The Use of Chlorinated Polyphenyls to Increase the Effective Insecticidal Life of Lindane[1]

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The tests described in this paper were designed to investigate the possibilities of extending the effective life of lindane by the addition of a chlorinated polyphenyl to the spray solution. Other research workers, in preliminary studies with cockroaches and house flies, have reported some evidence that there was a marked increase in the effective life of lindane when such material was added to the toxicant formulation (Hornstein & Sullivan 1953, Sullivan *et al.* 1955). From their tests they concluded that the effective life of lindane may be increased 10 to 20 times. Therefore, the author attempted to confirm their results under field conditions with an insect of economic importance to the shade tree field.

The materials selected for testing were 25% lindane wettable powder and Aroclor No. 5460, a chlorinated polyphenyl produced exclusively by the Monsanto Chemical Company (Benignus, n. d.). The insect used was the elm leaf beetle, *Galerucella xanthomelaena* (Schr.).

The resinous Aroclor, which is insoluble in water, was dis-

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Table 1.—Effect of lindane and lindane-Aroclor on the elm leaf beetle.

Days Treated Prior to Infesting	Per Cent Dead After			
	Lindane		Lindane-Aroclor	
	2 Days	5 Days	2 Days	
	Test 1 (Larvae)			
4	70	100	100	
7	65	100	100	
11	70	100	100	
14	45	80	100	
Untreated	10	25[a]		
	Test 2 (Adults)			
8	5	80	100	
36	0	15	100	
Untreated	0	0[b]		
	Test 3 (Adults)			
	1 Day	*3 Days*	*1 Day*	*3 Days*
23	0	60	60	100
35	0	70	70	100
41	0	90	90	100
58	0	0	0	50
65	10	40	40	70
71	0	10	10	90
Untreated	10	20		

[a] The remainder pupated within 20 days.
[b] None dead after 7 days.

solved in xylene at the rate of 1 pound of Aroclor No. 5460 to 1.25 pints of xylene and 1 fluid ounce of Triton X-100, added as an emulsifier. This mixture was then added, along with 1 pound of 25% lindane wettable powder, to enough water to make 100 gallons. This gave a suspension containing four parts of Aroclor to one part of actual toxicant.

Prior to carrying out the tests with lindane, it was deemed advisable to determine if Aroclor displayed any toxic properties when used alone. To determine this, a potted elm sapling was sprayed with a suspension of lindane, another with a suspension of lindane and Aorclor, a third with an emulsion of Aroclor, and a fourth with ordinary tap water. The plants were then allowed to dry. Leaves from each lot were removed, placed in separate trays and infested with adults of the elm leaf beetle. Twenty adult beetles were used per treatment, observed closely and their ensuing actions were recorded. The beetles which were placed on the lindane-treated leaves and on the lindane-Aroclor-treated leaves were affected almost immediately. After 1 hour all 40 beetles were on their backs showing only a slight movement of the appendages and after 24 hours all were dead. The beetles which were placed on the Aroclor-treated leaves, on the other hand, and on those leaves serving as the check displayed no ill effects at the end of an hour. At the end of 24 hours, however, those on the Aroclor-treated leaves appeared to have very little control of their movements. At the end of 48 hours they were on their backs but still alive, but were dead at the end of 72 hours, whereas, those serving as the check appeared perfectly normal. The results of this test indicated that the Aroclor formulations containing no lindane possessed some insecticidal properties.

On June 12, studies were begun in which small elm saplings growing in pots out-of-doors were sprayed with solutions of lindane or lindane-Aroclor. All applications were made with a 2-gallon D. B. Smith compressed air sprayer. The plants were sprayed to the point of run-off and then placed on a bench out-of-doors where they were subjected to the existing weather conditions during the months of June and July. One group of elms was treated with a suspension of 25% lindane wettable powder at the rate of 1 pound to 100 gallons of water while another group was treated with the same suspension to which Aroclor was added. Individual plants within each group were sprayed on different dates in order to provide material suitable for this study. Sufficient Aroclor was not available to treat a third group with an emulsion containing Aroclor alone. Therefore the results presented here give only a comparison between the respective actions of the lindane and the lindane-Aroclor formulations.

On June 28 leaves were removed from the elms of each group, placed in trays and infested with third- and fourth-instar larvae of the elm leaf beetle. Twenty larvae were placed in each tray, an unreplicated test. The results are given in table 1.

Two series of tests were conducted using the adult stage of the elm leaf beetle. On August 7 and again on August 22 adult beetles were placed on leaves removed from previously treated plants. Twenty adults were placed in each tray and, as in Test 1, they were not replicated but there were three replicates of the control or check. The results are also given in table 1.

Perhaps one of the most striking results in the data obtained is the apparent rapidity with which the lindane-Aroclor formulation acted. In Test 1 all larvae placed on leaves treated with the lindane-Aroclor mixture were dead within 2 days whereas, with lindane alone, 100% mortality was not reached until after 5 days. Results were similar with the adult beetles. Ninety per cent mortality occurred at the end of 24 hours and 100% mortality occurred within 3 days on the leaves treated with the lindane-Aroclor formulation even after 41 days had elapsed between the time of treatment and the placing of the adult beetles on the treated leaves.

In summary, the results presented indicate that an increase occurred in the effective life of lindane when Aroclor was added to the formulation. Aroclor when used alone, exhibited a toxic effect on the elm leaf beetle. When it was used in combination with lindane, mortality occurred earlier than from the use of lindane alone. It is possible that the Aroclor might have a synergistic effect on the lindane when the two insecticides are used in combination. Further investigations are needed to determine this point.

References Cited

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