

Laboratory Evaluation of Certain Chlorinated Hydrocarbon Insecticides against the Imported Fire Ant¹

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Field tests showing that the chlorinated hydrocarbon insecticides dieldrin, heptachlor, aldrin, and chlordane were very effective in controlling the imported fire ant, *Solenopsis saevissima richteri* Forel, have been summarized by Blake et al. (1959) and Lofgren et al. (1961). No information has been reported, however, on the comparative toxicity of the compounds under controlled laboratory conditions. Investigations were therefore initiated to develop a standard procedure for evaluating soil insecticides and to determine the comparative toxicity of the insecticides previously mentioned. This paper outlines the laboratory techniques developed and presents toxicity data obtained on these compounds.

METHODS.—A review of the literature failed to yield any information on methods for the laboratory evaluation of insecticides for the control of imported fire ants or ants in general. After considerable difficulty, owing mainly to contaminated equipment, the following procedures were developed: A small plastic flower pot (2½-in. diameter) containing a layer of plaster of paris and builder's cement (9:1 ratio) about ¼ inch thick in the bottom is used as the test chamber. The plaster covers the holes in the bottom of the pot and acts as a wick to draw up water when the pots are set on wet peat moss. This moisture is necessary to keep the soil in the pots moist and thereby prevent desiccation of the ants. The cement is added to make a hard mixture through which the ants cannot tunnel and escape.

Twenty-gram lots of dry, sandy loam soil are treated with 5 ml of an acetone solution of the test insecticide at concentrations which give the desired ppm in the soil. The acetone is evaporated under a hood at 77° ± 2° F for 1 hour. One level teaspoonful of treated soil is placed in each flower pot and 20 worker ants are placed in each pot. The sides of the pot are dusted with talc to force the ants to remain on the treated soil. A small glass disc is placed on the lip of the pot at the juncture of the slanted side and the upright rim at the top. This disc fits snugly and prevents the escape of the ants during the test. It also helps maintain high humidity in the pots. After 24 hours the ants are removed from the treated soil with a vacuum needle, which picks them up without danger of injury. The ants are then placed in clean flower pots without soil. Peanut oil, soaked on cotton in small vial caps, is provided for food. Counts for dead and moribund ants are made at 24-hour intervals from the start of the test and continued for 96 hours. The pots are kept on damp peat moss throughout the test. This procedure was followed in comparing the toxicity of heptachlor, heptachlor epoxide, dieldrin, aldrin, and chlordane.

RESULTS.—The results of the tests and the calculated LD₅₀ for each compound are shown in Table 1. The data show that heptachlor epoxide is the most toxic of the 5 compounds to the imported fire ant with an LD₅₀ of 0.0075 ppm. Heptachlor is slightly less toxic than the epoxide with an LD₅₀ of 0.0080 ppm. Aldrin is considerably more toxic to the fire ant with an LD₅₀ of 0.0099 ppm than is dieldrin, which has an LD₅₀ of 0.0243 ppm. Chlordane is the least effective of the 5 with an LD₅₀ of 0.0377 ppm.

Table 1.—Comparative toxicity of several chlorinated hydrocarbon insecticides incorporated with soil to imported fire ants.*

Insecticide	Dosage ppm in soil	% mortality after following hrs. from start of test				Calculated LD ₅₀ (96 hours)
		24	48	72	96	
Heptachlor epoxide	0.004	6	8	11	13	0.0075
	.006	6	10	16	24	
	.008	4	32	47	53	
	.01	8	38	72	76	
	.02	6	93	97	97	
Heptachlor	0.002	4	8	12	14	.0080
	.004	8	10	15	17	
	.006	8	11	16	19	
	.008	7	37	54	60	
	.01	8	25	42	45	
	.02	7	66	78	80	
Aldrin	0.006	6	10	20	23	.0099
	.008	2	17	23	30	
	.01	4	22	39	43	
	.02	7	83	95	97	
	.04	46	98	99	99	
Dieldrin	0.01	12	13	18	18	.0243
	.02	10	13	17	21	
	.04	9	55	59	73	
	.06	14	75	83	85	
	.08	19	90	95	97	
	.1	52	93	98	99	
Chlordane	0.02	1	3	13	16	.0377
	.04	3	7	26	34	
	.06	5	51	83	88	
	.08	5	62	72	94	
	.1	6	76	92	93	
	.2	28	92	97	99	
Check	—	5	5	5	7	

* Average of 6 replicates at each dosage level. The reference grade of each insecticide was used. Ants exposed to soil for 24 hours.

REFERENCES CITED

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¹ Received July 30, 1963; accepted for publication October 28, 1963.