

# TIMING



Pitting of lima beans caused by Lygus feeding (photo by A. S. Deal).

Proper timing of treatments, as well as choice of insecticides, is highly important in preventing losses in both yield and quality from lygus bug feeding on lima beans. In these tests, early applications were important and use of the organophosphorus insecticides Cygon alone, or malathion in combination with toxaphene proved most effective for control of this pest.

**F**AILURE TO CONTROL lygus bugs in southern California lima bean fields can mean severe losses in yield and quality. The species most commonly responsible for these losses are *Lygus hesperus* (Knight) and *L. elisus* Van Duzee. These sucking insects cause a reduction in bean yields by feeding on the developing buds,

blossoms or very small pods and causing them to drop from the plant. They reduce quality by later piercing the larger pods with their mouthparts and sucking the juices from the developing beans inside. If such feeding occurs early in the development of the bean, the result is shriveling and discoloration. If the feeding occurs later, the bean is pitted or scarred at the point where the mouthparts of the insect pierced the seed coat. Such injury is objectionable in both dry and green beans and results in a down-grading by the packer or processor.

An increase in the tolerance of lygus bugs to DDT was noted in California prior to 1955. Since that time effective control of lygus bugs with DDT and toxaphene applied separately or in combination has become increasingly difficult in many areas of southern California.

Several organophosphorus insecticides have been found to be effective in controlling lygus bugs on various seed crops and on cotton. Some of these were tested in a series of experiments on lima beans. These experiments had a two-fold purpose: (1) To determine which of the insecticides was most effective in controlling the lygus bugs, and (2) to discover the best timing of treatments for maximum yields and prevention of pitting or scarring of the beans.

All experiments were conducted on fields in Santa Barbara and Ventura counties. Bean varieties included were Mackie or Ventura (grown for harvest as dry limas) and Fordhook (grown for harvest as green or quick-freeze limas). Insecticides were applied as sprays from a Piper Cub or Stearman airplane at 10 gallons per acre or from a tractor-drawn boom sprayer at 50 gallons per acre. Because of the tendency of adult lygus bugs to move about, large plots (120 ft minimum dimension) were used in all experiments. Four replications of each treatment were arranged in randomized complete blocks.

TABLE 1. CONTROL OF LYGUS BUGS ON LIMA BEANS WITH SINGLE APPLICATIONS OF VARIOUS INSECTICIDES, SANTA MARIA, CALIFORNIA

Treatment	Toxicant (lb./A)	Lygus bugs/400 suction samples at specified interval after treatment							
		1 Day		1 Week		2 Weeks		4 Weeks	
		Adults	Nymphs	Adults	Nymphs	Adults	Nymphs	Adults	Nymphs
Experiment 1. August 1962									
Naled	1.0	6*	18*	38*	137*	83*	758	222	1,032
Malathion	1.0	0*	10*	10*	3*	72*	202*	72*	842*
Dylox	1.0	9*	111*	39*	64*	75*	436	91*	854*
Phosphamidon	0.5	29*	177*	28*	55*	61*	208*	66*	661*
Toxaphene	3.0	78	390	72*	159*	255	266*	94*	625*
DDT + Toxaphene	1.5 + 3.0	37*	209	35*	60*	129	99*	65*	161*
Malathion + Toxaphene	1.0 + 3.0	9*	54*	7*	8*	65*	7*	63*	124*
Untreated		120	548	139	544	274	949	387	1,739
Experiment 2. July 1963									
Cygon	1.0			3*	1*			7*	3*
Malathion + Toxaphene	1.0 + 3.0			14*	11*			15*	5*
Untreated				104	241			266	322

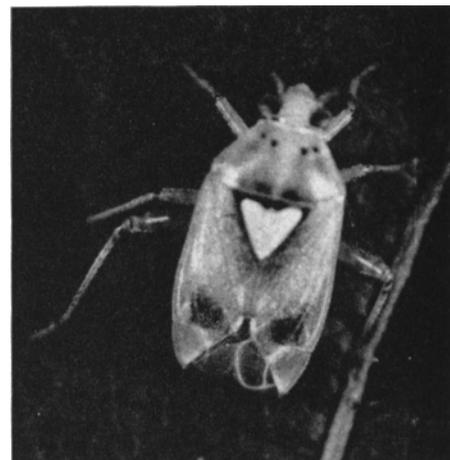
\* These counts are significantly different from the untreated check.

