K-STATE
Research and Extension

Bagworm

Insect Pest of Trees and Shrubs

Bagworm, *Thyridopteryx ephemeraeformis*, is native to North America and is a major insect pest of trees and shrubs in landscapes and gardens. The larva or caterpillar life stage causes damage by feeding on plant foliage (leaves). Bagworms are often associated with conifers such as arborvitae, bald cypress, cedar, fir, juniper, pine, and spruce. However, bagworms also feed on deciduous broadleaf trees and shrubs, including: black locust, crabapple, elm, hackberry, honey locust, linden, maple, oak, poplar, rose, sycamore, and willow.

Biology

Bagworms overwinter as eggs within the female pupal cases located inside the bags. Eggs hatch and the larvae (caterpillars) emerge from the bags in mid-May through early June. However, temperature influences the timing of bagworm emergence, with cooler temperatures delaying egg hatch and bagworm activity. Bagworm larvae emerge from bags over several weeks. When young larvae are about ⅛ to ¼ inches (3 to 6 mm) in length, they produce a fine strand of silk for ballooning (wind dispersal) to nearby host plants. Ballooning is the primary means of dispersal for the young larvae.

After finding a suitable host plant, bagworms settle and begin feeding. While feeding, bagworm larvae construct silken bags (Figure 1) that are covered with fragments of twigs and foliage from the host plant (Figure 2). The larvae remain in the bags with the head and thorax protruding while feeding on plant foliage (Figure 3). As the larvae increase in size, they cause progressively more plant damage. The bags expand to accommodate the growing larvae and allow them to withdraw when disturbed. Bagworm larvae can move among adjacent plants in landscapes and gardens when plant foliage is touching.

Bagworm bags are brown and easy to see in contrast with surrounding foliage. The bags hang from branches like Christmas tree ornaments (Figure 4) and can be mistaken for pine cones or other plant structures. The bags protect larvae from natural enemies such as birds. Bags can be found attached to buildings (Figure 5), garbage containers, and decks.

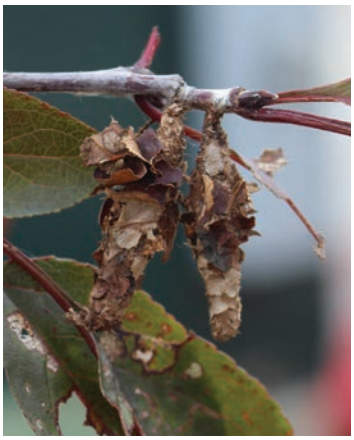

Figure 2. Bags covered with plant fragments (left). Figure 3. Bagworm larva protruding from the bag (right). (Photos: Raymond Cloyd)

Figure 1. Bagworm feeding on plant foliage. (Photo: Raymond Cloyd)

Figure 4. Bagworm bags hanging from a tree branch (left). Figure 5. Bagworm bag attached to a building (right). (Photos: Raymond Cloyd)

Figure 6. Bagworm bags with the tops sealed. (Photo: Raymond Cloyd)

Figure 7. Adult male bagworm. (Photo: University of Florida)

Figure 8. Male bag with brown papery pupal case protruding from the bottom. (Photo: Raymond Cloyd)

From mid-August to early September when bags are about 1 to 2 inches (25 to 50 mm) long, the larvae stop feeding and seal the top of the bags (Figure 6). The larvae then enter the pupae stage.

For the most part, female bags are located at the tops of trees and shrubs, and male bags near the bottom. Females remain in pupal cases within the bags but do not develop into moths. Females do not have wings, legs, antennae, or functional mouthparts. Males transition into black moths with clear wings that are approximately ½ inch (13 mm) long (Figure 7). Males follow the sex pheromone emitted by females, using their feathery antennae to locate the female bags. Male bags have a transparent papery brown pupal case protruding from the bottom (Figure 8). Once the male locates a female bag, he inserts his abdomen into the hole at the bottom of the bag and mates with the female. After mating, the male flies away and dies, and the female remains in the bag. The female lays between 500 and 1,000 eggs, which are retained in the pupal case inside her body. Females eventually die and the eggs inside the bodies of dead females are protected within the bags over the winter. There is one generation per year.

