

The Oklahoma Cooperative Extension Service Bringing the University to You!

The Cooperative Extension Service is the largest, most successful informal educational organization in the world. It is a nationwide system funded and guided by a partnership of federal, state, and local governments that delivers information to help people help themselves through the land-grant university system.

Extension carries out programs in the broad categories of agriculture, natural resources and environment; family and consumer sciences; 4-H and other youth; and community resource development. Extension staff members live and work among the people they serve to help stimulate and educate Americans to plan ahead and cope with their problems.

Some characteristics of the Cooperative Extension system are:

- The federal, state, and local governments cooperatively share in its financial support and program direction.
- It is administered by the land-grant university as designated by the state legislature through an Extension director.
- Extension programs are nonpolitical, objective, and research-based information.
- It provides practical, problem-oriented education for people of all ages. It is designated to take the knowledge of the university to those persons who do not or cannot participate in the formal classroom instruction of the university.
- It utilizes research from university, government, and other sources to help people make their own decisions.
- More than a million volunteers help multiply the impact of the Extension professional staff.
- It dispenses no funds to the public.
- It is not a regulatory agency, but it does inform people of regulations and of their options in meeting them.
- Local programs are developed and carried out in full recognition of national problems and goals.
- The Extension staff educates people through personal contacts, meetings, demonstrations, and the mass media.
- Extension has the built-in flexibility to adjust its programs and subject matter to meet new needs. Activities shift from year to year as citizen groups and Extension workers close to the problems advise changes.



Grasshopper Control in Gardens and Landscapes

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Oklahoma, with its forest and grassland landscapes is blessed (or cursed) with more than 130 resident species of grasshoppers. Fortunately, only 4 or 5 of them ever become pest problems. The redlegged, migratory, differential, and two-striped grasshoppers are major pest species, with the differential and two-striped being the main culprits causing damage to ornamental and vegetable plants. Grasshoppers are more of a problem in rural communities, especially if they are surrounded by pastures or rangeland, or urban fringe areas that contain large amounts of ground overgrown with weeds and vegetation. Grasshoppers are difficult to control in the urban landscape, but homeowners can reduce their impact through the use of barriers and insecticides, and by selecting plants less prone to damage.

Biology

Regarding grasshopper biology; one size does NOT fit all, but they all possess some similarities. All grasshoppers undergo gradual metamorphosis and have three life stages: the egg, nymph, and adult. Grasshopper eggs are laid in pods containing from 8-30 eggs, and deposited in the soil. Grasshoppers lay eggs during the fall in non-crop landscapes such as ditches, fencerows, shelter-belts, and weedy disturbed areas, or sometimes in harvested crop fields and pastures. The eggs hatch the following spring (April-June). Nymphs grow through 5 instars before becoming adults, shedding their cuticle each time. It usually takes the nymphs from 35-50 days to become adults. Most grasshoppers overwinter as eggs and produce only one generation each year, but differences in spring temperatures and successive emergence of different species make it seem like there is an endless "hatch" throughout the spring and summer.

Damage

Grasshoppers eat plants, but most specialize on grasses or broadleaf plants. Pest species, on the other hand, feed on a wide variety of plants and will readily switch from grasses to broadleaves. As nymphs, grasshoppers tend to congregate and remain near their hatching areas. They will remain there as long as there is an adequate supply of food and shelter. When food runs out they will move. Immature grasshoppers can't move very far, because they don't have wings, but winged adults can fly for miles in search of new food sources.

Oklahoma Cooperative Extension Fact Sheets
are also available on our website at:
<http://osufacts.okstate.edu>



Figure 1. Differential grasshopper.



Figure 2. Two-striped grasshopper. (Cranshaw, Whitney. Colorado State University. Image 1326160. www.insectimages.org. April 16, 2004)

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Hungry grasshoppers like gardens because they have optimal moisture and excellent plant growing conditions that provide an abundant food supply.

Grasshopper Management

People become alarmed when grasshoppers suddenly appear and begin feeding on prized flowers, vegetables, and ornamental plants. The distress can turn to frustration when grasshoppers are still seen after plants have been sprayed. In most situations, the spray worked and killed the grasshoppers that were there, but there is simply more grasshoppers moving in to take their place. The insecticides available for grasshopper control have a limited residual activity and will not kill new arrivals after several days. Grasshopper management in the garden and landscape requires patience, and when possible, cooperation with your neighbors. The following suggestions are offered for managing grasshoppers:

- Select plants from the following list, which was developed by extension horticulturalists John Cooper and Stan Lovelace of the Texas Cooperative Extension Service as they observed grasshoppers feeding in Denton County in 1998 (As reported by Dr. Mike Merchant, Extension Entomologist, Dallas).

Preferred	Slight Damage	Not Preferred
Althea	Flowering Almond	American beautyberry
Amaryllis	Grape	Artemisia
Bachelor's buttons	Hardy aster	Bridal wreath spirea
Bush honeysuckle		Confederate jasmine
Butterfly bush		Coralberry
Canna lily		Crapemyrtle
Cherry laurel		Dwarf yaupon
Day lily		Dwarf burning bush
Elaeagnus		Dwarf Mexican petunia
Hardy hibiscus		Euonymus
Iris		Forsythia
Liriope		Juniper
Mondograss		Lantana
Mums		Mexican bush sage
Peach		Moss rose
Photinia		Nandina
Privet		Passionvine
Rose		Perennial dianthus
Tradescantia		Persian lilac
Wegelia		Rock rose
Wisteria		Salvia greggii
		Verbena (perennial)

- Find hatching sites in surrounding areas and spot treat them with registered insecticides. Either flag those areas and treat them, or, in more suburban areas, try and work with your neighbors to find the sites and develop a neighborhood-wide control program. Best control is achieved if applied to immature grasshoppers in the 2nd and 3rd instar (less than 1/2 inch long).
- Purchase floating row covers to protect vegetables and prized plants. These fabrics permit sunlight to get through and allow for air circulation, yet are strong enough to keep grasshoppers from feeding. They can be sprayed with an appropriate insecticide to enhance their effectiveness. If the plants being protected require pollination (such as

cucurbits), they may have to be hand-pollinated. Floating row covers are available at garden and nursery supply stores.

