UTAH PESTS fact sheet
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Spotted Lanternfly

[*Lycorma delicatula* (White)]

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Quick Facts

- Spotted lanternfly (SLF) is an invasive planthopper that is native to China. It was first detected in the U.S. in Pennsylvania in 2014, and is not known to occur in Utah.
- SLF attacks more than 70 host plants, including grapes, fruit trees, hops, and hardwood ornamental trees. In China, its preferred host is tree-of-heaven (*Ailanthus altissima*).
- SLF uses a piercing-sucking mouthpart to feed on stems, leaves, and bark. It does not feed directly on fruit.
- Extensive feeding results in weeping wounds. SLF's sugary excrement (honeydew) and sap from oozing wounds can promote the growth of sooty mold, a gray-black fungus, which can impact plant vigor and crop yield.
- SLF can congregate in large numbers in and around homes and structures.
- SLF can spread to new areas by the unintentional movement of egg masses on infested plant material and outdoor items.
- At this time, there is limited information on control practices since SLF is a relatively new pest to the U.S.

Figure 1. Spotted lanternfly (SLF) adult.

Figure 2. SLF adults crawling along a tree trunk (left); SLF adult at rest (right).

Spotted lanternfly (SLF) (Order Hemiptera, Family Fulgoridae) (Figs. 1 and 2) is a new invasive planthopper to North America. It is native to northern China and has spread to other parts of Asia, including Vietnam, Japan, and South Korea, where it is causing considerable damage to grape (Shin et al. 2010; Lee et al. 2011). SLF was first detected in the U.S. in Pennsylvania in 2014. As of October 2018, it has also been reported in Delaware, New York, Virginia, New Jersey, Connecticut, and Maryland. SLF is not known to occur in Utah. If you suspect SLF in Utah, contact the Utah Plant Pest Diagnostic Lab. SLF is a quarantine pest and can restrict interstate movement of regulated articles (e.g., fruit, lumber, and firewood). Be certain you are not moving any life stage of SLF when traveling within or out of quarantine zones.

DESCRIPTION

Adult SLF are about 1 inch (2.54 cm) long and ½ inch (1.27 cm) wide when at rest. Females are slightly larger than males. The head is black with a piercing-sucking mouthpart. The forewing (visible outer wing when resting) is gray with black spots; the wing tips have closely spaced reticulated black blocks outlined in gray (Fig. 1). The hind wings, which are visible during flight, have striking red, black, and white patches. Legs are black, and the abdomen is yellow with broad black bands on the top and bottom surfaces.

Females lay 1-2 egg masses; each mass contains 30 to 50 eggs and is covered by a waxy substance roughly 1 inch (2.54 cm) long. Newly laid egg masses are white in color but turn brownish-gray and mud-like as they age (Fig. 3). Beneath the cover, the eggs are seed-like and deposited in 4-7 parallel rows (Fig. 3). Eggs are laid on any smooth surface that is at least 1 inch (2.54 cm) wide, including tree bark, landscaping stones, outdoor furniture, vehicles, railway cars, telephone poles and fence posts (Simisky 2018) (Fig. 4).

Nymphs (immature life stage) undergo 4 instars (Fig. 5). The first 3 instars are black with white spots. The 4th instar develops red patches in addition to the white and black coloration. Fully-winged adults develop after the 4th instar. Note that the boxelder bug (*Boisea trivettata*) and small milkweed bug (*Lygaeus kalmii*) have a similar appearance to the 4th instar SLF (Fig. 6).

Figure 3. Female SLF adult with a newly laid egg mass (left); beneath the mud-like covering, seed-like eggs are laid in parallel rows (center); hatched SLF eggs with emergence holes (right).

Figure 4. SLF lay eggs on a wide variety of surfaces that include both natural and manmade surfaces, such as fence posts (left) and rusty barrels (right).

Figure 5. Nymphs undergo 4 instars (molts). The first 3 instars are black with white spots (left); the 4th instar is black and white with red patches (right).

Figure 6. Boxelder bug (left, in various life stages) and small milkweed bug (right) are potential SLF lookalikes that commonly occur in Utah.

