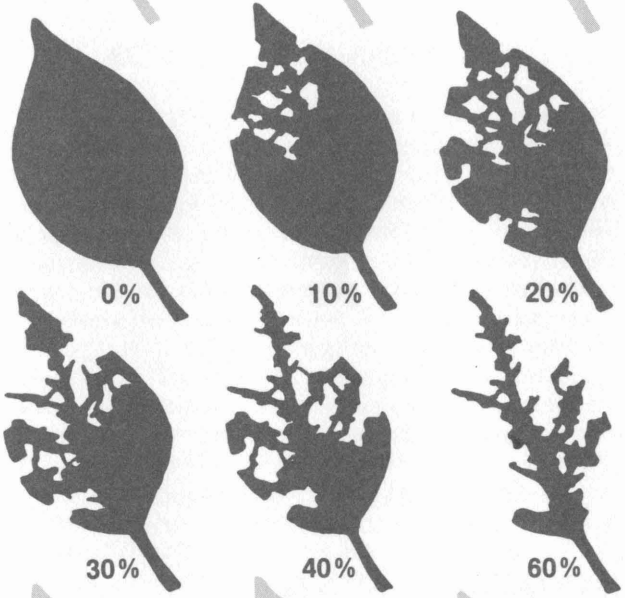
Soybean insect control suggestions



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Soybean Insect Control Suggestions

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Insects that feed on soybeans are numerous and the potential for yield or quality loss from their feeding is present each year. The frequency of pest damage and, thus, the need for chemical control differs in the various production areas from season to season. In Texas, the greatest potential for economic pest losses exists in the Gulf Coast and Lower Rio Grande Valley counties. The inconsistency in damaging pest populations clearly indicates the importance of *regular field inspections* and the utilization of established economic thresholds.

ECONOMIC THRESHOLDS

When pest populations or damage reach unacceptable levels, an economic threshold is used to determine the need of an insecticide application. An economic threshold will allow an insecticide to be used to control a pest while maintaining a profit margin. Threshold levels change throughout the growing season and when different pests are present. They also depend on the type of damage, plant growth stage and general plant vigor. The cost of the pesticide, its application and the anticipated market value of the crop also influence the economic returns resulting from properly timed pesticide applications. Since the thresholds depend on many factors, the simple threshold levels presented are to be considered as rules of thumb to determine "when to treat." In general, however, when the expected market value of the crop is high or when the crop is stressed, threshold levels may be lowered, and vice versa.

INSPECTING SOYBEAN FIELDS FOR INSECTS AND DAMAGE

Insect populations in soybean fields can change rapidly. Growers should check fields at least once and preferably twice a week to determine the species present, pest density and amount of damage that has occurred.

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Populations of most insects can be estimated by either the shake cloth method or with a sweep net. The shake cloth method is more accurate and works well in row beans when the soil is dry for sampling stink bugs and caterpillars. In broadcast beans or when the soil is wet, the sweep net is more convenient. The sweep net method requires less time but is less accurate, especially when plants are small, wet or when the canopy is dense. Plant damage estimates are also useful in making management decisions.

Shake Cloth Method

This technique is primarily used to survey for stink bug and caterpillar population levels, but is also useful for determining numbers of other species before and after pesticide applications. Equipment needed consists of an off-white cloth measuring 36 x 42 inches. Staple a thin strip of wood, approximately ½ x 1 inch wide, to each short side of the cloth. Select a random site in the field and unroll the cloth from one row over to the next row. By shaking the plants vigorously from both rows bordering the cloth using both hands and forearms, two 3-row-foot sections (6 feet total) can be sampled simultaneously for insect numbers. Count the number of insects that fall on the cloth. Repeat the process at a minimum of five locations in the field and sum the counts to get the number of each species per 30 row feet. If the resulting populations are close to threshold levels or if the field is very large, increase the number of samples to increase confidence in the results. This method is not useful in drill or broadcast planted soybean fields.

