Lygus bugs on potatoes in the Pacific Northwest

Josephine Antwi[1], Silvia I. Rondon[2], and Rodney Cooper[3]

Lygus bugs feed on a wide range of cultivated crops. In the U.S. Pacific Northwest (PNW), lygus bugs are pests of economically important crops including small fruits (e.g., strawberry), tree crops (e.g., apple, peach, nectarine, and pear), legume and hay for seed (e.g., alfalfa, clover seed, and canola), and vegetables (e.g., carrots and radish). Although rarely a pest on potatoes in the past, lygus bugs' current abundance and distribution are causing alarm to potato growers in the PNW. Numerous reports have been received from growers in Oregon and Washington, particularly those in the lower Columbia Basin. In addition to causing direct feeding damage, lygus bugs may carry or vector pathogens. Thus, it is important to understand the impact lygus bugs have on potatoes to fully understand the implications for potato production in the PNW.

Figure 1. Lygus bug feeding on a potato leaf. Insert: Lygus bugs are characterized by a conspicuous heart shape on their backs.
Photos: J. Antwi, OSU Irrigated Agricultural Entomology Program.

Identifying lygus bugs

Lygus bugs are Hemipteran insects with characteristic piercing-sucking mouthparts. Adults are about ¼ inch (6 mm) long, half as wide, somewhat hunchbacked, flat on the abdomen, and oval in shape (Figure 1). Lygus bugs are recognized by a conspicuous heart shape on the upper center of the back known as the scutellum (see insert in Figure 1). Immature lygus bugs look somewhat similar to adults, except immatures are smaller, do not have wings, and do not reproduce. Newly hatched lygus resemble aphids, but they can be distinguished from aphids by their lack of cornicles (Figure 2, page 2).

Females are slightly larger than males and lay light cream-colored, ½₅-inch (1 mm) long, oval-shaped eggs in potato plants. Lygus bug eggs are difficult to see with the naked eye when they are laid in stems or midribs of leaves, because females insert the eggs entirely into the plant tissues, exposing only each egg's flat cap cover (arrow in Figure 3, page 2). When eggs are laid in leaves, they are easier to spot (Figure 3). In both instances, you will need hand lenses to make proper identification. Immature lygus bugs, usually pale green, hatch out after about 7 days and then undergo five stages of development before reaching the adult stage.

[1]Entomology Postdoctoral Scholar, Hermiston Agricultural Research and Extension Center, Crop and Soil Sciences, Oregon State University; [2]Extension Entomologist and Professor, Hermiston Agricultural Research and Extension Center, Oregon State University; [3]USDA-ARS, Yakima Agricultural Research Laboratory, Wapato, Washington

Oregon State University

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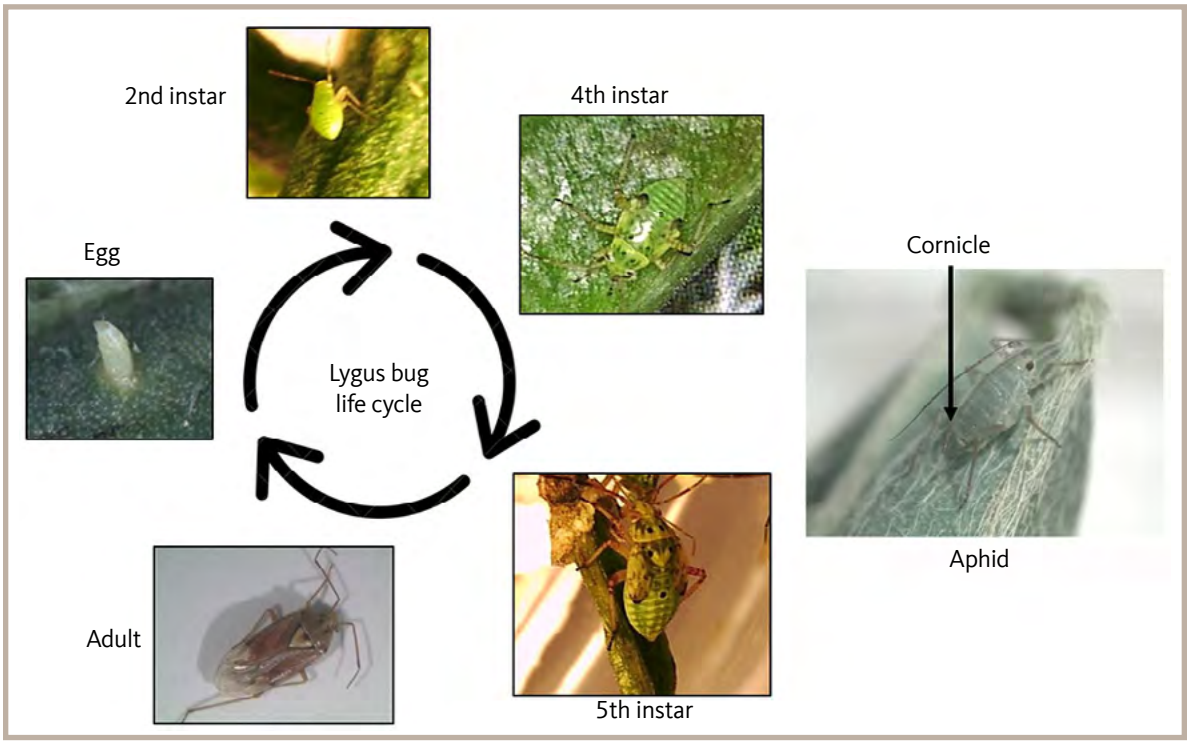

