.013 – 0.022	80 – 45.7	
bifenthrin (P)				
Bifenture EC	2.1 – 6.4 oz.	0.033 – 0.10	61 – 20	
Brigade 2EC	2.1 – 6.4 oz.	0.033 – 0.10	61 – 20	
Discipline 2EC	2.1 – 6.4 oz.	0.033 – 0.10	61 – 20	
Fanfare 2EC	2.1 – 6.4 oz.	0.033 – 0.10	61 – 20	
bifenthrin (P) + **Z-cypermethrin** (P)				
Hero 1.24EC	4 – 10.3 oz.	0.04 – 0.10	32 – 12.4	
chlorantraniliprole (D)				
Prevathon	14 – 20 oz.	0.047 – 0.067	9 – 6	
λ-cyhalothrin (P), **chlorantraniliprole** (D)				
Besiege	5 – 10 oz.		25.6 – 12.8	
cyfluthrin (P)				
Tombstone 2EC	1.6 – 2.8 oz.	0.025 – 0.044	80 – 45.7	
esfenvalerate (P)				
Asana XL 0.66EC	7.8 – 9.6 oz.	0.03 – 0.05	16 – 13	
flubendiamide (D)				
Belt 4SC	2 – 3 oz.	0.063 – 0.094	64 – 43	
gamma-cyhalothrin (P)				
Declare 1.25EC	1.02 – 1.54 oz.	0.01 – 0.015	125.5 – 83	
λ-cyhalothrin (P)				
Karate Z 2.08CS	1.28 – 1.92 oz.	0.02 – 0.03	100 – 66.7	
Lambda-Cy 1EC	2.56 – 3.84 oz.	0.02 – 0.03	50 – 33.3	
Silencer 1EC	2.56 – 3.84 oz.	0.02 – 0.03	50 – 33.3	
methoxyfenozide (IGR)				
Intrepid 2F	4 – 8 oz.	0.06 – 0.12	32 – 16	
permethrin (P)				
Ambush 2EC	6.4 – 12.8 oz.	0.1 – 0.2	20 – 10	
Pounce 3.2EC	4 – 8 oz.	0.1 – 0.2	32 – 16	
spinetoram (SPN)				
Radiant SC	3 – 6 oz.	0.023 – 0.047	42.7 – 21.3	
spinosad (SPN)				
Blackhawk	1.67 – 3.3 oz.	0.038 – 0.074	9.6 – 4.8	
Z-cypermethrin (P)				
Mustang Max 0.8EC	2.72 – 4.0 oz.	0.017 – 0.025	47 – 32	
Z-cypermethrin (P), **chlorpyrifos** (OP)				
Stallion	3.75 – 11.75		34.1 – 10.9	

EUROPEAN CORN BORERS are found mostly in north Mississippi. The larvae are gray or tan with rows of light brown spots. Normally there are three generations per year in Mississippi. First-generation corn borers attack plants in the early stages of development. Second- and third-generation corn borers may cause plant lodging and ear drop.

DAMAGE: Feeding signs show up as rows of pinholes or rectangular lesions in the leaf as it unfolds from the whorl. Larvae begin boring into the stalk tissue at about 10 days old. After entering the stalk, larvae may tunnel throughout the plant, including the ear shank.

CONTROL: To achieve adequate control, apply insecticide to prevent tunneling when you find egg masses or young larvae. Good coverage is a must for satisfactory control. Insecticides must be applied before larvae enter the stalk. Fall tillage reduces overwintering populations of corn borers. Bt corn provides excellent control for European and Southwestern corn borers. Current regulations allow for only 50 percent (50 percent refuge) of the corn acreage in cotton-producing regions to be planted to Bt corn that expresses only one lepidopteran active protein. Bt corn hybrids that express two or more lepidopteran active proteins require only a 20 percent refuge. When using pyrethroids for control, multiple applications are usually required because of extended egg laying and short residual of products.

THRESHOLD: Apply insecticides when larvae or egg masses are present on 50 percent or more of the plants. Good coverage is essential for satisfactory control and insecticides must be applied before larvae enter the stalk.

Southwestern Corn Borers

Insecticide	Amount of Formulation per Acre	Pounds Active Ingredient per Acre	Acres 1 Gallon or 1 Pound Dry Will Treat	Application and Comments
Foliar Sprays				
β-cyfluthrin (P)				
Baythroid XL 1EC	1.6 – 2.8 oz.	0.013 – 0.022	80 – 45.7	
bifenthrin (P)				
Bifenture 2EC	2.1 – 6.4 oz.	0.033 – 0.10	61 – 20	
Brigade 2EC	2.1 – 6.4 oz.	0.033 – 0.10	61 – 20	
Discipline 2EC	2.1 – 6.4 oz.	0.033 – 0.10	61 – 20	
Fanfare 2EC	2.1 – 6.4 oz.	0.033 – 0.10	61 – 20	
bifenthrin (P) + **Z-cypermethrin** (P)				
Hero 1.24EC	4 – 10.3 oz.	0.04 – 0.10	32 – 12.4	
chlorantraniliprole (D)				
Prevathon	14 – 20 oz.	0.047 – 0.067	9 – 6	
λ-cyhalothrin (P), **chlorantraniliprole** (D)				
Besiege	5 – 10 oz.		25.6 – 12.8	
cyfluthrin (P)				
Tombstone 2EC	1.6 – 2.8 oz.	0.025 – 0.044	80 – 45.7	
esfenvalerate (P)				
Asana XL 0.66EC	7.8 – 9.6 oz.	0.03 – 0.05	16 – 13	
flubendiamide (D)				
Belt SC	2 – 3 oz.	0.0625 – 0.094	64 – 43	
gamma-cyhalothrin (P)				
Declare 1.25EC	1.02 – 1.54 oz.	0.01 – 0.015	125.5 – 83	
λ-cyhalothrin (P)				
Karate Z 2.08CS	1.28 – 1.92 oz.	0.02 – 0.03	100 – 66.7	
Lambda-Cy 1EC	2.56 – 3.84 oz.	0.02 – 0.03	50 – 33.3	
Silencer 1EC	2.56 – 3.84 oz.	0.02 – 0.03	50 – 33.3	
methoxyfenozide (IGR)				
Intrepid 2F	4 – 8 oz.	0.06 – 0.12	32 – 16	
permethrin (P)				
Ambush 2EC	6.4 – 12.8 oz.	0.1 – 0.2	20 – 10	
Pounce 3.2EC	4 – 8 oz.	0.1 – 0.2	32 – 16	
spinetoram (SPN)				
Radiant SC	3 – 6 oz.	0.023 – 0.047	42.7 – 21.3	
spinosad (SPN)				
Blackhawk	2.2 – 3.3 oz.	0.05 – 0.074	7.3 – 4.8	
Z-cypermethrin (P)				
Mustang Max 0.8EC	2.72 – 4.0 oz.	0.017 – 0.025	47 – 32	
Z-cypermethrin (P), **chlorpyrifos** (OP)				
Stallion	3.75 – 11.75 oz.		34.1 – 10.9	

The **SOUTHWESTERN CORN BORER** occurs statewide but is now more abundant in the Delta than in other areas of the state. Larvae are white with distinct black spots covering the body. There are three generations of SWCB each year. Part of the second generation and all of the third generation will overwinter. Pheromone traps can be used to detect peak emergence for each generation. These traps can also be used as an indicator for intensified scouting efforts in the field.

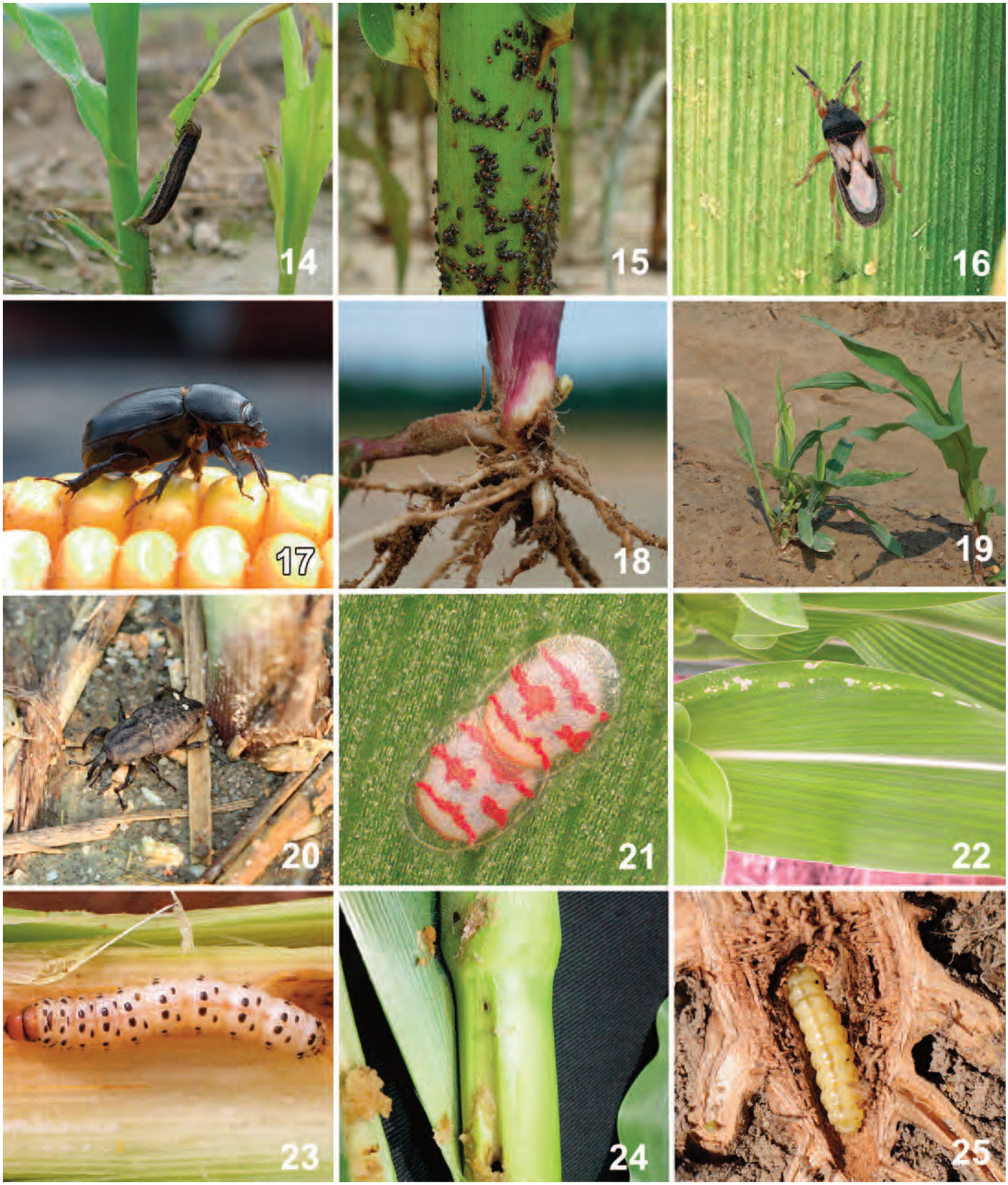
DAMAGE: SWCB causes plant damage by leaf feeding, stalk tunneling, ear feeding, and girdling the base of the plant. Young larvae will feed in the whorl or on leaves for about 10 days before boring into the stalk. Overwintering larvae will girdle the inside of the stalk at the base of the plants, just above the soil line. The girdling causes lodging of plants, especially in late-planted corn. Fields with a high percentage of lodging will slow harvest operations.

CONTROL: Corn planted within the recommended planting dates and harvested in a timely fashion will generally not be susceptible to girdling damage by the third generation corn borers. To achieve adequate control, you must apply insecticide to prevent tunneling while there are egg masses or young larvae. Good coverage is essential for satisfactory control. Insecticides must be applied before larvae enter the stalk. Fall tillage is also an important management practice to reduce overwintering populations of corn borers. Bt corn provides excellent control for European and Southwestern corn borers. Current regulations only allow for 50 percent (50 percent refuge) of the corn acreage in cotton-producing regions to be planted to Bt corn that expresses only one lepidopteran active protein. Bt corn hybrids that express two or more lepidopteran active proteins require only a 20 percent refuge.

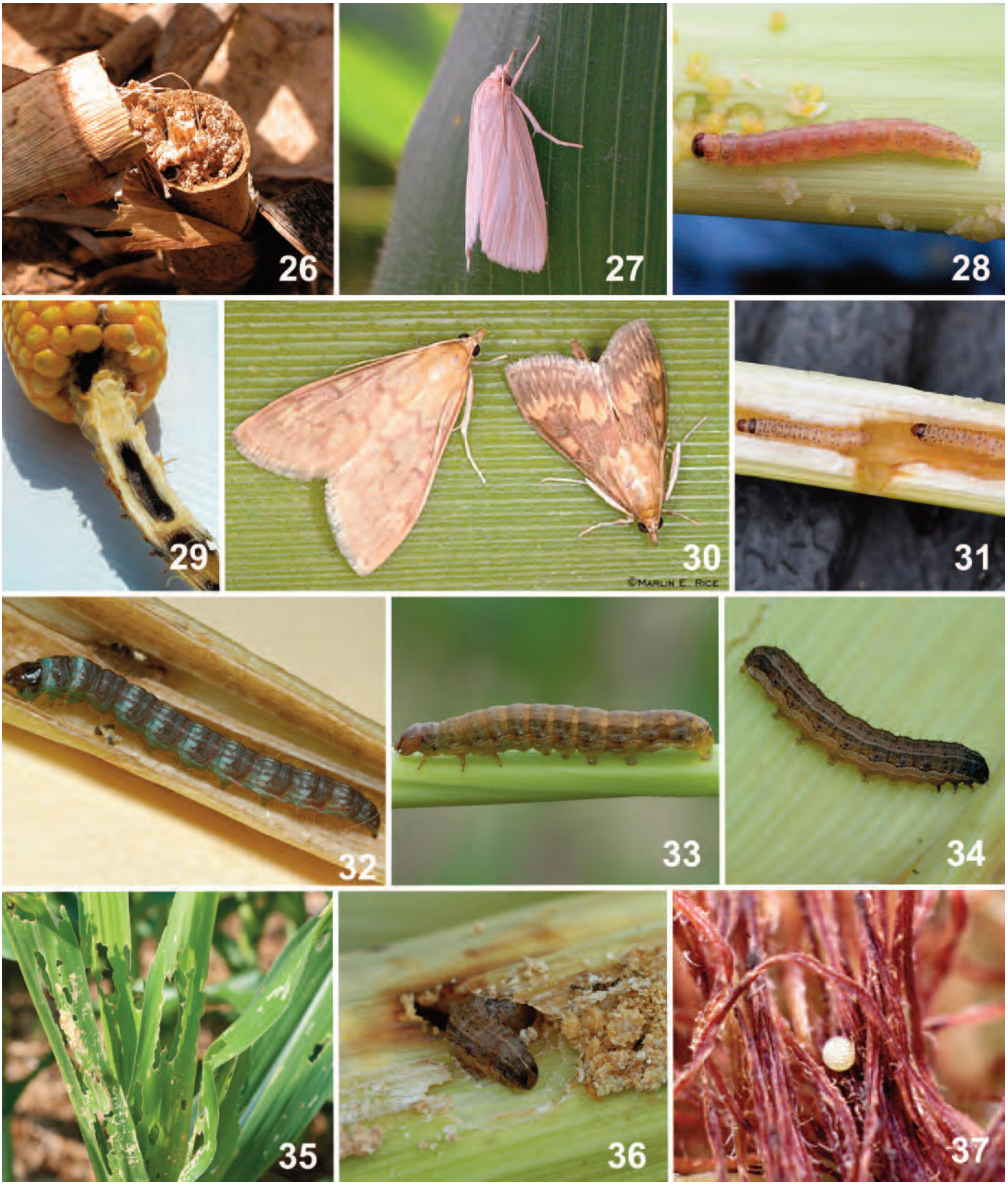
THRESHOLD:

V1 1 Leaf	V2 2 Leaf	Vnth Nth Leaf	VT Tassel	R1 Silk	R2 Blister	R3 Milk	R4 Dough	R5 Dent	R6 Black Layer
Treat 7-10 days after moth traps average 50 per trap on a 7-day catch from V1-Vnth. Or when plants average 5 percent corn borer egg masses or larval infestations per plant.				Treat 7-10 days after moth traps average 100 per trap on a 7-day catch from R1-R3. Or when plants average 10 percent corn borer egg masses or larval infestations per plant.			**DO NOT TREAT**		

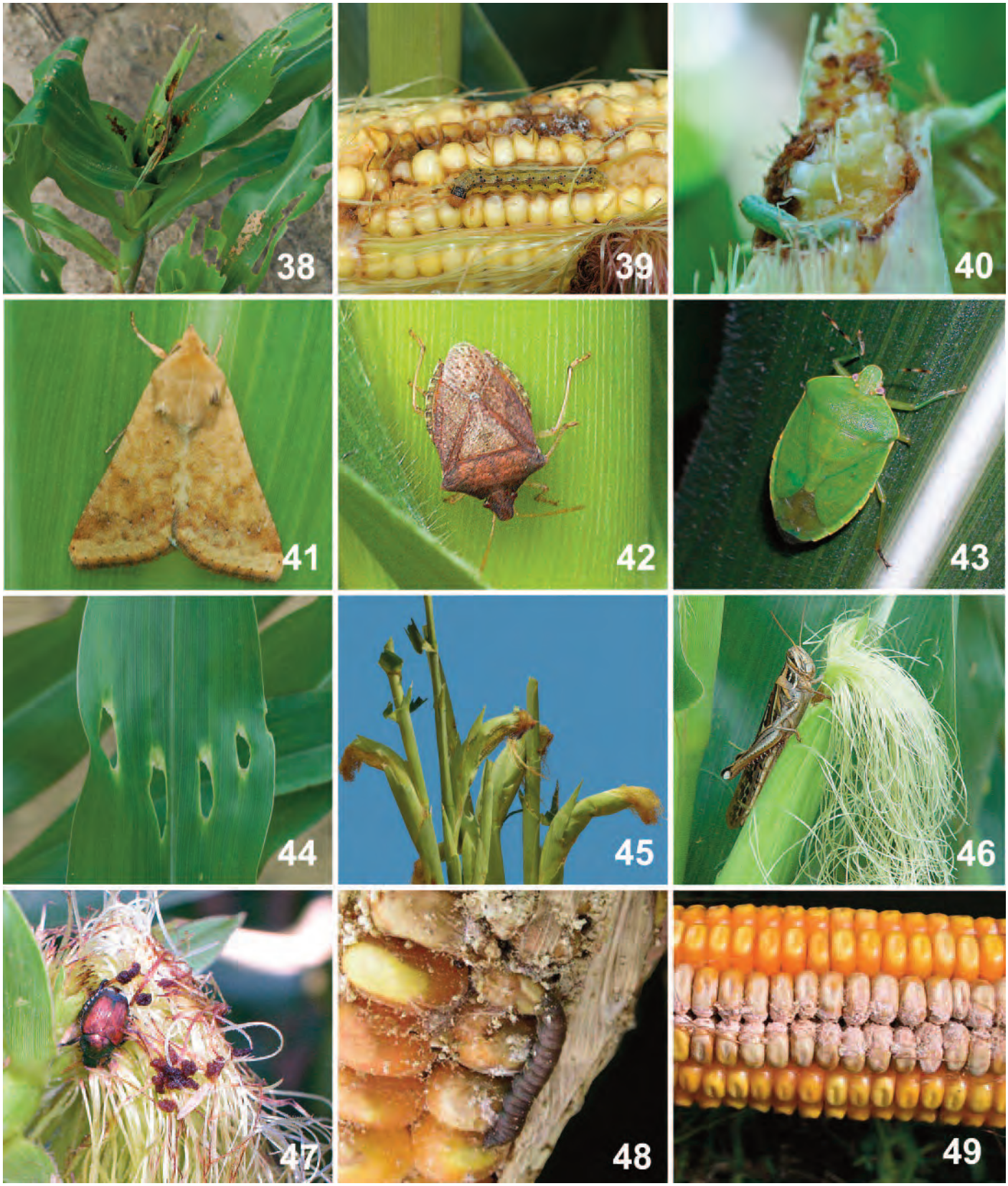
Figures 1-13. Wire worms (1), white grubs (2), seedcorn maggots (3), corn root aphids (4), corn leaf aphids (5), greenbugs (6), southern corn rootworm damage (7), southern corn rootworm immature (8), southern corn rootworm adult (9), dead heart plant from southern corn rootworm feeding (10), slug (11), thrips injury (12), black cutworm and damage (13).