Sweep Net Method

A standard 15-inch diameter sweep net is commonly used for sampling insects on soybeans. A sampling unit of 10 consecutive (180°) sweeps while walking through the field has proven an effective sampling method. The net is swung from side to side with each step. The net should be held so the lower half of the opening (7 to 8 inches) is drawn through the foliage. After 10 successive sweeps the insects are identified and counted as they are removed from the net. Repeat the sampling procedure at a minimum of 10 random sites and sum the counts of each species per 10 sweeps to determine the number of insects per 100

sweeps. If the resulting population estimates are close to threshold levels, or if the field is large, increase the number of samples to raise the accuracy of the results obtained.

Plant Damage

Insects produce four types of damage to soybean plants. Underground, chewing insects can feed on germinating seedlings or roots causing the plants to lose vigor, wilt or die. Above ground, stems can be damaged by tunneling larvae or girdling by the threecornered alfalfa hopper. Foliage can be damaged by chewing caterpillars and beetles, or by mites, aphids and thrips feeding. Finally, pods can be hollowed out by corn earworms or misformed and discolored by stink bug sucking damage. Estimating the level of insect related plant damage is essential in determining the need for control measures.

Insects that feed on seedling soybeans are important only if stands are damaged to the extent that yields are reduced. *Four to eight seedlings per row foot are sufficient to make optimum yields.* Uniform removal of seedlings is not as detrimental as the removal of all seedlings in portions of a row. Determine healthy and damaged seedlings in 3 row feet at randomly selected locations in the field for stand loss resulting from early season pests.

Threecornered alfalfa hoppers girdle the main stems of soybean plants prior to bloom. These girdles appear initially as slight indentations and later as swellings encircling the entire main stem. Random row foot sections should be examined for fresh damage early in the season (3 to 10 inch plants) at several locations in the field.

Estimation of foliage loss from feeding of caterpillars and beetles is made by visual observation. Examine randomly picked individual leaflets and estimate the percent leaf surface missing in each (see cover illustration). Add these estimates together and divide by the total number of leaves examined to determine percent defoliation for the different areas of the sampled field.

Pod damage is not sampled directly. Insect populations which cause pod damage are estimated using sweepnet or shake cloth techniques.

If the resulting damage estimates are close to threshold levels, increase the number of samples to determine the level of plant damage. Larger sample units generally increase the confidence of the results obtained.

SEEDLING AND EARLY-SEASON PESTS

Threecornered Alfalfa Hopper

The threecornered alfalfa hopper is present in soybean fields from the seedling stage through maturity. Feeding activity results in girdled main stems when attacked in the seedling stage and girdled petioles in later growth stages. Plants damaged in early growth stages may not be noticed until they are much older and heavier. Because of damaged stems, plants may fall into the middle of the rows when stressed by winds, rain or cultivation equipment. The restricted flow of nutrients in girdled plants can reduce the number of pods produced per plant.

Cutworms

Cutworms are the caterpillars of several moths and may be present in fields at planting. The larvae feed on young seedlings at or just below the soil surface. As the stems are cut, the top portion of the seedling wilts and dies. Locate larvae by digging below the soil surface around freshly damaged plants. Infestations often occur in fields with abundant plant residue or weeds prior to planting.

Armyworms

Armyworms are conspicuously striped caterpillars that may occur locally in high numbers. Often they develop in pastures or roadside vegetation and march in mass into fields, eating as they go. They also can develop where moths lay eggs in the field.

Beet Armyworm

Beet armyworm caterpillars are green to brown with pale stripes along their sides, and with a conspicuous black mark on each side of the second body segment. They prefer broad-leaved plants including soybeans and are generally more difficult to kill than fall armyworms, since they are tolerant to carbaryl, methyl parathion and parathion.

MID- TO LATE-SEASON PESTS

Foliage Feeding Pests

Various caterpillars, beetles and grasshoppers are all foliage feeding pests on soybeans. Since all cause defoliation, they are grouped together for damage estimation purposes. These can occur throughout the year but are most significant from blooming to pod fill when defoliation can cause yield reductions. Control of these pests is complicated when several species are involved. Infestations of one or a combination of these species usually become important from August through September along the Upper Gulf Coast. Infestations may develop very rapidly and completely defoliate soybean fields.