PLANT HOSTS

SLF are broad generalists that feed on more than 70 plant species including grape, fruit trees (apple, peach, cherry, apricot, and plum), and hardwood/ornamental trees (e.g., maple, willow, birch, ash, walnut, poplar, sycamore, aspen, oak, linden, pine, lilac, serviceberry, and dogwood) (Dara et al. 2015). Adult SLF show a strong host preference for tree-of-heaven (*Ailanthus altissima*), an invasive plant from China that is widely established in the U.S.

DAMAGE SYMPTOMS

SLF uses a piercing-sucking mouthpart to suck sap from stems, leaves, and bark on branches and trunks. It does not feed directly on fruit. Branches highly infested with SLF (Fig. 7) may lose vigor, wilt, and die. Extensive feeding by SLF results in weeping wounds that will leave a trail of sap along the bark (Fig. 8). As it feeds, SLF secretes large amounts of sugary excrement (called honeydew) that, along with sap from oozing wounds, can promote the growth of fungi such as sooty mold (Fig. 8). Sooty mold (a gray and black fungus) develops around the base of trees and branch crotches; it can coat leaf surfaces, interfere with photosynthesis, and negatively affect plant growth and crop yield. Heavy infestations of SLF can cause a buildup of honeydew on adjacent plants in the understory, and affected plants may emit a fermented odor when SLF is present. SLF is considered a nuisance pest, as it can congregate in large numbers in and around homes and structures (Han et al. 2008) (Fig. 9), and the honeydew can attract unwanted insects such as ants and wasps, and coat items underneath the affected tree(s) (e.g., porches and vehicles) with the sticky residue.

Figure 7. Apple (left) and grape (right) highly infested with adult SLF.

Figure 8. SLF feeding can result in weeping wounds and sooty mold growth (gray and black fungus on lower tree trunk).

Figure 9. SLF can congregate in large numbers and be a nuisance pest.

LIFE HISTORY

SLF has one generation per year, and overwinters as eggs. Eggs are capable of surviving temperatures of around 12 °F (-11 °C) (Lee et al. 2014), and hatch from late April to early summer. Nymphs then begin crawling and feeding on a wide range of host plants. Nymphs, especially younger nymphs, engage in a cyclic behavior in which they repeatedly ascend and then fall from the tree after being disturbed by wind or other physical forces (Kim et al. 2011). This behavior may be due to less developed tarsal adhesive pads, which allow them to hold onto surfaces more firmly, or as a means of host selection and dispersal (Kim et al. 2011; Dara 2014). Adults are present by mid-summer (mid to late July) and appear to feed on only a few hosts, including tree-of-heaven. Since females are not reproductively mature at emergence, they must feed before mating. Eggs are laid from September to the onset of winter (late November to early December). Each female can produce 1 to 2 egg masses (30-100 total eggs). Adults die with a hard frost.

MONITORING

SLF can be monitored with visual inspection. Nymphs and adults gather in large numbers on host plants and are easy to find at dusk or night when they move up and down tree trunks. During the day, they tend to congregate in the canopy or at the base of the host plant if there is adequate cover. Begin monitoring for nymphs toward late April or early May, and then continue monitoring for adults through the summer and fall. In addition, keep an eye out for the mud-like egg cases on any smooth surface from September through April.

Sticky tree bands are another useful monitoring tool. Sticky bands should be placed about 4 feet above the base of host trees, with the sticky portion of the band facing outward (Fig. 10). Push pins can be used to help secure the band to the tree. Bands should be checked and replaced every 2 weeks. Research shows that brown sticky traps are more attractive to nymphs and adults than blue or yellow sticky traps (Choi et al. 2012), and current field trials are assessing the combined efficacy of brown sticky bands and a methyl salicylate lure. Further, some research has examined the use of attractants and repellents for monitoring (and control) purposes. Possible attractants include spearmint oil and a methanol extract; possible repellents include lavender oil (Choi et al. 2012; Dara et al. 2015).

Figure 10. Place brown sticky bands around trees to monitor for SLF.

