# THE BIOLOGY AND ECOLOGY OF LYGUS SPP. ON COTTON AND ASSOCIATED CROPS

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Objective:

To determine the biology and ecology of the several species of Lygus in Arizona and to use this information to improve the control of Lygus spp. in cotton.

Summary of Progress:

Populations of lygus bugs were found to build up in both alfalfa and cotton at a logarithmic rate and in midsummer decreased on both crops. An average of four adults per 100 net sweeps was obtained in alfalfa during January and February. During April and May populations increased to 50 per 100 sweeps, and by early July over 500 adults per 100 sweeps were taken, with counts reaching 1400 to 1800 in some fields. The rate of increase was relatively uniform from April 18 to August 2, and the rate of decrease was similar from July 19 to October 24. Early July counts of 1000 adult lygus bugs per 100 sweeps were estimated to be equivalent to 1 million lygus bugs per acre. The buildup and decline of lygus bugs in alfalfa generally was independent of the cutting of individual fields just as the buildup in cotton proceeded independently of treatments with insecticides.

Regression equations for the increase of lygus bugs in cotton were found to be similar for 1961, 1962, 1965, and 1967 in different fields at Tucson, Marana, and Eloy, a clear indication that the factors causing the increase of lygus bugs in cotton is similar between seasons, localities, and even periods within the same season. Thus, regression analysis makes possible computer programming to control lygus bugs within the total systems engineering approach to cotton production. During June, applications of insecticides delayed the rate of buildup by only a few days; for example, one field that received three applications during June had an increase of 42,092%. The natural decrease in populations during July in both treated and untreated cotton fields was important. The prediction of this decline could be extremely useful and important in reducing costs of insecticides and helping avoid the upset of the natural control of bollworm and other harmful insect populations.

Lygus bugs are attracted to the sugars in both cotton and alfalfa plants, and the survival of adults and nymphs, dependent on the availability of sugar, may be enhanced by the application of sugar solutions to the plants. Populations of lygus bugs seldom develop on young cotton until the extra-floral nectaries on the leaves begin to produce nectar. Thus survival on the plants is not affected by the age of the squares, flowers, or bolls but by the secretion of the extra-floral nectaries. Large numphs are the most responsive to the presence of sugars and next followed by adults. Small nymphs appear to spend much time running about.

The blasting of pinhead squares of cotton was caused by the feeding of several species of plant bugs. Thus small buds are destroyed by the feeding, and there is a serious systemic effect on the plant. Lygus adults and nymphs

appear to be the most injurious of the plant bugs, and the cotton fleahopper, Psallus seriatus (Reuter) is next most damaging though the fleahopper is seldom abundant. If populations are large, which seldom occurs, both the black fleahoppers, Spanogonicus and Rhinacloa spp. may cause characteristic mirid damage to cotton.

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## BIOLOGICAL CONTROL INVESTIGATIONS

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Objective:

To determine the feasibility of utilizing native and introduced parasites and predators for the control of insects damaging to cotton.

Summary of Progress:

The potential use of tachinid parasites as biological control agents is being carefully considered. One of the most promising species in this group is Lespesia archippivora (Riley), a species that is common throughout the United States and is attracted to hosts in nine lepidopterous families.

In preparation for the field cage studies, the mean developmental times for L. archippivora were determined at several constant temperatures in each of four major cotton insect hosts. The shortest mean duration of egg, larval, and pupal stages ranged from 43.7 (±3.6) days at 59°F to 11.0 (±0.4) days at 86°F for the beet armyworm, Spodoptera exigua (Hübner). Development times were similar for the cabbage looper, Trichoplusia ni (Hübner), and substantially longer for the bollworm, Heliothis zea (Boddie). The longest times were found for the salt-marsh caterpillar, Estigmene acrea (Drury); the range was from 57.4 (±3.6) days at 59°F to 14.2 (±2.1) days at 86°F.

Studies of host preference showed no preimaginal imprinting due to the parental host.

Although while the females oviposited readily on any of the four species if they were offered separately, they apparently preferred salt-marsh larvae, beet armyworms, cabbage loopers, and bollworms in that order when a choice was provided. Preference was determined on the basis of number of parasitized hosts and number of puparia produced per host.

Studies of cotton plants in field cages showed that 4500 female L. archippivora per acre could parasitize as many as 88% of the bollworms in a simulated infestation of 15,000 third instar larvae per acre. When the infestation was reduced to the equivalent of 7500 larvae per acre, it was calculated that 1210 female flies per acre could parasitize 74% of the pest population.