Figures 14-25. Cutworm climbing young plant (14), chinch bug immatures (15), chinch bug adult (16), sugarcane beetle (17), sugarcane beetle damage (18), stunted plants from sugarcane beetles (19), billbug (20), southwestern corn borer eggs (21), southwestern corn borer leaf etching (22), southwestern corn borer larva (23), southwestern corn borer stalk damage (24), overwintering southwestern corn borer larva (25).



Figures 26-37. Girdled stalk by southwestern corn borer (26), southwestern corn borer moth (27), European corn borer larva (28), ear shank tunneling by European corn borer (29), female and male European corn borer moths (30), sugarcane borer tunneling stalk (31), lesser cornstalk borer larva (32), true armyworm larva (33), fall armyworm larva (34), fall armyworm damaged whorl (35), fall armyworm larvae in ear showing inverted Y on head capsule (36), corn earworm egg on silks (37).



Figures 38-49. Corn earworm damaged whorl (38), corn earworm larva on ear (39), corn earworm larva ear tip damage (40), corn earworm moth (41), brown stink bug adult (42), green stink bug adult (43), stink bug damage (44), "cow horned" ears by stink bug (45), grasshopper (46), Japanese beetle feeding on silks (47), chocolate milk worm (48), chocolate milk worm damage to ear (49).

GRAIN SORGHUM INSECT MANAGEMENT

General Comments and Guidelines

You can expect maximum yield production of grain sorghum by following recommended production practices. One key component should be applying proper control measures according to economic thresholds. Scout fields at least weekly, depending on growth stage and the possibility for insect pest infestations. Timely applications of insecticides are also important once economic thresholds have been reached or exceeded. Insecticides do work. Apply them when insects are in the early growth stages.

Soil Insect Pests

Insecticide	Amount of Formulation per Acre	Pounds Active Ingredient per Acre	Acres 1 Gallon or 1 Pound Dry Will Treat	Threshold and Comments
Seed Treatments				
clothianidin (CN)				
Poncho 600	(5.1 – 6.4 oz./cwt)			Commercially treated seed.
NipSit 5FS	(5.1 – 6.4 oz./cwt)			
imidacloprid (C)				
Gaucho 480	(8 oz./cwt)			Can be applied on farm or treated commercially.
thiamethoxam (CN)				
Cruiser 5FS	(5.1 oz./cwt)			Commercially treated seed.
In Furrow, Banded, or T-Banded				
chlorpyrifos (OP)				
Lorsban 15G	8 oz./1,000 row feet			Apply as a T-band in a 6- to 8-inch band. Suppression only.
terbufos (OP)				
Counter 15G	7 oz./1,000 row feet			7 oz./1,000 feet of row for any row spacing (minumim 20-inch row spacing).
Foliar Sprays				
β-cyfluthrin (P)				
Baythroid XL 1EC	2.0 – 2.8 oz.	0.019 – 0.022	64 – 45.7	
carbaryl (C)				
Sevin 80S	1.25 – 2.5 lb.	1 – 2	0.8 – 0.4	Use ground equipment with a directed spray at lower third of plant and 20 – 30 gallons of water per acre.
Carbaryl 4L	1 – 2 qt.	1 – 2	4 – 2	
Sevin XLR Plus 4L	1 – 2 qt.	1 – 2	4 – 2	
chlorpyrifos (OP)				
Lorsban 4E	16 – 32 oz.	0.5 – 1.0	8 – 4	Ground application only in Mississippi.
cyfluthrin (P)				
Tombstone 2EC	2.0 – 2.8 oz.	0.038 – 0.044	64 – 45.7	
esfenvalerate (P)				
Adjourn 0.66EC	5.8 – 9.6 oz.	0.03 – 0.05	22 – 13	
Asana XL 0.66EC	5.8 – 9.6 oz.	0.03 – 0.05	22 – 13	
gamma-cyhalothrin (P)				
Declare 1.25EC	1.54 oz.	0.015	83	
λ-cyhalothrin (P)				
Karate Z 2.08CS	1.92 oz.	0.03	66.7	
Lambda-Cy 1EC	3.84 oz.	0.03	33.3	
Silencer 1EC	3.84 oz.	0.03	33.3	
Tiaga Z 1CS	3.84 oz.	0.03	33.3	
Warrior Z 1CS	3.84 oz.	0.03	33.3	
Z-cypermethrin (P)				
Mustang Max 0.8EC	3.2 – 4.0 oz.	0.02 – 0.025	40 – 32	

Soil insect pests such as **WIREWORMS, SEED CORN MAGGOTS, WHITE GRUBS, SOUTHERN CORN ROOTWORMS, AND CUTWORMS** can attack grain sorghum. You can reduce them with cultural practices and by planting into weed-free fields. Fields recently taken out of pasture or sod production are often infested with white grubs and wireworms. Consider seed treatments or soil insecticides at planting for fields at risk. Gaucho, Cruiser, and Poncho seed treatments are labeled for use on grain sorghum. Foliar insecticides are recommended for postemergence cutworm control.

Occasionally **FIRE ANTS** feed on the seed or seedlings shortly after planting. These problems tend to be more common in reduced tillage fields, heavy clay soils, and under dry conditions. This is usually a result of poor planting conditions where the furrow was not completely closed, allowing access to the seed and the germinating plants. Seed treatments provide effective control.

Leaf and Stem Feeding Insects

Insecticide	Amount of Formulation per Acre	Pounds Active Ingredient per Acre	Acres 1 Gallon or 1 Pound Dry Will Treat	Threshold and Comments
Seed Treatments				
clothianidin (CN) Poncho 600	5.1 – 6.4 oz./100 lb. seed			Commercially treated seed.
imidacloprid (C) Gaucho 480	(8 oz./cwt)			Can be applied on farm or treated commercially.
thiamethoxam (CN) Cruiser 5FS	5.1 oz./100 lb. seed			Commercially treated seed.
In Furrow, Banded or T-Banded				
chlorpyrifos (OP) Lorsban 15G	8 – 32 oz.			Apply as a T-band in a 6- to 8-inch band.
terbufos (OP) Counter 15G	7 oz./1,000 row feet			
Foliar Sprays				
chlorpyrifos (OP) Lorsban 4E	0.5 – 2 pt.	0.25 – 1	16 – 4	Ground application only in Mississippi.
dimethoate (OP) Dimethoate 4EC	8 – 16 oz.	0.25 – 0.5	16 – 8	
Z-cypermethrin (P) Mustang Max 0.8EC	3.2 – 4.0 oz.	0.02 – 0.025	40 – 32	

CHINCH BUG adults are black and white with whitish wings marked by a dark triangle on the outer margins. Nymphs are bright red but darken with maturity.

Damage: The nymphs and adults have piercing-sucking mouthparts and cause damage by removing plant sap. Hot, dry weather favors chinch bug buildup. When scouting, check the base of the seedlings, behind the leaf collars, and the soil around the base of the plant. Use ground equipment with sprays directed at the lower third of the plant and 20 to 30 gallons of water per acre.

THRESHOLD: Treat when you find two or more adult chinch bugs on 20 percent of seedlings less than 6 inches tall.

The **BIRD-CHERRY OAT APHID** is broadly oval, and its color ranges from mottled yellowish or olive green to greenish-black. Often reddish patches are around the bases of the cornicles. The antennae are entirely black, but the legs and cornicles are green with black tips.

Damage: Nymphs and adults of the bird-cherry oat aphid extract plant sap from the leaves of small grains. There is no obvious toxin associated with its feeding, and damage symptoms are not readily apparent. Chemical control is rarely justified for the bird-cherry oat aphid.

The **CORN LEAF APHID** is dark blue-green and about the size of a greenbug or slightly smaller. Its legs, antennae, and cornicles are entirely black. It has the typical pear shape of aphids.

Damage: The corn leaf aphid is less injurious than the greenbug, primarily because it does not inject a toxin during feeding. This aphid commonly feeds in the whorl of the plant, where it often becomes extremely abundant and may fill the whorl of the middle leaf. Feeding causes a yellowish mottling on the leaves. Some marginal leaf necrosis may be associated with corn leaf aphid feeding, but this is likely the symptom of maize dwarf mosaic virus, which this aphid transmits. In rare instances, corn leaf aphids stunt plants, interfere with panicle extension, and if abundant in the panicle, may affect harvest. Heavy infestations during seedling stage may cause death of the plant and stand loss. Chemical control of this aphid is rarely justified.

The **SUGARCANE APHID** can be a very damaging pest of grain sorghum. Numbers can increase rapidly upon initial infestation.

THRESHOLD: Treatment is essential when populations reach 25 to 30 percent infested plants with localized areas of honeydew and high populations. **At this time, there are no products labeled for grain sorghum that provide consistent control. Check with your local Extension office for emergency exemptions.**

Mature female **GREENBUGS** are approximately one-sixteenth of an inch long, with the typical pear shape of aphids. They are pale green with a dark stripe down the middle of the back. The legs and cornicles are also green, except for the tips that are usually black.

Damage: Greenbugs injure small grains and sorghum three ways: 1) sap is extracted with piercing-sucking mouthparts, depriving the plant of nutrients and water; 2) a toxin is injected during feeding, causing disruption of cell walls and necrosis of tissue; 3) viruses such as barley yellow dwarf or maize dwarf mosaic may be transmitted, or plants may be predisposed to other diseases such as charcoal rot of sorghum. Greenbug infestations in small grains are often first detected by the red-spotted, yellowish, or orange leaves that appear on a few plants in localized areas of the field. Greenbugs often feed in colonies on the undersides of the lower leaves and stems of small grains but may feed on plant parts at or slightly below the soil surface. Seedling sorghum is very susceptible to greenbug injury and may turn yellow or reddish when infestations are light. Seedling death may result from extensive feeding. On larger plants, feeding results in stunted plants and kernel-weight reductions.

THRESHOLD: When plants are 6 inches or less, treat when greenbug colonies appear on lower leaf surfaces. When plants are 6 inches tall to pre-boot, treat before any leaves are killed. When plants are pre-boot and larger, treat when more than two lower leaves die.

Whorl/ Head Feeders	Insecticide	Amount of Formulation per Acre	Pounds Active Ingredient per Acre	Acres 1 Gallon or 1 Pound Dry Will Treat	Threshold and Comments
	Foliar Sprays **carbaryl** (C) Sevin 80S Carbaryl 4L	 1.25 – 2.5 lb. 1 – 2 qt.	 1 – 2	 0.8 – 0.4 4 – 2	In Louisiana, sorghum webworms have developed resistance to pyrethroid insecticides. To date, Mississippi has no reports or documented cases. If you experience a lack of control with pyrethroids, we recommend you switch to a different class of chemistry.
	chlorantraniliprole, λ-cyhalothrin (D + P) Besiege	6 – 10 oz.		21.3 – 12.8	
	chlorantraniliprole (D) Prevathon 0.43SC	14 – 20 oz.	0.047 – 0.067	9 – 6.4	Preharvest interval is 14 days.
	flubendiamide (D) Belt 4SC	2 – 4 oz.	0.06 – 0.125	64 – 32	
	methomyl (C) Lannate 2.4LV	12 – 24 oz.	0.225 – 0.45	10.6 – 5.3	For control of armyworms and webworms. Use higher rates (1.5 pt./ac.) for webworms.
	novaluron (IGR) Diamond 0.83EC	9 – 12 oz.	0.06 – 0.08	14.2 – 10.7	
	spinosad (SPN) Blackhawk	1.7 – 3.3 oz.	0.038 – 0.074	9.4 – 4.8	

Pyrethroids may not control bollworms. It is recommended to use only the highest labeled rate of pyrethroids.

CORN EARWORM/FALL ARMYWORM: Corn earworm larvae range from light green to brown to almost black, with light stripes and dark stripes running lengthwise of the body. The head capsule is usually orange. The most common feature of fall armyworm larvae is the inverted Y-shaped mark on the front of the head and longer hairs coming from black spots (tubercles) on the body.

Damage: "Whorlworms" refers to worms found feeding in the whorl of sorghum plants before bloom. Damage may be caused by corn earworms, fall armyworms, southwestern corn borers, and European corn borers. All of these pests may be in the same field and at the same time. Whorl feeding appears as ragged shot-holes in the leaves. Plants can withstand considerable damage in the whorl stage. Crop loss will occur when heavy infestations cause "deadheart" or severe stunting of plants. When worms infest young plants shorter than 24 inches, the center of the plant may be killed.

Whorl THRESHOLD: Treatment for worms in the whorl is rarely needed. Treat for corn earworms or fall armyworms when plants average 75 to 100 percent infestation of either species.

Head THRESHOLD: Treat when corn earworms or fall armyworms average one per head either alone or in combination.

The **SORGHUM WEBWORM** larval stage ranges from pale green to tan and is thickly covered with spines and hairs. The back has four red to brown longitudinal stripes. In Louisiana, sorghum webworms have developed resistance to pyrethroid insecticides. To date, Mississippi has no reports or documented cases. If you experience a lack of control with pyrethroids, we recommend that you switch to a different class of chemistry.

Damage: Larvae feed on the individual grain kernels and consume the contents, leaving the outside hull only.

THRESHOLD: Treat when you find an average of five small larvae per head. Do not apply methyl parathion to sorghum; it will injure crops.

Stalk Borers

Insecticide	Amount of Formulation per Acre	Pounds Active Ingredient per Acre	Acres 1 Gallon or 1 Pound Dry Will Treat	Threshold and Comments
Foliar Sprays				
β-cyfluthrin (P)				
Baythroid XL 1EC	1.3 – 2.8 oz.	0.010 – 0.022	98 – 45.7	
chlorantraniliprole (D)				
Prevathon 0.43SC	14 – 20 oz.	0.047 – 0.067	9 – 6.4	
chlorantraniliprole, λ-cyhalothrin (D + P)				
Besiege	6 – 10 oz.		21.3 – 12.8	
cyfluthrin (P)				
Tombstone 2EC	1.3 – 2.8 oz.	0.020 – 0.044	98 – 45.7	
deltamethrin (P)				
Battalion 0.2EC	9.6 – 14.1 oz.	0.015 – 0.022	13.3 – 9	
Delta Gold 1.5EC	1.3 – 1.9 oz.	0.015 – 0.022	98.5 – 67	
flubendiamide (D)				
Belt 4SC	2 – 4 oz.	0.06 – 0.125	64 –32	
gamma-cyhalothrin (P)				
Declare 1.25EC	1.02 – 1.54 oz.	0.01 – 0.015	125 – 83	
λ-cyhalothrin (P)				
Karate Z 2.08CS	1.28 – 1.92 oz.	0.02 – 0.03	100 – 66.7	
Lambda-Cy 1EC	2.56 – 3.84 oz.	0.02 – 0.03	50 – 33	
Silencer 1EC	2.56 – 3.84 oz.	0.02 – 0.03	50 – 33	
Tiaga Z 1CS	2.56 – 3.84 oz.	0.02 – 0.03	50 – 33	
Warrior Z 1CS	2.56 – 3.84 oz.	0.02 – 0.03	50 – 33	
spinosad (SPN)				
Blackhawk	1.7 – 3.3 oz.	0.038 – 0.074	9.4 – 4.8	
Z-cypermethrin (P)				
Mustang Max 0.8EC	1.76 – 4.0 oz.	0.011 – 0.025	72.7 – 32	
Z-cypermethrin (P), **chlorpyrifos** (OP)				
Stallion	3.75 – 11.75		34.1 – 10.9	

All mature **SOUTHWESTERN CORN BORER** larvae are dull white with a regular pattern of black spots, except for overwintering larvae. Time treatments before larvae begin to bore into the stalk. Once larvae enter the stalk, you cannot control them.

Damage: SWCB larvae feed on the leaf tissue for 7 to 10 days before boring into the plant. After entering the stalk, larvae tunnel throughout the stalk, disrupting movement of water and nutrients. As in corn, third-generation SWCB girdle the plants in preparation of overwintering and could cause lodging of the plants and increase risks associated with disease development. SWCB can be detrimental to late-planted or double-cropped grain sorghum.

Treatment: Economic thresholds for SWCB in grain sorghum are not well defined. If treatments are warranted, applications must be made before larvae enter the stalk to be effective.

Sorghum Midges

Insecticide	Amount of Formulation per Acre	Pounds Active Ingredient per Acre	Acres 1 Gallon or 1 Pound Dry Will Treat	Threshold and Comments
Foliar Sprays				
β-cyfluthrin (P) Baythroid XL 1EC	1.0 – 1.3 oz.	0.008 – 0.01	128 – 98.5	
chlorantraniliprole, λ-cyhalothrin (D + P) Besiege	5 – 6 oz.		16 – 21	Preharvest interval is 30 days.
cyfluthrin (P) Tombstone 2EC	1.0 – 1.3 oz.	0.016 – 0.02	128 – 98.5	
deltamethrin (P) Battalion 0.2EC	9.6 – 14.1 oz.	0.015 – 0.022	13.3 – 9	
Delta Gold 1.5EC	1.3 – 1.9 oz.	0.015 – 0.022	98.5 – 67.4	
dimethoate (OP) Dimethoate 4EC	0.25 – 0.5 pt.	0.125 – 0.25	32 – 16	
esfenvalerate (P) Adjourn 0.66EC	2.9 – 5.8 oz.	0.015 – 0.03	44 – 22	
Asana XL 0.66EC	2.9 – 5.8 oz.	0.015 – 0.03	44 – 22	
gamma-cyhalothrin (P) Declare 1.25	0.77 – 1.28 oz.	0.0075 – 0.0125	166 – 100	
λ-cyhalothrin (P) Karate Z 2.08CS	0.96 – 1.28 oz.	0.015 – 0.02	133.3 – 100	
Lambda-Cy 1EC	1.92 – 2.56 oz.	0.015 – 0.02	66.7 – 50	
Silencer 1EC	1.92 – 2.56 oz.	0.015 – 0.02	66.7 – 50	
Tiaga Z 1CS	1.92 – 2.56 oz.	0.015 – 0.02	66.7 – 50	
Warrior Z 1CS	1.92 – 2.56 oz.	0.015 – 0.02	66.7 – 50	
methomyl (C) Lannate 2.4LV	12 – 24 oz.	0.225 – 0.45	10.6 – 5.3	
Z-cypermethrin (P) Mustang Max 0.8EC	1.28 – 4.0 oz.	0.008 – 0.025	100 – 32	
Z-cypermethrin (P), **chlorpyrifos** (OP) Stallion	3.75 – 11.75		34.1 – 10.9	

SORGHUM MIDGE larvae overwinter inside cocoons spun within the spikelets of sorghum, Johnsongrass, or other host-plant residue. Time and percentage of emergence in the spring are influenced by temperature, cultural practices, and other factors.

The adult sorghum midge is a small orange fly. The edges of its wings appear fringed under magnification. The female lives 1 day, laying 30 to 120 eggs, one at a time, in the glume. About 90 percent of the eggs are laid during the 4 days after plant-head emergence. The life cycle of the midge requires approximately 14 to 18 days. The male midge lives only a few hours.

Damage: Sorghum is susceptible to damage from the midge only during the bloom period. Once blooming begins, an individual head is susceptible to damage for 4 to 9 days. Adult midges do not damage the grain. Females deposit eggs between the glumes of a floret. Larvae destroy the seed, resulting in blanks or shriveled seed coats that appear discolored. Heads with severe damage appear small and compressed with blank areas. Planting grain sorghum between April 15 and May 10, as uniformly as possible (depth and date), helps control sorghum midges.

