TECHNICAL BULLETIN

Monsanto Chemical Company . . . Foreign Department, St. Louis, Missouri, U. S. A.

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LINDANE-AROCLOR* COMBINATIONS

BULLETIN NO. EX-43

In recent news releases the Bureau of Entomology and Plant Quarantine, U.S. Department of Agriculture, Beltsville, Maryland, announced that results of laboratory and preliminary trial studies show marked increase in the effective insecticidal life of lindane when chlorinated polyphenyls (Monsanto's Aroclors) are incorporated in the toxicant formulation.

A number of chlorinated polyphenyls were tested; best results were obtained with Aroclor 5460. For specific purposes where a very tacky deposit is desired, it may be possible that Aroclor 4465, also a resin, may be of interest. If a "wet" deposit is desired, perhaps chlorinated biphenyls such as Aroclors 1254, 1260 and 1262, which are viscous liquids, will give the desired effect.

Lindane is a well established pesticidal chemical. When applied as a residue it may leave an unsightly crystalline deposit and because of its relatively high vapor pressure, its insecticidal value dissipates within a few weeks.

The Aroclors have good solvent action on lindane which results in improved appearance of the pesticidal residue. Moreover, the Aroclors function as relatively non-volatile, non-oxidizable, non-flammable bonding agents for lindane, imparting strong adhesion to all surfaces and reducing the evaporation of lindane to a marked degree.

The high resistance of Aroclors to water and corrosive influences, no doubt, accounts for the unusually good weather durability of the lindane-Aroclor residue as noted in the preliminary work.

Although the biphenyl Aroclors, and especially the lower chlorinated members of the series are known to possess activity as lousicides, miticides, larvicides and show synergistic action on nicotine, these properties seem to diminish with higher chlorination and also seem

*Trade name, (chlorinated biphenyl and chlorinated polyphenyls) Reg. U.S. Pat. Office.

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less prevalent in the terphenyl base Aroclors such as Aroclor 5460. Synergism, however, cannot be readily predicted and the possibility of synergism in this Aroclor-lindane mixture is at the present time being investigated by the Bureau of Entomology and Plant Quarantine.

Understanding of the dermatology and toxicology of Aroclors is important in their handling and use in insecticidal formulations. With reference to Monsanto's Technical Bulletin P-115, Page 19 reported data indicates that Aroclors 1254 and 5460 showed no primary irritancy or sensitization when tested by standard skin patch tests.

Although the vapor pressure of Aroclors is relatively low, if the materials are heated sufficiently to give off vapors it should be noted that such vapors bear a degree of toxicity and should not be breathed continuously, as indicated in greater detail in Bulletin P-115.

Experimental Work and Formulations

50 to 200 milligrams of lindane per square foot of surface has given good insect control on nonporous surfaces. The ratio of lindane to Aroclor 5460 has been varied from 1:1 to 1:4. For most purposes a 1:1 or a 1:2 mixture is satisfactory.

Formulations as used in the Bureau's experiments are:

1) For application as a solution

Lindane	5	parts by weight
Aroclor 5460	5	" " "
Carbon Tetrachloride*	750	" " "

2) For application as an emulsion

Lindane	20	parts by weight
Aroclor 5460	20	" " "
Xylene	100	" " "
Triton X-100	3	" " "

To obtain a stable 1% lindane emulsion, mix 143 parts by weight of the above concentrate to 1857 parts by weight of water.

3) For use as a pressurized spray

a) Lindane	5	parts by weight
Aroclor 5460	5	" " "
Methylene chloride	40	" " "
Freon 12	50	" " "

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* Carbon tetrachloride is toxic and should be handled with extreme caution. Less toxic solvents are being studied.

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b) Lindane	5	parts	by	weight
Aroclor 5460	5	"	"	"
Cyclohexanone	10	"	"	"
Ortho dichlorobenzene	35	"	"	"
Freon 12	45	"	"	"

The Bureau people do not want these formulations or results with them to be construed as a recommendation for use as the work is in the laboratory stage and has not had extensive field testing.

Experimental Results - American Roaches

Using Formulas 3a or 3b, the toxicant was applied onto a painted wall depositing about 200 mg./sq.ft. of lindane and a like amount of Aroclor 5460.

At the time of this writing, the toxicant coat is one month old, and it still gives 90-100% kill of American roaches when the roaches contained in a petri dish are placed against the surface of the treated wall for two hours.

The research team found that the lindane-Aroclor 5460 mixture (used at the rate of 50 mg. of actual lindane per sq. ft.) would kill 80% of all cockroaches exposed for 2 hours to a 60 day old treated surface. It remained lethal to 66% of the roaches after 90 days. Regular lindane sprays used at the same rate, killed only 4% of the roaches after 60 days.

House Flies

Deposits of 25 mg. of lindane plus 25 mg. of Aroclor 5460 applied from carbon tetrachloride onto glass and aluminum (hard surfaces) give 100% kill of normal house flies exposed for 2 hours to these treated surfaces after they had aged 18 weeks, the duration of the test. The surfaces are still equally active and the test is being continued.

Without the Aroclor the hard surfaces treated with Lindane alone would be effective only about one week.

A lindane plus Aroclor mixture sprayed as an aerosol onto leaves of a willow tree continues to kill house flies after 2 months outdoor weathering. Careful inspection of the treated leaves shows that the toxicant is held firmly to the surface and not withstanding rain and weather, the coating remains in good condition. Also, within limits of a preliminary inspection there does not seem to be injury to the willow leaves.

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Conclusion

According to these laboratory tests, it is believed that Aroclor may increase the effective life of lindane, 10 to 20 times.

Since Aroclors are relatively very inexpensive, their use with lindane would offer a great economic value. In addition to use with lindane, the Aroclors may be equally useful with a wide variety of other insecticidal agents.

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