Soybean loopers and **velvetbean caterpillars** are the most common and severe defoliators of Texas' soybeans. Soybean loopers are green caterpillars with 2 pairs of prolegs and may or may not be marked with black. This species is difficult to control with carbaryl, methyl parathion or parthion. Velvetbean caterpillar moths migrate into Texas each year in large numbers. Caterpillar populations can build up rapidly as a result. The larvae are green to brown with stripes along their sides, and possess 4 pairs of prolegs.

Stink Bugs

Several species of stink bugs feed on developing soybean seeds. The southern green stink bug and brown stink bug are the most common species along the Gulf Coast of Texas. They move into fields when pods are beginning to fill. Stink bugs feed by inserting their beaks into the beans inside the pods. This feeding may reduce yield and quality of the soybeans, and increase the incidence of yeast spot seedling disease.

Corn Earworm

This pest is also known as the bollworm and soybean podworm. The adult stage or moth of the corn earworm lays eggs on the terminal leaves of soybean plants. The young larvae feed for a few days and then move down the plant to feed on developing soybeans. Infestations are more common in areas where alternate hosts such as corn and cotton are grown.

OCCASIONAL PESTS

Soybeans in the seedling stage may be damaged by the **lesser cornstalk borer.** Larvae tunnel into the stem at the soil line, restricting the flow of nutrients to the upper portion of the plant, causing it to wilt and eventually die. The bluish green caterpillars have brown stripes and are found inside the stem or in a silken tube just below the soil surface adjacent to the stem. Infestations of lesser cornstalk borers usually are limited to soybeans growing in well drained, sandy soils and thrive under dry conditions. Chlorpyrifos (Losrban®) and diazinon (D•Z•N® Diazinon®) are labeled for their control.

Other early season defoliators include **garden webworms, saltmarsh caterpillars, Southern corn rootworm** and **banded cucumber beetles.** However, their leaf feeding rarely becomes serious enough to warrant the use of pesticides. Several **grasshopper** species will occasionally move into the margins of fields bordered by weedy areas, at times requiring spot treatments. Also, populations of **thrips, white-flies** and **spider mites** can produce noticeable damage to the foliage, but they rarely require treatment.

A small longhorned beetle in the genus *Dectes* is another occasional pest in the High Plains. Larvae of this species feed inside the stems and cause lodging in some fields. They are abundant enough to cause problems only in localized areas.

BENEFICIALS

Natural populations of beneficial insects and spiders often control pests such as loopers, corn earworms and velvetbean caterpillars. Key predators in soybeans include **spiders, big-eyed bugs, assassin bugs** and **damsel bugs.** Certain wasp and fly parasites are also important in reducing pest populations. Because most insecticides are injurious to beneficials, insecticide applications should be avoided unless economically damaging levels of injurious pests have been detected.

INSECTICIDE APPLICATION METHODS

Consult the pesticide label to determine the minimum amount of water required to attain adequate coverage. Spray applications are most effective and hazards minimized when wind velocity does not exceed 15 miles per hour. Nozzle size and number,

ground speed and pump pressure influence the rate of output per acre; therefore, calibrate the sprayer carefully to insure application of recommended insecticide. (For calibration and safety information refer to MP-1289 *Using Pesticides—Private Applicator Manual.*)

For ground applications, one nozzle per row usually is adequate for young plants, but two to three nozzles per row may be desirable on larger plants to obtain adequate coverage. Number 3 cone nozzles set 20 inches apart on a rear-mounted boom of a tractor sprayer are satisfactory. For best results with aerial applications, flag swaths so they meet or overlap. Do not fly higher than 15 feet above the plant canopy to insure less drift and maximum coverage. When making any insecticide applications, follow label directions. Refer to the "Protecting Bees and other Pollinators from Insecticides" section of this leaflet to avoid bee losses.