MANAGEMENT

SLF has NOT been detected in Utah, so there is no current need for control of this insect. The management options listed below are provided should this pest be detected in Utah in the future. If you suspect SLF in Utah, contact the Utah Plant Pest Diagnostic Lab.

Non-Chemical Control

Egg Mass Scraping: Egg cases can be scraped off a substrate by using a credit card, putty knife, or similar tool. Using a downward motion, scrape the egg mass into a vial containing rubbing alcohol or hand sanitizer and tightly seal (Fig. 11).

Host Plant Reduction/Removal: Consider removing the invasive tree-of-heaven (*Ailanthus altissima*) if it is present on your property. Tree-of-heaven is the preferred host of SLF, but it is not as common in Utah as it is in the eastern U.S. In Pennsylvania, it is recommended to remove female tree-of-heaven, while leaving a few male "trap" trees for targeted insecticide sprays. Male trap trees are preferred over female trees because females produce seeds which can repopulate the property. Further, an herbicide application may need to accompany tree-of-heaven removal, as small pieces of remaining root can generate new shoots. For more information about managing tree-of-heaven, refer to USDA Forest Service Field Guide for Managing Tree-of-Heaven in the Southwest.

Biological Control: At this time, the extent to which natural enemies will control SLF is unknown. In Pennsylvania, natural enemies of other planthoppers do not appear to play a role in controlling SLF, and relatively few parasitoids are known to parasitize nymphs in the lanternfly family. In China and South Korea, however, native parasitic wasps have been shown to be important biocontrol agents for eggs and nymphs, but these species are not currently found in North America. In China, adults prefer feeding on tree-of-heaven, which contains cytotoxic alkaloids that makes them

unpalatable to predators. The vivid red, black, and white coloration of nymphs and adults may serve as an indicator of their toxicity to potential predators. Adults will startle and scare predators by flashing their hindwings.

Figure 11. Scrape SLF egg masses into a container filled with rubbing alcohol or hand sanitizer and tightly seal.

Chemical Control

Research has shown that SLF nymphs and adults are susceptible to insecticides (Park et al. 2009; Shin et al. 2010); however, nearby SLF populations can repopulate treated areas (Kim et al. 2011). Insecticides that appear to be effective against SLF nymphs and adults and those that are currently registered in Utah are listed in Table 1. Not all products are labeled for all uses; therefore, be sure to consult the label for crop types and usage rates. Rotate among insecticide classes/modes of action (MoA) to reduce the development of resistance. Choose the least toxic insecticide possible, and do not apply insecticides while pollinators are active.

Table 1. Examples of insecticides that have shown to be effective against SLF. Insecticides are sorted by modes of action (MoA).

Active Ingredient	Example Brand Name	MoA*
Commercial Use		
carbaryl	Sevin	1A
malathion	Malathion	1B
zeta-cypermethrin	Mustang Maxx[R]	3A
acetamiprid	Assail	4A
dinotefuran	Safari	4A
imidacloprid	Admire Pro	4A
thiamethoxam	Actara	4A
spinosad	Entrust[O]	5
indoxacarb	Avaunt	22A
Home Use		
acetamiprid	Ortho Bug-B-Gon Systemic Insect Killer Concentrate; Ortho Flower, Fruit & Vegetable Insect Killer Concentrate	4A
spinosad	Bonide Captain Jack's Deadbug Brew; Ferti-Lome Borer Bagworm Leafminer & Tent Caterpiller Spray; Monterey Garden Insect Spray[O]; Protector Pro[O]; Spinosad 0.5% SC	5
azadirachtin (neem oil)	Molt-X	other

* Insecticide mode of action (MoA) classification number based on guidelines from the Insecticide Resistance Action Committee: 1A = carbamates, 1B = organophosphates, 3A = pyrethroids and pyrethrins, 4A = neonicotinoids, 5 = spinosyns, and 22A = oxadiazines.

[O] Organically certified insecticide products; approved by OMRI (Organic Materials Review Institute).

[R] Restricted use products that require an applicator license.