THRESHOLD: Treat when you find one adult midge per head when fields reach 20 to 30 percent bloom. Scout fields daily during the bloom period from midmorning until shortly after noon. Make midge applications as early in the morning or late in the evening as possible to avoid foraging honey bees during pollen shed.

Stink Bugs

Insecticide	Amount of Formulation per Acre	Pounds Active Ingredient per Acre	Acres 1 Gallon or 1 Pound Dry Will Treat	Threshold and Comments
Foliar Sprays				
β-cyfluthrin (P)				
Baythroid XL 1EC	1.3 – 2.8 oz.	0.010 – 0.022	98 – 45.7	
chlorantraniliprole, λ-cyhalothrin (D + P)				
Besiege	6 – 10 oz.		21.3 – 12.8	
cyfluthrin (P)				
Tombstone 2EC	1.3 – 2.8 oz.	0.020 – 0.044	98 – 45.7	
deltamethrin (P)				
Battalion 0.2EC	11.5 – 14.1 oz.	0.018 – 0.022	11 – 9	
Delta Gold 1.5EC	1.5 – 1.8 oz.	0.018 – 0.022	85 – 71	
gamma-cyhalothrin (P)				
Declare 1.25EC	1.02 – 1.54 oz.	0.01 – 0.015	125 – 83	
λ-cyhalothrin (P)				
Karate Z 2.08CS	1.28 – 1.92 oz.	0.02 – 0.03	100 – 66.7	
Lambda-Cy 1EC	2.56 – 3.84 oz.	0.02 – 0.03	50 – 33	
Silencer 1EC	2.56 – 3.84 oz.	0.02 – 0.03	50 – 33	
Tiaga Z 1CS	2.56 – 3.84 oz.	0.02 – 0.03	50 – 33	
Warrior Z 1CS	2.56 – 3.84 oz.	0.02 – 0.03	50 – 33	
Z-cypermethrin (P)				
Mustang Max 0.8EC	1.76 – 4.0 oz.	0.011 – 0.025	72.7 – 32	
Z-cypermethrin (P), **chlorpyrifos** (OP)				
Stallion	3.75 – 11.75		34.1 – 10.9	

Several species of "bugs," including **STINK BUGS**, attack grain sorghum during grain fill. These bugs are sometimes referred to as panicle-feeding bugs. Feeding can affect grain quality and yield. Sorghum is most susceptible when the grain is in the milk and soft dough stages.

THRESHOLD: Treat when fields average four to five stink bugs per head.

Aphids

Insecticide	Amount of Formulation per Acre	Pounds Active Ingredient per Acre	Acres 1 Gallon or 1 Pound Dry Will Treat	Threshold and Comments
Seed Treatments				
clothianidin (CN) Nipsit	0.75 – 1.79 oz./ 100 lb. seed			Commercially treated seed.
imidacloprid (C) Gaucho XT	3.4 – 4.5 oz./ 100 lb. seed			Can be applied on farm or treated commercially.
thiamethoxam (CN) Cruiser Maxx Vibrance Cereals	5.0 – 10.0 oz./ 100 lb. seed			Commercially treated seed.
Foliar Treatments				
dimethoate (OP)* Dimethoate 4EC	8 – 12 oz.	0.25 – 0.38	16 – 10.67	
methomyl (C)* Lannate LV 2.4	0.75 – 1.5 pt.	0.225 – 0.45	10.6 – 5.3	
beta-cyfluthrin (P) Baythroid XL 1EC	1.8 – 2.4 oz.	0.014 – 0.019	71.11 – 53.33	
gamma-cyhalothrin (P) Declare 1.25	1.54 oz.	0.015	80	
lambda-cyhalothrin (P) Karate 2.08 Warrior II	1.28 – 1.92 oz.	0.02 – 0.03	100 – 66.7	
zeta-cypermethrin (P) Mustang Max 0.8EC	3.2 – 4.0 oz.	0.02 – 0.025	40 – 32	

*Use extra caution when handling these insecticides.

Several **APHIDS** feed on the leaves and grain heads of wheat. These pests are significant because they can transmit diseases to the plant such as barley yellow dwarf virus (BYD), in addition to the damage their feeding habits cause. Adult aphids are only about one-eighth inch long, and adults may or may not have two pairs of nearly transparent wings.

The **bird cherry-oat aphid** is dark green and transmits BYD. This is usually the most common aphid in wheat.

The **corn leaf aphid** is bluish-green, and all of its legs, cornicles, and antennae are black.

The **rice root aphid** occurs on the roots of wheat and has been known to transmit BYD.

Threshold: No thresholds have been established in Mississippi for corn leaf, oat-bird cherry, and rice root aphids. Treat when heavy populations are causing leaves to dry up and die in several places in the field. You can use an insecticide seed treatment such as Gaucho or Cruiser to reduce spread of BYD. Data suggest that early-planted wheat is most likely to benefit from seed treatments. Foliar insecticide applications in the fall can also reduce the spread of BYD, but you must make them before aphid populations are already established in the field. Also, note that in Mississippi many aphid flights can occur throughout the season, and insecticides cannot always prevent BYD.

GREENBUG aphids are pale green and usually have a dark green stripe down the back of their wingless backs. The tips of the legs and cornicles are black, and the antennae are mostly black. This aphid injects a toxin while feeding, which can cause leaves to turn yellow or brick-red around the feeding site, causing the leaves to die.

Threshold: When plants are 4 to 6 inches tall, treat when there are 50 aphids per linear foot. When plants are 6 to 10 inches, treat when there are 200 aphids per linear foot. When plants are 18 to 20 inches, treat when there are 300 aphids per linear foot. When plants are 30 inches or taller, treat when there are 800 aphids per linear foot.

Armyworms

Insecticide	Amount of Formulation per Acre	Pounds Active Ingredient per Acre	Acres 1 Gallon or 1 Pound Dry Will Treat	Threshold and Comments
Foliar Treatments				
carbaryl (C) Sevin XLR Plus 4	1 – 1.5 qt.	1 – 1.5	4 – 2.7	
methomyl (C) * Lannate LV 2.4	0.75 – 1.5 pt.	0.225 – 0.45	10.6 – 5.3	
spinosad (SPN) Blackhawk	1.7 – 3.3 oz.	0.04 – 0.074	9.4 – 4.8	
beta-cyfluthrin (P) Baythroid XL 1EC	1.8 – 2.4 oz.	0.014 – 0.019	71.11 – 53.33	
gamma-cyhalothrin (P) Declare 1.25	1.02 - 1.54 oz.	0.01 – 0.015	125.5 – 83	
lambda-cyhalothrin (P) Karate 2.08 Warrior II	1.28 – 1.92 oz.	0.02 – 0.03	100 – 66.7	
zeta-cypermethrin (P) Mustang Max 0.8EC	3.2 – 4.0 oz.	0.02 – 0.025	40 - 32	

*Use extra caution when handling these insecticides.

ARMYWORMS can be serious pests of wheat when populations reach large numbers. They get their name from their migrating habit, since they sometimes start at one portion of the field and devour everything in their path.

Damaging infestations of **TRUE ARMYWORMS** normally occur in the spring. Mature larvae are smooth (almost hairless) and greenish-brown to reddish-brown, with a dark stripe along each side. A broad dorsal stripe runs down the length of the back. This species differs from the fall armyworm by having a dark lateral band on the outer portion of each proleg. Besides feeding on foliage, larvae sometimes cut the heads of maturing wheat plants.

The **FALL ARMYWORM** is normally a pest of early-planted seedling wheat in the fall of the year. These insects can completely defoliate a wheat field when populations are very high. This insect differs from the true armyworm by having a prominent inverted "Y" on the front of its head and no dark bands on the outer part of its prolegs.

Threshold: Consider treating for fall armyworms when five or more larvae are present per square foot. For true armyworms, use a threshold of five to six larvae per square foot if wheat is still in the milk stage. Once past the milk stage, wheat can tolerate higher populations, and treatment is not usually recommended unless larvae are cutting wheat heads.

Cereal Leaf Beetles

Insecticide	Amount of Formulation per Acre	Pounds Active Ingredient per Acre	Acres 1 Gallon or 1 Pound Dry Will Treat	Threshold and Comments
Foliar Treatments				
carbaryl (C) Sevin XLR Plus 4	1 qt.	1	4	
methomyl (C) * Lannate LV 2.4	0.75 – 1.5 pt.	0.225 – 0.45	10.6 – 5.3	
spinosad (SPN) Blackhawk	1.1 – 3.3 oz.	0.025 – 0.074	14.5 – 4.8	
beta-cyfluthrin (P) Baythroid XL 1EC	1 – 1.8 oz.	0.008 – 0.014	128 – 71.11	
gamma-cyhalothrin (P) Declare 1.25	1.02 – 1.54 oz.	0.01 – 0.015	125.5 – 83	
lambda-cyhalothrin (P) Karate 2.08 Warrior II	1.28 – 1.92 oz.	0.02 – 0.03	100 – 66.7	
zeta-cypermethrin (P) Mustang Max 0.8EC	1.76 – 4.0 oz.	0.011 – 0.025	72.7 – 32	

*Use extra caution when handling these insecticides.

CEREAL LEAF BEETLES are pests of wheat, oats, barley, and other cereal crops, but they are not common in Mississippi. The larvae are pale yellow and soft-bodied, but because they are normally covered with their fecal material, they have a dark, gooey, shiny appearance. Adults are shiny, black beetles with red legs and thorax, approximately three-sixteenths inch long. Adults and larvae skeletonize the leaf tissue between the veins.

Threshold: Check 10 plants per sample site for larvae and adults. Treatment is necessary if one larva or adult is present per stem.

HESSIAN FLIES have been responsible for tremendous wheat losses in the past. Hessian fly larvae feed on stems at the base of plants, hidden behind the leaf sheaths. Larvae are reddish at first emergence and turn white or greenish-white. Larvae are shiny and legless, resembling small grains of rice, and are approximately one-fourth inch long when fully grown. The pupae, or flax seed stage, are brown but otherwise similar to the larvae. Mississippi typically does not have significant problems with this pest, but early-planted wheat is susceptible to infestation. Planting after the "fly-free date" (see recommended planting dates on page 70) greatly reduces the chance for serious Hessian fly infestations. Also, avoid planting wheat as a cover crop before the fly-free date. Volunteer wheat is a good fall host for this pest, and any volunteer wheat should be destroyed before September. Plowing under wheat stubble after harvest may help reduce subsequent infestations in the fall. Some varieties are available with resistance to Hessian flies, but no varieties have adequate resistance to all Hessian fly biotypes.

Threshold: Foliar-applied insecticides are difficult to time and only marginally effective. Plant after the fly-free date, and use resistant varieties if they are available. Resistant varieties may help suppress Hessian fly populations, although no varieties provide adequate resistance to Biotype L. Insecticide seed treatments (Cruiser and Gaucho) provide some suppression of fall infestations of Hessian flies.

STINK BUGS are often found in heading wheat but rarely cause an economic concern. Control is only warranted if numbers exceed one stink bug per 10 heads until soft dough stage. After soft dough stage, do not treat.

Recommended Mississippi Wheat Planting Dates

North and Central Mississippi: October 15 – November 10
South Mississippi: November 1 – November 25
Mississippi Delta: October 20 – November 15
Coastal: November 15 – December 10

SWEETPOTATO INSECT MANAGEMENT

Objective

To lessen the impact of pests and pest control costs:

a. Scout fields regularly, and make careful counts of insect pest populations.
b. Use all available, practical noninsecticidal IPM tools.
c. Apply insecticides promptly when needed.
d. Use the most cost-efficient insecticide recommended for the target pest, and target applications against the most susceptible stage of development.
e. Follow recommended guidelines for practicing insecticide-resistance management.

Before deciding to treat and before choosing the insecticide, consider such factors as the potential to intensify secondary pest problems and insecticide resistance.

Warning

Information in this guide is provided for educational and planning purposes only. When using agricultural chemicals, you, the user, are responsible for ensuring that the intended use complies with current regulations and conforms to the product label. Before applying any insecticide, be sure to obtain current information about usage, and read and follow the product label.

Precautions

Before using a pesticide, read the label carefully. Follow the directions, and heed all precautions on the pesticide container label. Observe all regulations on worker protection and pesticide record-keeping. Store pesticides in original containers, safely away from livestock, pets, and children. Store pesticides in an area where they will not contaminate food or feed.

Integrated Pest Management

Successful, economical control of insect pests requires using a variety of control methods rather than relying just on one method of control, such as scheduled insecticide use. Integrated pest management (IPM) refers to this multi-tactic approach to insect control. Current insect control recommendations are based on the IPM concept.

Insecticides are a key part of sweetpotato IPM, but sustained economical insect control relying solely on insecticides is not possible in Mississippi.

The objective of sweetpotato IPM is to use all available, practical nonchemical methods of suppressing insect populations; to monitor pest populations closely; and when scouting indicates that pest populations are greater than economic thresholds, to integrate insecticides into the system to optimize crop production and minimize ecosystem disruption.

Management tactics applied against one pest may be favorable or unfavorable to the development of other pests in the system. Thus, an overall IPM program must consider these types of long-term effects, because they greatly influence the ability of Mississippi growers to maintain economical production.

Many IPM components must be used to manage insect pests effectively. These include managing for early crop maturity, various cultural practices, insecticide resistance management, using economic thresholds, thorough scouting, and timely application of insecticides when needed.

Scouting

Proper scouting is the backbone of an effective insect management program. The goal of any scouting program should be to minimize insecticide use and insect control costs by avoiding unnecessary treatments and by properly timing required treatments. Effective scouting requires spending adequate time in the field and taking enough samples to make an accurate decision on whether or not treatment is required. Frequency of scouting is critical. During most of the growing season, scout fields thoroughly every 3 to 4 days, and allow enough time in the scouting schedule to allow spot checks more often when necessary.

Sampling equipment

Bugvac: You can use a shredder, vacuum, or leaf blower as a bugvac. Insert a 4.75-inch diameter plastic cup with the bottom replaced by a fine mesh (100 mesh) nylon screen into the end of the vacuum tube. Move the suction opening back and forth within the plant canopy to vacuum plants as you walk briskly along. Count the insects every 25 feet of row, but thresholds are expressed as numbers of insects per 100 feet of row.

Sweep net: We recommend a standard 15-inch diameter sweep net of heavy construction. Sweep nets are available from commercial sources. Count the insects every 25 sweeps, but thresholds are expressed as numbers of insects per 100 sweeps.

Thresholds

Making insect management decisions based on established treatment thresholds rather than applying treatments based on schedules or presence or absence of pests is a proven method of reducing insect management costs. Effective use of thresholds requires frequent, intensive scouting to obtain accurate estimates of populations of various pest species that may be in a field.

The treatment threshold is the pest population level at which you must treat to avoid economic loss that would be greater than the cost of the treatment. Thresholds can vary, depending on species of pest present, stage of crop development, yield potential of crop, cost of the treatment, price of crop, populations of other pests present, number of beneficial insects, potential for flaring secondary pests, ability to control secondary pests, and a variety of other factors. While the thresholds recommended in this guide vary according to pest species and stage of crop development, fixed thresholds cannot fully consider the many other factors that can influence a treatment decision. Although the thresholds recommended in this guide are generally somewhat conservative (quick to treat), factors such as multiple pest species could indicate a need to reduce thresholds. Likewise, factors such as high beneficial insect populations, risk of flaring difficult to control secondary pests, high treatment costs, and low price potential could indicate a need to use higher thresholds.

General Practices

Conduct tillage or herbicide operations to destroy vegetation at least 4 weeks before planting.

Preplant insecticides do not control the entire growing season but may significantly protect from some soil insects much of the season. Apply preplant insecticides as close to the time of planting as the preharvest interval (PHI) allows.

Make layby applications before canopy closure, preferably at last cultivation. Rotating foliar products helps manage insecticide resistance.

Adequate coverage can be difficult but is essential with most products. Best results from contact insecticides are with application volumes of 5 to 10 gpa, using hollow-cone nozzles. Do not use herbicide nozzles (low-drift nozzles or other types that produce large droplets) to apply insecticides.

Sweetpotato fields near pastures or hay fields appear to be more at risk for sugarcane beetle infestations. Planting more productive fields (fields with higher yield potential) first and harvesting them as soon as possible may allow these fields to be harvested before sugarcane beetle infestations get severe.

Biological Control

Mississippi producers are fortunate to have a wide array of naturally occurring biological control agents that play an important role in managing pest populations. Together, these biological control agents are the primary method of controlling insect pests in Mississippi. Often the full economic value of these biological agents is not recognized or appreciated. Severe outbreaks resulting in high levels of crop loss or unusually high control costs seldom occur unless natural control has been disrupted. Profitable production would not be possible in Mississippi without these biological control agents that include predators such as big-eyed bugs, lady beetles, spiders, minute pirate bugs; and parasites. To gain the maximum economic benefit from the control provided by these natural control agents, growers need to know which species are beneficial, how to identify these species, which pests they attack, what factors enhance their usefulness, when they are most useful, and when they may not provide effective control.

Predators and parasites can often prevent a pest population from reaching treatable levels, and the control they provide is often cheaper, better, and longer-lasting than insecticides. Scouts and producers should be aware of population levels of naturally occurring predators and parasites and should recognize that treatment thresholds can often be increased when predator and population levels are high. Certain cultural practices may favor populations of specific predators (for example, fire ants and reduced tillage). When insecticide treatment is necessary, it is often possible to select treatments that have little impact on populations of certain beneficial insects while still providing control of the target pest.

Insecticide Resistance and Resistance Management

Insecticide resistance is the increased tolerance to a particular insecticide by a pest population to the point the insecticide no longer controls effectively.

Resistance develops as a result of repeated or continuous exposure of a pest population to a particular insecticide or class of insecticides. Following an insecticide application, the death rate for susceptible insects is considerably higher than the death rate of resistant insects. Thus the numbers of resistant insects increase, and the frequency of resistance genes is increased in the next generation. If the same insecticide or class of insecticide is used against the next generation of pests, the level of resistance increases even more. At first the number of resistant individuals within a population may be extremely low, one individual in every 10,000 or more, and loss in efficiency is very small. But with repeated use of the same insecticide or class of insecticides, the percent of the population composed of resistant insects becomes great enough that efficacy declines and field control fails.

Resistance is costly to producers because it results in the need to increase insecticide rates, shorten treatment intervals, use expensive mixtures of insecticides, or use more costly alternative insecticides to keep effective control. Reduced control means increased yield losses, which can further reduce profits. In the absence of effective treatment alternatives, outbreaks of resistant pests can result in disastrous levels of crop destruction.

Insecticide resistance management is a plan of insecticide use that limits exposure of a pest population to a particular class of insecticide chemistry to prolong the useful life of that insecticide or class of insecticides. It is important to note that the goal of resistance management is not necessarily to prevent resistance from ever occurring, but to slow the development of resistance.

To be most effective, resistance management must be started before resistance is evident (while the frequency of resistant genes is very low) rather than waiting until resistance is evident in the field (frequency of resistance is high). Because many insects can readily move from farm to farm, resistance management efforts are most effective when all producers in a large geographic area practice them.

With foliar insecticides, selection for resistance may occur whenever an insecticide is used, simply because the pests that survive exposure to the treatment are more likely to be resistant. Thus, the proportion of the pest population that carries genes for resistance to a particular insecticide is higher after that insecticide has been applied. With foliar insecticides, resistance can be delayed by not exposing successive generations of pests to insecticides from the same class. Rotating different classes of insecticides against different generations of pests is an effective resistance management tool because insects resistant to one class of chemistry are often susceptible to insecticides from a different class. This provides immediate benefits in terms of improved control as well as long-term benefits in terms of reduced selection for resistance.

