

DISTRIBUTION OF *LYGUS* SPP. IN THE NORTHERN TEXAS ROLLING PLAINS

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Abstract

Sweep net sampling was used to determine species composition, distribution and abundance of *Lygus* bugs in the northern Texas Rolling Plains. Samples were taken in 15 counties during May and July in 2001 and 2002. Samples taken in May were from alfalfa, vetch, and blooming roadside weeds, and samples taken in July were from alfalfa and cotton. Of the 409 *Lygus* spp. identified from 20,646 sweeps, 15.9, 32.3, and 51.8% were *L. lineolaris* (Palisot De Beauvois), *L. hesperus* Knight, and *L. elisus* Van Duzee, respectively. *Lygus lineolaris* was present in low numbers throughout the Rolling Plains, while both *L. hesperus* and *L. elisus* were most numerous in the northwestern region of the northern Rolling Plains. There was an apparent species ratio shift in alfalfa, and *L. lineolaris* was more abundant in July than in May, while *L. hesperus* and *L. elisus* were more abundant in May than in July. Sweep net sampling data taken in 1976 and 2001/2002 indicate that there has not been a significant change in *Lygus* abundance in cotton or alfalfa since the mid-1970's. Only 8 *Lygus* bugs, in 10,675 sweeps (0.07/100 sweeps), were detected in cotton in only four counties, and there was no evidence to suggest that *Lygus* bugs pose a current threat to cotton production in the Texas Rolling Plains.

Introduction

Lygus bugs are regarded as potentially serious pests in cotton, and factors influencing yearly severity and losses were discussed by Goodell (1998) and O'Leary (1998). From 1999 to 2001, *Lygus* bugs ranked fourth, sixth and second, respectively, as the most serious pest affecting US cotton production, and percentage yield reductions attributed to these pests ranged from 0.5 to 1.0%. In Texas during these same three years, production losses have ranged from 0.1 to 1.2%; however, no losses attributed to *Lygus* bugs were reported in the northern Texas Rolling Plains (Williams 1999, 2000, 2001). Stewart and Layton (2000) listed four reasons for recent concerns about *Lygus* bugs that are related to reduced insecticide use in cotton: (1) eradication programs have eliminated the boll weevil, *Anthonomus grandis* Boheman, as a key pest in the Southeast and much of Texas, (2) insecticide resistant *Lygus* populations have developed in the mid-South, (3) broad acceptance and use of Bt cottons with resistance to pink bollworms, *Pectinophora gossypiella* (Saunders), and tobacco budworms, *Heliothis virescens* (F.), and (4) new insecticides for control of lepidopteran pests have limited efficacy on non-lepidopteran pests.

There are three species of *Lygus* bugs affecting cotton production in the US. These are the tarnished plant bug, *Lygus lineolaris* (Palisot De Beauvois), western tarnished plant bug, *Lygus hesperus* Knight, and pale legume bug, *Lygus elisus* Van Duzee. The tarnished plant bug is regarded as the primary *Lygus* sp. in the southeastern cotton belt (Latson et al. 1977), while the western tarnished plant bug and pale legume bug are more important in the southwestern cotton belt (Clancy 1968, Graham et al. 1982). The species reported as *L. desertus* (*desertinus*) Knight from the western United States is now regarded as a synonym of *L. elisus* (see Schwartz and Foottit 2001).

Two of us (JES and EPB) believe that *Lygus* bugs have not historically posed a threat to cotton production in the Texas Rolling Plains. However, with recent concerns about a potential increase in damage from these pests and an altered species composition in cotton due to boll weevil eradication, we decided to survey the Rolling Plains for *Lygus*. Objectives were to determine species composition, distribution, and abundance of *Lygus* spp. in the northern Texas Rolling Plains.