BIOLOGICAL INSECTICIDES

Bacillus thuringiensis (Dipel®, Thuricide® and others) is presently labeled for use on soybeans. Use of this biological insecticide offers its greatest advantage in controlling foliage-feeding larvae before bloom or moderate populations after bloom initiation and during the pod-formation stage. It is not recommended where heavy populations develop during the pod-filling period. This product will not control defoliating beetles, grasshoppers or pod-feeding stink bugs.

Bacillus thuringiensis use requires a different approach to insect pest management. It is rather slow acting, is much more effective on smaller worms and performs much better when applied in greater volumes of water per acre (10 to 15 gallons by ground application and 5 to 8 gallons by air). Application rates are related to thorough coverage.

The real advantage of biological insecticides lies in their ability to suppress pest species without disrupting beneficial species that contribute to natural control. This is an extremely important characteristic. To be used effectively, careful field monitoring and accurate analysis of the potential for plant damage is essential. Precise application (timing, rate and coverage) is required. Application equipment must be clean to avoid parasite and predator mortality, which can result from a "carryover" of the broad-spectrum, conventional insecticides remaining in application equipment.

PROTECTING BEES AND OTHER POLLINATORS FROM INSECTICIDES

Pollination is extremely important in producing many seed crops. Protect bees and other pollen collecting insects which may be active in flowering soybean fields or on other flowering plants in the vicinity of soybeans to be treated by following these guidelines which reduce bee losses:

1. Where insecticides are needed, use materials least toxic to bees. Where it is necessary to use an insecticide from groups 1 or 2 in the following list, notify beekeepers so they can make necessary arrangements to protect their bees.
2. Make all applications when bees are away from the field. Evening or early morning treatments between the hours of 7 p.m. and 6 a.m. generally are more satisfactory. Evening applications, after bees have left the field, are less hazardous than early morning applications.
3. Use spray or granular formulations.
4. To prevent heavy losses of bees, avoid insecticide drift or sprays directly on colonies. Bees often cluster on the front of their hives on hot evenings. Pesticide drift or direct spray at this time generally results in high mortality.

Insecticides Grouped According to Their Relative Hazards to Honey Bees

Insecticides	Remarks
Group 1 - Highly Toxic Acephate (Orthene®) Carbaryl (Sevin®) Chlorpyrifos (Lorsban®) Diazinon (D•Z•N® Diazinon®) Dimethoate (Cygon®, Defeud®) Fenvalerate (Pydrin®) Methyl parathion Parathion	This group includes materials that kill bees on contact during application or for several days following application. Remove bees from the area if these are used on plants being visited by the bees, with some exceptions.
Group 2 - Moderately Toxic Methomyl (Lannate®, Nudrin®)	Do not apply when bees are working in field. Apply in late evening.
Group 3 - Relatively NonToxic *Bacillus thuringiensis* (Dipel®, Thuricide®, and others)	Make applications in late evening or early morning when bees are not foraging.

Policy Statement for Making Chemical Control Suggestions

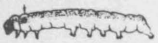
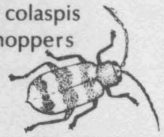
Suggestions for use of pesticides made by the Texas Agricultural Extension Service and the Texas Agricultural Experiment Station are based upon:

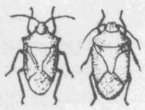
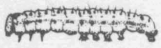
- Effectiveness under Texas Conditions
- Avoidance of residues in excess of allowable tolerances
- Avoidance of toxicity to desired vegetation, fish and other wildlife, plants, animals and humans
- Avoidance of adverse side effects upon beneficial predators, parasites, honeybees, fish and other wildlife, plants animals and humans.

Suggested pesticides must be registered and labeled for use by the Environmental Protection Agency and the Texas Department of Agriculture. The status of pesticide label clearances is subject to change and may have changed since this publication was printed. County Extension agents and appropriate specialists are advised of changes as they occur.

The USER always is responsible for the effects of pesticide residues on his livestock and crops, as well as problems that could arise from drift or movement of the pesticide from his property to that of others. *Always read and follow carefully the instructions on the container label.*

Proper disposal of waste pesticides and "empty" or used containers is an essential step in safe pesticide use.