Responding to Control Failures

Key considerations and responses following suspected insecticide failures:

1. Don't panic! Do not automatically assume that the presence of live insects following an insecticide application is the result of an insecticide failure.
2. Examine the possible reasons unsatisfactory control may have occurred. Control decisions should consider a wide range of variables that influence insecticide efficacy and damage potential: species complex, population density and age structure, application timing, insecticide dosage rate, application methods and carriers, treatment evaluation timing, need for multiple applications, environmental conditions, and levels of insecticide resistance.
3. Under continuous pressure, multiple insecticide applications are required to reduce crop damage. Against high, sustained infestations, multiple close-interval (3 to 5 days) applications of recommended economical treatments are often more effective than applications of expensive mixtures at high rates applied at longer intervals.
4. If you suspect a field failure is due to insecticide resistance, do not reapply the same insecticide at any rate. Change to another class of insecticides, or use mixtures of insecticides from different classes.

Caution: Recommendations of specific insecticides are based on information on the manufacturer's label and performance in a limited number of efficacy trials. Because levels of insecticide resistance, environmental conditions, and methods of application by growers may vary widely, insecticide performance does not always conform to the safety and pest control standards indicated by experimental data.

Insecticides are not listed in order of their effectiveness. Effectiveness of a particular insecticide can vary greatly from field to field, depending on previous insecticide use, pest species, levels of resistance, and many other factors. Within a group of insecticides recommended for control of a specific pest, there often will be considerable variability in cost, effectiveness against the primary target pest, and secondary pests controlled. Growers must consider each of these factors as well as the need to rotate among different insecticide classes (for resistance management purposes) when selecting insecticides.

Insecticides with the same trade name may be available in many different formulations. Please be aware of the product formulations listed in these guidelines and know that they may differ from the formulated product on hand.

Classes of insecticides: Effective resistance management requires rotation among the various classes of available insecticide chemistry. Often when one insecticide in a class fails because of insecticide resistance, other insecticides in the same class will also be ineffective, and selection of an insecticide from a different class will improve the chances of obtaining control. Growers need to be very aware of the type of insecticide chemistry being used. Classes of insecticides recommended in this guide are identified by the following abbreviations:

Carbamate – (C)	Pyrethroid – (P)	Oxadiazine – (OX)	Biologicals – (B)
Spinosyns – (SPN)	Organochlorine – (OC)	Organophosphate – (OP)	Insect Growth Regulators – (IGR)
Neonicotinoids – (N)	Avermectins – (AV)	Pyridine Carboxamide – (PC)	Tetronic Acid – (TA)

Sweetpotato Weevils

Insecticide	Amount of Formulation per Acre	Pounds Active Ingredient per Acre	Acres 1 Gallon or 1 Pound Dry Will Treat	PHI (days)	Comments
Soil Application:					
bifenthrin (P)					
Brigade 2EC	9.6-19.2 oz (at planting)	0.15–0.30	13.3–6.7	21	
Brigade 2EC	3.2-9.6 oz (at layby)	0.05–0.15	40–13.3	21	
carbaryl (C)					
Sevin 4F	48 oz.	1.5	2.7	7	
clothianidin (N)					
Belay 2.13 SC	12 oz.	0.2	10.7		
Foliar Application:					
β-cyfluthrin (P)					
Baythroid XL	1.6-2.8 oz.	0.013–0.022	80–45.7	0	
bifenthrin (P)					
Brigade 2EC	2.1-6.4 oz	0.033–0.10	60.6–20	21	
chlorantraniliprole (D) + **λcyhalothrin** (P)					
Besiege	6 – 9 oz.		21.3 – 14.2	14	
cyfluthrin (P)					
Tombstone 2 EC	1.6-2.8 oz.	0.025–0.044	80–45.7	0	
phosmet (OP)					
Imidan 70 W	21.3 oz.	0.93	0.75	7	

The **SWEETPOTATO WEEVIL** is a serious insect pest, but it rarely infests commercial fields in north Mississippi. The Bureau of Plant Industry has a monitoring program to detect sweetpotato weevils and a quarantine program to prevent this pest from infesting most Mississippi sweetpotato production areas. Producers with 3 or more acres in sweetpotato production must register with BPI for the monitoring program.

Beds are susceptible to sweetpotato weevil infestations. If you purchase slips, insist on weevil-free slips. Locate plant beds away from sweetpotato storage and last season's production areas. Female weevils oviposit in stems near the soil line, so cut slips at least 2 inches above the soil to help prevent spreading weevils to production fields. Destroy plant beds as soon as you no longer need them. Weevils in the sweetpotato crop in most of Mississippi warrant regulatory action. If you catch one or more weevils in pheromone traps, the Bureau of Plant Industry will notify you of required treatments.

Foliar applications are effective only against adult sweetpotato weevils.

Whiteflies

Insecticide	Amount of Formulation per Acre	Pounds Active Ingredient per Acre	Acres 1 Gallon or 1 Pound Dry Will Treat	PHI (days)	Comments
Soil Application:					
imidacloprid (N)				125	
Admire Pro 4.6 SC	7–10.5 oz.	0.25–0.38	18.3–12.2		
Foliar Application:					
bifenthrin (P) + **imidacloprid** (CN)					
Brigadier	5.1 – 7.7 oz.		25.1 – 16.6	21	
imidacloprid (N)					
Admire Pro 4.6 SC	1.2 oz.	0.043	106.7	7	
novaluron (IGR)					
Rimon 0.83 EC	12 oz.	0.078	10.7	14	
spiromesifen (TN)					
Oberon 4SC	4 – 8 oz.	0.125 – 0.25	32 – 16	7	
spirotetramat (TA)					
Movento 2 SC	4–5 oz.	0.06–0.08	32–25.6	7	
sulfoxaflor (SX)					
Transform WG	2.0 – 2.5 oz.	0.023 – 0.047	21.3 – 10.7	7	

WHITEFLIES can transmit several viral diseases. Control of whiteflies infesting plant beds may reduce transfer of diseased plants to the field.

Two species of whiteflies infest sweetpotatoes. The sweetpotato whitefly is more difficult to control than the bandedwinged whitefly.

THRESHOLD: Treat when colonies are present.

Flea Beetles

Insecticide	Amount of Formulation per Acre	Pounds Active Ingredient per Acre	Acres 1 Gallon or 1 Pound Dry Will Treat	PHI (days)	Comments
Soil Application:					
bifenthrin (P)					
Brigade 2EC	9.6–19.2 oz (at planting)	0.15–0.30	13.3–6.7	21	
Brigade 2EC	3.2–9.6 oz (at layby)	0.05–0.15	40–13.3	21	
chlorpyrifos (OP)					
Lorsban 15G	13.5 lb	2.0	0.08	125	Lorsban Advanced has a 24(c) Special Local Needs registration with a 60-day preharvest interval.
Lorsban Advanced	64 oz.	1.88	2	60	
clothianidin (N)					
Belay 2.13 SC	9–12 oz.	0.15–0.2	14.2–10.7		
ethoprop (OP)					
Mocap 6 EC	63–86 oz.	3–4	2–1.5		Apply 2–3 weeks before planting.
imidacloprid (N)					
Admire Pro 4.6 SC	7–10.5 oz.	0.25–0.38	18.3–12.2	125	
thiamethoxam (N)					
Platinum 2 SC	5–8 oz	0.078–0.125	25.6–16		
Foliar Application:					
acetamiprid (N)					
Assail 30 SG	1.5–2.5 oz.	0.028–0.047	10.7–6.4	7	
β–cyfluthrin (P)					
Baythroid XL	1.6–2.8 oz.	0.013–0.022	80–45.7	0	
bifenthrin (P)					
Brigade 2EC	2.1–6.4 oz	0.033–0.10	60.6–20	21	
bifenthrin (P) + **imidacloprid** (CN)					
Brigadier	5.1 – 7.7 oz.		25.1 – 16.6	21	
bifenthrin (P) + **Z-cypermethrin** (P)					
Hero	4.0 – 10.3 oz.		32 – 12.4	21	21 days minimum between applications.
carbaryl (C)					
Sevin 4F	48 oz.	1.5	2.67	7	
chlorantraniliprole (D) + **λcyhalothrin** (P)					
Besiege	6 – 9 oz.		21.3 – 14.2	14	
clothianidin (N)					
Belay 2.13 SC	2–3 oz.	0.033–0.05	8–5.3	14	
cyfluthrin (P)					
Tombstone 2 EC	1.6–2.8 oz.	0.025–0.044	80–45.7	0	
deltamethrin (P)					
Delta Gold 1.5EC	1.5–2.4 oz.	0.018–0.028	85.3–53.3	3	
imidacloprid (N)					
Admire Pro 4.6 SC	1.2 oz.	0.043	106.7	7	
imidacloprid (N) + **B-cyfluthrin** (P)					
Leverage 360	2.4 – 2.8 oz.		53.3 – 45.7	7	
λ–cyhalothrin (P)					
Karate Z 2.08 CS	1.28–1.92 oz.	0.02–0.03	100–66.7	7	
thiamethoxam (N)					
Actara 25 WDG	3 oz.	0.047	5.3	14	
thiamethoxam (CN) + **chlorantraniprole** (D)					
Voliam Flexi	4 oz.		32	14	
Z–cypermethrin (P)					
Mustang Max	1.76–4 oz.	0.011–0.025	72.7–32	1	

Soil insecticides may be applied preplant or at layby. Disk and/or hip immediately after application to incorporate. A 4- to 6-inch incorporation is preferred. Some products are labeled for broadcast or band applications, while others are labeled only for one method. Refer to product label for appropriate method of application. Preplant incorporated products often control first-generation **FLEA BEETLE** larvae.

Immediately after transplanting, sweetpotatoes are susceptible to injury from flea beetle adult feeding. However, most foliar applications against adults are aimed to minimize oviposition.

Threshold: Plant beds: Treat when 10 or more beetles per 100 feet of bed or per 100 sweeps are present. Fields: Treat when two or more beetles per 100 feet of bed or per 100 sweeps are present.

Aphids

Insecticide	Amount of Formulation per Acre	Pounds Active Ingredient per Acre	Acres 1 Gallon or 1 Pound Dry Will Treat	PHI (days)	Comments
Soil Application:					
clothianidin (N) Belay 2.13 SC	9–12 oz.	0.15–0.2	14.2–10.7		
imidacloprid (N) Admire Pro 4.6 SC	7–10.5 oz.	0.25–0.38	18.3–12.2	125	
thiamethoxam (N) Platinum 2 SC	5–8 oz	0.078–0.125	25.6–16		
Foliar Application:					
acetamiprid (N) Assail 30 SG	2.5–4 oz.	0.047–0.075	6.4–4.0	7	
bifenthrin (P) + **imidacloprid** (CN) Brigadier	5.1 – 7.7 oz.		25.1 – 16.6	21	
chlorantraniliprole (D) + **λ-cyhalothrin** (P) Besiege	6 – 9 oz.		21.3 – 14.2	14	
clothianidin (N) Belay 2.13 SC	2–3 oz.	0.033–0.05	8–5.3	14	
flonicamid (PC) Beleaf 50 SG	2.0–2.8 oz.	0.062–0.089	8–5.7	7	
imidacloprid (N) Admire Pro 4.6 SC	1.2 oz.	0.043	106.7	7	
imidacloprid (CN) + **β-cyfluthrin** (P) Leverage 360	2.4 – 2.8 oz.		53.3 – 45.7	7	
pymetrozine (PC) Fulfill 50 WDG	2.75–5.5 oz.	0.086–0.17	5.8–2.9	14	
spirotetramat (TA) Movento 2 SC	4–5 oz.	0.06–0.08	32–25.6	7	
sulfoxaflor (N) Transform WG	0.75 – 1.5 oz.	0.023 – 0.047	21.3 – 10.7	7	
thiamethoxam (N) Actara 25 WDG	3 oz.	0.047	5.3	14	
thiamethoxam (CN) + **chlorantraniprole** (D) Voliam Flexi	4 oz.		32	14	

APHIDS can transmit several viral diseases. Control of aphids infesting plant beds may reduce transfer of diseased plants to the field.

THRESHOLD: After removing plastic in plant beds, begin treatments if two to five aphids per 100 feet of bed or per 100 sweeps are present. Aphids are rarely a problem after transplanting.

White Grubs/ May–June Beetles

Insecticide	Amount of Formulation per Acre	Pounds Active Ingredient per Acre	Acres 1 Gallon or 1 Pound Dry Will Treat	PHI (days)	Comments
Soil Application:					
bifenthrin (P)					
Brigade 2EC	9.6–19.2 oz (at planting)	0.15–0.30	13.3–6.7	21	
Brigade 2EC	3.2–9.6 oz (at layby)	0.05–0.15	40–13.3	21	
clothianidin (N) Belay 2.13 SC	12 oz.	0.2	10.7		
ethoprop (OP) Mocap 6 EC	63–86 oz.	3–4	2–1.5		Apply 2–3 weeks before planting.
Foliar Application:					
bifenthrin (P) Brigade 2EC	2.1–6.4 oz.	0.033–0.10	60.6–20	21	
bifenthrin (P) + **imidacloprid** (CN) Brigadier	5.1 – 7.7 oz.		25.1 – 16.6	21	
bifenthrin (P) + **Z-cypermethrin** (P) Hero	4.0 – 10.3 oz.		32 – 12.4	21	21 days minimum between applications.
phosmet (OP) Imidan 70 W	21.3 oz.	0.93	0.75	7	Provides suppression only.

Soil insecticides may be applied preplant or at layby to control **WHITE GRUBS/MAY–JUNE BEETLES**. Disk and/or hip immediately after application to incorporate. A 4- to 6-inch incorporation is preferred. Some products are labeled for broadcast or band applications, while others are labeled only for one method. Refer to product label for appropriate method of application.

Foliar applications against adults are aimed to minimize oviposition.

THRESHOLD: Treat when two beetles per 100 feet of bed or per 100 sweeps are present. Beetles are more active at night and may not be captured in high numbers.

Rootworms/ Cucumber Beetles

Insecticide	Amount of Formulation per Acre	Pounds Active Ingredient per Acre	Acres 1 Gallon or 1 Pound Dry Will Treat	PHI (days)	Threshold and Comments
Soil Application:					
bifenthrin (P)					
Brigade 2EC	9.6–19.2 oz (at planting)	0.15–0.30	13.3–6.7	21	
Brigade 2EC	3.2–9.6 oz (at layby)	0.05–0.15	40–13.3	21	
ethoprop (OP)					
Mocap 6EC	63–86 oz.	3–4	2–1.5		Apply 2–3 weeks before planting.
Foliar Application:					
acetamiprid (N)					
Assail 30 SG	1.5–4 oz.	0.028–0.075	10.7–4	7	
β–cyfluthrin (P)					
Baythroid XL	1.6–2.8 oz.	0.013–0.022	80–45.7	0	
bifenthrin (P)					
Brigade 2EC	2.1–6.4 oz.	0.033–0.10	60.6–20	21	
bifenthrin (P) + **imidacloprid** (CN)					
Brigadier	5.1 – 7.7 oz.		25.1 – 16.6	21	
bifenthrin (P) + **Z-cypermethrin** (P)					
Hero	4.0 – 10.3 oz.		32 – 12.4	21	21 days minimum between applications.
carbaryl (C)					
Sevin 4F	48 oz.	1.5	2.67	7	
chlorantraniliprole (D) + **λcyhalothrin** (P)					
Besiege	6 – 9 oz.		21.3 – 14.2	14	
λ–cyhalothrin (P)					
Karate Z 2.08 CS	1.28–1.92 oz.	0.02–0.03	100–66.7	7	
phosmet (OP)					
Imidan 70 W	21.3 oz.	0.93	0.75	7	
Z–cypermethrin (P)					
Mustang Max	1.76–4 oz.	0.011–0.025	72.7–32	1	

Soil insecticides may be applied preplant or at layby. Disk and/or hip immediately after application to incorporate. A 4- to 6-inch incorporation is preferred. Some products are labeled for broadcast or band applications, while others are labeled only for one method. Refer to product label for appropriate method of application. Most first-generation **CUCUMBER BEETLES** are controlled by preplant incorporated applications.

Foliar applications against adults are aimed to minimize oviposition.

THRESHOLD: Treat when two female beetles per 100 feet of bed or per 100 sweeps are present. Spotted cucumber beetle sex ratio should be determined prior to spray application. Females may be rare in sweetpotatoes during mid- to late season.

Wireworms/ Click Beetles

Insecticide	Amount of Formulation per Acre	Pounds Active Ingredient per Acre	Acres 1 Gallon or 1 Pound Dry Will Treat	PHI (days)	Comments
Soil Application:					
bifenthrin (P)					
Brigade 2EC	9.6–19.2 oz (at planting)	0.15–0.30	13.3–6.7	21	
Brigade 2EC	3.2–9.6 oz (at layby)	0.05–0.15	40–13.3	21	
chlorpyrifos (OP)					
Lorsban 15G	13.5 lb	2.0	0.08	125	Lorsban Advanced has a 24(c) Special Local Needs registration with a 60–day preharvest interval.
Lorsban Advanced	64 oz.	1.88	2	60	
clothianidin (N)					
Belay 2.13 SC	12 oz.	0.2	10.7		Provides suppression only.
ethoprop (OP)					
Mocap 6 EC	63–86 oz.	3–4	2–1.5		Apply 2–3 weeks before planting.
Foliar Application:					
bifenthrin (P)					
Brigade 2EC	2.1–6.4 oz.	0.033–0.10	60.6–20	21	
phosmet (OP)					
Imidan 70W	21.3 oz.	0.93	0.75	7	Provides suppression only.

Avoid fields that have been out of production. Bait fields in late winter before disturbing the soil to check for **WIREWORMS** and grubs. Baits can be made with rolled oats soaked in water. Soil insecticides may be applied preplant or at layby. Disk and/or hip immediately after application to incorporate. A 4- to 6-inch incorporation is preferred. Some products are labeled for broadcast or band applications, while others are labeled only for one method. Refer to product label for appropriate method of application. Most first-generation wireworms are controlled by preplant incorporated applications.

Foliar applications against adults are aimed to minimize oviposition.

Threshold: Treat when four beetles per 100 feet of bed or per 100 sweeps are present.

Cutworms

Insecticide	Amount of Formulation per Acre	Pounds Active Ingredient per Acre	Acres 1 Gallon or 1 Pound Dry Will Treat	PHI (days)	Comments
β-cyfluthrin (P)					
Baythroid XL	0.8–1.6 oz.	0.006–0.013	160–80	0	
bifenthrin (P)					
Brigade 2EC	2.1–6.4 oz.	0.033–0.10	60.6–20	21	
bifenthrin (P) + **Z-cypermethrin** (P)					
Hero	4.0 – 10.3 oz.		32 – 12.4	21	21 days minimum between applications.
chlorantraniliprole (D) + **λ-cyhalothrin** (P)					
Besiege	5 – 8 oz.		25.6 – 16	14	
cyfluthrin (P)					
Tombstone 2EC	0.8–1.6 oz.	0.013–0.025	160–80	0	
deltamethrin (P)					
Delta Gold 1.5EC	1.0–2.4 oz.	0.012–0.028	125–53.6	3	
λ–cyhalothrin (P)					
Karate Z 2.08 CS	1.28–1.92 oz.	0.02–0.03	100–66.7	7	
thiamethoxam (CN) + **chlorantraniprole** (D)					
Voliam Flexi	4 oz.		32	14	
Z-cypermethrin (P)					
Mustang Max	1.28–4 oz.	0.008–0.025	100–32	1	

Fields planted to cover crops are susceptible to **CUTWORM** injury, especially if the cover crop is terminated fewer than 4 weeks before planting. Pyrethroids are effective against most cutworm species if adequate coverage is obtained. Apply herbicides early enough or conduct tillage operations to kill vegetation at least 4 weeks before planting.

Threshold: Treat if cutworms reduce stand below eight plants per 10 row feet. If plant density is reduced below five plants per 10 row feet, consider replanting.