Materials and Methods

Sampling was conducted in late spring and mid-summer. Spring samples were taken between May 3-16 and May 21-28 in 2001 and 2002, respectively. The summer samples were taken July 24-30 and July 22-25 in 2001 and 2002, respectively. Spring samples were collected from 15 counties in the northern Texas Rolling Plains: Baylor, Childress, Collingsworth, Donley, Foard, Hall, Hardeman, Haskell, Jones, Knox, Shackelford, Stonewall, Throckmorton, Wichita, and Wilbarger. Only 12 of the 15 counties were sampled in the summer; samples were not taken from Shackelford, Throckmorton, and Wichita counties because cotton was essentially absent from these three.

We tried to sample at least four locations within each county, but depending on availability of hosts, the actual number of locations varied from three to six. A standard 15" sweep net was used to collect *Lygus* bugs by each of three samplers. Each sampler took 25 or 50 sweeps for a total of 75 or 150 sweeps per sampling location within a county. An effort was made to take a minimum

of 450 sweeps per county (75 sweep samples at two locations plus 150 sweeps at two locations). *Lygus* bugs were collected from the sweep nets and placed into a plastic bag for later identification. A tag identifying county, date, and host plant was placed in each bag with the *Lygus* specimens. Additional notes on approximate location of the sampling site within a county, host plants swept, date, and number of sweeps by each person were recorded.

Spring samples were taken primarily along roadsides, except for alfalfa. Samples taken in Leguminosae were alfalfa, *Medicago sativa* L., vetch, *Vicia* sp., yellow sweet clover, *Melilotus officinalis* (L.), bur-clover, *Medicago* sp., and Texas bluebonnet, *Lupinus texensis* Hook.; in Convolvulaciae, field bindweed, *Convolvulus arvensis* L.; in Labiatae, Basil beebalm, *Monarda clinopodioides* Gray, in Solanaceae, silverleaf nightshade, *Solanum elaeagnifolium* Cav., and potato, *Solanum tuberosum* L., in Brassicaceae, flixweed (a tansymustard), *Descurainia sophia* (L.) Webb, in Onagraceae, wavy-leaf gaura, *Gaura sinuata* Ser., and in Asteraceae, cut-leaved daisy, *Engelmannia pinnatifida* Nutt., cutleaf evening primrose, *Oenothera laciniata* Hill, clasping coneflower, *Dracopis amplexicaulis* (Vahl) Cass., Indian blanket, *Gaillardia pulchella* Foug., yellow woolly-white, *Hymenopappus flavescens* Gray, and common sunflower, *Helianthus annuus* L. At least one of the spring samples was taken in a legume, if present, in each county. A few samples were taken in flowering roadside plants that we were unable to identify. Summer samples were taken only in alfalfa and cotton, *Gossypium hirsutum* L. In counties where alfalfa was present, only one sample was taken from alfalfa, and the remaining samples were taken in cotton; if alfalfa was not present, all samples were taken from cotton.

All *Lygus* bugs were identified with the aid of a microscope, using the characteristics given by Schwartz and Foottit (2001), in the laboratory at Vernon, TX. Dr. Scott Armstrong, Texas Tech University, Lubbock, provided useful comments and photographs to aid identification. Representative specimens from the 2001 collection were verified by Dr. Joe Schnaffer, Texas A&M University, College Station.

Results and Discussion

A total of 409 *Lygus* spp. were captured in 20,646 sweeps in the 15 counties represented in the survey (Table 1). *Lygus* bugs were more abundant in the spring surveys than in the summer surveys, with about 75% of the *Lygus* collected in the spring on alfalfa, vetch, and other roadside weeds. *Lygus* averaged 2.4 and 1.4 per 100 sweeps in the spring and summer surveys, respectively. *Lygus lineolaris*, *L. elisus*, and *L. hesperus* comprised 15.9, 51.8, and 32.3%, respectively, of the three species caught in 2001 and 2002.

Lygus lineolaris was present in low numbers throughout the northern Rolling Plains, but numbers did not exceed 2/100 sweeps in any county (Figure 1). Both *L. elisus* and *L. hesperus* were most numerous in the northwestern region of the northern Rolling Plains, with numbers exceeding 2-5 per 100 sweeps in Hall and Donley counties. No *Lygus* bugs were collected in Shackelford or Throckmorton counties in the southeastern part of the Rolling Plains region. Of the 409 *Lygus* bugs collected in the survey, 68% (278) were taken in four counties [Childress (n=77), Hall (n=37), Donley (n=136), and Collingsworth (n=28)] in the northwestern region of the survey, and an additional 22% were taken in Foard (n=49) and Wilbarger (n=41) counties.