Damage

Bagworm larvae or caterpillars have chewing mouthparts that are used to feed on plant foliage (Figure 9). Feeding damage can affect the aesthetic quality of trees and shrubs (Figures 10 and 11). Bagworm larvae feed for approximately three months. Larvae feed intensively and cause more damage as they increase in size. If not managed, excessive bagworm populations can defoliate trees or shrubs. However, the extent of defoliation depends on plant size and type. Conifers are particularly susceptible to damage from larval feeding because they do not regenerate new growth after the foliage has been consumed. Extensive feeding for several years in succession may result in complete defoliation and can kill well-established trees and shrubs (Figure 12).

Figure 9. Damage caused by the feeding of bagworm larvae on crabapple leaves. (Photo: Raymond Cloyd)

Figure 11. Extensive damage caused by bagworm larvae feeding on juniper. (Photo: Raymond Cloyd)

Figure 10. Damage associated with bagworm larval feeding on a Colorado blue spruce tree. (Photo: Raymond Cloyd)

Figure 12. Arborvitae shrub defoliated and killed by bagworm larvae feeding. (Photo: Raymond Cloyd)

Management

Bagworms can be managed with proper cultural practices and well-timed insecticide applications.

Cultural

For minor bagworm infestations, regular handpicking of bags during the growing season and the winter reduces bagworm populations in subsequent years. The plant canopy should be checked thoroughly for bags of all sizes. Overlooking a single female bag can result in 500 to 1,000 young bagworm larvae the next season. However, handpicking may not be practical when trees are too tall or too many trees are infested. Bags should be removed and placed in a bucket of soapy water solution (1 fl oz/1 gallon of water). Allow the bags to soak for 15 minutes (Figure 13). Then empty the bucket, placing the bags into a pile in a location receiving full sun. Bags should not be placed in garbage containers, compost piles, or left on the ground.

Insecticides

Insecticides should be applied when bagworm larvae are ⅛ to ¼ inches (3 to 6 mm) long (Figure 14). Small larvae are more susceptible to insecticides than larger, older larvae. Starting in late May, apply insecticides once a week for four weeks. Eggs do not all hatch at the same time. Therefore, applications must be repeated to kill larvae emerging from bags over several weeks. To determine if additional insecticide applications are needed, check plants for bags. Repeat applications will be required to kill bagworms that may have dispersed from other areas.

Thorough coverage of plant foliage increases an insecticide's effectiveness in killing bagworms. Insecticides should be applied in the morning or evening when bagworm larvae are most active. Insecticides containing the active ingredients *Bacillus thuringiensis* subsp. *kurstaki* or spinosad are effective against bagworms if applied when larvae are small. Because both of these insecticides are stomach poisons, larvae must consume, or ingest, wet or dry insecticide residues on plant foliage to be affected. Once bagworms reach a length of 1 to 2 inches (25 to 51 mm), they are more difficult to manage with insecticides. As larvae mature, feeding declines, thus reducing pesticide exposure.

Figure 13. Bagworm bags soaking in a solution of soapy water after their removal from an infested tree. (Photo: Raymond Cloyd)

Figure 14. Young bagworm larva feeding on juniper. (Photo: Raymond Cloyd)

Contact your local K-State Research and Extension office for a list of insecticides registered for use against bagworms.

Treatment of windbreaks or long rows of eastern red cedar, *Juniperus virginiana*, can be a challenge because it is difficult to obtain thorough coverage of plant foliage, particularly the upper and inner portions of mature trees. A high-pressure sprayer that delivers a large volume of spray may be necessary for effective treatment.

Biological

Although bagworms have natural enemies such as birds and parasitoids (parasitic wasps), these natural enemies do not kill enough bagworms to affect populations, nor do they prevent or minimize subsequent plant damage.

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