Tortoise Beetles

Insecticide	Amount of Formulation per Acre	Pounds Active Ingredient per Acre	Acres 1 Gallon or 1 Pound Dry Will Treat	PHI (days)	Comments
carbaryl (C) Sevin 4F	48 oz.	1.5	2.67	7	
chlorantraniliprole (D) + **λcyhalothrin** (P) Besiege	6 – 9 oz.		21.3 – 14.2	14	
λ–cyhalothrin (P) Karate Z 2.08 CS	1.28–1.92 oz.	0.02–0.03	100–66.7	7	

THRESHOLD: Treat if defoliation exceeds 30 percent and beetles are present.

Armyworms and Loopers

Insecticide	Amount of Formulation per Acre	Pounds Active Ingredient per Acre	Acres 1 Gallon or 1 Pound Dry Will Treat	PHI (days)	Threshold and Comments
bifenthrin (P) + **imidacloprid** (CN) Brigadier	5.1 – 7.7 oz.		25.1 – 16.6	21	
bifenthrin (P) + **Z-cypermethrin** (P) Hero	4 – 10.3 oz.		32 – 12.4	21	21 days minimum between applications.
chlorantraniprole (D) Coragen 1.67 SC	3.5–5.0 oz.	0.045–0.065	36.6–25.6	1	
chlorantraniliprole (D) + **λcyhalothrin** (P) Besiege	6 – 9 oz.		21.3 – 14.2	14	
deltamethrin (P) Delta Gold 1.5 EC	1.5–2.4 oz.	0.018–0.028	85.3–53.6	3	
λ–cyhalothrin (P) Karate Z 2.08 CS	1.28–1.92 oz.	0.02–0.03	100–66.7	7	
methoxyfenozide (IGR) Intrepid 2F	6–10 oz.	0.094–0.156	21.3–12.8	7	
novaluron (IGR) Rimon 0.83 EC	9–12 oz.	0.058–0.078	14.2–10.7	14	
spinetoram (SPN) Radiant 1SC	6–8 oz.	0.05–0.06	21.3–16	7	
spinosad (SPN) Blackhawk	2.25–3.5 oz.	0.05–0.08	7.1–4.6	3	
Z–cypermethrin (P) Mustang Max	3.2–4 oz.	0.02–0.025	40–32	1	

In addition to defoliation, **ARMYWORMS and LOOPERS** can invade cracks in the soil around the roots during dry years and damage roots directly, reducing quality and/or yield.

THRESHOLD: Treat when 10 or more caterpillars (all species combined) are present per 100 row feet or per 100 sweeps with a sweep net.

White-fringed Beetles

Insecticide	Amount of Formulation per Acre	Pounds Active Ingredient per Acre	Acres 1 Gallon or 1 Pound Dry Will Treat	PHI (days)	Comments
Foliar Application: **bifenthrin** (P) Brigade 2EC	2.1–6.4 oz.	0.033–0.10	60.6–20	21	
carbaryl (C) Sevin 4F	48 oz.	1.5	2.67	7	
phosmet (OP) Imidan 70 W	21.3 oz.	0.93	0.75	7	
Z–cypermethrin (P) Mustang Max	1.76–4 oz.	0.011–0.025	72.7–32	1	

Use caution when planting into whitefringed beetle-infested fields. No soil insecticides are labeled for **WHITEFRINGED BEETLE** control in sweet potatoes. However, some soil insecticides may provide some control when applied to control other soil insect pests.

Foliar applications against adults are aimed to minimize oviposition.

THRESHOLD: Treat when one beetle per 100 feet of bed are present or when 10 plants per 100 plants show whitefringed beetle feeding injury. Shake plants vigorously and examine soil for dislodged beetles.

Sugarcane Beetles

Sugarcane beetle adults may enter fields from root enlargement until harvest. The beetles burrow down to the roots and feed. Currently no effective insecticides have been identified for controlling sugarcane beetles in sweetpotatoes. In fields that historically have had sugarcane beetle problems, crop rotation may be beneficial. Sweetpotato fields near pastures or hay fields appear to be more at risk for sugarcane beetle infestations. Planting more productive fields (fields with higher yield potential) first and harvesting them as soon as possible may allow these fields to be harvested before sugarcane beetle infestations get severe. Sugarcane beetles may also be brought into storage facilities on or in infested potatoes. Sugarcane beetles are strongly attracted to lights. In storage areas kept in darkness for periods of time (such as overnight), light traps may be helpful in capturing beetles and reducing damage to stored sweetpotatoes.

Thrips

Insecticide	Amount of Formulation per Acre	Pounds Active Ingredient per Acre	Acres 1 Gallon or 1 Pound Dry Will Treat	PHI (days)	Comments
Soil Application:					
imidacloprid (N) Admire Pro 4.6 SC	7–10.5 oz.	0.25–0.38	18.3–12.2	125	
Foliar Application: **λ–cyhalothrin** (P) Karate Z 2.08 CS	1.28–1.92 oz.	0.02–0.03	100–66.7	7	Does not control western flower thrips.
spinetoram (SPN) Radiant 1SC	6–8 oz.	0.05–0.06	21.3–16	7	
spinosad (SPN) Blackhawk	2.25–3.5 oz.	0.05–0.08	7.1–4.6	3	

THRIPS can stunt and reduce growth in young transplants. They can quickly infest freshly planted fields, especially when alternate hosts (weeds and border plants) are senescing or have been destroyed by chemical or mechanical means. Scout for thrips by beating plants onto a white surface and counting them as they move about. Sample at least 50 plants.

THRESHOLD: Treat when plants are stunted and thrips are present.

Storage Insects

Insecticide	Amount of Formulation per Acre	Threshold and Comments
Sweetpotato Weevils **phosmet** (OP) Imidan 5D	4 oz./50 bu	Apply to stored Sweetpotatoes in areas of suspected sweetpotato weevil infestation as a preventive treatment.
Fruit Flies **pyrethrins**	Apply 1 gal. of solution/100,000 cu ft. Refer to label for proper dilution.	Space spray for stored sweetpotatoes.
Sugarcane Beetles		Sugarcane beetles may also be brought into storage facilities on or in infested potatoes. Currently no effective insecticides have been identified for controlling sugarcane beetles in sweetpotatoes. Sugarcane beetles are strongly attracted to lights. In storage areas kept in darkness for periods of time (such as overnight), light traps may be helpful in capturing beetles and reducing damage to stored sweetpotatoes.

Supplemental Information

Based on historical data, the following pests could be expected at different stages of plant development. This is a generalized statement; conditions may be different on specific farms or in specific seasons.

Stages of Plant Development	Insect Pests
Plant beds	Sweetpotato weevils, flea beetles, aphids, whiteflies
Planting to runner development	Wireworms, white grubs, root worms, flea beetle adults and larvae, whitefringed beetle larvae, cutworms, thrips
Canopy closure to full root development	Wireworms, root worms, white grubs, flea beetle larvae, caterpillars
Root maturity to harvest	Wireworms, root worms, white grubs, flea beetle larvae, sugarcane beetles, caterpillars
Post-harvest storage	Sweetpotato weevils, sugarcane beetles, fruit flies

Foliar Insecticide Application Recommendations

Adequate coverage can be difficult but is essential with most products. Best results from contact insecticides will be with application volumes of 5 to 10 gallons per acre. Apply foliar insecticides with hollow cone nozzles and do not exceed 12 gallons per acre application volume.

Chinch Bugs

Insecticide	Amount of Formulation per Acre	Pounds Active Ingredient per Acre	Acres 1 Gallon or 1 Pound Dry Will Treat	Threshold and Comments
Seed Treatments				
clothianidin (CN) Nipsit INSIDE	1.92 fl. oz.			Per 100 lbs. seed. Or the equivalent of 0.075 lbs. ai/100 lbs. seed.
thiamethoxam (CN) Cruiser 5FS		3.3 fl. oz.		Per 100 lbs. seed. Or the equivalent of 0.03 mg thiamethoxam per seed.
Foliar Treatments				
clothianidin (CN) Belay 2.13	4.5 fl. oz.	0.075	28	Do not apply after third tillering has initiated.
gamma-cyhalothrin (P)				
Prolex 1.25CS	1.28 – 2.05 fl. oz.	0.0125 – 0.02	62 – 100	
Proaxis 0.5CS	3.2 – 5.12 fl. oz.	0.0125 – 0.02	25 – 40	
λ-cyhalothrin (P)				
Karate Z 2.08CS	1.6 – 2.56 fl. oz.	0.025 – 0.04	50 – 80	Treat when stand loss occurs. Do not tank mix carbaryl with propanil or apply within 14 days of a propanil application. Flushing or flooding alone may not control chinch bugs.
Lambda 2.08CS	1.6 – 2.56 fl. oz.	0.025 – 0.04	50 – 80	
Z-cypermethrin (P) Mustang Max 0.8EC	2.64 – 4.0 fl. oz.	0.165 – 0.025	32 – 48.5	

Rice plants are most susceptible to injury from chinch bugs during the first 3 weeks after plant emergence. Fields should be scouted frequently during this time. First instar nymphs are orange and about one-sixteenth inch long. As chinch bugs mature through subsequent instars, they become black with conspicuous wing pads. They feed mostly on the rice stems just below the surface of the soil. Flooding or flushing will help control this pest, but an insecticide application may still be necessary. Chinch bugs are less active during the day and often hidden behind leaf sheaths and below the soil surface. Insecticides applied late in the day or early in the morning often provide the best results.

THRESHOLD: Treat when stand loss occurs.

Fall Armyworms

Insecticide	Amount of Formulation per Acre	Pounds Active Ingredient per Acre	Acres 1 Gallon or 1 Pound Dry Will Treat	Threshold and Comments
gamma-cyhalothrin (P)				
Prolex 1.25CS	1.28 – 2.05 fl. oz.	0.0125 – 0.02	62 – 100	
Proaxis 0.5CS	3.2 – 5.12 fl. oz.	0.0125 – 0.02	25 – 40	
λ-cyhalothrin (P)				
Karate Z 2.08CS	1.6 – 2.56 fl. oz.	0.025 – 0.04	50 – 80	
Lambda 2.08CS	1.6 – 2.56 fl. oz.	0.025 – 0.04	50 – 80	
Z-cypermethrin (P) Mustang Max 0.8EC	3.2 – 4.0 fl. oz.	0.02 – 0.025	32 – 48.5	

Occasional outbreaks of fall armyworms and other armyworm species occur in rice fields in Mississippi. These insects feed mostly on leaves and stems of un-flooded rice. They may move out of nearby wheat fields and grassy areas into fields that have seedling rice plants. Submerging the crop with water usually provides an effective control. If the rice plants are too young to be flooded, use an insecticide. These insects occasionally occur in headed rice and, if left uncontrolled, will cause substantial yield losses.

THRESHOLD: Treat when you find an average of five or more worms per 10 sweeps or when you see considerable damage.

Grasshoppers

Insecticide	Amount of Formulation per Acre	Pounds Active Ingredient per Acre	Acres 1 Gallon or 1 Pound Dry Will Treat	Threshold and Comments
gamma-cyhalothrin (P)				
Prolex 1.25CS	1.28 – 2.05 fl. oz.	0.0125 – 0.02	62 – 100	
Proaxis 0.5CS	3.2 – 5.12 fl. oz.	0.0125 – 0.02	25 – 40	
λ-cyhalothrin (P)				
Karate Z 2.08CS	1.6 – 2.56 fl. oz.	0.025 – 0.04	50 – 80	
Lambda 2.08CS	1.6 – 2.56 fl. oz.	0.025 – 0.04	50 – 80	
Z-cypemethrin (P)				
Mustang Max 0.8EC	3.2 – 4.0 fl. oz.	0.02 – 0.025	32 – 48.5	

Several species of grasshoppers may be found in rice fields. Green grasshoppers from the longhorn species usually feed on the flower parts of the plants. The brown species feed on leaves and the sides of stems of rice plants. Injured plants will sometimes produce white heads.

Grasshoppers are very seldom an economic problem in rice fields. However, during drought conditions, large numbers may move into fields as food plants around the fields dry up. In most situations, only border treatment is necessary to control a damaging population. Start checking the rice fields when rice is about 10 percent headed. Sample four to six locations. Sample fields at least once a week with a sweep net until rice heads are mature.

THRESHOLD: **Treatments should be made when you find an average of 5 grasshoppers in 10 sweeps during the first 2 weeks of heading. After the field is completely headed and most of the heads are in the milk stage, treatments should be made when you find an average of 10 grasshoppers in 10 sweeps.**

Rice Water Weevils (Eggs) (Adults)

Insecticide	Amount of Formulation per Acre	Pounds Active Ingredient per Acre	Acres 1 Gallon or 1 Pound Dry Will Treat	Threshold and Comments
clothianidin (N) Belay	4.5 fl. oz.	0.075	28	Do not apply more than 0.075 lb. ai./acre per season.
diflubenzuron (IGR) Dimilin 2L	12 – 16 fl. oz.	0.19 – 0.25	8 – 10.6	Apply an insecticide when adults and feeding scars are observed and conditions are favorable for egg laying. Kills the eggs of rice water weevils. Apply 2 to 5 days after the permanent flood has been established.
λ-cyhalothrin (P)				Apply an insecticide when adults and feeding scars are observed and conditions are favorable for egg laying. Kills only adult rice water weevils. Apply within a week of permanent flood establishment.
Karate Z 2.08CS	1.6 – 2.56 fl. oz.	0.025 – 0.04	50 – 80	
Lambda 2.08CS	1.6 – 2.56 fl. oz.	0.025 – 0.04	50 – 80	
Z-cypemethrin (P) Mustang Max 0.8EC	3.2 – 4.0 fl. oz.	0.02 – 0.025	32 – 40	

Rice Water Weevils (Larvae)

	Rate in fl. oz. per 100 lbs. seed		
Rough Rice Seeding Rate (lb./A)	**thiamethoxam** Cruiser 5 FS	**chlorantraniliprole** Dermacor X-100	**clothianidin** Nipsit INSIDE
100 – 120	3.3	1.50	1.92
90 – 100	3.3	1.75	1.92
80 – 90	3.3	2.00	1.92
60 – 80	3.3	2.50	1.92
30 – 40	3.3	5.00	1.92
≤ 30	3.3	6.00	1.92

The labeled rate for Cruiser is 0.03 mg of thiamethoxam per seed. Therefore, the actual rate per 100 pounds seed may vary slightly based on the number of seeds per pound.

Rice water weevils occur throughout Mississippi's rice-growing area. Fields planted to rice for several years usually have larger populations than fields recently brought into production. The adults are grayish-brown, broad-nosed, and about one-eighth inch long.

Adults overwinter in grasses and ground trash near rice fields. They are strong fliers and migrate into rice fields in the spring. Adult weevils may be found in rice before flooding but usually invade fields in large numbers soon after flooding. If the field is flushed, water weevils may be attracted before a permanent flood is established. Weevil activity is more common in areas with open water, such as around levees, and thin stands. Higher populations are usually found in fields flooded between late May and mid-June.

Adult weevils feed on the leaves of rice plants. They remove portions of the upper leaf surface, resulting in a feeding scar. The adult leaf feeding does not seriously damage rice plants but does indicate whether or not adult weevils are present. The adults move into a field of rice and lay eggs on young plants. After the eggs hatch, the larvae move down the plants to the root system. The larvae, or root maggots, feed on the root system. They can injure plants seriously by pruning the root system. Larvae are white, legless, and up to one-fourth inch long. They feed on the root system for about 3 weeks, until they pupate. Weevils spend about 2 weeks in the pupae stage before emerging as adults.

Start checking fields within the first few days after flooding. Rice fields with a history of water weevil infestations are more likely to require treatment than those without a history of damaging water weevil populations. Adults usually appear first in areas where water is deep and stands are sparse, exposing open water. Populations are heavier around open areas and levee ditches than in thicker stands in bay areas. Check these areas for signs of adult feeding, but do not decide to treat based only on weevil counts from such areas. They may not be representative of the infestation level in the other, more typical plant population areas of the field. Check six or more locations that are representative of rice plant populations. Correct timing of the insecticide application is necessary for acceptable control.

Threshold: Apply an insecticide when adults and feeding scars are observed and conditions are good for egg laying. Treat the fields within the first 7 days after establishment of the permanent flood. Data from other rice producing states show that a pyrethroid application up to 5 days before flooding can provide effective control of rice water weevil adults. Generally, one application of insecticide has provided effective control. A second application may be needed in areas with severe water weevil populations. In areas with moderate to severe populations, research has shown that seed treatments are more effective than foliar applications with a pyrethroid.

Rice Stink Bugs

Insecticide	Amount of Formulation per Acre	Pounds Active Ingredient per Acre	Acres 1 Gallon or 1 Pound Dry Will Treat	Threshold and Comments
gamma-cyhalothrin (P)				
Prolex 1.25CS	1.28 – 2.05 fl. oz.	0.0125 – 0.02	62 – 100	
Proaxis 0.5CS	3.2 – 5.12 fl. oz.	0.0125 – 0.02	25 – 40	
λ-cyhalothrin (P)				
Karate Z 2.08CS	1.6 – 2.56 fl. oz.	0.025 – 0.04	50 – 80	
Lambda 2.08CS	1.6 – 2.56 fl. oz.	0.025 – 0.04	50 – 80	
malathion (OP)				
Malathion 57% EC	1 – 1.5 pt.	0.625 – 0.94	8 – 16	
Malathion 5	1 – 1.5 pt.	0.625 – 0.94	8 – 16	
Z-cypermethrin (P)				
Mustang Max 0.8EC	2.64 – 4.0 fl. oz.	0.165 – 0.025	32 – 48.5	

The adult rice stink bug is light brown and shield-shaped. It spends the winter in clumps of grass and other ground litter before emerging in the spring to feed on grasses. The adult migrates to rice soon after rice begins to head. There, it feeds and deposits eggs. Feeding on the milk stage of rice produces blank grains. Feeding on the soft dough stage can cause peckiness of grains, but peckiness can also be caused by other factors. Start checking the rice fields when rice is about 10 percent headed. Sample four to six locations. Sample fields at least once a week with a sweep net until rice heads are mature.

Threshold: Treatments should be made when you find an average of three stink bugs in 10 sweeps from panicle emergence through soft dough. After that point, treatments should be made when you find an average of 10 stink bugs in 10 sweeps.

Mowing grass prior to the grass heading around the edges of the rice fields can decrease rice stink bug populations in the field. Grasses with seed heads may host the rice stink bug, so mowing eliminates potential stink bug habitat.

PEANUT INSECT MANAGEMENT

Insect pests in peanuts can be divided into three general groups: foliage feeders, sucking pests, and soil insects. Peanuts can tolerate some leaf damage with no effects on yield. Sample fields weekly and make treatment decisions based on set economic thresholds.

Foliage Feeders

To scout for foliage feeders in peanuts, randomly select a 3-foot section of row in the field. Vigorously shake the plants over the row middle to dislodge the caterpillars, much like you would do when taking a drop cloth sample. Count the total number of larvae dislodged, and repeat this process across the field. While walking through the field, pay attention to moths that may fly, as this will help to identify potential infestations. Also, monitor for leaf-feeding damage. If defoliation approaches 20 percent, consider reducing the threshold.

