2003 BELTWIDE COTTON CONFERENCES, NASHVILLE, TN – JANUARY 6-10

LYGUS ABUNDANCE ON WILD HOSTS: A SURVEY ACROSS THE TEXAS HIGH PLAINS

M.N. Parajulee, M.D. Arnold, S.C. Carroll, A.M. Cranmer, R.B. Shrestha, and P.L. Bommireddy
Texas Agricultural Experiment Station
Lubbock, TX

Abstract

The tarnished plant bug, *Lygus lineolaris*, and western tarnished plant bug, *L. hesperus*, have been known to be key pests of cotton in several States in the Cotton Belt. In addition to these two species, a third species, *Lygus elisus*, has been identified to be an equally prevalent species of *Lygus* in the Texas High Plains. The objectives of this project were to identify the noncotton host plant sequence prior to cotton planting and to establish the relationship between noncotton host plants and *Lygus* migration to adjacent cotton. *Lygus* bugs were recorded from 26 noncotton host plants that were sampled along the roadside in the Texas High Plains. *Lygus* species identification has not been completed, but it appears that *L. elisus* and *L. hesperus* are the two dominant species in the Texas High Plains *Lygus* complex, with occasional occurrence of *L. lineolaris*. The mid-April survey showed that wild mustard, redstem filaree, and alfalfa were the dominant hosts that supported *Lygus* bugs. When mustard senesced and alfalfa began to bloom in mid-May, alfalfa, yellow sweetclover, woolyleaf bursage, prickly lettuce, curly dock, Russian thistle, field bindweed, broomweed, ragweed, pigweed, and gaura supported *Lygus* populations. The mid-June survey indicated that alfalfa and yellow sweetclover were still the dominant hosts prior to cotton squaring, while Russian thistle and wild sunflower supported a significant population in areas where alfalfa was not very lush. In late July, overall *Lygus* numbers in wild hosts declined, with alfalfa, pigweed, Russian thistle, and silverleaf nightshade supporting a small number of *Lygus*. In early September, alfalfa continued to be the most attractive host for *Lygus*. *Lygus* abundance in cotton was 0.5 adults per 100 sweeps compared with 2.5 per 100 sweeps in alfalfa in late July. *Lygus* abundance in cotton remained the same from late July to early September, when alfalfa became more attractive for *Lygus*. Preliminary data suggest that in the Texas High Plains a host sequence exists for *Lygus* to move from noncotton hosts to cotton and back to noncotton hosts.

Introduction

The tarnished plant bug, *Lygus lineolaris* (Palisot de Beauvois), and western tarnished plant bug, *L. hesperus* Knight, have been known to be key pests of cotton in several states in the Cotton Belt. In addition to these two species, a third species, *Lygus elisus* Van Duzee, has been identified to be an equally prevalent species of *Lygus* in the Texas High Plains. However, no biological information on *Lygus* bugs is available for the Texas High Plains, hindering the management of this pest in cotton. Area IPM agents, extension specialists, and crop consultants have reported that the *Lygus* species complex has caused an emerging pest problem in High Plains cotton during the last five years and that the situation is expected to become more serious in coming years. Possible reasons for increased *Lygus* pressure to High Plains cotton include the release of early season *Lygus* populations due to reduction in insecticide usage for boll weevil control and increased acreage of sunflower, alfalfa, peanut, guar, and canola that are suitable or perhaps preferred hosts for *Lygus*. These factors are expected to bring about a shift in the pest complex in cotton and may elevate *Lygus* species from minor to economic pest status.

Potential factors influencing the population dynamics of *Lygus* species include diversity of cultivated and wild plant hosts which support *Lygus* populations when cotton is not available, variation in cotton cultivars (leaf smoothness, timing of maturity, and plant height), the geographic gradient, cotton planting date, and irrigation management. To develop a knowledge base on biotic and abiotic factors that affect population dynamics of *Lygus* species, the Texas *Lygus* Research Working Group suggested that comprehensive research on *Lygus* biology and management be initiated immediately to examine the effects of known and potential factors on *Lygus* population dynamics and develop a management plan. Responding to that recommendation, the Cotton Entomology Research Program at the TAES Lubbock Center, which coordinates the statewide effort in *Lygus* research, initiated several projects in 2002 to study the biology and ecology of *Lygus* bugs in the Texas High Plains. This project was designed to examine the role of noncotton host plants (along the roadside) on *Lygus* movement into cotton during the growing season. Specific objectives were to: 1) identify the noncotton host plant sequence prior to cotton planting, 2) determine *Lygus* species composition as affected by noncotton host plants, 3) establish the relationship between noncotton host plants and *Lygus* migration to adjacent cotton, and 4) quantify the *Lygus* host preference among noncotton host plants and between cotton and noncotton hosts.

