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Chlorinated Polyphenyls to Improve Lindane Residues

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The use of lindane as a pesticidal residue is well established. On some surfaces the residue is unsightly and it generally dissipates within a few weeks, owing to the relatively high vapor pressure of lindane (9.4×10^{-6} mm. Hg. at 20° C.). Studies were therefore initiated to improve both the appearance and persistence of lindane residues.

Previous work by Block (1948) and Lindquist *et al.* (1945) proved that DDT can be incorporated into resins and paints. We chose to blend lindane with a chlorinated polyphenyl for the following reasons: (1) Chlorinated polyphenyls are obtainable as high-molecular-weight, noncrystallizing, film-forming materials. (2) Since both these materials are chlorinated hydrocarbons, it was expected that lindane would be soluble in the polyphenyl and therefore would show no tendency to crystallize out of such films. (3) The vapor pressure of such mixtures is lower than that of lindane alone, and thus the effective life of lindane would be extended. (4) Chlorinated polyphenyls would not be expected to discolor or change their physical characteristics with time. Paints and polymerizable films such as urea formaldehyde may change in time. Paints may form a hard skin impervious to lindane diffusion, and polymerizable materials, in addition to discoloring, may continue to polymerize and eventually cause the lindane to crystallize out of the film.

Chlorinated polyphenyls are inexpensive, nonoxidizing, of low volatility, noncorrosive to metals, and resistant to fire and water. They are available under the trademark *Aroclor*.[1]

Materials and Methods.—Because of good preliminary results, the chlorinated polyphenyl used in these tests was an isomeric terphenyl (ortho, meta, and para mixture) containing about 60 per cent of chlorine by weight and commercially available as *Aroclor 5460*. It forms a yellow transparent resin with a very low vapor pressure.

Carbon tetrachloride solutions of lindane and the chlorinated polyphenyl, separately and together, were prepared in several concentrations. The test solutions were poured on aluminum and masonite panels each 1 square foot. The spreading properties of the solutions were excellent. The carbon tetrachloride soon evaporated, leaving the lindane as a white deposit, the mixture as a clear residue that was tenacious and slightly tacky, and the chlorinated polyphenyl as a hard, transparent residue. The panels were placed in a horizontal position and held at summer room temperature (70°–100° F.) for 3 months.

Large nymph and adult roaches, *Periplaneta americana* (L.), were used as test insects. After 2, 10, 30, 60, and 90 days, 15 roaches were confined for 2 hours under each of two petri dishes inverted over each test panel. The roaches were thus exposed to the contact and fumigation action of the residues on the test panel. They were then transferred to observation cages and held for 4 days.

Results.—The results of the tests are given in table 1.

The effective life of a lindane residue, as measured by a 50 per cent or better kill of roaches on an aluminum surface, is shown to be dependent on the amount of lindane used. Lindane residues of 50, 100, and 200 mg. per square foot were effective under summer conditions for less than 15, 30, and 60 days, respectively. These were the periods during which the white deposit was visible.

The effective period was greatly increased when lindane was mixed with the chlorinated polyphenyl. A 66 per cent kill was obtained when the roaches were exposed to 80-day-old residues containing 50 mg. of lindane plus 200 mg. of chlorinated poly-

[1] The Aroclors, physical and chemical properties and suggested applications. Application Data Bulletin No. P-115, Monsanto Chemical Co., St. Louis, Mo.

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Table 1.—Per cent mortality of roaches exposed to lindane and lindane-chlorinated-polyphenyl residues of different ages on aluminum and masonite surfaces.

Dosage (Mg./Sq. Ft.)		Aluminum Surface					Masonite Surface				
		Days					Days				
Lindane	Chlorinated Polyphenyl	2	10	30	60	90	2	10	30	60	90
50	0	100	37	9	4	6	72	0	0	4	0
100	0	100	100	36	3	0	100	19	0	3	0
200	0	100	100	78	22	0	100	78	6	6	0
50	200	86	89	78	80	66	91	8	0	6	0
100	200	94	67	76	82	80	100	17	12	2	4
200	200	98	100	63	66	99	100	30	0	3	0
200	400	95	—	79	96	95	—	—	—	—	—
0	200	0	0	0	0	0	—	—	—	—	—

phenyl per square foot. Residues from 100 mg. of lindane plus 200 mg. of chlorinated polypheny per square foot increased the kill to 80 per cent, and residues from 200 mg. of lindane plus 200 mg. of chlorinated polyphenyl increased the kill to 99 per cent. The residues remained transparent, tenacious, and only very slightly tacky. Both lindane and lindane-chlorinated-polyphenyl residues were much less effective on the porous masonite surfaces. Residues of the chlorinated polyphenyl alone on aluminum surfaces caused no mortality.

Discussion.—These tests showed that the persistence of lindane as a residue was greatly improved by incorporation into a film of chlorinated polyphenyl. The lindane in the main body of the film remained in solution and acted as a reservoir. As the lindane evaporated from the surface it was continually renewed by a study diffusion of lindane to this surface. Because the lindane remained in solution, there was no white powdery deposit, which often mars treated surfaces.

The excellent spreading properties of the solutions and the inertness and tenacity of the films suggest further uses in the field of entomology, and they are being investigated.

Literature Cited

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