TABLE 2. EFFECT OF TIMING OF MALATHION PLUS TOXAPHENE TREATMENTS ON LIMA BEAN YIELD AND AMOUNT OF BEAN PITTING, SANTA MARIA, CALIFORNIA

Time of treatment	Pods per plant	Beans per plant	% pitted beans
On dry limas			
Early	21*	48*	1.5*
Intermediate	18*	36*	1.3*
Late	14	27	1.4*
Early + Intermediate	20*	44*	0.3*
Early + Late	21*	50*	0.4*
Intermediate + Late	17*	34*	0.7*
Early + Intermediate + Late	21*	48*	0.1*
Untreated	14	27	3.7
On green limas			
Early	23*	48*	0.1*
Late	18	31	0.5*
Early + Late	22*	44*	0.0*
Untreated	17	31	1.2

\* These counts are significantly different from the untreated check.

# Lygus Bug Control Increases Lima Bean Yield and Quality



Lygus Bug (photo by L. R. Brown).

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Lygus bug populations were sampled at selected time intervals with a backpack suction-sampling apparatus. The intake tube of this equipment, fitted with a 9-inch diameter adapter, was inserted into the bean foliage at 100 locations in each plot on each sampling date. Collected samples were exposed briefly to carbon dioxide to anesthetize the lygus bugs and were then placed in modified Berlese funnels to separate the insects from the plant debris.

Differences in bean yields from treatment to treatment were measured in terms of the average number of marketable beans per plant or in terms of pounds per acre. Quality was determined at harvest time by selecting plants at random in each plot and stripping them of pods until a total of 600 pods had been collected. The pods were opened and all beans of marketable size were counted and evaluated for presence of pitting.

Experiments conducted during 1962 and 1963 clearly showed that the lygus bug control obtained with toxaphene alone or with a toxaphene plus DDT combination was inferior to that provided by the best phosphate insecticide treatments (see table 1). Malathion gave excellent control of lygus bug adults and nymphs for a period of a little less than two weeks. The addition of toxaphene to malathion

extended the period of very effective control to three or four weeks.

Dimethoate (Cygon) gave an initial and residual control equal to that of the malathion plus toxaphene combination. Naled (Dibrom) gave good initial control of lygus bug adults and nymphs, but its effective residual activity was less than one week. Phosphamidon (Dimecron) and Dylox gave inferior control at the dosages tested.

Experiments with single or multiple applications of malathion plus toxaphene showed that timing of treatments is important (see table 2). On dry limas an early application at the bud and blossom stage was more effective in ensuring high yields than an intermediate treatment at the small pod stage. The combined effect of an early and intermediate application (when most pods are approximately 1 inch in length) or an early and late application (when beans are beginning to swell in the pods) appeared necessary to give maximum protection from pitting of the beans.

An early, intermediate or late treatment alone did not give adequate control of pitting on dry limas. Differences in the vegetative growth of the plants from plot to plot on the dry limas were easily seen just prior to harvest. The plants in the insecticide-treated plots, especially those

receiving early treatments, were heavily loaded with pods and had dried and turned brown with maturity. Plants in the untreated plots, having few pods, were still green and succulent. These untreated plots were conspicuous as green vegetative "islands" in the otherwise brown fields.

The period from blossom stage to harvest for green lima beans is very short. In the one timing experiment conducted on green limas, an early treatment alone provided increases in yields and protection against pitting equal to that of an early plus a late treatment.

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Piper Cub airplane spraying a lima bean field (photo by Hal Fisher).