Fall Armyworms

Insecticide	Rate per Acre	Pounds Active Ingredient per Acre	Acres 1 Gallon or 1 Pound Dry Will Treat	Comments
β-cyfluthrin (P) Baythroid XL 1EC	2.4 – 2.8 fl. oz.	0.019 – 0.022	53.33 – 45.72	**Do not** make more than three applications per year.
chlorantraniliprole (D) Prevathon 0.43SC	14 – 20 fl. oz.	0.047 – 0.067	9 – 6.4	
chlorantraniliprole (D), **λ-cyhalothrin** (P) Besiege	6 – 10 oz.		21 – 12	21 days PHI.
cyfluthrin (P) Tombstone 2EC	2.4 – 2.8 fl. oz.	0.038 – 0.44	53.33 – 45.72	**Do not** make more than three applications per year.
diflubenzuron (IGR) Dimilin 2L	4 – 8 fl. oz.	0.25 – 0.50	32 – 16	**Do not** make more than three applications per season. Because Dimilin is an IGR, insects must ingest treated foliage. Control may not be evident for 5 to 7 days.
flubendiamide (D) Belt 4SC	2 – 4 oz.	0.06 – 0.125	64 – 32	
gamma-cyhalothrin (P) Prolex 1.25EC	1 – 1.5 fl. oz.	0.01 – 0.015	128 – 85.33	**Do not** apply more than 0.06 lb. AI per acre per season.
indoxacarb (OX) Steward 1.25EC	9.2 – 11.3 fl. oz.	0.09 – 0.11	13.91 – 11.34	**Do not** apply more than 45 fl. oz. per acre per season.
λ-cyhalothrin (P) Karate Z 2.08SC	1.28 – 1.96 fl. oz.	0.02 – 0.03	100 – 65.31	**Do not** exceed 1 pt. per acre per season. **Do not** graze or use treated vines for animal feed.
methoxyfenozide (IGR) Intrepid 2F	6 – 10 fl. oz.	0.09 – 0.16	21 – 12.8	
methoxyfenozide (IGR) **+ spinetoram** (SPN) Intrepid Edge	4 – 8 oz.		32 – 16	Do not exceed 12 oz. per year.
novaluron (IGR) Diamond 0.83 SC	6 – 12 fl. oz.	0.04 – 0.08	21 – 11	Do not feed treated peanut hay or vines to livestock.
spinosad (SPN) Blackhawk	1.7 – 3.3 oz.	0.038 – 0.075	9.4 – 4.8	**Do not** feed hay for 14 days following final application. **Do not** apply more than 9 fl. oz. per acre per year.
spinetoram (SPN) Radiant SC	3 – 8 oz.	0.023 – 0.063	43 – 16	Do not apply within 3 days of harvest.

FALL ARMYWORMS are a pest of peanuts throughout the growing season. Two host strains of this species can occur in peanuts, and management options can vary greatly between the two strains. The two strains include the grass/rice strain and the corn strain. Infestations of the grass/rice strain become established when poor weed control leaves grass in the field.

THRESHOLD: Treat when four or more caterpillars per row foot are present early in the season or when plants are stressed from drought or some other cause. In older, more lush peanuts, treat when eight or more caterpillars are present.

Beet Armyworms

Insecticide	Rate per Acre	Pounds Active Ingredient per Acre	Acres 1 Gallon or 1 Pound Dry Will Treat	Comments
chlorantraniliprole (D) Prevathon 0.43SC	14 – 20 fl. oz.	0.047 – 0.067	9 – 6.4	
chlorantraniliprole (D), **λ-cyhalothrin** (P) Besiege	6 – 10 oz.		21 – 12	21 days PHI.
flubendiamide (D) Belt 4SC	2 – 4 oz.	0.06 – 0.125	64 – 32	
indoxacarb (OX) Steward 1.25EC	9.2 – 11.26 fl. oz.	0.09 – 0.11	13.91 – 11.37	**Do not** apply more than 45 fl. oz. per acre per season.
methomyl (C) Lannate 2.4LV	24 – 48 fl. oz.	0.45 – 0.9	5.33 – 2.67	**Do not** exceed more than 12 pt. per season. Do not feed treated vines to livestock.
methoxyfenozide (IGR) Intrepid 2F	6 – 10 fl. oz.	0.09 – 0.16	21 – 12.8	
methoxyfenozide (IGR) **+ spinetoram** (SPN) Intrepid Edge	4 – 8 oz.		32 – 16	Do not exceed 12 oz. per year.
novaluron (IGR) Diamond 0.83 SC	6 – 12 fl. oz.	0.04 – 0.08	21 – 11	Do not feed treated peanut hay or vines to livestock.
spinosad (SPN) Blackhawk	1.7 – 3.3 oz.	0.038 – 0.075	9.4 – 4.8	**Do not** feed hay for 14 days following final application. Do not apply more than 9 fl oz per acre per year.
spinetoram (SPN) Radiant SC	3 – 8 oz.	0.023 – 0.063	43 – 16	Do not apply within 3 days of harvest.

The **BEET ARMYWORM** larva can be identified by a small black spot on each side of the second body segment, directly above the second pair of true legs. The larva has four pairs of prologs and a smooth body. Color may vary from grayish-green to almost black with pale lines running the length of the body.

Threshold: Treat when four or more caterpillars per row foot are present early in the season or when plants are stressed from drought or some other cause. In older, more lush peanuts, treat when eight or more caterpillars are present.

Corn Earworms or Bollworms or Tobacco Budworms

Insecticide	Rate per Acre	Pounds Active Ingredient per Acre	Acres 1 Gallon or 1 Pound Dry Will Treat	Comments
chlorantraniliprole (D) Prevathon 0.43SC	14 – 20 fl. oz.	0.047 – 0.067	9 – 6.4	
chlorantraniliprole (D), **λ-cyhalothrin** (P) Besiege	6 – 10 oz.		21 – 12	21 days PHI.
flubendiamide (D) Belt 4SC	2 – 4 oz.	0.06 – 0.125	64 – 32	Do not apply more than 45 fl. oz. per acre per season.
indoxacarb (OX) Steward 1.25EC	9.2 – 11.3 fl. oz.	0.09 – 0.11	13.9 – 11.33	Do not feed hay for 14 days following final application. Do not apply more than 9 fl. oz. per acre per year.
methoxyfenozide (IGR) **+ spinetoram** (SPN) Intrepid Edge	4 – 8 oz.		32 – 16	Do not exceed 12 oz. per year.
spinosad (SPN) Blackhawk	1.7 – 3.3 oz.	0.038 – 0.075	9.4 – 4.8	
spinetoram (SPN) Radiant SC	3 – 8 oz.	0.023 – 0.063	43 – 16	Do not apply within 3 days of harvest.

CORN EARWORMS OR BOLLWORMS OR TOBACCO BUDWORMS vary in color from light green to pink, dark brown, or rust, with pale lines running the length of the body. They have four pairs of abdominal prologs and are about 1¼ inch long when fully grown. Infestations can occur throughout the growing season.

Threshold: Treat when four or more caterpillars per row foot are present early in the season or when plants are stressed from drought or some other cause. In older, more lush peanuts, treat when eight or more caterpillars are present.

Cutworms

Insecticide	Rate per Acre	Pounds Active Ingredient per Acre	Acres 1 Gallon or 1 Pound Dry Will Treat	Comments
β-cyfluthrin (P) Baythroid XL 1EC	1.0 – 1.8 fl. oz.	0.008 – 0.014	128 – 71.11	**Do not** make more than three applications per year.
bifenthrin (P) Brigade 2EC	2.1 – 6.4 fl. oz.	0.033 – 0.1	61 – 20	**Do not** apply more than 0.5 lb. AI per acre per season. **Do not** feed peanut hay to livestock.
chlorantraniliprole (D) Prevathon 0.43SC	14 – 20 fl. oz.	0.047 – 0.067	9 – 6.4	
chlorantraniliprole (D), **λ-cyhalothrin** (P) Besiege	6 – 10 oz.		21 – 12	21 days PHI.
cyfluthrin (P) Tombstone 2EC	1.0 – 1.8 fl. oz.	0.016 – 0.028	128 – 71.11	**Do not** make more than three applications per year.
esfenvalerate (P) Asana XL 0.66EC	9.6 fl. oz.	0.05	13.33	**Do not** exceed more than 0.15 lb. AI per acre per season. **Do not** feed or graze livestock on treated vines.
flubendiamide (D) Belt 4SC	2 – 4 fl. oz.	0.06 – 0.125	64 – 32	
gamma-cyhalothrin (P) Prolex 1.25EC Declare 1.25EC	 0.75 – 1.25 fl. oz. 0.75 – 1.25 fl. oz.	 0.0075 – 0.0125 0.0075 – 0.0125	 170.67 – 102.4 170.67 – 102.4	**Do not** apply more than 0.06 lb. AI per acre per season.
indoxacarb (OX) Steward 1.25EC	9.2 – 11.3 fl. oz.	0.09 – 0.11	13.9 – 11.33	**Do not** apply more than 45 fl. oz. per acre per season.
λ-cyhalothrin (P) Karate Z 2.08SC	1.28 – 1.92 fl. oz.	0.015 – 0.025	100 – 65.31	**Do not** exceed 1 pt. per acre per season. **Do not** graze or use treated vines for animal feed.
methoxyfenozide (IGR) **+ spinetoram** (SPN) Intrepid Edge	4 – 8 oz.		32 – 16	Do not exceed 12 oz. per year.
novaluron (IGR) Diamond 0.83 SC	6 – 12 fl. oz.	0.04 – 0.08	21 – 11	Do not feed treated peanut hay or vines to livestock.
Z-cypermethrin (P) Mustang Max 0.8EC	1.28 – 4 fl oz.	0.008 – 0.025	100 – 32	**Do not** apply more than 0.15 lb. AI per acre per season. **Do not** graze livestock in treated areas or use treated vines for animal feed.

In peanuts, there are several species of **CUTWORMS** that occur. They are most active around dusk and dawn, and will be hidden below the soil surface during the day. Early in the season, these insects will cut the plant off just above the soil surface. Later in the season, they will feed on the foliage. DINGY CUTWORMS AND GRANULATE CUTWORMS are more difficult to control than other species. Pyrethroid insecticides ARE NOT effective when treating dingy cutworms and granulate cutworms.

Threshold: Treat when four or more caterpillars per row foot are present early in the season or when plants are stressed from drought or some other cause. In older, more lush peanuts, treat when eight or more caterpillars are present.

Grasshoppers

Insecticide	Rate per Acre	Pounds Active Ingredient per Acre	Acres 1 Gallon or 1 Pound Dry Will Treat	Comments
acephate (OP) Orthene 90S Orthene 97AG	 0.28 – 0.56 lb. 0.26 – 0.52 oz.	 0.25 – 0.5 0.25 – 0.5	 3.6 – 1.8 3.8 – 1.9	**Do not** feed treated foliage to livestock or allow animals to graze treated areas.
β-cyfluthrin (P) Baythroid XL 1EC	1.8 – 2.4 fl. oz.	0.014 – 0.019	71.11 – 53.33	**Do not** make more than three applications per year.
cyfluthrin (P) Tombstone 2EC	1.8 – 2.4 fl. oz.	0.028 – 0.038	71.11 – 53.33	**Do not** make more than three applications per year.
gamma-cyhalothrin (P) Prolex 1.25EC Declare 1.25EC	 1 – 1.5 fl. oz. 1 – 1.5 fl. oz.	 0.01 – 0.015 0.01 – 0.015	 128 – 85.33 128 – 85.33	**Do not** apply more than 0.06 lb. AI per acre per season.
λ-cyhalothrin (P) Karate Z 2.08CS	1.28 – 1.92 fl.oz.	0.02 – 0.03	100 – 65.31	**Do not** exceed 1 pt. per acre per season. **Do not** graze or use treated vines for animal feed.
Z-cypermethrin (P) Mustang Max 0.8EC	3.2 – 4.0 fl. oz.	0.02 – 0.025	40 – 32	**Do not** apply more than 0.15 lb. AI per acre per season. **Do not** graze livestock in treated areas or use treated vines for animal feed.

GRASSHOPPERS are mainly foliage-feeders in peanuts. Females lay eggs in a cemented pod below the soil surface, most often in undisturbed grassy sites such as roadsides, prairies, field borders, and ditch banks. Nymphs go through five or six instars, depending on the species. Nymphs and adults are damaging. You can tell the difference between grasshopper nymphs and adults by the presence of wing pads (not fully developed wings). Weather is the most important factor influencing population densities. Grasshoppers are more numerous following a drought, especially when it lasts for several years in a row. Populations usually build around field borders before spreading into the field.

Threshold: Treat when 25 percent or greater defoliation of leaves occurs and insects are present in the field.

Rednecked Peanut Worms

Insecticide	Rate per Acre	Pounds Active Ingredient per Acre	Acres 1 Gallon or 1 Pound Dry Will Treat	Comments
β-cyfluthrin (P) Baythroid XL 1EC	1.8 – 2.4 fl. oz.	0.008 – 0.014	71.11 – 53.33	Do not make more than three applications per year.
bifenthrin (P) Brigade 2EC	2.1 – 6.4 fl. oz.	0.033 – 0.1	61 – 20	Do not apply more than 0.5 lb. AI per acre per season. Do not feed peanut hay to livestock.
chlorantraniliprole (D) Prevathon 0.43SC	14 – 20 fl. oz.	0.047 – 0.067	9 – 6.4	
chlorantraniliprole (D), **λ-cyhalothrin** (P) Besiege	6 – 10 oz.		21 – 12	21 days PHI.
cyfluthrin (P) Tombstone 2E	1.0 – 1.8 fl. oz.	0.016 – 0.028	128 – 71.11	Do not make more than three applications per year.
esfenvalerate (P) Asana XL 0.66EC	2.9 – 5.8 fl. oz.	0.015 – 0.03	44.14 – 22.07	Do not exceed more than 0.15 lb. AI per acre per season. Do not feed or graze livestock on treated vines.
flubendiamide (D) Belt 4SC	2 – 4 fl. oz.	0.06 – 0.125	64 – 32	
gamma-cyhalothrin (P) Prolex 1.25EC Declare 1.25EC	0.75 – 1.25 fl. oz. 0.75 – 1.25 fl. oz.	0.0075 – 0.0125 0.0075 – 0.0125	170.67 – 120.4 170.67 – 120.4	Do not apply more than 0.06 lb. AI per acre per season.
indoxacarb (OX) Steward 1.25EC	9.2 – 11.3 fl. oz.	0.09 – 0.11	13.9 – 11.33	Do not apply more than 45 fl. oz. per acre per season.
λ-cyhalothrin (P) Karate Z 2.08CS	0.96 – 1.6 fl. oz.	0.015 – 0.025	133.34 – 80	Do not exceed 1 pt. per acre per season. Do not graze or use treated vines for animal feed.
methoxyfenozide (IGR) **+ spinetoram** (SPN) Intrepid Edge	4 – 8 oz.		32 – 16	Do not exceed 12 oz. per year.
novaluron (IGR) Diamond 0.83 SC	6 – 12 fl. oz.	0.04 – 0.08	21 – 11	Do not feed treated peanut hay or vines to livestock.
spinosad (SPN) Blackhawk	1.7 – 3.3 oz.	0.039 – 0.075	9.4 – 4.8	Do not feed hay for 14 days following final application. Do not apply more than 9.0 fl. oz. per acre per year.
spinetoram (SPN) Radiant SC	3 – 8 oz.	0.023 – 0.063	43 – 16	Do not apply within 3 days of harvest.
Z-cypermethrin (P) Mustang Max 0.8E	1.28 – 4.0 oz.	0.008 – 0.025	100 – 32	Do not apply more than 0.15 lb. AI per acre per season. Do not graze livestock in treated areas or use treated vines for animal feed.

The **REDNECKED PEANUT WORM** is a light-colored larva with a red band on the two segments behind the head. It is the most common foliage feeder in Oklahoma, but it is extremely rare in Mississippi. Larva feed exclusively on terminal buds.

Threshold: Treat when excessive terminal damage (more than 80 percent) is present.

Soybean Loopers

Insecticide	Rate per Acre	Pounds Active Ingredient per Acre	Acres 1 Gallon or 1 Pound Dry Will Treat	Comments
chlorantraniliprole (D) Prevathon 0.43SC	14 – 20 fl. oz.	0.047 – 0.067	9 – 6.4	
chlorantraniliprole (D), **λ-cyhalothrin** (P) Besiege	6 – 10 oz.		21 – 12	21 days PHI.
flubendiamide Belt 4SC	2 – 4 oz.	0.06 – 0.125	64 – 32	Do not apply more than 45 fl. oz. per acre per season.
indoxacarb (OX) Steward 1.25EC	9.2 – 11.3 fl. oz.	0.09 – 0.11	13.9 – 11.33	Do not feed hay for 14 days following final application. Do not apply more than 9 fl. oz. per acre per year.
methoxyfenozide Intrepid 2F	6 – 10 fl. oz.	0.09 – 0.16	21 – 12.8	
methoxyfenozide (IGR) **+ spinetoram** (SPN) Intrepid Edge	4 – 8 oz.		32 – 16	Do not exceed 12 oz. per year.
spinosad (SPN) Blackhawk	1.7 – 3.3 oz.	0.039 – 0.075	9.4 – 4.8	Do not feed hay for 14 days following final application. Do not apply more than 9.0 fl. oz. per acre per year.
spinetoram (SPN) Radiant SC	3 – 8 oz.	0.023 – 0.063	43 – 16	Do not apply within 3 days of harvest.

SOYBEAN LOOPERS are migratory insects that fly in from Central and South America each year and infest peanuts late in the season. Soybean loopers are leaf-feeders and can cause extensive defoliation when present in high numbers. The larva has a characteristic looping movement when crawling. It is light green with white lines running the length of the body on the sides and top. The body tapers toward the head, and the larva has two pairs of abdominal prolegs. The soybean looper has developed resistance to some insecticides but is often controlled by disease organisms.

Threshold: Treat when four or more caterpillars per row foot are present early in the season or when plants are stressed from drought or some other cause. In older, more lush peanuts, treat when eight or more caterpillars are present.

Velvetbean Caterpillars

Insecticide	Rate per Acre	Pounds Active Ingredient per Acre	Acres 1 Gallon or 1 Pound Dry Will Treat	Comments
β-cyfluthrin (P) Baythroid XL 1EC	1.0 – 1.8 fl. oz.	0.008 – 0.014	128 – 71.11	Do not make more than three applications per year.
bifenthrin (P) Brigade 2EC	2.1 – 6.4 fl. oz.	0.033 – 0.1	61 – 20	Do not apply more than 0.5 lb. AI per acre per season. Do not feed peanut hay to livestock.
carbaryl (C) Sevin 4F, XLR Sevin 80S	32 fl. oz. 1.25 lb.	1.0 1.0	4	Do not apply more than 8 qt. per acre per season.
chlorantraniliprole (D) Prevathon 0.43SC	14 – 20 fl. oz.	0.047 – 0.067	9 – 6.4	
chlorantraniliprole (D), **λ-cyhalothrin** (P) Besiege	6 – 10 oz.		21 – 12	21 days PHI.
cyfluthrin (P) Tombstone 2E	1.0 – 1.8 fl. oz.	0.016 – 0.028	128 – 71.11	Do not make more than three applications per year.
diflubenzuron (IGR) Dimilin 2L	2 – 4 fl. oz.	0.03 – 0.06	64 – 32	Do not make more than three applications per season. Because Dimilin is an IGR, insects must ingest treated foliage. Control may not be evident for 5 to 7 days.
esfenvalerate (P) Asana XL 0.66EC	2.9 – 5.8 fl. oz.	0.015 – 0.03	44.14 – 22.07	Do not exceed more than 0.15 lb. AI per acre per season. Do not feed or graze livestock on treated vines.
flubendiamide (D) Belt 4SC	2 – 4 oz.	0.06 – 0.125	64 – 32	
gamma-cyhalothrin (P) Prolex 1.25EC Declare 1.25EC	0.75 – 1.25 fl. oz. 0.75 – 1.25 fl. oz.	0.0075 – 0.0125 0.0075 – 0.0125	170.67 – 120.4 170.67 – 120.4	Do not apply more than 0.06 lb. AI per acre per season.
λ-cyhalothrin (P) Karate Z 2.08CS	0.96 – 1.6 fl. oz.	0.015 – 0.025	133.34 – 80	Do not exceed 1 pt. per acre per season. Do not graze or use treated vines for animal feed.
methoxyfenozide Intrepid 2F	6 – 10 fl. oz.	0.09 – 0.16	21 – 12.8	
methoxyfenozide (IGR) **+ spinetoram** (SPN) Intrepid Edge	4 – 8 oz.		32 – 16	Do not exceed 12 oz. per year.
spinosad (SPN) Blackhawk	1.7 – 3.3 oz.	0.038 – 0.075	9.4 – 4.8	Do not feed hay for 14 days following final application. Do not apply more than 9.0 fl. oz. per acre per year.
Z-cypermethrin (P) Mustang Max 0.8EC	1.28 – 4.0 fl. oz.	0.008 – 0.025	100 – 32	Do not apply more than 0.15 lb. AI per acre per season. Do not graze livestock in treated areas or use treated vines for animal feed.