Materials and Methods

Lygus surveys were conducted in mid- to late April in each of the 25 counties of the Texas High Plains that comprise what is called the Plains Cotton Growers (PCG) service area. The standard sweep sampling method was used to survey prominent weed hosts along roadsides in each County. Approximately 1,000 sweep samples were taken per county, and approximately 200 sweeps were taken per host plant species. A total of five locations were surveyed per county and the survey locations

were identified using a GPS unit. In an effort to establish a host plant sequence of *Lygus* movement from wild habitat to cotton, surveying was continued at a 4-week interval in Hale, Lubbock, and Gaines counties. This represented the northern, central, and southern regions of the 25-county PCG service area. All 25 counties were again surveyed in late July to coincide with cotton blooming/fruiting. The last survey was conducted in early September, coinciding with boll maturity. A season total of 67,330 sweep samples were taken from noncotton hosts, with a survey sequence of mid-April, mid-May, mid-June, late July, and early September.

All 25 counties were also surveyed for cotton in late July. Cotton survey sites were adjacent to the noncotton survey sites in each county. A second survey was conducted in cotton in Hale, Lubbock, and Gaines counties in early September. A total of 33,015 sweeps were taken from cotton.

Results and Discussion

Lygus bugs were collected from 26 of 28 noncotton host plants surveyed during the season (Table 1). *Lygus* bugs were not found in cocklebur and gumweed samples. *Lygus* bugs were collected from wild host plants throughout the survey season (Table 2). The mid-April survey showed that wild mustard, redstem filaree, and alfalfa were the dominant hosts that supported *Lygus* bugs. Other host plants surveyed in mid-April included spectacle pod, Virginia pepperweed, and kochia, but these hosts supported very few *Lygus*. When mustard senesced and alfalfa began to bloom in mid-May, *Lygus* moved to (in the order of dominance) alfalfa, yellow sweetclover, woolyleaf bursage, prickly lettuce, curly dock, Russian thistle, field bindweed, broomweed, ragweed, pigweed, and gaura. The mid-June survey indicated that alfalfa and yellow sweetclover were still the dominant hosts prior to cotton squaring, while Russian thistle and wild sunflower supported a significant population in areas where alfalfa was not very lush. In late July, overall *Lygus* numbers in wild hosts declined, with alfalfa, pigweed, Russian thistle, and silverleaf nightshade supporting a small number of *Lygus*. At this time *Lygus* began to move into adjacent cotton fields, but this timeframe also coincided with dry spell in the High Plains that dried many of the wild host plants. In early September, alfalfa continued to be the most attractive host for *Lygus* while pigweed, Russian thistle, silverleaf nightshade, and wild sunflower also attracted more *Lygus* than they did in late July.

Averaged across all wild host plants surveyed, the northern region of the High Plains had the highest *Lygus* numbers and numbers declined to the south (Table 3). The mid-April survey showed twice the abundance of *Lygus* adults in Hale County compared with the numbers in Lubbock County, whereas Gaines County had almost no *Lygus*. In mid-May, *Lygus* numbers were similar between the southern and the central regions, but the northern region had 4-5 times more *Lygus* than the other two regions. The northern region continued to have the highest *Lygus* activity through mid-June. Overall *Lygus* numbers in wild hosts declined in late July, and there were no apparent differences among the three regions in the July survey. *Lygus* numbers in wild hosts increased in early September, and the southern region had the fewest *Lygus* while the central region had slightly higher than the northern region. These data suggest that *Lygus* are more prevalent in the central and northern parts of the High Plains compared with the southern region. We believe that the wild host plant diversity is greater in the northern and central parts of the High Plains than in the southern part, contributing a greater amount of habitat refuge for *Lygus* to colonize in the spring and to build larger populations during the cotton growing season.