Figure 2. Life cycle of lygus bugs. Immatures resemble aphids, except immature lygus lack the cornicles found on the abdomen of aphids.
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Composition of lygus bugs in potato fields in the PNW

Since 2015, the Irrigated Agricultural Entomology Program (IAEP) at the Hermiston Agricultural Research and Extension Center (HAREC) has been conducting an area-wide lygus bug survey in commercial potato fields in the lower Columbia Basin. Two main Lygus species have been identified (based on morphological features): *Lygus hesperus* (Knight) (western tarnished plant bug) and *Lygus elisus* (Van Duzee) (pale legume bug). Both seem to be common lygus bug species in the western U.S. *Lygus lineolaris* (Palisot de Beauvois) (tarnished plant bug) is commonly found in the eastern U.S., where it is a common pest on a wide range of crops including cotton, strawberry, and alfalfa.

Figure 3. Lygus bug egg inserted into a potato leaf. A flat cap covers the egg.
Photo: J. Antwi, OSU Irrigated Agricultural Entomology Program, © Oregon State University.

Lygus bug damage on potatoes

Both adult and immature lygus bugs feed on plants by inserting their piercing-sucking stylets into leaves and stems of host plants. Lygus bugs feed using "lacerate or macerate and flush feeding," which allows them to ingest high volumes of food. They digest their food extraorally (outside of the mouth) by secreting enzymes through their saliva that produce a liquefied "plant soup" before ingestion.

In potatoes, tissues at the site of lygus bug feeding do not grow normally. Feeding usually results in leaf flagging (leaves shrivel and turn brown or die and eventually fall off) (Figure 4a, page 3). Abnormal tissue growth through lygus bug feeding also results in leaf deformation (Figure 4b, page 3). Feeding injury often appears as brown lesions or dead tissue on stems, leaf petioles, and midribs (Figure 4c, page 3),

and sometimes plant sap oozes from the point of feeding (Figure 4d). Lygus bugs prefer to feed on the upper foliage of potatoes, leaving much of their damage on terminal leaves.

Lygus bugs as potential vectors of potato pathogens

The extent to which lygus bug feeding damage affects potato tuber yield is still unknown. But there are concerns that lygus bugs could transmit potato pathogens, specifically the beet leafhopper-transmitted virescence agent (BLTVA)—the causal agent of potato purple top disease (Figure 5, page 4). The pathogen is thought to be transmitted to potatoes primarily by the beet leafhopper (BLH), *Circulifer tenellus* Baker (Figure 5). However, lygus bugs have been observed in association with potato plants expressing purple top symptoms, and some growers have a firm belief that lygus vectors this pathogen.