VELVETBEAN CATERPILLAR larvae vary from light to dull green, with white lines running the length of the body. The lines on the side of the body are usually much broader than those of green cloverworms or loopers. Velvetbean caterpillars have four pairs of abdominal prolegs and are about 1½ inch long when fully developed. When disturbed, the velvetbean caterpillar becomes very active and wriggles about like the green cloverworm. Velvetbean caterpillars are migratory insects flying in from Central and South America each year. Velvetbean caterpillars are primarily foliage-feeders but will feed on petioles, causing pods to drop to the ground after a significant loss of foliage. Velvetbean caterpillars generally are late-season pests of peanuts in Mississippi. Foliar Bt products may also be effective in controlling velvetbean caterpillars.

THRESHOLD: Treat when four or more caterpillars per row foot are present early in the season or when plants are stressed from drought or some other cause. In older, more lush peanuts, treat when eight or more caterpillars are present.

Sucking Pests

Sucking pests in peanuts include leafhoppers, spider mites, three-cornered alfalfa hoppers, and thrips. Scouting for leafhoppers and three-cornered alfalfa hoppers is best accomplished by visual observation. Gently disturb the plants and count the insects as they fly. The use of a sweep net is difficult in peanuts because of the growth pattern. Spider mites can be detected by visually examining the underside of leaves, and thrips are best monitored by beating young plants onto a white box or cloth to dislodge insects.

Leafhoppers

Insecticide	Rate per Acre	Pounds Active Ingredient per Acre	Acres 1 Gallon or 1 Pound Dry Will Treat	Comments
acephate (OP) Orthene 90S Orthene 97AG	 0.83 – 1.1 lb. 0.77 – 1.03 lb.	 0.75 – 1.0 0.75 – 1.0	 1.2 – 1 1.3 – 0.97	**Do not** feed treated foliage to livestock or allow animals to graze treated areas.
β-cyfluthrin (P) Baythroid XL 1EC	1.0 – 1.8 fl. oz.	0.008 – 0.014	128 – 71.11	**Do not** make more than three applications per year.
bifenthrin (P) Brigade 2EC	2.1 – 6.4 fl. oz.	0.033 – 0.1	61 – 20	**Do not** apply more than 0.5 lb. AI per acre per season. **Do not** feed peanut hay to livestock.
bifenthrin (P) + **imidacloprid** (N) Brigadier	3.5 – 5.6 fl. oz.		34 – 23	
bifenthrin (P) + **Z-cypermethrin** (P) Hero	4 – 10.3 fl. oz.		32 – 16	
carbaryl (C) Sevin 4F, XLR Sevin 80S	 32 fl. oz. 1.25 lb.	 1.0 1.0	4	**Do not** apply more than 8 qt. per acre per season.
cyfluthrin (P) Tombstone 2EC	1.0 – 1.8 fl. oz.	0.016 – 0.028	128 – 71.11	**Do not** make more than three applications per year.
esfenvalerate (P) Asana XL 0.66EC	2.9 – 5.8 fl. oz.	0.015 – 0.03	44.14 – 22.07	**Do not** exceed more than 0.15 lb. AI per acre per season. **Do not** feed or graze livestock on treated vines.
gamma-cyhalothrin (P) Prolex 1.25EC Declare 1.25EC	 0.75 – 1.25 fl. oz. 0.75 – 1.25 fl. oz.	 0.0075 – 0.0125 0.0075 – 0.0125	 170.67 – 120.4 170.67 – 120.4	**Do not** apply more than 0.06 lb. AI per acre per season.
λ-cyhalothrin (P) Karate Z 2.08CS	0.96 – 1.6 fl. oz.	0.015 – 0.025	133.33 – 80	**Do not** exceed 1 pt. per acre per season. **Do not** graze or use treated vines for animal feed.
Z-cypermethrin (P) Mustang Max 0.8EC	1.76 – 4.0 fl. oz.	0.011 – 0.025	72.7 – 32	**Do not** apply more than 0.15 lb. AI per acre per season. **Do not** graze livestock in treated areas or use treated vines for animal feed.

There are several species of **LEAFHOPPERS** that will feed on peanuts. The potato leafhopper is the most common. This is a light green, wedge-shaped insect that is about one-fourth inch long. This insect feeds by sucking fluids from the leaves. Damage appears as chlorotic spots on the tip of the leaf that become larger over time (hopper burn).

THRESHOLD: Treat when 25 percent of plants show hopper burn damage and insects are present.

Spider Mites

Insecticide	Rate per Acre	Pounds Active Ingredient per Acre	Acres 1 Gallon or 1 Pound Dry Will Treat	Comments
propargite (PG) Comite II 6EC	36 fl. oz.	1.68	3.56	**Do not** apply more than twice per season. Do not graze or feed livestock on treated areas or cut treated forage for hay. Foliar burn may occur, especially if air temperature is above 90 °F.

SPIDER MITES are small relatives of insects that feed on the undersides of peanut leaves. Initial infestations may be in small isolated areas of the field, then move outward. Under low infestations, leaves will become yellow. Under higher pressure, leaves will turn brown to reddish-brown and may fall from the plant. Spider mite infestations tend to be more of a problem in hot, dry periods.

THRESHOLD: Treat when populations threaten premature defoliation.

Three-Cornered Alfalfa Hoppers

Insecticide	Rate per Acre	Pounds Active Ingredient per Acre	Acres 1 Gallon or 1 Pound Dry Will Treat	Comments
β-cyfluthrin (P) Baythroid XL 1EC	1.8 – 2.4 fl. oz.	0.014 – 0.019	71.11 – 53.33	**Do not** make more than three applications per year.
bifenthrin (P) Brigade 2 EC	2.1 – 6.4 fl. oz.	0.033 – 0.1	61 – 20	**Do not** apply more than 0.5 lb. AI per acre per season. **Do not** feed peanut hay to livestock.
bifenthrin (P) **+ imidacloprid** (N) Brigadier	3.5 – 5.6 fl. oz.		34 – 23	
bifenthrin (P) **+ Z-cypermethrin** (P) Hero	4 – 10.3 fl. oz.		32 – 16	
carbaryl (C) Sevin 4F, XLR Sevin 80S	32 fl. oz. 1.25 lb.	1.0 1.0	4	**Do not** apply more than 8 qt. per acre per season.
cyfluthrin (P) Tombstone 2EC	1.8 – 2.4 fl. oz.	0.028 – 0.38	71.11 – 53.33	**Do not** make more than three applications per year.
gamma-cyhalothrin (P) Prolex 1.25EC Declare 1.25EC	0.75 – 1.25 fl. oz. 0.75 – 1.25 fl. oz.	0.075 – 0.0125 0.0075 – 0.0125	170.67 – 120.4 170.67 – 120.4	**Do not** apply more than 0.06 lb. AI per acre per season.
λ-cyhalothrin (P) Karate Z 2.08CS	0.96 – 1.6	0.015 – 0.025	133.33 – 80	**Do not** exceed 1 pt. per acre per season. **Do not** graze or use treated vines for animal feed.

THREE-CORNERED ALFALFA HOPPERS are green, triangular-shaped insects about one-fourth inch long. Young hoppers or nymphs are green to light brown, wingless, and covered with spines. They will feed around the stem of plants, girdling the stem. This makes the stem prone to breaking easily and interferes with nutrient movement in the plant. Damaged stems will often turn a deep purple color. Three-cornered alfalfa hoppers will also feed on the pegs.

Threshold: Treat when fresh damage is present and number approach two insects per 6 row feet.

Thrips

Insecticide	Rate per Acre	Pounds Active Ingredient per Acre	Acres 1 Gallon or 1 Pound Dry Will Treat	Comments
In Furrow **phorate** (OP)	5 lb.	1		Apply in furrow at planting. **Do not** graze or feed treated hay or forage to livestock.
imidacloprid (N) Admire Pro	7.0 – 10.5 oz.	0.25 – 0.37		In-furrow spray directed on or below the seed.
imidacloprid (N) **+ fluopyram** (F) Velum Total	14.0 – 18.0 oz.	*0.24 – 0.31		*a.i. of imidacloprid in mix.
Foliar **acephate** (OP) Orthene 90S Orthene 97AG	 0.42 – 0.83 lb. 0.39 – 0.77 lb.	 0.38 – 0.75 0.38 – 0.75	 2.4 – 1.2 2.6 – 1.3	**Do not** feed treated foliage to livestock or allow animals to graze treated areas.

Controlling **THRIPS** significantly reduces the probability of tomato spotted wilt virus. Thrips transmit this disease to the plant when feeding. Therefore, applying an in-furrow insecticide is recommended when planting peanuts. There is little evidence to show that thrips will reduce yield in peanuts, even at high levels.

Threshold: Research has shown no benefit to foliar treating thrips populations. Under extreme conditions, treatment may be warranted.

Soil Insects

Monitoring for some soil insects can be done before planting. Dig soil about 4 to 8 inches deep, and pass through a sieve to scout for most soil insects. After crop emergence, monitor in a similar manner, looking closely near the base of the plants. Soil insects are usually more of a problem following a grass crop. In areas known to have a problem, treatment is recommended before planting.

Threshold: Treat when fresh damage or borers are found at 30 percent of sites scouted.

Lesser Cornstalk Borers	Insecticide	Rate per Acre	Pounds Active Ingredient per Acre	Acres 1 Gallon or 1 Pound Dry Will Treat	Comments
	chlorpyrifos (OP) Lorsban 15G	13.6 lb.	2		Do not apply more than 30 (broadcast or banded) oz. per 1000 feet of row or 26.6 lb. per acre per crop season. For banded applications use a 10- to 18-inch band. If banding on row spacings other than 36 inches, use 14.7 oz. per 1000 linear feet.

Southern Corn Rootworms	Insecticide	Rate per Acre	Pounds Active Ingredient per Acre	Acres 1 Gallon or 1 Pound Dry Will Treat	Comments
	chlorpyrifos (OP) Lorsban 15G	13.6 lb.	2		**Do not** apply more than 30 (banded) oz. per 1000 feet of row or 26.6 lb. per acre per crop season. For banded applications use a 10- to 18-inch band. If banding on row spacings other than 36 inches, use 14.7 oz. per 1000 linear feet.

The adult **SOUTHERN CORN ROOTWORM** is also known as the 12-spotted cucumber beetle. Adults are found on many plants throughout the growing season. Females deposit their eggs at the base of the plants. Upon hatching, the larvae move into the root zone and begin feeding. The larva is about one-half inch long when full-sized. It has three pairs of small legs just behind the head and brownish patches on the head and tail end.

Threshold: Treat when fresh damage or insects are found at 30 percent of scouted sites.

Wireworms	Insecticide	Rate per Acre	Pounds Active Ingredient per Acre	Acres 1 Gallon or 1 Pound Dry Will Treat	Comments
	chlorpyrifos (OP) Lorsban 15G	13.6 lb.	2		Suppression only. Do not apply more than 30 oz. per 1000 feet of row or 26.6 lb. per acre per crop season. For banded applications use a 10- to 18-inch band. If banding on row spacings other than 36 inches, use 14.7 oz. per 1000 linear feet.

WIREWORMS are the larval stages of click beetles. The larvae are elongated, slender, and usually brown. Depending on species, larvae may take 2 to 5 years to mature. This pest is often difficult to control in fields that were fallow or in pasture before being planted in peanuts. Large larvae in the field at planting are the most destructive.

Threshold: Treat when two or more wireworms are present at each location.

Burrower Bugs	Insecticide	Rate per Acre	Pounds Active Ingredient per Acre	Acres 1 Gallon or 1 Pound Dry Will Treat	Comments
	chlorpyrifos (OP) Lorsban 15G	13.3 lb.	2		Do not apply more than 30 (broadcast or banded) oz. per 1000 feet of row or 26.6 lb. per acre per crop season. For banded applications use a 10- to 18-inch band. If banding on row spacings other than 36 inches, use 14.7 oz. per 1000 linear feet.

BURROWER BUGS are black, oval-shaped insects with spiny legs. They resemble stink bugs in appearance but are much smaller. Damage is similar to that of stink bugs. They will feed underground, feeding through the shell directly on the nut.

Threshold: Treat when two bugs are present per 3 feet of row at pod stage.

Fall Armyworms	Insecticide	Amount of Formulation per Acre	Pounds Active Ingredient per Acre	Acres 1 Gallon or 1 Pound Dry Will Treat	Pre-Grazing Interval	Pre-Harvest Interval	Application and Comments
	β-cyfluthrin (P) *Baythroid XL 1EC	1.6 – 1.9 oz.	0.013 – 0.015	80 – 67	0	0	0 day restriction for grazing or hay.
	carbaryl (C) Sevin XLR 4L	1.0 – 1.5 qt.	1 – 1.5	4 – 2.6	14	14	Must remove cattle. Do not apply within 14 days of harvest or grazing. Other Sevin formulations are also available.
	carbaryl (C) Sevin 80WSP	1.25 – 1.88 lb.	1.0 – 1.5	0.8 – 0.53	14	14	Do not apply within 14 days of harvest or grazing.
	chlorantraniliprole (D) Prevathon 0.43SC	14 – 20 fl. oz	0.047 – 0.067	9 – 6.4	0	0	Remove livestock before spraying.
	diflubenzuron (IGR) Dimilin 2L	2 fl oz.	0.031	64	0	1	Allow 1 day after treatment before cutting for hay. Apply when larvae are less than one-half inch in size.
	λ-cyhalothrin (P) *Karate Z 2.08CS	1.28 – 1.92 fl. oz.	0.02 – 0.03	100 – 66.7	0	7	Do not apply within 7 days of harvest; 0 day restriction for grazing. Target larvae under one-half inch in size.
	malathion (OP) Malathion 57EC	1 qt.	1.25	4	0	0	Must remove cattle. Allow spray to dry before harvest or grazing.
	methoxyfenozide (IGR) Intrepid 2F	4 – 8 fl. oz.	0.06 – 0.12	32 – 16	0	7	Do not apply within 7 days of harvest; 0 day application restriction for grazing.
	spinosad (SPN) Blackhawk 36% WDG	1.1 – 2.2 oz.	0.025 – 0.05	14.5 – 7.3	0	3	Do not apply within 3 days of harvest; 0 day restriction for grazing. Do not allow grazing until spray is dry.
	Z-cypermethrin (P) *Mustang Max 0.8EC	2.8 – 4.0 fl. oz.	0.0175 – 0.025	45.7 – 32	0	0	0 day application restriction for forage or hay. Do not allow grazing until spray is dry.

* Denotes restricted-use insecticides. Must have private or commercial applicators' license to purchase and apply restricted-use insecticides.

Two types of armyworms commonly feed in hay and pastures in Mississippi. They are **TRUE ARMYWORMS** and **FALL ARMYWORMS**. True armyworms are a problem in early spring, and fall armyworms occur in late summer (beginning mid- to late July).

The adults (moths) are rarely seen during the day but become active in the late evening and during the night. Female moths lay eggs in the lower leaves of host plants. Feeding begins shortly after the eggs hatch. These young larvae feed in the lower canopy, close to the ground, until they are approximately 1 inch long. Once the worms reach this size, they can eat a large amount of foliage.

Begin looking for true armyworm outbreaks in early spring and fall armyworm outbreaks mid- to late July. Scout fields on a regular basis during periods of armyworm activity. Barnyard grass and broadleaf signal grass are favored hosts of armyworms. These are good indicator plants; if there are no worms on these hosts, your Bermuda grass is probably OK. Consider cost, efficacy, mode of action, size of the larvae, grazing, and haying restrictions before choosing a product.

Threshold: To prevent excessive damage, treat when you find three to five caterpillars per square foot. Do not count caterpillars that are less than a quarter-inch long.

Bermudagrass Stem Maggots	Insecticide/Formulation (active ingredient)	Rate of Formulated Product per Acre	Pounds Active Ingredient per Acre	Acres 1 Gallon Will Treat	Pre-Grazing Interval	Pre-Harvest Interval	Comments
	Z-cypermethrin (P) *Mustang Max 0.8 EC	2.8 fl. oz.	0.0175	45	0	0	Do not allow grazing until spray is dry.
	cyfluthrin (P) *Baythroid XL, 1 lb./gal.	1.6 fl. oz.	0.013	80	0	0	0-day restriction for grazing or hay.
	λ-cyhalothrin (P) *Karate Z, 2.08 lb./gal.	1.28 fl. oz.	0.02	100	0	7	Do not apply within 7 days of harvest; 0-day restriction for grazing. Target larvae under one-half inch in size.

This information is for preliminary planning purposes only. Generic products containing some of the active ingredients listed above are also available. Be sure to carefully read the label of any product you plan to use, and follow all label restrictions carefully.
*Denotes restricted-use pesticides. Must have private or commercial applicator's license to purchase and apply restricted-use pesticides.

BERMUDAGRASS STEM MAGGOT (BGSM), *Antherigona reversura*, is a nonnative pest of bermudagrass hayfields that was first found in Mississippi in 2012. Bermudagrass hay producers need to become familiar with this new pest because it has the potential to cause significant reductions in bermudagrass hay yields.

Adult flies are about the size of horn flies and have yellow abdomens. The legless, white larvae bore inside the tips of bermudagrass shoots, feeding down to the first internode and killing the shoot tip and emerging leaves. At first, this may seem like relatively minor damage, but heavy infestations can essentially stop a field from growing. When viewed from a distance, heavily infested fields have an unusual bronzed appearance due to the large number of dead, infested shoot tips. Such infestations have occurred across the Southeast, and yield reductions have been estimated to range from 20 percent to 50 percent. Fine-stemmed bermudagrass varieties, like most of those we currently grow, are most susceptible to attack, as are highly managed, well-fertilized fields.

Populations increase through the growing season, so if the previous cutting sustained significant injury, assume damage will be even higher in the next cutting—unless you treat the field. Pastures are not seriously affected because grazing continually removes susceptible shoots. BGSM is specific to bermudagrass (it does not attack other types of grasses).

With currently available insecticides, the larvae cannot be controlled once they have bored into the stem. Management depends on controlling adult flies before they lay eggs. Once a field has sustained heavy damage with a high percent of shoots infested, the best course of action is to harvest the field and prepare to control the flies in the next cutting. Because stem maggot populations are usually low in the spring and increase as the growing season progresses, infestations in the earlier cuttings of hay may not be high enough to cause significant damage, but the risk of damage increases for each successive cutting.

Base treatment decisions on the amount of damage sustained in the previous cutting. If a field had 15–20 percent or more damaged shoot tips in the previous cutting, plan on treating for BGSM in the next cutting as described below:

- Harvest the field and remove the bales.
- Spray 5–7 days after harvest (as soon as the field begins to green up again).
- Use the low rate of one of the pyrethroid insecticides that is labeled for fall armyworms.
- Spray again 5–7 days later.
- You may wish to add 2 fl oz Dimilin 2L to the second spray if fall armyworms are a threat.
- Cut as soon as maturity and weather allow.

Unfortunately, the timing required for control of BGSM does not coincide with the time in the growth cycle when fall armyworms are most likely to require control. Pyrethroid insecticides are effective against both pests, but BGSM sprays have to be applied early in the growth cycle, while fall armyworm infestations are most likely to occur in the later weeks of a crop growth cycle. Do not expect that sprays applied to control BGSM will provide season-long protection against fall armyworms. Continue to scout fields regularly for fall armyworms, and treat promptly when infestations occur.

Insecticide Classes, Reentry Intervals, and EPA Registration Numbers

The reentry interval is the time period required by federal law between application of pesticides to crops and the entrance of workers into those crops without protective clothing. Reentry intervals serve to protect workers from possible pesticide poisoning. Growers, scouts, and other farm laborers must effectively communicate when and where pesticides have been applied. Reentry periods vary by product. Scouts should not enter fields until all reentry intervals have expired. Safety is of utmost importance. Be sure to establish proper communication channels with all parties involved.

