K-STATE Kansas State University

Home and Horticultural PESTS

Boxelder and Red-Shouldered Bugs

Few insects annoy homeowners like the boxelder bug and the red-shouldered bug. This is because adults of both species congregate on the south and west sides of homes in late fall when they seek protected overwintering sites. Boxelder bugs and red-shouldered bugs enter homes through openings or cracks. They are nuisance pests whether in large or small numbers. However, they do not sting or transmit pathogenic organisms, damage structures (as do termites or carpenter ants), destroy fabric (clothes moths, silverfish, dermestids), infest stored products (Indian meal moths and their larvae, cereal/flour weevils, dermestids), or carry filth (cockroaches).

Boxelder bugs were first described in 1825, based on specimens collected near Omaha, Neb., between 1819 and 1820. The first recorded outbreak was in Washington state in 1891, when boxelder bugs reportedly did "much damage to fruit such as apples, plums, grapes and peaches." Since then, boxelder bug observations have frequently appeared in scientific journals, proceedings, and farm press publications. They are mainly recognized as uninvited guests in and around homes.

Hosts

Boxelder bugs feed on a variety of hosts including ageratum, apples, ash, asparagus, boxelder, buckeye, cacti, cherry, chinaberry, coleus, crabgrass, foxtail, geranium, grape, hollyhock, honeylocust, honeysuckle, iris, lavender, lilies, linden, mulberry, peach, pears, pigweed, pin oak, plum, silver/soft maple, soapberry, spirea, strawberry, tree-of-heaven, and tulips. They can be cannibalistic, attacking other boxelder bugs that are immobile and defenseless while molting. Boxelder bugs have even been known to feed on dead bees and cicadas. Despite this wide range of hosts, boxelder trees are the host of choice. Boxelder bugs prefer the female tree that produces fruits and seeds necessary for growth.

Red-shouldered bugs have a narrower host range, and prefer plants of the family *Sapindaceae* such as Balloonvine, *Ficus* spp. and *Althaea* spp. Another Sapindales host, the goldenrain tree, is common in Kansas, especially in the east. Given their preference for goldenrain trees, red-shouldered bugs are sometimes called goldenrain tree bugs. Other hosts include arborvitae, bluebonnets, chinaberry, grain sorghum, and western soapberry.

Developmental Stages

Boxelder bugs and red-shouldered bugs undergo simple, gradual metamorphosis. The initial egg stage is followed by immature forms called nymphs. Nymphs molt one final time and emerge as adults.

Eggs. Eggs are flat and oval, ranging from 1.3 to 1.7 millimeters in length. Straw-colored at first, eggs turn a deep brown soon after they are deposited (Figure 1). Just before hatching, eggs take on a reddish tint because of the red nymph visible through the transparent eggshell.

Figure 1. Red-shouldered bug eggs

Nymphs. In the nymphal stages, both boxelder bugs and red-shouldered bugs are red to orange (Figure 2, individuals 1 to 5). First through third instars are relatively nondescript, aside from an increase in size. Slate-colored, bud-like wing pads appear during the fourth instar. Wing pad lengths increase in the last two instars.

Figure 2. Boxelder bug developmental stages

Adults. When viewed from above, the adult boxelder bug is elliptical with a pointed head (Figure 2, far right individual). Prominent red eyes project from each side. Antennae, legs and overall body color are dark gray to black. Reddish-orange markings include three bold thoracic stripes (two lateral and one median), bold margins surrounding the non-membranous portion (corium) of front wings, and the thinner veins of the corium. The portion of the body covered by the wings retains the red-orange color. The larger abdomen of female boxelder bugs extends beyond the front margins of the forewings, further accenting the bug's colorful outline. Overall, adult red-shouldered bugs are smoky-gray to black. Their eyes, pronotal/shoulder margins, and abdominal borders are red (Figure 3).

Figure 3. Adult red-shouldered bug

Figure 4. Red-shouldered bugs mating

Figure 5. Nymphs clustering on fallen seed

Seasonal Life History

Boxelder bugs and red-shouldered bugs produce two generations per year in Kansas. Seasonal developmental patterns and habits are similar. Both species overwinter as adults in protected sites: under leaves and debris, hedge rows, roadside ditches, in and under stone, lumber and wood piles, beneath bark, in tree hollows, near building and home foundations, and accessible indoor areas. On warm winter days, bugs are temporarily active and often seen on the sides of buildings and homes directly exposed to the sun, but it is not until continued warm weather in the spring that boxelder bugs and red-shouldered bugs mass in preparation for spring migration.

By mid-April, most overwintered boxelder bug and red-shouldered bug adults will have migrated back to their preferred tree hosts, some up to two miles from overwintering sites. Because trees have not yet leafed out, adults settle on the ground where they feed on the previous year's seeds that litter the ground.