Through molecular analysis, we have confirmed the presence of BLTVA in lygus bugs collected from commercial potato fields in Oregon's Columbia Basin. In 2015 and 2016, the highest frequency of BLTVA infection in lygus occurred mid-season (i.e., June–July) compared to infection in May or August. Thus, preliminary results prove that lygus bugs can carry the pathogen, but the efficiency of transmission, if it occurs, is unknown. Further experiments are underway to test the potential for lygus bugs to transmit the pathogen to potatoes.

Monitoring lygus bugs

There are different techniques available for sampling lygus bugs, including sticky cards, insect nets, and vacuums. Based on our experiments, the inverted leaf blower (a.k.a. DVAC) is the most effective sampling tool (Figure 6, page 4). The inverted leaf blower serves as a vacuum where the open end is covered with a nylon mesh that works as a trapping bag for insects and prevents them from clogging the vacuum system. Currently, we recommend using the vacuum for 5 minutes, 5 to 10 feet from field borders.

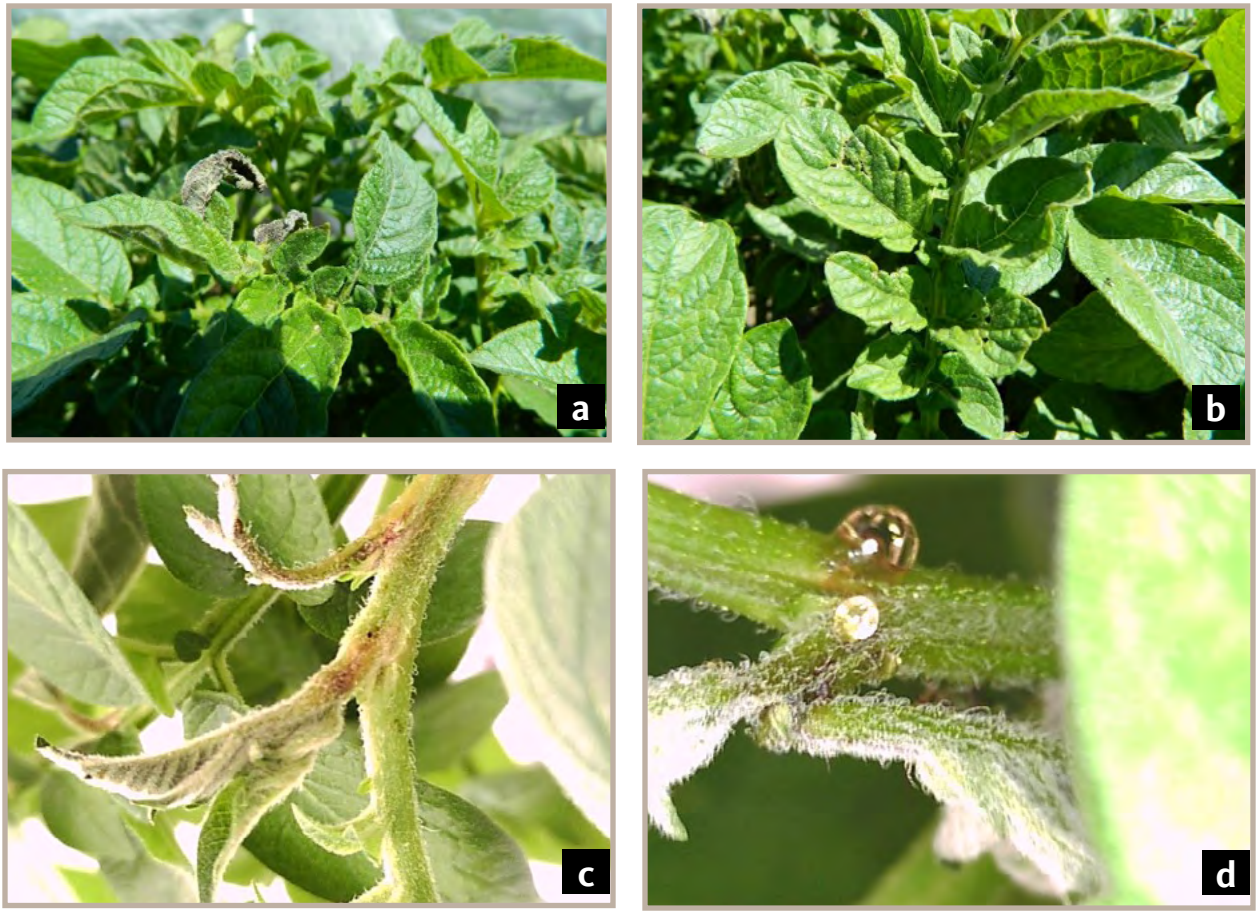

Figure 4. Damage on potato caused by lygus bug feeding: (a) flagging of leaves, (b) leaf deformation, (c) brown lesions at feeding site, (d) plant sap oozing from feeding sites
Photos: J. Antwi, OSU Irrigated Agricultural Entomology Program, © Oregon State University.

At this time, there is no economic threshold for lygus bugs on potatoes in the PNW.[1] Even so, it is very important to monitor lygus bugs in the field to avoid any potential yield losses due to excessive feeding damage. Lygus bugs are abundant on potatoes throughout the growing season from as early as vegetative growth stage, when the visible portion of the plant emerges and develops, to vine kill, when vines start yellowing and leaves fall. Our 2015 and 2016 area-wide lygus survey yielded high numbers of lygus from June to August, with population peaks in July.

Thorough scouting in the early stages of potato development is important. This will allow for early detection and management of lygus bugs in order to avoid population outbreaks and severe damage, especially on young plants.

Figure 5. (a) Potato symptomatic for purple top disease. (b) Beet leafhopper (*Circulifer tenellus*) is the primary vector of the pathogen that causes purple top disease.
Photo 5a: S.I. Rondon, © Oregon State University. Photo 5b: G. Oldfield (USDA, Bugwood.org).

Managing lygus bugs on potatoes and alfalfa