Pests	Economic threshold	Insecticide and rate (active ingredient/acre)	Days from last application to harvest	Days from last application to livestock grazing or feeding	Remarks
Cutworms 	When stands are threatened (30% or more of the seedling plants are killed). Four to eight healthy seedlings per foot of row are sufficient to make optimum yields.	Methyl parathion - 0.25 lb (climbing cutworm only)	20	20	Direct spray to base of plants and to soil several inches on each side of rows. See restrictions.
Armyworm Fall armyworm 	When stands are threatened (30% or more of the seedling plants are killed)	Carbaryl (Sevin®) - 1.0 lb	0	0	See restrictions.
		Fenvalerate (Pydrin®) - 0.1 lb	21	X	
		Methyl parathion - 0.5 to 1.0 lb	20	20	
		Parathion - 0.5 to 0.8 lb (fall armyworm only)	15	15	
Beet armyworm 	When stands are threatened (30% or more of young plants lost)	Fenvalerate (Pydrin®) - 0.1 lb	21	X	See restrictions.
		Methomyl (Lannate® or Nudrin®) - 0.25 to 0.4 lb	14	3 forage 7 hay	
Threecornered alfalfa hopper 	Before bloom, when the infestation has reduced the number of ungirdled plants to 6 or less per foot of row and nymphs are still present	Acephate (Orthene®) - 0.5 lb	14	X	Thorough coverage of plants and stems is needed. See restrictions.
		Carbaryl (Sevin®) - 1.0 lb	0	0	
		Methyl parathion - 0.5 lb	20	20	
Velvetbean caterpillar 	When defoliation exceeds 40% *prebloom*, 20% during *blooming* and *pod fill*, and 35% from *pod fill* to *harvest*; or when ½ in. or larger "worms" reach or exceed 8 per foot of row or 300 per 100 sweeps	Acephate (Orthene®) - 0.5 lb	14	X	Check infestations at weekly intervals to determine damage level. Applications may need to be repeated at 5-day intervals to achieve control. See restrictions.
Green cloverworm 		*Bacillus thuringiensis* (Dipel®, Thuricide® and others) - see labels for rates (see remarks in text)	0	0	
		Carbaryl (Sevin®) - 1.0 lb	0	0	
		Fenvalerate (Pydrin®) - 0.1 lb	21	X	
		Methomyl (Lannate® or Nudrin®) - 0.3 to 0.4 lb	14	3 forage 7 hay	
		Methyl parathion - 0.5 lb	20	20	
		Parathion - 0.5 lb	15	15	
Soybean looper Cabbage looper 	When defoliation exceeds 40% *prebloom*, 20% during *blooming* and *pod fill*, and 35% from *pod fill to harvest*; or when ½ in. or larger "worms" reach or exceed 8 per foot of row or 150 per 100 sweeps	Acephate (Orthene®) - 0.5 lb	14	X	
		Bacillus thuringiensis (Dipel®, Thuricide® and others) - see labels for rates (see remarks in text)	0	0	
		Methomyl (Lannate® or Nudrin®) - 0.45 lb	14		
Bean leaf beetle Blister beetles Grape colaspis Grasshoppers 	When defoliation exceeds 40% *prebloom*, 20% during blooming and pod fill, and 35% from pod fill to harvest.	Acephate (Orthene®) (grasshoppers only) 0.5 lb	14	X	
		Carbaryl (Sevin®) - 0.5 to 1.0 lb	0	0	
		Fenvalerate (Pydrin® - 0.1 lb	21	X	
		Methyl parathion - 0.5 to 1.0 lb (not for grape colaspis)	20	20	

