

Dislodgable Insecticide Residues on Cotton (1976)

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There is a continuing need for dislodgable residue data to aid in establishing field reentry safety intervals, and also for purposes of comparing insecticidal residue lives. Our most recent study (Ware et al., 1975) compared the dislodgable residues of Supracide, Fundal, Sevinol, methyl parathion alone and with toxaphene, Carzol and Sevin on cotton over 96 hours post-application. The present study continues to explore on an annual basis the disappearance rates from cotton of several insecticides: methyl parathion, microencapsulated methyl parathion, methyl parathion with EPN, methyl parathion with toxaphene, diazinon, microencapsulated diazinon, Fundal, and Lorsban.

MATERIALS AND METHODS

The test plots were located in a 16-acre block of DP&L short staple cotton on the Arizona Agricultural Experiment Station, Marana, Arizona. The plots were treated on August 9, 1976, when the cotton averaged 29.8" in height. Each plot consisted of 4 rows, with 40" spacing, 50' long. The sprays were applied at the rate of 13 gallons per acre, at 2.5 MPH and 40 PSI. The spray rig was a manually-drawn experimental spray apparatus, designed to treat 2 rows at a time, using 3 DC-2-13 Spraying Systems nozzles per row. Pressure was maintained from a small, 3-lb, CO₂ tank using a single stage regulator.

The materials in sequence of application, rate of active ingredient (AI) per acre, and formulations were:

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Fundal (4 EC) @ 1.0 lb. AI/acre
Trion 6 (3 lbs EPN + 3 lbs methyl parathion/gal) @
1.0 lb. AI/acre
Toxaphene-methyl parathion (8 + 2 EC) @ 1.0 lb. methyl
parathion AI/acre
Lorsban (4 EC) @ 1.0 lb. AI/acre
Methyl parathion (4 EC) @ 1.0 lb. AI/acre
Diazinon (4 EC) @ 1.0 lb. AI/acre
Methyl parathion, microencapsulated (Pencap M, 2 lb/gal)
@ 1.0 lb. AI/acre
Diazinon, microencapsulated (Knox Out, 2 lb/gal) @
1.0 lb. AI/acre
Control

Maximum and minimum temperatures during the study were:
Aug. 9, 99°-72°; Aug. 10, 99°-73°; Aug. 11, 101°-70°; Aug. 12,
104°-70°; and Aug. 13, 103°-66°F. No precipitation occurred
during the study.

Triplicate leaf samples were collected in each treated and
control plot at 0, 24, 48, 72, and 96 hours after treatment. Each
sample consisted of 100 leaves picked singly and consecutively from
the top, middle and bottom portions of plants in all 4 rows. Each
sample was placed in a plastic bag and held in an ice chest in
the field for 8-10 minutes until leaf punches were made.

The leaves were center punched with a 36-mm, sharpened
aluminum tube, 10 leaves at a time stacked together, and extracted
by shaking for 1 minute in pint jars using 250 ml of the appro-
priate solvent. Extracts were decanted into 8-oz bottles, solvent
level marked, maintained on ice until they were returned to the
laboratory and then held at 0°F.

The extracting solvents were benzene for EPN-methyl para-
thion, toxaphene-methyl parathion, Lorsban, methyl parathion, and
encapsulated methyl parathion; acetone for diazinon and encap-
sulated diazinon; and hexane for Fundal.

The Fundal extracts were analyzed by the Nor-Am Agricultural
Products, Inc., laboratories in Woodstock, Illinois. All other
compounds were analyzed in our own laboratory by gas chroma-
tography using a Micro Tek MT-220 equipped with a flame photometric

detector, on phosphorus mode, a 4' Pyrex glass column, 4 mm I.D., packed with 5% SE 30 on 100/120 mesh Chromosorb W (H.P.), and nitrogen carrier at 40 psi and 62 ml/min. Quantitation was by peak height, utilizing 2 to 6 μ l of sample or standard. All results represent an average of the 3 replicated samples.

The results are presented in Table 1, expressed as milligrams of insecticide or metabolite per square meter of cotton leaf (mg/m^2). Toxaphene preserves the residual life of methyl parathion by several fold compared to methyl parathion alone (Ware, et al., 1975). EPN also improves the residual life of methyl parathion (Trion), as does microencapsulation, for both methyl parathion (PenCap M[®]) and diazinon (Knox Out[®]), extending their residual lives by 2-4 times. Fundal continues to escape capture as a residue (Ware, et al., 1974;1975). Even at 1.0 lb. AI/acre, 5 to 10 times the normal use rate, initial residues appear at only 3.2 mg/m^2 , as compared to 75-90 mg/m^2 normally expected. Generally, it appears that methyl parathion and diazinon alone, or Lorsban and Fundal have no significant or efficacious dislodgable residue levels beyond 24 hours.

Developing a method of preserving the integrity of Fundal, as with methyl parathion or diazinon, by microencapsulation or some other technique, would appear to be a worthy formulation achievement and should be pursued.

REFERENCES

- WARE, G.W., BETTY ESTESEN and W.P. CAHILL: 1975. Bull. Environ. Contam. Toxicol. 14 (5): 606-609.
- WARE, G.W., BETTY ESTESEN, and W.P. CAHILL: 1974. Bull. Environ. Contam. Toxicol. 11, 434 (1974).

Table 1. Insecticide residues expressed as mg/m² of cotton leaf following application by manually-drawn ground sprayer. Marana, Arizona, August 9, 1976.

Hours	Methyl Parathion		Pencap M		Toxaphene- Methyl Parathion		Fundal
	1#/A		1#/A		2#+1#/A		
	Methyl Parathion	Methyl Paraoxon	Methyl Parathion	Methyl Paraoxon	Methyl Parathion	Methyl Paraoxon	
0	43.6	0.20	22.1	0.07	92.2	0.14	3.24
24	2.18	0.21	27.2	0.49	60.9	0.51	1.79
48	0.43	0.11	30.2	0.67	39.2	0.56	1.94
72	0.53	0.08	17.6	0.52	15.0	0.27	1.79
96	0.14	0.03	21.4	0.60	11.0	0.28	1.79
Controls	< 0.03	< 0.03	< 0.03	< 0.03	< 0.03	< 0.03	0.99

Hours	Diazinon		Diazinon Encapsulated		Lorsban		Trion 6	
	1#/A		1#/A		1#/A		1# + 1#/A	
	Diazinon	Diazinon Encapsulated	Diazinon Encapsulated	Lorsban	Methyl Parathion + EPN	Methyl Parathion + EPN	Methyl Parathion + EPN	Methyl Parathion + EPN
0	32.9	53.9	36.2	78.7	0.13	81.4		
24	7.56	64.9	3.0	30.4	0.38	55.4		
48	4.51	41.8	1.91	9.21	0.29	34.1		
72	2.24	23.6	0.69	2.62	0.10	15.2		
96	3.32	22.2	0.68	1.29	0.08	14.1		
Controls	< 0.03	< 0.03	< 0.08	< 0.03	< 0.03	--		