Monitoring lygus populations on surrounding alfalfa crops has been suggested, because preliminary results indicate that as alfalfa is harvested, lygus bugs migrate to nearby potato fields. In alfalfa, lygus bug populations can build up to high numbers. As many as 100 lygus bug adults and 500 nymphs per 100 square feet have been reported in mature alfalfa stands. Thus, if feasible, proper management of alfalfa should be practiced to reduce lygus movement into potato fields. Potato growers are encouraged to time scouting and management of lygus bugs to coincide with alfalfa cuts.

Border crops of alfalfa have proven successful in controlling lygus bug populations in cotton fields in the southeastern and southwestern U.S. Besides serving as a trap crop for lygus bugs, alfalfa fields also function as a refuge for beneficial insect predators (Figure 7, page 5) and parasitoids. If left uncut, alfalfa strips can support beneficial insect populations that

Figure 6. An inverted leaf blower or DVAC for collecting insects. The open end is covered with a mesh secured with a rubber band. It works as a vacuum by sucking up and trapping insects in the mesh.
Photo: S.I. Rondon, © Oregon State University.

[1] In Ontario, Canada, where *L. lineolaris* is prevalent on potatoes, 25 adults per 25 sweeps over crop foliage seems to be the established threshold. This threshold may be different from the one needed in the PNW.

will move into potato fields to suppress lygus bugs and other pests on potatoes. Quinoa (*Chenopodium quinoa* Willd.) also supports large populations of Lygus (Figure 8).

In potatoes, chemical products such as Vydate Cl-V or permethrin kept immatures and adults at low levels.

Where do we go from here?

The escalating numbers of lygus bugs on PNW potato fields in recent years suggest that these insects are emerging pests of potato. Damage caused by lygus bug feeding may be serious, and there are efforts underway to determine the consequences of any such damage on potato yield. We also know that lygus bugs carry the potato pathogen BLTVA, but the efficiency and rate of transmission, if transmission occurs, are still unknown. For these reasons, there is an urgent need for more research to identify effective pest management programs for the insect.

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Figure 7. An insect predator (reduviid bug) feeding on an adult lygus bug in a potato plot surrounded by alfalfa strips.
Photo: J. Antwi, OSU Irrigated Agricultural Entomology Program, © Oregon State University.

Figure 8. *Chenopodium quinoa*, another host of Lygus.
Photo: S.I. Rondon, © Oregon State University.

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