Lygus bugs were found in cotton in only four of the twelve counties sampled (Figure 2), and of the eight *Lygus* collected in 10,675 sweeps, 50% (4) were *L. elisus*, and 25% (2) were *L. hesperus* and 25% (2) were *L. lineolaris*. *Lygus* bugs probably occur in very low numbers in cotton in most Rolling Plains counties because we did see an occasional *Lygus* bug in cotton in late summer of 2002 in Knox County, a county where no *Lygus* bugs were detected in cotton during the formal survey.

The *Lygus* captures in alfalfa were utilized to determine if species composition shifted between spring and summer. A total of 107 *Lygus* spp. were caught in spring alfalfa samples, and of these 10 were *L. lineolaris*, 38 were *L. hesperus*, and 59 were *L. elisus*. A total of 100 *Lygus* spp. were caught in summer alfalfa samples, and of these 27 were *L. lineolaris*, 25 were *L. hesperus*, and 48 were *L. elisus*. A Chi-Square test was used to test the homogeneity of the frequency distributions of these three species in spring and summer, and calculated $\chi^2 = 11.40$ (P = 0.003) indicated that there was a species composition shift between spring and summer populations in alfalfa. *Lygus lineolaris* was more abundant in summer than in spring, while *L. hesperus* and *L. elisus* were less abundant in summer than in spring.

Numbers of *Lygus* spp. taken in sweep net samples from alfalfa and cotton in 2001 and 2002 were compared to sweep net sample data collected in 1976 in alfalfa and cotton. Comparisons were made between alfalfa samples taken in May and late July in Hardeman and Wilbarger counties and between cotton samples taken in late July in Hardeman County. In samples taken in 1976, there was an average of 7.5 *Lygus* spp. per 100 sweeps in alfalfa during May compared to an average of 1.1 *Lygus* per 100 sweeps in alfalfa during May in 2001/2002. In late July in alfalfa, there was an average of 0.8 *Lygus* spp. per 100 sweeps in 1976 compared to 7.8 *Lygus* spp. per 100 sweeps in 2001/2002. Although timing of peak numbers varied between 1976 and 2001/2002,

the range in numbers captured was similar between the samples collected 26 years apart. In cotton in late July, there was an average of 0.5 *Lygus* spp. per 100 sweeps in 1976 and an average of 0.1 *Lygus* spp. per 100 sweeps in 2001/2002. These values from cotton indicate that similar low numbers of *Lygus* spp. were present in cotton in samples taken 26 years apart. These values suggest that there has not been a significant change in *Lygus* spp. abundance since the mid-1970's.

In summary, *L. lineolaris* is present at low levels throughout the Rolling Plains. Both *L. hesperus* and *L. elisus* are present throughout the survey area, but they are most abundant in the northwest Rolling Plains. *Lygus elisus* was the most abundant species in the survey area, comprising 52% of the *Lygus* spp. complex. In alfalfa, species ratios shift, and *L. lineolaris* is more abundant in summer than in spring, while *L. hesperus* and *L. elisus* are more abundant in spring than in summer. Sweep net sampling data taken in 1976 and 2001/2002 indicate that there has not been a change in *Lygus* spp. abundance since the mid-1970's. *Lygus* bugs were present only in low numbers in cotton, and there is no evidence to suggest that *Lygus* spp. pose a threat to cotton production in the northern Texas Rolling Plains.