Stink bugs 	Pod formation to bean maturity — when 10 bugs per 30 feet of row are found	Carbaryl (Sevin®) - 1.0 to 1.5 lb	0	0	Check infestations weekly and repeat applications as necessary to maintain populations below economic levels. See restrictions.
		Fenvalerate (Pydrin®) 0.1 - 0.2 lb	21	X	
		Methyl parathion - 0.5 to 1.0 lb	20	20	
		Parathion - 0.5 lb	15	15	
Corn earworm (bollworm) 	Pod formation to bean maturity — when 30 larvae per 30 feet of row are found. Seldom causes economic damage after solid plant canopy formed	Bacillus thuringiensis (Dipel®, Thuricide®, and others) - See labels for rates (See remarks in text),	0	0	Difficulty in controlling large worms is encountered frequently. When treatment becomes necessary, repeat applications at less than 5-day intervals until the infestation is reduced below economic levels. If worms are large and emergency or salvage treatments are necessary, apply at 3-day intervals until the outbreak is under control, or use methomyl at 5-day intervals. See restrictions.
		Carbaryl (Sevin®) - 1.5 lb	0	0	
		Fenvalerate (Pydrin®) - 0.1 lb	21	X	
		Methomyl (Lannate® or Nudrin®) - 0.3 lb	14	3 forage 7 hay	
		Methyl parathion - 1.0 lb	20	20	
		Paration - 0.8 lb	15	15	

RESTRICTIONS

Carbaryl—To avoid possible injury to tender foliage, do not apply when foliage is wet or when rain or high humidity is anticipated within 48 hours of application. Do not apply a combination of carbaryl and 2, 4-DB herbicides to soybeans.

Chlorpyrifos—Do not apply more than 3 lbs. a.i. per acre per season. Do not apply last 2 treatments closer than 4 days apart.

Fenvalerate—Do not exceed 0.8 lb. a.i. per acre per season.

Methyl parathion—Do not apply more than twice per growing season.

Parathion—Do not apply more than twice per season.

CONVERSION TABLE: Pounds active ingredients (AI) per acre to amount formulation per acre. For additional conversions use these formulas: lb AI/acre ÷ lb formulation/gal = gal formulation/acre; lb AI/acre ÷ % AI formulation/lb ÷ 100 = lb formulation/acre; note: 1 gal = 4 qt = 8 pt = 128 fl. oz.

Insecticide and formulation	Units per Acre	LB/ACRE															
		0.05	0.1	0.2	0.25	0.3	0.4	0.45	0.5	0.75	0.8	0.9	1.0	1.5	2.0	4.0	5.7
Acephate																	
Orthene® 75S	lb	-	-	-	-	-	-	-	0.67	-	-	-	-	-	-	-	-
Carbaryl																	
Sevin® Sprayable	lb	-	-	-	-	-	-	-	0.63	-	-	-	1.25	1.88	-	-	-
Sevin® 50 WP	lb	-	-	-	-	-	-	-	1.00	-	-	-	2.00	3.00	-	-	-
Sevimol® 4 and Sevin® XLR and Sevin® SL	qt	-	-	-	-	-	-	-	0.50	-	-	-	1.00	1.50	-	-	-
Chlorpyrifos																	
Lorsban® 4E	pt	-	-	-	-	-	-	-	-	1.50	-	-	2.00	-	4.00	-	-
Lorsban® 15G	lb	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	38
Diazinon																	
D•Z•N Diazinon® 50W	lb	-	-	-	-	-	-	-	-	-	-	-	-	-	4.00	8.00	-
D•Z•N Diazinon® 14G	lb	-	-	-	-	-	-	-	-	-	-	-	-	-	14.0	28.0	-
Fenvalerate																	
Pydrin® 2.4 EC	fl. oz.	2.70	5.30	10.7	-	-	-	-	-	-	-	-	-	-	-	-	-
Methomyl																	
Lannate® L and Nudrin® 1.8	pt	-	-	-	1.11	1.33	1.78	2.00	-	-	-	4.00	-	-	-	-	-
Lannate® WSP and Nudrin® 90	lb	-	-	-	0.27	0.33	0.44	0.40	-	-	-	1.0	-	-	-	-	-
Methyl Parathion																	
MP 4 EC	pt	-	-	-	0.5	-	-	-	1.0	-	-	-	-	-	2.0	-	-
Penncap-M®	pt	-	-	-	1.0	-	-	-	2.0	-	-	-	-	-	4.0	-	-
Parathion																	
Parathion 8	fl. oz.	-	-	-	-	-	-	-	8	-	12	-	-	-	-	-	-

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