After feeding for two weeks, they mate, with smaller males often passively carried around by females (Figure 4). The peak ovipositional period for boxelder bugs is April 20 to May 10. Females are not prolific egg producers; they average only 10 to 11 eggs per bug. Red-shouldered bugs deposit an average of 19 eggs per bug. Eggs are glued to stones, leaves, grass blades, tree bark and shrubbery, or indiscriminately dropped wherever females happen to be when eggs are ready to be deposited.

The incubation period for eggs is about two weeks. Recorded extremes for nymphal developmental ranges between 50 and 78 days depending on prevailing temperatures and food availability. Nymphs often cluster on a single seed for feeding (Figure 5). Development of the first generation is primarily on the ground.

Some first-generation adults climb or fly into trees where they mate and lay eggs for the second generation. Because of the ample food supply of fallen fruits and seeds beneath trees, many adult boxelder bugs and red-shouldered bugs remain on the ground to produce the second generation. Second-generation nymphs typically complete their development by the end of September, and adults begin migrating to overwintering sites. Most migration occurs by mid-October when adult boxelder bugs and red-shouldered bugs often crawl on the sides of houses and buildings.

While the life history of these insects seems cut-and-dried, life stages overlap considerably. The wide range of first-generation nymphal instars is caused by the varying times that individual boxelder bugs or red-shouldered bugs migrated in the spring. Late instar first-generation nymphs, progeny of late-spring migrants, can be found next to early instar second-generation nymphs that are the offspring of adults initiated by early spring migrants.

Given the variation in first-generation nymphal development, there is a corresponding wide range in the appearance first-generation adults. For instance, red-shouldered bugs mate from July 1 through August 29, which prolongs egg production for the second generation of red-shouldered bugs, and likely boxelder bugs as well. This explains the large populations of second-generation red-shouldered bug nymphs still active and feeding well into winter. In fact, during mild winters, nymphs are abundant into January after surviving brief cold spells. However, after a series of extremely cold days and nights, even those nymphs succumbed to cold temperatures. This suggests that adults in sites protected from harsh winter elements are more likely to survive.

Outbreaks of boxelder and red-shouldered bugs are associated with a succession of hot and dry years. Hot weather accelerates the development of nymphs, which maximizes numbers of migrating and overwintering adults. Mild winters increase overwintering and the number of adults present to propagate the following season's numbers. Dry years increase numbers because boxelder and red-shouldered bugs drown easily. Many nymphs and adults are found dead on the ground after hard rains. Also, high mortality occurs when nymphs are drowned by water droplets. Dry weather also promotes high boxelder and red-shouldered bug populations by protecting them against naturally occurring fungal pathogens that require high relative humidity to promote high population of the parasitic fungi.

Control

While feeding causes damage to certain fruit commodities, boxelder bugs typically are not considered economically important. Because they cause no noticeable tree damage, attempts to reduce boxelder and red-shouldered bug populations are not aimed at protecting trees but at reducing overall numbers of migrating individuals and keeping them from becoming a nuisance around homes and buildings in the fall.

Biological Control. Little information is available on the effect of natural controls against boxelder and red-shouldered bugs. Based on a study in which field eggs were closely monitored for the emergence of egg parasites, boxelder bugs are exceptionally free from insect parasites. No eggs were blackened (a common indicator of parasites), no parasites emerged, and boxelder bug nymphs hatched. Research showed birds do not catch or eat any of the bugs, but spiders do.

Implemented Control. Although there are a number of ways to combat boxelder and red-shouldered bugs, results are often disappointing. Individuals must determine the amount of time and energy they wish to devote to control efforts. Several tactics might be useful in reducing numbers of boxelder and red-shouldered bugs.

Around Homes and Buildings

Habitat modification. Adult boxelder and red-shouldered bugs seek protected sites where they can survive the winter, so it is important to eliminate potential overwintering sites. Rake leaves and other lawn debris. Remove accumulated leaf litter in and under hedges and bushes. Remove leaves, debris, wood piles, lumber, equipment, trash or anything around homes and buildings that might provide protection for boxelder and red-shouldered bugs.

Exclusion. Locate and seal all cracks and crevices into buildings and homes. Ill-fitting doors and windows should be repaired. Small mesh screens should be placed over louvers and air exchange systems.

Physical removal. Reduce the number of adult boxelder bugs available to propagate the population. In the fall, winter, and spring, small numbers of overwintering adult boxelder and red-shouldered bugs can be handpicked as they appear. When numbers make handpicking impractical, a vacuum cleaner or shop vacuum can gather them up. Be prepared to repeat this process when additional adults arrive in the fall or reemerge before spring migration.

Physical destruction. On outside home and building surfaces, use a hose to direct a forceful stream of water to destroy boxelder and red-shouldered bugs where they rest.

