Control of Imported Fire Ants with Chlordane[1]

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ABSTRACT

One application of 1 lb or more or 2 applications of ¼ or ½ lb of chlordane per acre afforded good control of the imported fire ant. *Solenopsis saevissima richteri* Forel. The duration of good control varied from 1 to 2 years.

Chlordane was one of the first insecticides used satisfactorily for controlling the imported fire ant, *Solenopsis saevissima richteri* Forel. Most of the early tests involved attempts to control ants with individual mound treatments; however, Blake et al. (1959) reported tests which showed that granular chlordane formulations broadcast at the rate of 4 lb of actual chlordane per acre gave good control of ants for 2 years. When the Imported Fire Ant Eradication Program was initiated in 1957, chlordane was not included as one of the standard treatments primarily because of the high dosage recommended. The treatments adopted at that time were 2 lb of heptachlor or dieldrin per acre. Following a series of studies by Lofgren et al. (1961) and Murphy et al. (1962) the dosage was reduced, and two split applications of ¼ lb of heptachlor per acre were made at intervals of 3 to 6 months.

In 1960 the existing no-residue tolerance for heptachlor in milk was expanded by the Food and Drug Administration to include most crops. This action created a necessity for alternate treatment procedures for the imported fire ant in areas where residues would pose a problem. Since tolerances for chlordane had been established for a wide variety of crops, a series of tests was conducted to evaluate chlordane as a soil residual for use in the Imported Fire Ant Eradication Program. This paper presents the results of 4 tests conducted for this evaluation.

Materials and Methods.—In each of the tests the chlordane was formulated on granular attapulgite clay. The mesh size range of the granules in the first test was 20–40 and in the other 3 tests 16–30. The percentage of the insecticide solvent, a heavy aromatic naphtha, was 10 to 12%, and the formulations contained 7% deactivator. The insecticide concentration was adjusted in each test so that a uniform application rate was maintained for the various dosages.

The formulations were applied with a jeep-mounted Buffalo turbine blower in Tests 1 and 3 and with a 20-ft Gandy fertilizer distributor in Tests 2 and 4. The application rate per acre was 20 lb of formulated material in the first test, and 10 lb in the others.

The effectiveness of the various treatments was determined by counting the number of active imported fire ant mounds on the test plots before treatment and at regular intervals thereafter. The average percentage of control was calculated for the replicates in each treatment. An ant colony was considered inactive when 20 or less workers were found in the mound, unless a wingless queen was present.

Results.—*Test* 1.—In August 1959, an experiment was begun to evaluate dosages of 1, 2, and 4 lb of chlordane per acre. A treatment of 1 lb of heptachlor per acre was included for comparison. The test plots of approximately 1 acre, located in a Bahia grass pasture, were treated in triplicate at each dosage level. The results are presented in Table 1. After 4 months, 99 to 100% control was obtained with all 3 dosages. A high degree of control was maintained on all the plots through 18 months, but after 2 years there was a definite decline. Control in the heptachlor plot ranged from 90 to 95% from 4 months through 2 years. Most of the colonies present at the 2-year count were small, indicating reinfestation from mating flights during the summer of 1961.