Note: All brand names are registered trademarks. Examples of brands may not be all-inclusive, but are meant to provide examples of insecticides registered on fruit in Utah. The availability of insecticides and active ingredients in brands can change. Always check the label for active ingredient(s), registered uses, application and safety information, and protection and pre-harvest intervals.

REFERENCES AND FURTHER READING

Biddinger, D., and H. Leach. 2018. Updated insecticide recommendations for spotted lanternfly on grape. Pennsylvania State Univ. Extension.

Choi, D.S., D.I. Kim, S.J. Ko, B.R. Kang, J.D. Park, S.G. Kim, and K.J. Choi. 2012. Environmentally-friendly control methods and forecasting the hatching time *Lycorma delicatula* (Hemiptera: Fulgoridae) in Jeonnam Province. Korea J. Appl. Entomol. 51: 371-376.

Dara, S.K. 2014. Spotted lanternfly (*Lycorma delicatula*) is a new invasive pest in the United States. Agriculture and Natural Resources, Univ. of California (UCANR).

Dara, S.K., L. Barringer, and S.P. Arthurs. 2015. *Lycorma delicatula* (Hemiptera: Fulgoridae): a new invasive pest in the U.S. J. Integr. Pest Manag. 6: 20.

Guédot, C. 2016. Spotted lanternfly. Univ. of Wisconsin Extension.

Han, J.M., H.J. Kim, E.J. Lim, S.H. Lee, Y.J. Kwon, and S.W. Cho. 2008. *Lycorma delicatula* (Hemiptera: Auchenorrhyncha: Fulgoridae: Aphaeninae) finally, but suddenly arrived in Korea. Entomol. Res. 38: 281-286.

Kim, J. G., E. –H. Lee, Y. –M. Seo, and N. –Y. Kim. 2011. Cyclic behavior of *Lycorma delicatula* (Insecta: Hemiptera: Fulgoridae) on host plants. J. Insect Behav. 24: 423-435.

Krawczyk, G., D. Biddinger, and H.L. Leach. 2018. Spotted lanternfly management for homeowners. Pennsylvania State Univ. Extension.

Lee, J.S., I.K. Kim, S.H. Koh, S.J. Cho, S.J. Jang, S.H. Pyo, and W.I. Choi. 2011. Impact of minimum winter temperature on *Lycorma delicatula* (Hemiptera:

Fulgoridae) egg mortality. J. Asia Pac. Entomol. 14: 123-125.

Moylett, H., and T. Molet. 2018. CPHST pest datasheet for *Lycorma delicatula.* USDA-APHIS-PPQ-CPHST.

Park, J.D., M.Y. Kim, S.G. Lee, S.C. Shin, J. Kim, and I.K. Park. 2009. Biological characteristics of *Lycorma delicatula* and the control effects of some insecticides. Korean J. Appl. Entomol. 48(1): 53-57.

Pennsylvania Department of Agriculture. 2017. Guidelines for the control of spotted lanternfly. Pennsylvania Dept. of Agriculture.

Shin, Y.-H., S.-R. Moon, C.-M. Yoon, K.-S. Ahn, and G.-H. Kim. 2010. Insecticidal activity of 26 insecticides against eggs and nymphs of *Lycorma delicatula* (Hemiptera: Fulgoridae). Korean J. Pest. Sci., 14: 157-163.

Simisky, T. 2018. Spotted lanternfly. Univ. of Massachusetts at Amherst Extension.

Swackhamer, E. 2018. Spotted lanternfly management: placing sticky bands on trees. Pennsylvania State Univ. Extension.

Swackhamer, E., D. Jackson, and A. Gover. Spotted Lanternfly IPM Management Calendar. Pennsylvania State Univ. Extension.

Yoon, C., S.R. Moon, J.W. Jeong, Y.H. Shin, S.R. Cho, K.S. Ahn, J.O. Yang, and G.H. Kim. 2001. Repellency of lavender oil and linalool against spot clothing wax cicada, *Lycorma delicatula* (Hemiptera: Fulgoridae) and their electrophysiological responses. J. Asia Pac. Entomol. 14: 411-416.

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