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Table 1. Percentage composition of three *Lygus* species in the Texas Rolling Plains: 2001 & 2002.

| <i>Lygus</i> sp. | Spring Hosts (Alfalfa, Vetch, Weeds) | Summer Hosts (Cotton & Alfalfa) | Total |
|---|---|------------------------------------|---------------|
| <i>lineolaris</i> | 12.0 | 26.9 | 15.9 |
| <i>elisus</i> | 53.2 | 48.1 | 51.8 |
| <i>hesperus</i> | 34.9 | 25.0 | 32.3 |
| <hr style="border-top: 1px dashed black;"/> | | | |
| No. Sweeps | 12,650 | 7,996 | 20,646 |
| No. Caught | 301 | 108 | 409 |
| No/100 Sweeps | 2.4 | 1.4 | 2.0 |

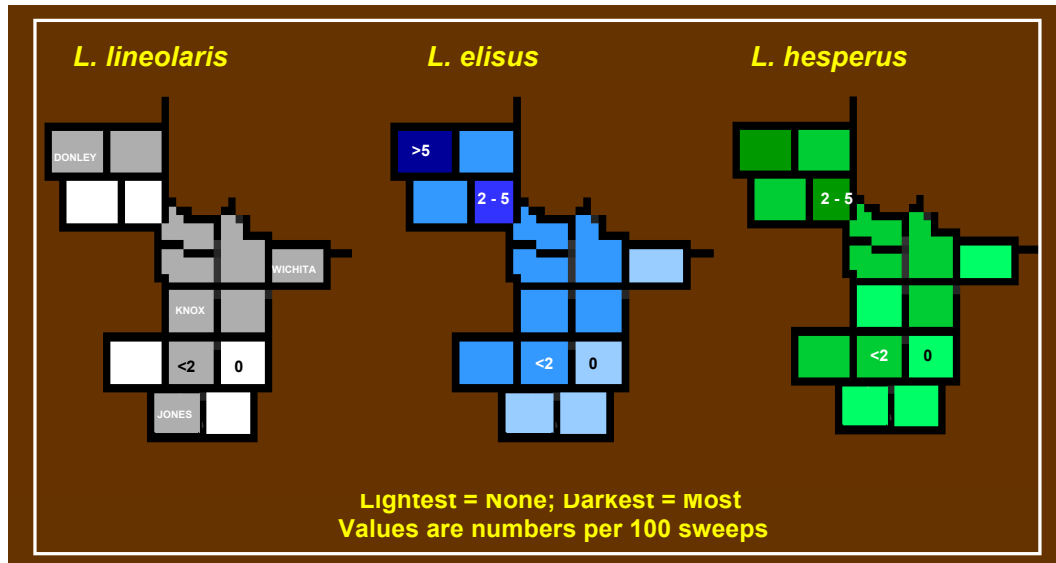


Figure 1. Distribution of Lygus spp. in the Texas Rolling Plains: 2001 & 2002.

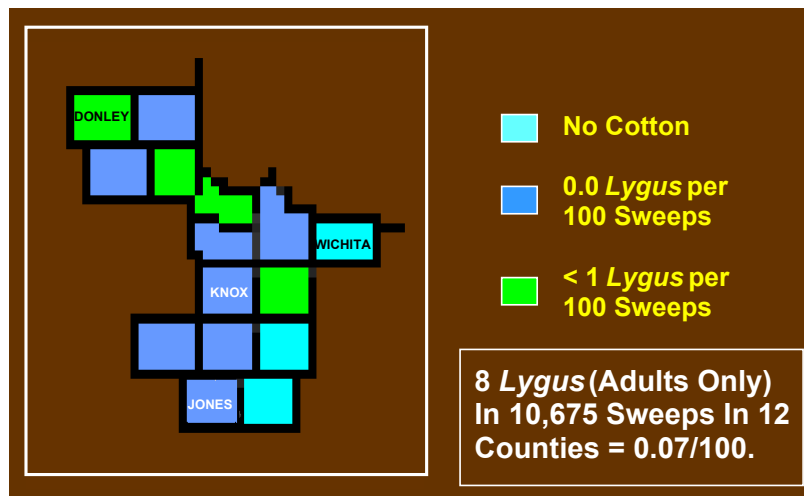


Figure 2. Average number of Lygus spp. in cotton in the Texas Rolling Plains. Late July, 2001 and 2002.