Test 2.—Lofgren, et al. (1961) reported excellent control of imported fire ants with 2 applications of heptachlor at ¼ or ½ lb/acre and applied at 3- to 6-month intervals. The results of this study led to a test to determine the effectiveness of split applications of ½ and 1 lb of chlordane per acre. Six 1-acre plots located in a Bahia grass and crimson clover pasture were treated at each dosage level. Three of the plots were retreated after 8 months; the other 3, as indicated in Table 2, received only 1 treatment. Chemical residue studies (Barthel et al. 1960) indicated that the addition of rosin to granular heptachlor formulations increased the soil residue of heptachlor and heptachlor epoxide; therefore, another set of plots was treated with a formulation of rosin and chlordane (2 to 1 ratio) at the rate of ½ lb of chlordane per acre. Heptachlor at a dosage of ¼ lb/acre was included as the standard. The applications were made in June 1960 and February 1961. The results of the posttreatment counts as recorded in Table 2 show a high degree of control at both dosage levels after 1 month. The control obtained may have been influenced by the facts that most of the colonies of the plots were young and the weather after treatment was very hot and dry. After 6 months the degrees of control with the various formulations ranged as follows: chlordane without rosin, 96 to 98%; chlordane with rosin, 88 to 92%; and heptachlor, 94%. At the end of 1 year (4 months after the second application) all the retreated plots and plots treated with a single application of 1 lb of chlordane per acre were free of ants. After 1½ years all the plots were reinfested. However, the control still remained at a high level on the retreated plots and the plots treated with a single applica-

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Table 1.—Control of imported fire ants with single applications of different dosages of chlordane based on average results from three 1-acre plots. 1959.

Insecticide	Dosage (lb/acre)	Average pretreatment count of active ant mounds	Percent reduction in active mounds after following months: 1	2	4	8	12	18	24
Chlordane	1	27	49	89	100	100	98	96	76
Chlordane	2	27	61	94	99	100	99	99	91
Chlordane	4	25	73	100	100	99	95	99	88
Heptachlor	1	36	78	89	93	93	95	92	90
Check		27	0	0	0	0	9	23	30

Table 2.—Comparative control of imported fire ants with 1 or 2 applications of chlordane based on average results from three 1-acre plots.

Insecticide	Dosage (lb/acre)	Number of applications[a]	Avg. pretreatment count of active ant mounds	Percentage reduction in active mounds at indicated months after 1st appl. 1	4	6	8	12	18
Chlordane[b]	½	1	19	100	89	88	82	86	19
Chlordane[b]	½	2	29	94	94	92	93	100	90
Chlordane	½	1	17	94	96	98	100	96	47
Chlordane	½	2	18	100	98	96	98	100	80
Chlordane	1	1	14	98	98	98	95	100	95
Chlordane	1	2	23	99	97	96	99	100	96
Heptachlor	¼	1	24	100	86	94	90	97	50
Heptachlor	¼	2	22	95	94	94	97	100	92
Check			14	56	0	0	0	0	0

[a] First application made in June 1960; second application in February 1961.
[b] Ten % rosin included in granular formulation to retard loss of chlordane.

Table 3.—Control of imported fire ants in 33–40 acre pastures with 2 applications of chlordane applied at intervals of 7 months.[a]

Insecticide	Dosage (lb/acre)	Avg. pretreatment count of active ant mounds	Percentage reduction in active mounds at indicated months after 1st appl. 1	3	5	8	12	18	24
Chlordane	¼	28	—	61	50	98	99	100	59
Chlordane	½	32	58	78	78	99	100	100	99
Chlordane	1	23	70	84	94	100	100	100	99
Heptachlor	¼	19	81	84	88	100	100	100	100
Check		40	0	0	0	3	0	0	2

[a] First application made in October 1960; second application in May 1961. Results based on average % reduction in ant colonies on four 2-acre subplots within each pasture.

Table 4.—Effectiveness of two or more applications of low dosages of chlordane in controlling imported fire ants based on average results from three 1-acre subplots located in each 6- to 10-acre test area. 1961.[a]

Insecticide	Dosage (lb/acre)	Avg. pretreatment count of active ant mounds	Percentage reduction in active mounds at indicated months after 1st. appl. 1	2	4	6	8	12	18
Chlordane	1/16	29	11	17	51	52	52	32	—
Chlordane	⅛	30	5	51	59	77	85	71	—
Chlordane	¼	20	38	80	97	98	98	97	88
Chlordane	½	26	45	92	99	99	100	99	96
Heptachlor	¼	44	70	99	100	99	100	100	96
Check	—	23	23	15	1	0	1	6	3

[a] All plots were retreated at the same dosage level after 2 months; the 1/16 and 1/8 lb/acre plots received a third treatment after 5 months.

tion of 1 lb of chlordane per acre. The addition of rosin to the formulations did not increase the effectiveness of chlordane.

