



Grasshoppers and Their Control

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Grasshoppers are among the most widespread and damaging pests in Texas. Approximately 150 species of grasshoppers are known to exist in the state; however, the following five species cause 90 percent of the damage to crops, gardens, trees and shrubs:

- Differential grasshopper, *Melanoplus differentialis*
- Red-legged grasshopper, *Melanoplus femur-rubrum*
- Migratory grasshopper, *Melanoplus sanguinipes*
- Two-striped grasshopper, *Melanoplus bivittatus*
- Packard grasshopper, *Melanoplus packardii*

These insects cause some damage every year, but become very destructive during outbreak periods. An often asked question during outbreak years is: Why are there so many? Weather is the main factor affecting grasshopper populations. Outbreaks are usually preceded by several years of hot, dry summers and warm autumns. Dry weather increases nymph and adult survival. Warm autumns allow grasshoppers more time to feed and lay eggs. Cool, wet weather slows nymphal development, reduces the number of eggs laid, and increases the incidence of diseases. Grasshoppers have a high reproductive capacity. The female can lay an average of 200 eggs during a single season. Under favorable conditions up to 400 eggs can be laid. Approximately 40 eggs can be laid even if unfavorable conditions exist. Thus, 10 times more eggs can be produced during favorable conditions. With an average of 200 eggs per female, 198 eggs or young grasshoppers would have to die if the population were to remain the same. If, instead of only two

adults surviving, there are four, six, eight, 10 or 50, then the adult population the following year will be increased two, three, four, five or 25 times, respectively.

Biology

Grasshopper eggs are laid $\frac{1}{2}$ to 2 inches beneath the soil surface in pod-like structures. Each egg pod consists of 20 to 120 elongated eggs securely cemented together; the whole mass is somewhat egg-shaped and covered with soil. The egg pods are very resistant to moisture and cold and are affected very little by winter conditions if the soil is not disturbed. Eggs are deposited in a variety of non-crop areas including ditches, fencerows, shelter-belts and weedy areas. They are also laid in cropped areas including late season crops, weedy fields, hay fields and alfalfa. Grasshopper egg hatch normally begins in late April to early May. Peak hatch occurs about mid-June and is usually near completion by late June. Cool and extremely dry springs may delay hatch, allowing it to continue into July.

Young grasshoppers are referred to as nymphs. They are similar to adults in general appearance, but are smaller and have wing pads instead of wings. There are usually five or six nymphal stages and the length of time from egg to adult is 40 to 60 days.

Adults of crop-damaging grasshopper species become numerous in mid-July with egg laying usually beginning in late July and continuing into the fall. In general, only one generation of grasshoppers is produced per year.

Biological Control

Grasshoppers have many natural enemies that help suppress populations. A fungus, *Entomophthora grylli*, often causes locally high mortality. Infected grasshoppers strike a characteristic pose at the top of a plant or other object. The grasshopper grasps the plant in a death embrace with front and middle legs while the hind legs are extended. It dies in this position. Fungal spores develop in and on the body of the infected grasshopper. These spores become airborne and infect other grasshoppers. Under warm, humid conditions, great numbers of grasshoppers have been destroyed by this fungus. A protozoan, *Nosema locustae*, is normally present to some extent in grasshopper populations, but generally does not cause significant mortality. *N. locustae* spores incorporated on bran baits are sold under such names as Semaspore[®], Nolo Bait[®] or Grasshopper Attack[®]. These baits kill some nymphs but virtually no adults. However, infected adults lay fewer eggs. *N. locustae* baits act too slowly and kill too few grasshoppers to be of much value when the need for control is immediate. Nematodes called hairworms commonly infest adult grasshoppers. They reduce the vigor of grasshoppers, but do not cause significant mortality. Insects that feed on grasshoppers include the larvae of blister beetles (predators of the eggs), bee flies (parasites of eggs), robber flies, ground beetles, flesh flies and tangle-veined flies. Birds (quail, turkey, larks, etc.) and mammals consume grasshoppers, but have little impact in outbreak years.

Mechanical Control

Grasshopper populations can be reduced by eliminating potential egg-laying sites. Since grasshoppers tend to select undisturbed areas for egg-laying, tilling crop land in mid- to late summer discourages females from laying eggs in these areas. Producers who are worried about soil erosion and reduced moisture conservation must weigh these possibilities against the benefit of potential grasshopper control from tillage operations.

Cultural Control

Summer weed control in fallow fields accomplishes two objectives: (1) if eggs are already in the field, there will be nothing for small nymphs to feed on when eggs hatch; and (2) fields will not be attractive to egg-laying adults since there is nothing on which to feed. Eliminate tall grass and weeds from around those plants you wish to protect (e.g., crops, trees and gardens). This reduces food sources so grasshoppers

are not attracted to these areas, exposes grasshoppers to greater predation from birds, etc., and makes these areas less attractive for egg-laying.

Monitoring Population Development

Farmers and ranchers should watch for grasshoppers early in the season and begin control measures while grasshoppers are in the nymphal stages and still within hatching sites (roadsides, fencerows, etc.). There are a number of advantages in treating grasshoppers early: (1) fewer acres will have to be treated and less insecticide is necessary to obtain control; (2) grasshoppers are killed before they have had the opportunity to cause significant crop loss; (3) smaller grasshoppers are more susceptible to insecticides than larger hoppers; (4) early treatment before grasshoppers reach maturity prevents migration of the winged (flying) adult stage and egg laying, which may help reduce the grasshopper threat for the following crop year.

