

## BIOLOGY, ECOLOGY, AND HOST PLANTS OF *LYGUS LINEOLARIS* AND *LYGUS HESPERUS*

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### Abstract

*Lygus sp.* is a key pest throughout the cotton belt, attacking fruiting buds prior to flower. While the severity of the problem is dictated by seasonal conditions, these insects are present every year. A review of the literature indicates that *L. lineolaris* and *L. hesperus* are similar in their habitats and ecological niche. Regional differences are key in determining the degree of severity which they cause a cotton crop.

### Background

*Lygus lineolaris* and *L. hesperus* attack the growing tip and young buds of many plants. In addition to cotton, it is a pest in strawberries, tree fruit, seed crops, and edible beans. Since 1979, *Lygus* has been the second or third most destructive cotton insect pest in 9 of 18 years reported (Williams, 1997a). While *L. lineolaris* is reported to be the most widely distributed species in North America, in the San Joaquin Valley *L. hesperus* is the key pest in cotton. The amount of yield loss attributable to *Lygus* varies between regions and years (Table 1). For the cotton belt in 1996, yield losses due to *Lygus sp.* ranged between no loss to 4.65% of the crop (Williams, 1997b). This pest is capable of causing severe loss such as those occurring in 1978 in the San Joaquin Valley. Leigh *et al* (1996) provide a general review of *Lygus* biology and ecology.

### Biology and Life Cycle

*Lygus* overwinter as adults and move from ground cover protection to a variety of host plants in spring. In alfalfa, five to seven generations per year will occur but only three can develop in cotton (Leigh *et al*, 1996). The number of generations occurring in spring on non-crop hosts is determined by the amount of heat available for development. Developmental thresholds for *L. hesperus* range from 46.4° (Champlain and Butler, 1967) to 53.6° (Cave and Gutierrez, 1983) and about 50° F is reported for *L. lineolaris* (Fleischer and Gaylor, 1988). As day length decreases to less than 9 hours, premature *L. hesperus* adults enter into an arrested development or sexual diapause (Beards and Strong, 1966).

### Host Plants

*L. lineolaris* and *L. hesperus* have a wide host range and have been well reported (Scott, 1977; Young, 1986). The former has reported hosts of 328 while *L. hesperus* is reported with 110 hosts recordings. When the hosts are grouped into families, similarities are striking (Table 2). Asteraceae and Fabaceae account for 37% and 38% of the hosts for *L. lineolaris* and *L. hesperus*, respectively. Another 13% and 13.5% of the total hosts can also be claimed by similar families for both species. Thus 50% and 51.5% of reported hosts are shared by four plant families. These data are taken from the literature which were reported over a number of years by numerous reporters (Scott, 1977; Young, 1986). Many of these plants represent colonizers of disturbed habitats which if left undisturbed could not compete with later successionist plants.

### Factors Important in *Lygus* Outbreaks

Cotton is not a preferred host of *Lygus* but in the absence of other hosts will suffice to support a population. *Lygus* migrations occur when hosts are destroyed or become unsuitable (Stern, 1969). In California's Mediterranean climate, few hosts survive beyond June and most *Lygus* movement from wild areas occur between April and May. Winter rainfall patterns set the stage for the abundance, diversity, and longevity of hosts coupled with the amount of area suitable for the colonization. Early winter rains tend to produce grass years in the surrounding hills while late winter rains favor broad leaf hosts suitable for *Lygus* such as filaree and clovers (George *et al*, 1988). Abundant rainfall in spring provides deep moisture for Russian thistle, extending this host into mid-summer. In years when moisture is adequate to extend the host plants into June or July, additional generations build creating severe *Lygus* migrations.

The San Joaquin Valley produces over 200 crops throughout the entire year. Alfalfa hay represents a substantial portion of cropland which *Lygus* inhabit and prefer to cotton. Many crops such as sugar beets, seed alfalfa, tomatoes, and weeds within orchards, vineyards, and row crops provide areas of refuge during the winter and spring, regardless of weather conditions. As these crops are readied for harvest, *Lygus* will be forced to migrate (Stern, 1969). Thus the proximity of cotton to these sources will determine the severity of the problem.

The situation in rain-fed areas of the Cotton Belt are not dissimilar. Cotton is not preferred host over many summer weeds and will remain on them unless forced to move (Snodgrass *et al*, 1984). Destruction of habitat through cultivation or drought will result in movement to cotton, a situation identical to the San Joaquin Valley.

Thus with both species of *Lygus* a regional management approach could be successful. The severity of the problem

in a particular location or year is determined by sources of migrations and the lack of sinks other than cotton. Managing sources and providing sinks are not new suggestions but have been proposed for interplanting alfalfa (Stern, 1969), maintaining alfalfa habitat (Stern et al, 1967), managing neighboring sources with insecticides (Sevacharian et al, 1977), and managing weed hosts with insecticides (Fleischer and Gaylor, 1987). In addition, reducing the winter and spring population increase would mean reducing the amount of disturbed areas in which the favored hosts will develop.

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Table 1. Estimated yield loss caused by *Lygus* sp. for 1989 and 1996.

State	% Yield reduction	
	1989	1996
Alabama	1.70	0.75
Arkansas	0.06	2.24
Arizona	0.41	4.75
California	7.65	1.40
Florida	0.01	0.05
Georgia	0.09	0.00
Louisiana	0.39	0.89
Mississippi	1.23	1.68
Missouri	0.00	0.05
North Carolina	0.00	0.00
New Mexico	0.42	0.17
Oklahoma	0.00	0.00
South Carolina	0.03	0.00
Tennessee	0.16	0.69
Texas	0.01	0.05
Virginia	0.00	0.00
<b>All States</b>	<b>0.76</b>	<b>0.79</b>

Head, 1990 and Williams, 1997b

Table 2. Percent of hosts reported by family.

Family	<i>L. lineolaris</i>	<i>L. hesperus</i>
Asteraceae	26.17	23.42
Fabaceae	11.01	15.32
Brassicaceae	7.70	6.31
Graminae	5.23	7.20
Chenopodiaceae	3.31	6.31
Plantaginaceae	1.10	7.21
Rosaceae	5.79	5.00
Others	39.69	29.00

Scott, 1977 and Young, 1986.