Test 3.—The encouraging results obtained in the preceding experiment led to a test using large plots to determine if the results could be duplicated or improved. Four Bahia grass pastures ranging from 33 to 40 acres were selected for the test. Three of the fields were treated with 2 applications of chlordane at rates of $\frac{1}{4}$, $\frac{1}{2}$ or 1 lb/acre, and the fourth field was treated with 2 applications of heptachlor at a rate of $\frac{1}{4}$ lb/acre as a standard. The applications were made at a 7-month-interval, October 1960 and May 1961. Four 2-acre subplots were set up within each large plot. These plots were used for all pre- and posttreatment counts to determine the percentage control obtained. The average results for each treatment are presented in Table 3. The results indicate that 2 applications of chlordane were highly effective for fire ant control. The $\frac{1}{2}$/ and 1 lb/acre dosages resulted in complete control and only one weakened colony remained on the subplots in the $\frac{1}{4}$ lb/acre treatment after 1 year. After $1\frac{1}{2}$ years all plots were free of ants but at the end of 2 years plots treated with $\frac{1}{4}$ lb of chlordane per acre were heavily reinfested and a slight reinfestation had occurred on plots treated with $\frac{1}{2}$ and 1 lb/acre. The standard heptachlor treatment gave complete control from 8 months to 2 years. Since there were no accompanying plots which received only 1 treatment, no direct comparison of 1 and 2 treatments can be made. However, the results of the 5-month count can be considered indicative of the maximum control which would have been attained with 1 treatment.

Test 4.—The 100% control obtained with 2 applications of $\frac{1}{4}$ lb of chlordane per acre in the preceding test precipitated a fourth test to determine the limits of lesser dosages that would result in control with 2 or more applications. Five plots ranging from 6 to 10 acres and located in Bahia grass pastures were selected for the test areas. Three subplots, 1-acre each, were set up within each large plot for making the pre- and posttreatment counts. The borders of the subplots were at least 50 ft from each other and from the outer edges of the large plot. Four of the plots were scheduled for successive treatments of $\frac{1}{16}$, $\frac{1}{8}$, $\frac{1}{4}$, or $\frac{1}{2}$ lb of chlordane per acre and the fifth with 1 lb of heptachlor per acre. Observations for active ant colonies were made in the plots at 2-month intervals. If no active or only very weakened colonies were found, the plot was not re-treated. The plots containing active colonies were re-treated with the same dosage of insecticide. On this basis all the plots were re-treated after 8 weeks, but only the $\frac{1}{16}$ and $\frac{1}{8}$ lb/acre plots were treated after 16 weeks. The results as presented in Table 4 indicate that good control was obtained with two $\frac{1}{4}$ or $\frac{1}{2}$ lb/acre applications; however, 100% control was noted only at the 8-month count on the $\frac{1}{2}$ lb/acre plot. After 18 months considerable reinfestation had occurred. Three applications of $\frac{1}{16}$ or $\frac{1}{8}$ lb of chlordane per acre afforded only fair control. The standard application of $\frac{1}{4}$ lb of heptachlor per acre resulted in 100% control after 8 and 12 months, but the degree of control declined to 96% after 18 months.

DISCUSSION AND CONCLUSIONS.—It is evident from the results obtained that 1 application of 1 lb or more of chlordane per acre or 2 applications of $\frac{1}{4}$ or $\frac{1}{2}$ lb/acre will effectively control the imported fire ant. The period over which good control was obtained varied from 1 to 2 years. The variation is presumed to be the results of postapplication differences in atmospheric and soil temperatures, rainfall, ground cover, and soil type.

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