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Evaluation of Insecticides For Control Of Bean Leaf Beetles

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During the past 50 years the bean leaf beetle *Cerotoma trifurcata* (Foster) has been a periodic economic pest of soybeans. Insecticides reported to give effective control are: pyrethrum and rotenone (1), DDT and toxaphene (5), malathion (6), methyl parathion (4), carbofuran, aldicarb, phorate and disulfoton (3), and carbaryl (6,7). With attention turning rapidly from eradicating to effectively managing pests, it becomes neces-

sary that studies to determine minimum effective rates of insecticides be undertaken. Results of an evaluation of the minimum effective rates of some approved and experimental insecticides for controlling bean leaf beetles are reported here.

MATERIALS AND METHODS

Tests were conducted during late August and early September, 1975 and

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1976, at the Auburn University Agricultural Experiment Station's Black Belt Substation, near Marion Junction, Alabama, to determine effective rates of insecticides for control of bean leaf beetles on soybeans. Insecticides selected on the basis of present or potential use were: methomyl, methyl parathion, acephate, toxaphene-methyl parathion, methamidophos, Mobil 9087, chlorpyrifos, fonofos, Bolstar®, Sevimol® (carbaryl and molasses), carbaryl, DS24-465, permethrin (Ambush®), permethrin (Pounce®), Pydrin®, curacron®, GCP 9646, encapsulated methyl parathion (Pennacap-M®), Bay 92114, dimethoate, carbofuran, diazinon, and leptophos.

Plots of Bragg soybeans were four rows wide (40 in. rows) and 37 feet long in all tests. Tests were arranged in a randomized complete block replicated four times. Sprays were applied (one application only) using a CO₂ pressurized sprayer calibrated to deliver 12.5 gallons of insecticidal spray per acre.

Counts of live bean leaf beetles were made 24 hours after treatment. Beetles were collected from the two middle rows of each plot using a sweepnet. Each count represented 25 sweeps, and each sweep consisted of sweeping across and through two rows of soybeans. Percent control was calculated according to this formula:

$$\frac{\text{No. in check} - \text{no. in treatment}}{\text{no. in check}} \times 100$$

The bean leaf beetle has been controlled with several insecticides at rates as low as 1 lb/acre (4,7). Thus, the highest rate used for any insecticide evaluated in these tests was 1 lb/acre. Subsequent tests utilized progressively lower rates until effectiveness was lost. A few materials (synthetic pyrethroids) were tested at rates as low as 0.025 lb/acre.

The economic injury threshold, based on number of beetles per foot of row, has not been established for the bean leaf beetle. However, for purposes of determining adequate effectiveness of mate-

rials for use in making control recommendations, many researchers have used 80 percent control as an acceptable level. This criterion for evaluation was utilized in these tests.

RESULTS

In the series of tests conducted in 1975, Bolstar® and acephate provided acceptable control at 1 lb (active ingredient)/acre, but not at lower rates, table 1. Methomyl, methyl parathion, toxaphene-methyl parathion, methamidophos, chlorpyrifos, carbaryl, and DS24-465 provided acceptable control at rates as low as one-half lb ai/acre. Sevimol®, Mobil 9087 and fonofos did not provide 80 percent control at any rate tested.

Two series of experiments were conducted in 1976. Data from the first series of experiments are presented in table 2. In the series of tests presented in this table, the minimum rate which afforded at least 80 percent control of the bean leaf beetle was 1 lb/acre for Curacron®, 0.75 lb/acre for GCP 9646, and one-half lb/acre for Pennacap-M®, dimethoate, diazinon, and leptophos.

In the second series of tests conducted in 1976, table 3, the minimum rate tested which provided at least 80 percent control was 0.5 lb/acre for Bay 92114 and carbofuran, 0.125 lb/acre for Pounce®, 0.1 lb/acre for Ambush®, and 0.05 lb/acre for Pydrin®.

The following is a combined list of all materials tested which provided 80 percent or better control at some tested rate. The list is in order based on the minimum effective rate per acre (80 percent control) and starting with the material effective at the lowest rate: 0.05 lb., Pydrin®; 0.1 lb., permethrin (Ambush®); 0.125 lb., permethrin (Pounce®); 0.5 lb., Bay 92114, carbofuran, leptophos, diazinon, dimethoate, encapsulated methyl parathion (Pennacap-M®), DS24-465, carbaryl, chlorpyrifos, methamidophos, toxaphene-methyl parathion, methyl parathion, and methomyl; 0.75 lb., GCP 9646; 1 lb., Curacron®, and Bolstar®.

TABLE 1. PERCENT CONTROL AND AVERAGE NUMBER OF LIVE ADULT BEAN LEAF BEETLES PER 25 SWEEPS PER PLOT 24 HOURS AFTER TREATMENT WITH INDICATED RATES OF INSECTICIDES. 1975

Insecticide	1 lb AI/A (Test 1)		0.5 lb AI/A (Test 2)		0.25 lb AI/A (Test 3)		0.125 lb AI/A (Test 4)	
	Live beetles ¹	Control	Live beetles ¹	Control	Live beetles ¹	Control	Live beetles ¹	Control
	No.	Pct.	No.	Pct.	No.	Pct.	No.	Pct.
Carbaryl 80S	0.2	96	0.5	95	5.2	5	4.5	36
Methomyl 1.8L	0.5	92	0.8	86	4.0	27	6.2	11
Methyl Parathion 4EC ..	0.5	92	0.2	95	4.0	27	5.2	25
Acephate 75S	1.0	84	1.2	76	4.0	27	5.2	25
Toxaphene-Methyl Parathion 6-3EC ²	1.0	84	1.0	81	4.0	27	5.0	29
Chlorpyrifos 4EC	1.2	80	1.0	81	4.5	18	3.8	46
Methamidophos 4EC ...	1.2	80	1.0	81	2.5	55	4.8	32
DS 24-465 3.6EC	1.2	80	0.2	95	3.0	45	4.5	36
Bolstar® 6EC	1.2	80	1.8	66	2.0	63	4.0	43
Fonophos 4EC	1.8	72	1.2	76	4.7	14	3.5	50
Mobil 9087 2EC	2.0	68	1.5	71	4.0	27	5.0	29
Sevimol® 4	2.2	64	1.5	71	4.0	27	6.0	14
Check —	6.2	—	5.2	—	5.5	—	7.0	—

¹Mean of four replications.

