

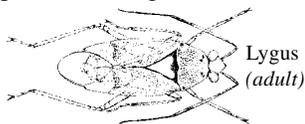
Lygus in Cotton: Identification, Biology & Management

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The first insects of concern in Arizona cotton each year are *Lygus* bugs. *Lygus* management has become even more important in Arizona cotton in the last few years due to a series of factors including widespread availability of insect growth regulators (IGRs) for whitefly control, transgenic Bt cotton for lepidopteran control, and the substantial increase in alfalfa acreage. In particular, the availability of pest-specific pesticides (i.e. IGRs, Bt cotton) has resulted in a significant reduction in the number of applications of insecticides with activity against *Lygus*. This reduction in use has effectively opened a window during which *Lygus* can cause damage. An understanding of the biology and seasonal cycle of *Lygus* bugs coupled with cautious management is necessary to minimize reduction in yields caused by *Lygus* feeding while avoiding the release of other pests including whiteflies from natural control.

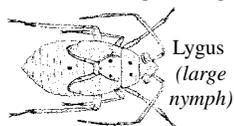
Identification



Lygus
(adult)

Lygus bugs belong to the family Miridae or plant bugs. Like other members of the order Hemiptera or true bugs, *Lygus* have front wings that are thick and leathery adjacent to the body and membranous at the ends. These bugs have sucking mouthparts with which they pierce and consume plant tissue. *Lygus* bugs found in Arizona cotton are actually a complex of three different species, *L. hesperus* Knight, *L. elisus* Van Duzee, and *L. lineolaris* (Palisot de Beauvois). Relative abundance of these species varies from place to place and over the year, but *L. hesperus* is the species most commonly found on cotton in Arizona. The three species appear similar to each other, and adults are green to brown in color with a prominent lighter colored triangle or “valentine” in the center of the back. It is normally not necessary to distinguish between these species in making management decisions.

Biology



Lygus
(large
nymph)

Lygus eggs are laid within plant tissue so that only the oval-shaped cap is visible. In cotton, most of the eggs are laid in the petioles, particularly where they join the leaf blades. These eggs are hard to locate, even with the use of a hand lens. Active, green nymphs hatch from the eggs. Red coloration on the tips of the antennae help to distinguish early instar *Lygus* from similarly appearing aphids. Older nymphs may be recognized by distinct wing pads and by the five black dots on their back, two on the first and second segments of the thorax and one in the center of the abdomen. The *Lygus* nymph completes five instars before becoming a

winged adult. These highly mobile adults do most of their flying 1 hour before sunrise and 1 hour after sunset and live for up to 30 days. Adult *Lygus* go through a short non-reproductive period before mating and laying eggs. Development time of each stage varies with temperature but, during the summer in Arizona, is about 7 days for eggs, 7 days for small nymphs (instars 1–3), and 7 days for large nymphs (instars 4 and 5).

Several natural enemies prey on *Lygus*. Predators that feed on *Lygus* eggs and nymphs include bigeyed bugs, damsel bugs, *Collops* beetles, and lacewings. In addition, the parasitic wasp, *Anaphes iole* feeds on *Lygus* eggs in a variety of plants throughout Arizona and another parasitic wasp, *Leiophron uniformis*, attacks *Lygus* nymphs in the Yuma area. These natural enemies may help keep *Lygus* numbers in check on alfalfa and other plants, but are seldom abundant enough to control *Lygus* bugs migrating into cotton.

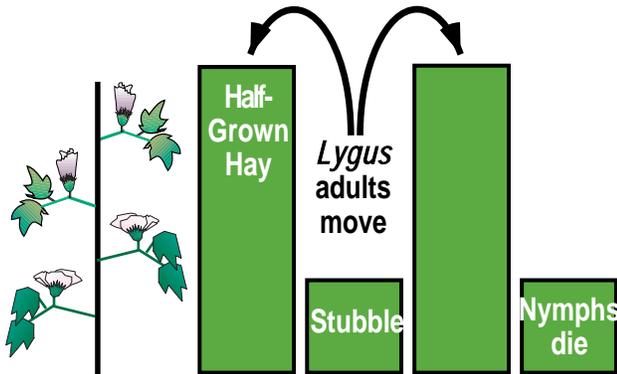
Seasonal Cycle

Lygus feed on and oviposit into a wide variety of plants including over 100 species in 24 families. Alfalfa is a preferred plant and, in Arizona, *Lygus* may be found on alfalfa year round. Populations in alfalfa typically are lowest between December and February and peak in June and July. Alfalfa and safflower are crop hosts on which *Lygus* numbers commonly increase in the spring and early summer. In the winter and early spring, *Lygus* are also found on weeds. London rocket, pigweed, globe mallow and nettleleaf goosefoot are common weeds in Arizona which are important in the overwintering and development of the first generation of *Lygus*. Early in the summer, *Lygus* begin to move into cotton when alfalfa fields are cut, safflower begins to mature, or weed hosts senesce.