Producers are required to keep records, including EPA product registration numbers, of all insecticides applied to fields. Reentry intervals and product registration numbers for products not listed below are provided on the insecticide labels.

Insecticide (IRAC Class)*	**Reentry Interval (hours)**	**EPA Product Registration Number****	**Insecticide (IRAC Class)***	**Reentry Interval (hours)**	**EPA Product Registration Number****
Acramite	12	400-514	Fanfare (3A)	12	66222-99
Admire Pro (4A)	12	264-827	Force (3A)	0	100-1075
Agri-Mek (6)	12	100-898	Fyfanon Plus ULV (1B,3A)	24	67760-108
Ammo (3A)	12	279-3027-5905	Gaucho (4A)	12	264-968
Asana XL (3A)	12	352-515	Hero (3A)	12	279-3315
Baythroid XL (3A)	12	264-840	Intrepid (18)	4	62719-442
Belay (4A)	12	59639-150	Intrepid Edge (5,18)	4	62719-666
Belt SC (28)	12	264-1025	Intruder (4A)	12	8033-24-10163
Besiege (3A, 28)	24	100-1402	Karate (3A)	24	100-1097
Bidrin (1B)	6 days	5481-448	Lannate (1A)	72	352-384
Bidrin XP II (3A, 1B)	6 days	5481-9024	Larvin (1A)	48	264-379
Brigade (3A)	12	279-3313	Leverage 360 (3A,4A)	12	264-1104
Brigadier (3A,4A)	12	279-3332	Lorsban Advanced (1B)	24	62719-591
Carbine (9C)	12	71512-9-279	Malathion (1B)	12	See label
Centric (4A)	12	100-1147	Methyl parathion (1B)	96	See label
Cobalt Advanced (3A,1B)	24	62719-615	Mustang Max (3A)	12	279 - 3249
Comite II (12C)	7 days	400-154	Oberon (23)	12	264-850
Counter (1B)	48	5481-545	Orthene 90S (1B)	24	59639-33
Couraze Max (4A)	12	264-783-67760	Poncho (4A)	---	264-789
Cruiser (4A)	12	100-941	Pounce 25WP (3A)	12	279-3051
Curacron (1B)	48	100-669	Portal (21A)	12	71711-19
Delta Gold (3A)	12	264-1011-1381	Prevathon (28)	4	352-844
Declare (3A)	24	67760-96	Radiant (5)	4	62719-545
Denim (6)	48	100 - 903	Sevin XLR Plus (1A)	12	264-333
Diamond (15)	12	66222-35-400	Sevin 80S (1A)	12	264-316
Dicofol 4 (UN)	12	66222-56	Steward (22A)	12	352-638
Dimethoate (1B)	48	See label	Temik (1A)	48	264-330
Dimilin (15)	12	400-461	Tracer (5)	4	62719-267
Di-Syston (1B)	48	264-734	Vydate CL-V (1A)	48	352-532
Discipline (3A)	12	5481-517	Warrior (3A)	24	100-1112
Endigo ZC (3A,4A)	24	100-1276	Zeal (10B)	12	59639-123

* Insecticide mode of actions class as identified by Insecticide Resistance Action Committee: 1A, carbamates; 1B, organophosphates; 3A, pyrethroids; 4A, neonicotinoids; 5, spinosyns; 6, avermectins; 9C, flonicamid; 10B, etoxazole; 12C, organosulfurs; 15, benzolureas; 18, diacylhydrazines; 21A, METI acaricides; 22A, oxadiazines; 23 = spiromesifen; 28, diamides; UN = unknown.

** Registration numbers change with company brands, although the product name or active ingredient may be the same. Check the label to be sure.

Additional Brand Names of Commonly Used Active Ingredients
(Generic Insecticides)

Active Ingredients (Common Brand Names)	Additional Brands with Same or Similar Active Ingredient*
abamectin (Agri-Mek, Zephyr, Zoro)	Abba, Temprano
acephate (Orthene 90, Orthene 97)	Acephate 90, Acephate 97
bifenthrin (Brigade, Capture, Discipline, Fanfare)	Bifenthrin, Bifenture, Capture LFR, Sniper, Tundra
chlorpyrifos (Lorsban, Nufos)	Chlorpyrifos, Govern, Lorsban Advanced, Warhawk, Yuma
cypermethrin (Ammo)	Cypermethrin, Up-Cyde
esfenvalerate (Asana XL)	Adjourn, S-FenvalorStar
imidacloprid (Trimax Pro, Couraze Max)	Alias, Imida, Imidacloprid, Nuprid, Pasada, Provado, Wrangler
methyl parathion (Methyl 4E)	Methyl Parathion 4E, Penncap-M 2E
permethrin (Pounce 3.2E)	Ambush 2E, Permethrin 3.2, Perm-Up
β-cyfluthrin (Baythroid XL)	Tombstone (= cyfluthrin)
γ-cyhalothrin (Declare, Prolex)	Proaxis
λ-cyhalothrin (Karate, Warrior II)	Lambda, Lambda-Cy, LambdaStar, Silencer
Z-cypermethrin (Mustang Max)	Respect

*Read the insecticide label before making application. Although active ingredients are the same or very similar, brands often have different formulations, different labeled uses, and different use rates. This information is provided for educational purposes, and some of the additional brands listed above have not been independently evaluated by Mississippi State University.

Spray Drift Precautions

- Keep all aerial and ground application equipment maintained and calibrated using appropriate carriers.
- Do not make aerial or ground applications during temperature inversions.
- Make aerial or ground applications when wind velocity (approximately 3 to10 mph) favors on-target product deposition. Do not apply when wind velocity exceeds 15 mph.
- For aerial applications, mount the spray boom on the aircraft to reduce drift caused by wing tip or rotor vortices. Boom length must not exceed 75 percent of wing span or rotor diameter.
- When using pyrethroid insecticides, do not apply by ground within 25 feet or by air within 150 feet of lakes, reservoirs, rivers, permanent streams, marshes, natural ponds, estuaries, commercial fish ponds, or other bodies of water. Increase the buffer zone to 450 feet when ultralow volume (ULV) applications are made. Be sure to observe all other label restrictions regarding drift precautions for pyrethroids and all other insecticides.

Cotton

Insecticide	Restricted Entry Interval (hours)	Restricted Use (R)	Fall Armyworm	Beet Armyworm	Aphid**	Thrips	Western Flower Thrip	Cutworm	Grasshopper	Bollworm	Tobacco Budworm	Cabbage Looper	Soybean Looper	Salt Marsh Caterpillar	Plant Bug (Delta/Hills)	Spider Mite**	Green and Southern Green Stink Bug	Brown Stink Bug	Whitefly
Admire/Alias/Imidacloprid	12		0	0	3	3	1	0	2	0	0	0	0	0	5	0	2	2	0
Aeris		X				8	6	5											
Ammo	12	X	5	1	0	6	3	8	6	7	1	6	1	5	3/6	0	8	4	1
Asana XL/Adjourn	12	X	5	2	0	6	3	8	6	7	2	8	2	5	3/7	0	8	4	2
Bacillus thuringiensis	4		1	1	0	0	0	0	0	4	5	6	6	2	0	0	0	0	0
Baythroid XL	12	X	5	2		6	2	8	7	7	2	8	2	5	3/7	0	8	4	4
Belt	12		8							7	7	9	9	7	0				
Bidrin	6	X	0	0	5	6	5	0	7	0	0	0	0	1	6/8	0	9	9	3
Bidrin XP II	6	X	5	2	6	6	5	8	7	7	2	8	2	5	7/9	5	9	9	3
Brigadier	12	X	5	2	6	6	5	8	7	7	2	8	2	5	5/7	5	8	7	6
Brigrade/Discipline/Fanfare	12	X	5	2		6	2	6	8	7	2	8	2	5	4/8	5	8	7	6
Carbine	12		0	0	8	5	1	0	2	0	0	0	0	0	4	0	2	2	0
Centric	12		0	0	5	4	4	0	2	0	0	0	0	0	6/8	0	6	4	6
Comite	144		0	0	0	0	0	0	0	0	0	0	0	0	0	6	0	0	0
Confirm	4		8	8	0	0	0	2	0	4	4	7	7	8	0	0	0	0	0
Cruiser	12		0	0	0	8	4	0	0	0	0	0	0	0	0	0	0	0	0
Denim	12		8	9	0	1	1	7	2	7	7	9	9	3	0	5	0	0	0
Diamond/Mayhem	12		8			1	1	1		4	4	6	6		7*		4*	4*	
Dicofol	12		0	0	0	0	0	0	0	0	0	0	0	0	0	8	0	0	0
Dimethoate/Dimate	48		0	0	5	6	2	0	6	0	0	0	0	1	6/8	3	6	4*	3
Endigo	24	X	5	2	8	6	4	8	7	7	2	8	2	5	7/8	0	8	7	8
Gaucho	12					8	4	0	0										
Intrepid	4		8	9	0	0	0	5	0	6	6	9	9	9	0	0	0	0	0
Intruder	12		0	0	9	6		0	0	0	0	0	0	0	4	0	1	1	6
Karate/Silencer/Lambda-Cy	24	X	5	2	0	6	2	8	7	7	2	8	2	5	3/7	0	8	4	2
Lannate	72	X	7	4	5	1	0	5	6	4	4	7	7	4	3	0	5	3	0
Larvin	48	X	7	5	0	0	0	5	5	6	6	8	8	4	0	0	2	2	0
Leverage 360	12	X	5	2	5	6	2	8	7	7	2	8	2	5	5/8	0	8	6	5
Mustang Max/Respect	12	X	5	3	0	6	3	8	7	7	2	8	2	5	3/7	0	8	7	2
Oberon	12															8			
Orthene/Acephate	24		4	3	4	6	5	6	8	5	5	7	4	3	7/9	0	6	9	5
Portal	12															8			
Prevathon	4		9							9	9	9	9		0				
Prolex/Declare	24	X	5	2	0	6	2	8	7	7	2	8	2	5	3/7	0	8	4	2
Radiant	4					6	7			7	8								
Steward	12		8	9	0	0	0	5	0	7	8	9	9	5	3	0	3	3	
Temik	48	X				9	6	0	0										
Tracer	4		7	9	0	1	1	7	2	7	8	9	9	3	0	0	0	0	0
Vydate C-LV	48	X	0	0	1	3	1	0	6	0	0	0	0	0	6	0	8	7	0
Zeal	12															9			
Zoro/Abba/Agri-Mek/Epi-Mek	12	X	0	0	0	0	0	0	0	0	8	0	0	0	2	7	0	0	0

*Effective on nymphs only. ES - early season; LS - late season

Rating Scale: 0 = no control, 10 = excellent. The performance ratings in the chart are for comparison purposes only and are not necessarily a measure of percent control.

**Cotton aphids and spider mites can be flared by use of broad-spectrum insecticides such as pyrethtoids or OPs.

Modified from University of Arkansas "Insecticide Recommendations for Arkansas MP144.

Soybeans

Insecticide	Restricted Entry Interval (hours)	Restricted Use (R)	Stem Feeders: Cutworm	Stem Feeders: Threecornered Alfalfa Hopper	Defoliators: Blister Beetle	Defoliators: Garden Webworm	Defoliators: Grasshopper	Defoliators: Green Cloverworm	Defoliators: Saltmarsh Caterpillar	Defoliators: Soybean Looper	Defoliators: Cabbage Looper	Defoliators: Spider Mite	Defoliators: Velvetbean Caterpillar	Defoliators and Pod Feeders: Bean Leaf Beetle	Defoliators and Pod Feeders: Beet Armyworm	Defoliators and Pod Feeders: Yellowstriped Fall Armyworm	Defoliators and Pod Feeders: Corn Earworm	Pod Feeders: Green Stink Bug	Pod Feeders: Brown Stink Bug
Ambush/Pounce	12	X		7	6	7	6	8	4	2	6	0	8	4	3	7	4	4	3
Asana XL/Adjourn	12	X	8	8	7	8	7	9	5	3	7	0	9	4	3	7	5	8	5
Bacillus thuringiensis	4		0	0	0	5	0	8	3	6	6	0	8	0	2	0	2	0	0
Baythroid XL	12	X	8	8	7	8	7	9	5	3	7	0	9	4	3	7	5	9	5
Belay	12																	7	7
Belt	12					9		9	8	9	9				8	9	8		
Brigade/Discipline/Fanfare	12	X	9	9	7	7	7	9	6	3	7	6	9	7		8	5	9	6
Cruiser	12			7										5					
Dimethoate	48		0	6	5	5	7	3	1	2	2	4	3	6	2	4	2	7	6
Endigo	24	X	8	8	7	8	7	9	5	3	7	0	9	8	3	7	5	9	7
Gaucho	12			5										5					
Hero	12	X	9	9	7	7	7	9	6	3	7	6	9	7		8	5	9	6
Intrepid	4					8		8	8	8			8		8	8	5		
Karate/Silencer/Lambda-Cy	24	X	8	8	7	8	7	9	5	3	7	0	9	4	3	7	5	8	6
Lannate 2.4 LV	48	X	2	5	5	8	6	9	4	7	7	0	9	4	7	7	8	7	5
Larvin 3.2 F	48	X	5	2	2	8	5	9	5	8	8	0	9	8	7	7	8	3	2
Leverage	12	X	8	8	7	8	7	9	5	3	7	0	9	6	3	7	5	9	6
Mustang Max/Respect	12	X	8	8	7	8	7	9	5	3	7	0	9	4	3	7	5	9	6
Orthene/Acephate	24	X					8				7							8	9
Prolex/Declare	24	X	8	8	7	8	7	9	5	3	7	0	9	4	3	7	5	8	5
Sevin	12		5	3	8	3	7	8	5	1	1	0	8	8	3	6	6	5	4
Steward	12		9	0	0	8	0	9	5	8	9	0	4		8	8	8	3	2
Tracer	4		7	0	0	8	2	9	5	8	9	0	9	3	8	7	8	1	1

Rating Scale: 0 = no control, 10 = excellent. The performance ratings in the chart are for comparison purposes only and are not necessarily a measure of percent control.
Modified from University of Arkansas "Insecticide Recommendations for Arkansas MP144.

Corn

Insecticide	Restricted Entry Interval (hours)	Restricted Use (R)	Chinch Bug	Corn Earworm, Fall Armyworm	Corn Rootworm	Cutworm	European Corn Borer	Flea Beetle	Grasshopper	Seed Corn Maggot	Southwestern Corn Borer	Green and Southern Green Stink Bug	Brown Stink Bug	Wireworm	Fire Ant
Ambush	12	X	7	5		8	6		7		5	4			
Asana XL/Adjourn	12	X	7	6		8	6		7		6	8	4		
Axcess/Senator/Concur	12				6					8				5	5
Aztec/Defcon	48	X	6		6	4				8					
Baythroid XL	12	X	7	6		8	6	6	8		6	8	4		
Belt	12			8			8				8				
Cobalt	24	X	7	7		8	7	6	8		7	8	5		
Counter	48	X	6		6	0		6		8				6	
Cruiser	12		3		6					8				5	5
Discipline/Fanfare/Brigade	12	X	7	6		8	7	6	8		7	8	7		
Force	0	X	3		6	4				5					
Hero	12	X	7	6			7	6	8		7	8	7		
Intrepid	4						7				7				
Karate/Silencer	24	X	7	6		8	6	6	8		6	8	4		
Lannate	48	X	3	7		5	1		4		1				
Lorsban/Chlorpyrifos/Nufos	24	X	7	4	6	7	5		6	8	5				8
Malathion	12		1	2		0	1		5		1				
Mustang Max/Respect	12	X	7	6		8	6	6	8		6	8	4		
Poncho		X	3		6					8				5	5
Pounce/Perm-UP	12	X	7	5		8	6	6	8		6	4			
Prevathon	4			9			9				9				
Proaxis/Declare	24	X	7	6		8	6	6	8		6	8	4		
Regent	0	X	5	0	6		4			4	4				
Sevin	12	X	3	4		5	2	8	5		2				
Thimet/Phorate	48	X			5	0				1					
Tracer	4		0	7		7	5		1		5				

Rating Scale: 0 = no control, 10 = excellent. The performance ratings in the chart are for comparison purposes only and are not necessarily a measure of percent control.
Modified from University of Arkansas "Insecticide Recommendations for Arkansas MP144.

Grain Sorghum **Insecticide**	Restricted Entry Interval (hours)	Restricted Use (R)	Chinch Bug	Sorghum	Corn Earworm	Fall Armyworm	Fire Ant	Greenbug/Aphid	Sorghum Midge	Stink Bug
Asana XL/Adjourn	12	X	7	6	6	6		8	8	7
Baythroid XL	12	X	7	6	6	6		8	8	7
Belt	12			6	7	8				
Cruiser	12		3				7	7		
Diamond	12			7	4	9				
Dimethoate	48		5	5		5		8	8	5
Gaucho/Axcess/Senator	12		3				7	7		
Karate Z/Silencer/Lambda-Cy	24	X	7	6	6	6		8	8	7
Lannate	48	X	5	8	7	8		7	6	5
Lorsban/Chlorpyrifos/Nufos	24	X	5	7	5	7	7	8	6	5
Mustang Max/Respect	12	X	7	6	6	6		8	8	7
Nipsit Inside	12		7					7		
Poncho	12		7					7		
Prolex/Declare	24	X	7	6	6	6		8	8	7
Sevin	12		7	7	5	7		5	6	5
Tracer	4			7	6	7	0	0		0

Rating Scale: 0 = no control, 10 = excellent. The performance ratings in the chart are for comparison purposes only and are not necessarily a measure of percent control.
Modified from University of Arkansas “Insecticide Recommendations for Arkansas MP144.

Small Grains

Insecticide	Restricted Entry Interval (hours)	Restricted Use (R)	Armyworm	Greenbug/Aphid	Grasshopper	Hessian Fly	Cereal Leaf Beetle
Dimethoate	48			7	6		
Baythroid XL	12	X	8	8	7		7
Lannate	48	X	7	7	3		8
Malathion/Fyfanon	12		3	6	6		8
Mustang Max/Respect	12	X	8	8	7		7
Proaxis/Declare	24	X	8	8	7		7
Sevin	12		6	0			7
Tracer	4		7	0	2		
Karate/Silencer/Lambda-Cy	24	X	8	8	7		7

Rating Scale: 0 = no control, 10 = excellent. The performance ratings in the chart are for comparison purposes only and are not necessarily a measure of percent control.
Modified from University of Arkansas "Insecticide Recommendations for Arkansas MP144.

Rice

Insecticide	Restricted Entry Interval (hours)	Restricted Use (R)	Chinch Bug	Fall Armyworm	True Armyworm	Short-horned Grasshopper	Rice Stink Bug		Rice Water Weevil (adult)	Rice Water Weevil (egg)	Midge Larvae	Rice Stalk Borer	Aphids (Green-bug, Oat Bird-Cherry Aphid)	Grape Colaspis
							Adult	Eggs & Immatures						
Belay	12			0	0	0	7	7	7	6				
Cruiser	12		6		2				6	7				8
Dermacor X-100	4	X	1		7				1	8		8		4
Dimilin 2L	12	X							0	7			0	
Karate Z	24	X	7	8	8	7	6	8	9		6	5	8	
Malathion	12		1	2	5	6	5	5					4	
Mustang Max	12	X	7	8	8	7	6	8	9			5	8	
NipSit Inside	12		6						6	7				8
Prolex/Proaxis/Delcare	24	X	7	8	8	7	6	8	9			5	8	
Sevin	12		6	6	5	6	7	5					1	

Rating Scale: 0 = no control, 10 = excellent. The performance ratings in the chart are for comparison purposes only and are not necessarily a measure of percent control.
Modified from University of Arkansas "Insecticide Recommendations for Arkansas MP144.

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