- Poultry, especially guinea hens, are effective predators. They may be useful for gardeners who live in rural areas and have room and interest in keeping them.

Control with Insecticides

Insecticides: Several insecticides are registered and effective at killing grasshoppers. Insecticides work better on small grasshoppers because it takes less active ingredient to kill them. If a single rate is applied (as is suggested in many labels) it will work better and kill grasshoppers longer if they are small.

Temperature and sunlight: Insecticides start to break down as soon as they are mixed with water. They also break down when exposed to sunlight, and the breakdown process speeds up as temperatures increase. Thus, in the summer when temperatures are high and sunlight intense, most insecticides will work for about 24 hours. As summer progresses, grasshoppers get bigger, move faster and feed more intensely. All of this means that sprays will need to be repeated to keep plants protected with an insecticide late in the growing season.

Border treatments: Home yards and gardens in rural areas that are surrounded by range or pastures are subject to invasion by grasshoppers from those areas. Irrigated yards and gardens are an "oasis" for grasshoppers during the heat of the dry summer months. The best way to control grasshoppers in this situation is to prevent them from ever entering the yard. That can best be accomplished by treating the surrounding range and pasture lands to control the grasshoppers as described in EPP-7196, Grasshopper Management in Rangeland, Pastures, and Crops. If preventative control is not possible, the best alternative is to make a border treatment around the yard and garden. Generally, grasshoppers move across areas in "jumps" as they search for suitable food. A homeowner can slow or block their movement by treating all vegetation in a band or border perimeter around the yard and/or garden with an insecticide. Border treatments that are wider provide more effective control.

Yard and garden treatments: The line of last defense is to directly spray the plants that need to be protected. However, none of the insecticides will totally prevent damage from large grasshoppers because they have to do some feeding to pick up enough insecticide to die. Additionally, even the pesticides with the longest lasting residues will have to be sprayed at 3-4 day intervals when large numbers of large grasshoppers are constantly invading a landscape. Consult EPP-7306 Ornamental and Lawn Pest Control for Homeowners, or E-832, OSU Extension Agent's Handbook of Insect, Plant Disease, and Weed Control for specific information on available products for control of grasshoppers.

Biological control: Several botanical and biological products are sold to manage grasshoppers. *Nosema locustae* is a protozoan microbe that causes disease in grasshoppers. Its resting spores are mixed into a bait which is then spread in areas with grasshoppers. The grasshoppers eat the bait and microbe spores, which then infect and kill the grasshoppers. Under the best conditions, these products can provide 30-40% mortality of grasshopper populations and under the wrong conditions (low dose, large grasshoppers and high temperatures) will provide little effective control.

Insecticide	Trade names	For use on	Group	Comments
Acephate	Ortho Systemic Insect Killer	Ornamentals only	Organophosphate	Lasts several days, is systemic, fast acting, effective
Carbaryl	Ferti-lome and others	Pasture/yard/garden	Carbamate	Fast acting; moderately effective;
Nosema locustae	Nolo Bait, Semaspore, and others	Yard and garden	Biological	Perishable; low effectiveness, slow acting
Esfenvalerate	Ortho esfenvalerate and others	Yard and garden	pyrethroid	Fast acting; moderate residual period; very effective;
Lambda-cyhalothrin	Spectracide	Yard and garden	pyrethroid	As above
Cyfluthrin	Bayer Advanced Garden	Yard and garden	pyrethroid	As above
Pyrethrins	Safer pyrethrin and others	Yard and garden	Botanical extract	Short residual; low effectiveness; fast acting; certified organic
Azadiractin	AzaMax, Bioneem, and others	Yard and garden	Botanical extract	As above; primarily active against nymphs

Beauveria bassiana is another microbe (fungus) disease that can kill grasshoppers if sprayed on plants and they eat the spores. The fungus then infects and kills the insects. However, at best, it will provide moderate control and little to no control during the hot and dry summer conditions in Oklahoma.

Sources for *Nosema locustae* baits for grasshoppers.

Biological Grasshopper Bait

Buglogical Control Systems
PO Box 32046,
Tucson, AZ 85751-2046
Phone/Fax: 520-298-4400
E:mail: info@buglogical.com
Website: <http://www.buglogical.com/>

NoLo Bait

Biocontrol Network
5116 Williamsburg Rd.
Brentwood, TN 37027
Phone/Fax (800) 441-BUGS(2847)
<http://www.biconet.com/>

Semaspore

Planet Natural
612 Gold Ave.
Bozeman, MT 59715
Phone Orders: 800-289-6656 or 406-587-5891
FAX: 406-587-0223
E-mail: info@planetnatural.com
Website: <http://www.planetnatural.com/>

Semaspore

Hydro Gardens
P.O. Box 25845
Colorado Springs, CO 80936-5845
Phone: 888-693-0578
E:mail: hgi@hydro-gardens.com
Website: <http://hydro-gardens.com/>

NoLo Bait

Harmony Farm Supply
3244 Gravenstein Highway, No. B
Sebastopol, CA 95472
Phone: 707-823-9125
FAX 707-823-1734
<http://www.harmonyfarm.com/>