Control in Other Crops

The need to control *Lygus* in cotton may be alleviated by managing these pests in other crops before they migrate to cotton. Safflower produces large numbers of *Lygus* that move into alfalfa and/or cotton as the safflower matures. Properly timed, an application of insecticide can greatly reduce this source of *Lygus*. To determine the proper time of application, the safflower must be observed or sampled regularly. The insecticide should be applied when a majority of young *Lygus* (nymphs) are in the late stages of development. Although the time will vary because of weather conditions and plant development, it is most likely to occur in late May or early June.

Alfalfa also produces large numbers of *Lygus*. Because of the maturity and regrowth pattern of the crop, it is possible to adjust harvesting procedures to provide a continuous availability of the host and greatly reduce *Lygus* migration into cotton. To accomplish this, alfalfa fields can be strip-cut or block-cut at 2 week intervals to accommodate migration within the crop. *Lygus* prefer alfalfa to cotton, and research has clearly shown they will stay in the alfalfa when it is cut on an alternating basis. Strip-cutting is preferred to block-cutting; either method is better than solid-cutting.



Alternate cuttings of alfalfa, a major host for *Lygus* bugs, results in stubble where nymphs die and half-grown hay to where adult *Lygus* move. This prevents *Lygus* movement into nearby squaring cotton.

Control in Cotton

Be careful! Begin control of *Lygus* only when economic damage is occurring. Most insecticides used for *Lygus* control will destroy beneficial insects which help keep whiteflies and other pests in check. Further, most insecticides fail to reduce adult numbers significantly, and populations comprised of mainly adults often fluctuate drastically especially as host availability changes locally.

Cotton fields should be sampled at regular intervals. To establish the level of *Lygus* damage, examine 25 half-grown squares from each of four areas in an average-sized field. In making counts, select squares which appear normal and examine them thoroughly by parting the bracts and looking for signs of feeding. Evidence of damaged squares includes obvious external puncture marks and yellowish exudate, but only count those with internal discoloration. Square shed due to *Lygus* damage can be identified by their brown, shriveled anthers. In contrast, squares shed due to physiological stress just dry up showing no evidence of physical damage. Thrips damage is accompanied by soft rot while bollworm damaged squares often have signs of chewing and a distinct entry hole, usually at the base of the square.

Lygus nymphs may be more damaging than adults, because nymphs may inflict more injury over their total life-span than adults. The amount of damage caused by nymphs varies with nymphal stage. First and second instar nymphs cause negligible damage while fifth instar nymphs may cause

greater shedding of squares than third and fourth instars. Severity of damage by adults may differ with gender. Damage by females has been observed to result in the shedding of about twice as many squares as damage by males.

Sweep net samples should be taken to supplement the square damage survey. Take samples of 25 sweeps from each of four sites within the field. Count adults and nymphs separately because abundance of nymphs helps in determining whether the *Lygus* are primarily migrating adults or are established, reproducing infestations.

In deciding whether or not to control, the number of *Lygus* and percent damage should be considered in relation to the amount of fruit available and the yield potential of the field. Generally, treatment is required when 25% of the squares are damaged and/or 15–20 total *Lygus* (nymphs and adults) are present per 100 sweeps and *Lygus* nymphs are present. It is not uncommon to sample fields with 30 to 50 adults per 100 net sweeps during June and early July but find damage below the 25% level. These fields should not be treated unless later samples prove a 25% damage level with associated presence of nymphs. An economic return is most likely if these threshold levels are observed and about 1/3 of the total count are nymphs.

Because of extreme difficulties associated with controlling the sweetpotato whitefly it is most important to avoid unnecessary *Lygus* treatments in June and July which would destroy beneficial insects and permit a whitefly outbreak.

Summary

Several pest management practices can be used to reduce the *Lygus* problem in cotton and to avoid problems with other insects such as whiteflies that often occur after *Lygus* treatments. The following practices are suggested:

1. Treat all safflower with a single insecticide application when a majority of *Lygus* nymphs are in late stages of development (usually in late May or early June).
2. Strip-cut or block-cut alfalfa at alternating intervals to prevent migration into cotton.
3. Sample all cotton fields regularly; record percentage of square damage and numbers of adults and nymphs.
4. Treat fields for *Lygus* ONLY when 1) square damage reaches 25% with associated presence of nymphs and/or 2) 15–20 total *Lygus* per 100 sweeps are present and some of these *Lygus* are nymphs (usually about one-third of total).

Jon Diehl, Research Specialist
 Peter Ellsworth, IPM Specialist
 Leon Moore, Professor Emeritus
 Department of Entomology, University of Arizona