Grasshopper infestation levels can be estimated by surveying for nymphs or adults. One method is the square-foot method. In the area to be sampled, count the number of grasshoppers that hop or move within a square-foot area. With 15 to 20 paces between each square-foot sample, conduct 18 square-foot samples and divide the total number of grasshoppers by two to obtain the number per square yard. If the grasshoppers are predominantly first to third instar, (wingless and generally less than 1/2 inch long), divide the number by three to give the adult equivalent. Consider fourth instar nymphs and above as adults. Control will generally be necessary when square-yard counts reach the threatening level. Use Table 1 to determine the need for insecticide applications to control grasshoppers.

When grasshopper populations reach intolerable levels, or when crops are threatened (Table 1), select a

Table 1. Adult grasshopper infestation ratings based on numbers per square yard.

Rating	Adults per sq. yard	
	Margin	Field ^a
Non-economic	5 to 10	0 to 2
Light	11 to 20	3 to 7
Threatening	21 to 40	8 to 14
Severe	41 to 80	15 to 28
Very severe	80	28+

^a Field ratings are to be used for both rangeland and field crop locations.

Differential grasshopper, *Melanoplus differentialis* Adults are 1 1/8 to 1 3/4 inches long. Black chevron markings on the hind femur help identify this grasshopper. Black individuals may occur. Moving in from weedy borders, they are very destructive in cultivated crops. They are seldom found in grassland.



Red-legged grasshopper, *Melanoplus femurrubrum* Adults are 7/8 to 1 1/4 inches long. The hind tibiae are red. They are especially damaging to alfalfa and other legumes, but can be an important pest in other crops. They are of very little importance in grassland.



Migratory grasshopper, *Melanoplus sanguinipes* Adults are 7/8 to 1 1/8 inches long. One of the most destructive grasshoppers in grassland as well as in cultivated crops. This grasshopper is a strong flier and is known to swarm over long distances.



Lubber grasshopper, *Brachystola magna* Adults are 1 3/4 to 2 inches long. They do not have fully developed wings and, therefore, are flightless. They prefer weedy areas, but will readily move into crops, especially cotton. They also feed on dead insects, even members of their own kind. Rarely are they a problem in grassland.



Two-striped grasshopper, *Melanoplus bivittatus* Adults are 1 to 2 1/4 inches long. Two light colored stripes extend from eyes to wing tips. They are primarily weed feeders, but will readily move into cultivated crops.

Packard grasshopper, *Melanoplus packardii* Adults are 1 1/8 to 1 1/2 inches long. They prefer sandy soils with light grass cover. They are the least damaging of the species named in this publication, but can be a problem in both grassland and cultivated crops.



suitable insecticide from Tables 2 and 3. Multiple insecticide applications likely will be required to protect gardens, trees and crops, especially if the

grasshoppers' weed and grass food plants have been eaten or have begun to dry out.

Table 2. Insecticides labeled for grasshopper control on various crops.^a

<i>Insecticide</i>	<i>Alfalfa</i>	<i>Corn</i>	<i>Cotton</i>	<i>Peanuts</i>	<i>Wheat</i>	<i>Sorghum</i>	<i>Soybeans</i>	<i>Sunflowers</i>
Asana XL	+(21)		+(21)			+(21)	+(28)	
Baythroid 2	+(7)	+(0) ^b						
Dimethoate 400	+(10)	+(14)			+(35)	+(28)	+(21)	
Furadan 4F	+(7)	+(30)			+		+(21)	+(28)
Guthion	+(21)							
Karate	+(21)		+(14)	+(30)	+(30)	+(45)	+(45)	
Lorsban 4E	+(7 to 14)	+(35)	+(14)			+(30)	+(28)	+(42)
Lorsban 4E SG					+(28)			
Malathion 57 EC	+(0)				+(7)			
Malathion ULV	+(0)	+(5)	+(0)		+(7)	+(7)	+(7)	
Orthene 75S			+(14)					
Pennacp-M	+(15)	+(12)			+(15)		+(20)	
Scout X-TRA							+(21)	+(21)
Sevin 4F, 50W XLR ^c , 80S	+(7)	+(18)	+(28)	+(14)	+(21)	+(21)	+(21)	+(60)
Thimet 15G, 20G					+(70)			

^a Preharvest interval days are in parentheses.

+ = Labeled for specific crop indicated.

^b Sweet corn only.

^c The Sevin XLR label has directions for making a wheat bran bait.

Table 3. Insecticides labeled for grasshopper control at various other sites.^a

<i>Insecticides</i>	<i>Trees & Shrubs</i>	<i>Garden</i>	<i>Range</i>	<i>Non-cropland</i>
Asana XL				+
Diazinon	+	+		+
Dimethoate	+			
Dursban	+			
Lorsban 4E	+ ^b			
Malathion	+	+	+	+
Malathion ULV			+	+
Orthene	+			+
Pennacp M			+	
Sevin 4 Oil			+	+
Sevin	+	+	+	+

^a Carefully read label for preharvest and pregrazing intervals, phytotoxicity, and other precautions.

^b Christmas tree nurseries and plantations only.

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