Dry large LIMA BEANS benefit from LYGUS BUG CONTROL

R. W. BUSHING · V. E. BURTON · C. L. TUCKER

Control of lygus bugs resulted in dry large Lima bean yield increases ranging from twice to six times more than control plots in Davis tests, over a four year period.

LARGE LIMA BEANS contribute substantially to the 150,000 tons of dry beans produced annually in California (which ranked second in U. S. production of dry beans in 1972). Large Lima beans are highly susceptible to injury by lygus bugs, principally *Lygus hesperus* (Knight). Cotton, alfalfa and vegetable seed crops, sugar beets, strawberries, and oil seed crops are also attacked by this insect, which ranks within the top five most destructive pests in California. In 1969, losses (all crops) assigned to these insects were valued at $25 million.

Host crops

Host crops and weeds that mature and dry in the spring, and alfalfa which is cut regularly during the growing season, are major sources of lygus infestations. Dry beans, in addition to supporting their own infestations of lygus bugs, also are damaged by bugs which move into the fields from other crops and weeds.

Experiments to determine the effect of lygus bugs on the yield and quality of dry large Lima beans were carried out at U.C. Davis plots, from 1969–72. Each year the trials were located near blocks of clover and experimental alfalfa which was cut at irregular intervals.

The variety White Ventura 65 was seeded on 30-inch rows early in May with a belt planter. Each plot consisted of six adjacent rows 100 ft long. Each spray was applied to four identical plots semi-randomly placed in the experimental field (Latin square design).

Sprays were applied with a portable tractor mounted sprayer calibrated to deliver 20 gallons of spray per acre at 40 psi. Sprays of Kelthane for mite control were applied with drop nozzles well before bloom, when the plants were young and the rows still open. A boom with one flat-fan nozzle over each row was used for lygus bug sprays after the rows closed. Height of the boom was adjusted to give a uniform broadcast pattern.

Counts of lygus bugs were made with a standard 15-inch California sweep net as used on various crops. Sweeps were made across two adjacent rows and 6 to 8 inches deep into the foliage. Adult bugs with fully developed wings and wingless nymphs were counted for 10 sweeps in each plot. Sampling of lygus bugs was started well before the first blooms appeared. At first bloom, sprays were applied if the lygus counts equalled or exceeded one-half bug per sweep. After first bloom, the timing of sprays was based solely on bug counts, and sprays were applied when the counts reached a level of one to two bugs per sweep.

The University of California suggests that for control of lygus bugs on dry beans, sprays should be applied when counts exceed an average of one-half bug per sweep during early bloom and one to two bugs per sweep after pods begin to swell.

Lygus bugs damage Lima beans in two ways. Bugs feeding on developing flower buds cause the buds to abort, and no fruit is produced. This results in a loss of yield. When feeding occurs on partly developed fruit, individual seeds may abort. Those injured seeds which attain complete development may show depressed and/or discolored spots.

Sprays for controlling lygus bugs were applied during the early part of the first flush of bloom. The dates of first application for trials conducted during four years varied between July 6 and 10, except for 1970 (July 20), when parts of each plot had to be replanted due to depredations of the seed corn maggot. Average counts of lygus bugs per sweep at the time of application ranged from 0.7 in 1969 to 2.9 in 1970 (adults and nymphs). Counts of bugs per sweep after spraying in 1969 with Cygon 2 EC at 6.4 ounces of active ingredient per acre (AI/A) are presented in table 1.

Three additional years of experimentation with sprays of Cygon for lygus bugs have yielded similar results (data not shown). Counts during the comparable 3½ week period after spraying with Cygon were almost identical for 1970 through 1972. However, the numbers of lygus bugs swept from untreated plots during 1970–72 were considerably higher than those shown in table 1. Cygon was used at rates of from 6 to 16 ounces of 2 EC or 2.67 EC AI/A. Different rates resulted in no differences in control or duration of residual effectiveness. It appears that the currently suggested rate of 8 ounces AI/A of Cygon should suffice.