Our data suggest that a host sequence exists for *Lygus* to move from noncotton hosts to cotton and back to noncotton hosts in the Texas High Plains (Table 4). It appeared that the spring colonization of *Lygus* took place mainly in wild mustard and alfalfa. As wild mustard senesced, alfalfa became more attractive for *Lygus* in mid-May, providing an uninterrupted host sequence for *Lygus* population buildup. Alfalfa was complemented by yellow sweetclover as equally supportive host for *Lygus* through mid-June. Overall *Lygus* numbers declined in wild hosts in late July when *Lygus* were detected in adjacent cotton plots. Although *Lygus* numbers were lowest in late July compared with other sampling months, numbers were still higher than those recorded from cotton. *Lygus* abundance in cotton was 0.5 adults per 100 sweeps compared with 2.5 per 100 sweeps in alfalfa in late July. *Lygus* abundance in cotton remained the same from late July to early September, whereas alfalfa became more attractive for *Lygus*. Overall, *Lygus* abundance was higher in noncotton hosts compared to that in cotton in both late July and early September surveys.

Table 1. List of host plants surveyed for *Lygus* in the Texas High Plains in 2002.

Common Name	Scientific Name
Alfalfa	*Medicago sativa*
Bladderpod	*Lesquerella gordonii*
Broomweed	*Amphiachyris dracunculoides*
Curly dock	*Rumex crispus*
Cocklebur	*Xanthium strumarium*
Cotton	*Gossypium hirsutum*
Field bindweed	*Convolvulus arvensis*
Gumweed	*Grindelia squarrosa*
Gaura	*Guara* spp.
Kochia	*Kochia scoparia*
Mexican hat	*Rabbida columnani*
Tansy mustard/flixweed	*Descurainia sophia*
Pigweed	*Amaranthus* spp.
Prickly lettuce	*Lactuca serriola*
Primrose	*Calylophus hartwegii*
Ragweed (common)	*Ambrosia artemisiifolia*
Redstem filaree	*Erodium cicutarium*
Russian thistle	*Salsola iberica*
Scarlet globemallow	*Sphaeralcea coccinea*
Silverleaf nightshade	*Solanum elaeagnifolium*
Spectacle pod	*Dimorphoscaspa wislizeni*
Texas blueweed	*Helianthus ciliaris*
Tumble mustard	*Sisymbrium altissimum*
Cota, Indian tea, or Navajo tea	*Thelesperma megapotamicum*
Tansy aster	*Machaeranthera tanacetifulia*
Virginia pepperweed	*Lepidium virginicum*
Woolyleaf bursage or lakeweed	*Ambrosia grayi*
Wild sunflower	*Helianthus annuus*
Yellow sweetclover	*Melilotus officinalis*

Table 2. Number of adult *Lygus* bugs per 100 sweeps in six dominant wild hosts within each sampling period in the Texas High Plains in 2002.

	Mid-April	Mid-May	Mid-June	Late July	Early September
Alfalfa	19.2	134.0	20.9	2.5	21.5
Curly dock		63.3			
Wild mustard	32.1	7.2			
Pigweed		18.0	2.0	0.8	5.0
Redstem filaree	24.5				
Russian thistle		49.0	12.1	0.5	6.0
Silverleaf nightshade			1.3	0.3	1.7
Wild sunflower			6.4	0.0	2.0
Yellow sweetclover		131.9	19.2		

Table 3. Number of adult *Lygus* bugs per 100 sweeps in the three High Plains zones in 2002. Data are averaged over all wild hosts.

Survey Zone	Mid-April	Mid-May	Mid-June	Late July	Early September
Central (Lubbock Co.)	20.0	30.0	9.0	1.4	14.4
Northern (Hale Co.)	46.0	125.2	15.2	0.6	11.6
Southern (Gaines Co.)	0.3	24.6	6.8	0.5	2.9

Table 4. Number of adult *Lygus* bugs per 100 sweeps in three dominant wild hosts that expanded over two successive surveys and cotton in the Texas High Plains in 2002.

Host Plant	Mid-April	Mid-May	Mid-June	Late July	Early September
Alfalfa	19.2	134.0	20.9	2.5	21.5
Wild mustard	32.1	7.2			
Yellow sweetclover		131.9	19.2		
Cotton				0.5	0.4