Insecticide applications. Homeowners may use insecticides registered for use as perimeter treatments to reduce numbers of boxelder and red-shouldered bug migrants that congregate around buildings and homes in the spring and fall. Property owners must be vigilant, reapplying fresh insecticide treatments while boxelder and red-shouldered bugs remain active.

Breeding and Feeding Sites

Food source deprivation. Determine the location of the tree host(s) that are accessible. Tree removal is sometimes recommended to eliminate boxelder and red-shouldered bugs. Recall that boxelder bugs can fly distances up to two miles. So, while removing the host tree(s) will eliminate a breeding site, spring migrants will simply move to other nearby trees and back to your home in the fall. Other arguments against tree removal: If a tree is large, an inexperienced homeowner could be injured or killed while attempting to remove it; hiring a professional arborist is costly; and the property owner loses a shade tree or landscape component.

Sanitation will deprive spring migrants and their progeny of their major food source. Clear fallen seeds from areas beneath and near trees. A broom or shop vacuum can be used on hard surfaces such as driveways, sidewalks, patios, decks, parking lots and walking paths. A shop vacuum provides adequate suction to remove most seeds and litter from the ground in grassy areas.

Entrapment. Because some first-generation adults will move to trees to deposit eggs for the second generation, placing sticky bands around tree trunks (Figure 6, page 4) can reduce adult numbers by trapping them as they climb. There are several drawbacks to this method:

- Sticky materials are messy. Bands must be placed high enough to avoid accidental contact by children and pets. Be sure ladders are firm and steady before climbing them to apply the bands.
- Sticky bands are labor intensive. Dirt and debris carried by wind gusts may coat sticky bands and reduce their effectiveness. After goldenrain trees flower, shed flowers stick to and eliminate the effectiveness of the band. Old material must be removed and a fresh band applied. This process may have to be repeated many times.
- Sticky bands vary in their tackiness. When boxelder and red-shouldered bugs are active during cooler times of the day, sticky materials are less tacky. Red-shouldered bugs have been observed walking across the barrier. During second-generation development, the bands intercept only a small number of individuals as they move up and down trees. If enough are trapped, and the bands are filled, trapped individuals serve as a bridge for others to cross. Insect-laden bands must be removed and fresh bands applied.
- Sticky bands can be bypassed. First-generation adults may fly up into trees and never contact the sticky bands.
- Sticky bands are ineffective against the numerous first- generation adults that remain on the ground for mating and egg deposition.

Figure 6. Sticky bands used to trap bugs

Figure 7. Red-shouldered bugs hiding under tree bark

Physical destruction. Apply a powerful stream of water to boxelder and red-shouldered bugs when they mass on tree trunks. Because of their susceptibility to drowning, heavily water lawns beneath trees throughout the season to drown first- and second-generation boxelder and red-shouldered bugs as they feed and develop on fallen seed. Continually moist conditions could promote a buildup of the naturally occurring fungal pathogen Beauvaria bassiana, which may reduce insect populations.

Insecticide applications. Insecticides can be used to reduce the number of boxelder and red-shouldered bugs available for migrations to overwintering near residential sites. Insecticides must be applied to the breeding and feeding sites beneath tree hosts continually from late March through October. Simultaneously, similar applications must be applied to trees in which a portion of boxelder and red-shouldered bug populations also develop. This is an ominous task given the length of the season. Also, many boxelder and red-shouldered bugs may hide beneath ground debris, litter and grass, which shields them from direct contact by insecticide treatments. Even if insects are active, only those directly exposed are affected by insecticides. It is difficult to achieve total insecticide coverage of all exposed boxelder and red-shouldered bugs on all limbs, branches and leaves of large trees. Insects often hide in cracks, crevices, and beneath loose bark, surviving insecticide treatments (Figure 7).

A number of insecticides are registered for use against boxelder bugs. Many products available to the general public contain the same active ingredients. It is not possible to list all products registered for use in Kansas. Nor does every retail outlet stock all products. When purchasing an insecticide, users should refer to the active ingredient listed on the product label to determine its proper use.

Active Ingredients In Insecticidal Products Available At Retail Outlets

Active Ingredient	Tree Treatment	Premise Treatment
carbaryl	X	
cyfluthrin	X	X
endosulfan	X	
lambda-cyhalothrin	X	
malathion	X	
permethrin		X
rotenone/pyrethrin	X	

Companies may include or exclude specific pests and sites. The user is responsible for reading the product label to ensure safe and legal use. Although not registered for use against red-shouldered bugs, the same products registered for use against boxelder bugs may legally be used against red-shouldered bugs if applied in compliance with K.S.A. Number 2-2470 (Allowable pesticide applications by the applicator) and K.A.R. 4-13-28 (Target pests that are not specified on the pestacide's label or labeling).

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MF-2580 June 2005