TABLE 1. AVERAGE COUNTS OF LYGUS BUGS PER SWEEP AFTER TREATMENT WITH CYGON DURING THE LARGE LIMA BEAN BLOOM PERIOD, AS COMPARED WITH NO TREATMENT, U.C. DAVIS, 1969.

Treatment		Days after treatment						
		4	8	12	15	18	25	29
		Ave. bug counts per sweep						
CYGON	Adults	0.1	0.1	0.4	0.6	0.4	0.8	0.9
	Nymphs	0	0	0	0	0	0	.3
	Total	.1	.1	.4	.6	.4	.8	1.2
CHECK	Adults	.6	.7	.7	.8	.5	.8	1.8
	Nymphs	.1	.3	1.3	1.0	.3	.4	1.1
	Total	.7	1.0	2.0	1.8	.8	1.2	2.9

TABLE 2. AVERAGE YIELDS PER ACRE OF DRY LARGE LIMA BEANS FROM BLOOM APPLICATIONS OF CYGON FOR LYGUS BUG CONTROL, U.C. DAVIS, 1969–1972

Treatment	1969*	1970	1971	1972
	Hundredweights per acre			
CYGON	30.6	29.9	23.9	23.4
CHECK	5.8	15.7	6.2	11.8

* Values for each year were taken from a four-treatment trial. Analysis of variance for the plot series showed that the weights of beans taken from treated and untreated plots were significantly different for each of the four years.

TABLE 3. LIMA BEAN DAMAGE ATTRIBUTED TO LYGUS BUGS, WORMS AND OTHER CAUSES AS RECORDED FOR SAMPLES OF 500 RANDOMLY SELECTED SEEDS, U.C. DAVIS, 1970

Time of sprays	Percent Damage			Yield
	Lygus*	Worms	Other	Cwt./acre*
Early Bloom	18.4 a	.4	6.2	29.9 a
Early Bloom + Mid-Season	5.0 b	.3	5.1	33.3 a
Check	15.3 b	.9	9.8	15.7 b

* Duncan's Multiple Range Test. Values followed by the same letter are not significantly different at the 5% level.

Yields of dry beans (table 2) from the single applications of Cygon at first bloom and from the untreated plots were significantly different in the trials over a four year period. Yields doubled in 1970 and 1972, were up four times in 1971, and were up six times in 1969 as a result of Cygon applications at bloom.

Estimates of percent damage to seeds were obtained from examinations of 500 seeds selected at random from harvested seed in different experimental plots. They provided a further evaluation of early, late, or a combination of treatments for lygus control and seed quality (table 3). Lygus bug populations attained densities great enough to average two bugs per sweep when the mid-season sprays were applied 33 days after the bloom treatments. The two-spray treatment produced a significant increase in the quality of the dry beans, but yields were not significantly increased when compared with a single bloom application. There were no significant differences in other types of damage, such as worms, waterspots, cracked seed, etc.

The results of these experiments indicate that lygus bug population levels above one-half bug per sweep will reduce yields. Lygus bug controls applied after early bloom allow some yield compensation, but yields never approach those achieved from early season control. Where lygus bugs are ignored, the plants remain vegetative and set very few pods. Applications made in mid-to-late season, after early bloom treatments, allowed production of high quality seed.

Fields should be checked for lygus bug infestations with a sweep net starting soon before first blooms appear. Sprays should be applied to prevent yield or quality losses when the bug counts exceed suggested treatment levels at appropriate stages of plant development.

Several experimental insecticides not currently registered in California were evaluated for lygus bug control during the four years of this study. Several appeared to equal Cygon in effectiveness. These products, and the rates in ounces of active ingredient per acre (in parenthesis) are: Azodrin 3.2 EC (6.5), Furadan 4 F (8), Meta-Systox R 2 EC (8), Orthene 75 SP (8), and Carzol 92 SP (8). One or more of these may become available for use when enough technical data are developed.

R. W. Bushing is Assistant Entomologist, V. E. Burton is Extension Entomology Specialist, and C. L. Tucker is Agronomy Specialist, University of California, Davis.

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