²This mixture was applied at the designated rate for toxaphene and ½ that rate for methyl parathion.

TABLE 2. PERCENT CONTROL AND AVERAGE NUMBER OF LIVE ADULT BEAN LEAF BEETLES PER 25 SWEEPS PER PLOT 24 HOURS AFTER TREATMENT WITH INDICATED RATES OF INSECTICIDES. 1976

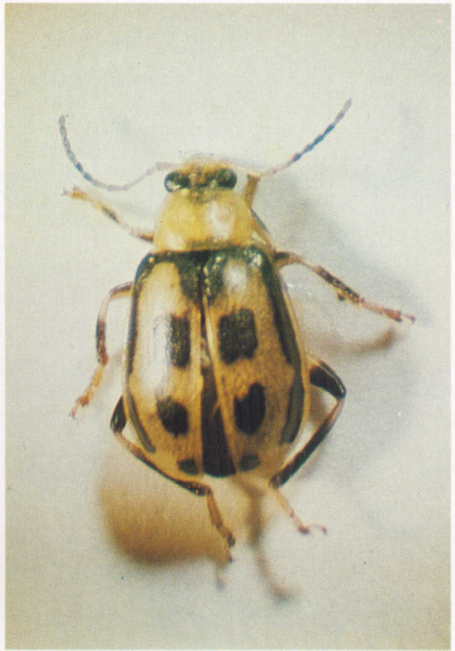
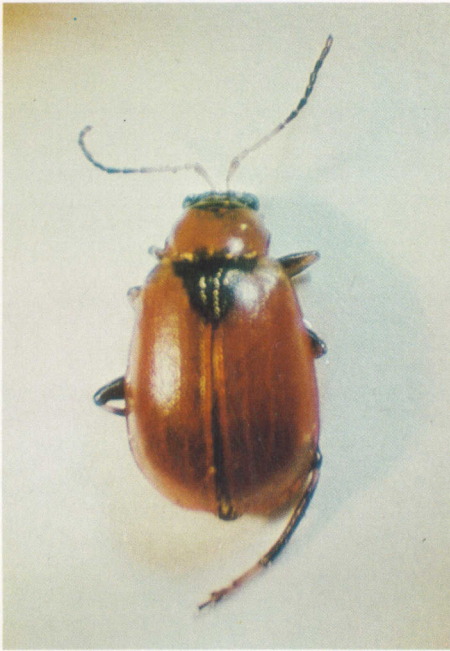
Insecticide	1 lb AI/A (Test 1)		0.75 lb AI/A (Test 2)		0.5 lb AI/A (Test 3)		0.25 lb AI/A (Test 4)	
	Live beetles ¹	Control	Live beetles ¹	Control	Live beetles ¹	Control	Live beetles ¹	Control
	No.	Pct.	No.	Pct.	No.	Pct.	No.	Pct.
Pennacp-M® 2EC	0.0	100	0.5	95	0.2	96	3.8	59
Diazinon 2EC	0.2	97	1.0	89	1.2	81	6.8	27
Dimethoate 2.67EC	1.0	89	1.8	82	0.0	100	6.2	33
Leptophos 2.7EC	1.0	89	1.2	87	1.0	85	9.2	0
Curacron®	1.0	89	2.5	74	2.2	65	4.8	49
GCP 9646 6EC	1.8	81	1.8	82	2.2	65	8.0	14
Check —	9.0	—	9.5	—	6.5	—	9.2	—

¹Mean of four replications.

TABLE 3. PERCENT CONTROL AND AVERAGE NUMBER OF LIVE ADULT BEAN LEAF BEETLES PER 25 SWEEPS PER PLOT AT INDICATED INSECTICIDAL RATES. 1976

Rate AI/A	Ambush® 2EC		Pydrin® 2.4EC		Pounce® 3.2EC		Bay 92114 6EC		Carbofuran 4EC		Check
	Live beetles ¹	Control	Live beetles ¹	Control	Live beetles ¹	Control	Live beetles ¹	Control	Live beetles ¹	Control	Live beetles ¹
	No.	Pct.	No.	Pct.	No.	Pct.	No.	Pct.	No.	Pct.	No.
1.000 lb					0.0	100	0.2	97	0.0	100	9.0
0.750 lb					0.5	95	0.5	95	0.2	97	9.5
0.500 lb					0.2	96	0.8	88	0.0	100	6.5
0.250 lb					0.5	94	2.8	70	3.8	59	9.2
0.200 lb	0.0	100	0.2	97							9.0
0.125 lb					1.0	90	7.5	25	5.8	43	10.0
0.100 lb	0.2	97	1.2	87							9.5
0.050 lb	1.8	73	1.2	81							6.5
0.025 lb	5.0	46	5.2	43							9.2

¹Mean of four replications.



Bean leaf beetles have several different color phases due to genetic variation, as shown in the above photographs.

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