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Selected Toxicants for Control of Lice[1] on Poultry at Kerrville, Texas, 1961–69[2,3]

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ABSTRACT

A method of treating poultry for the primary evaluation of insecticides for control of poultry lice was developed. When the technique was used with 65 candidate insecticides and the results were evaluated by a classification schedule, 14 gave control equal or superior to that of the malathion standard. Crotoxyphos, Zectran® (4-dimethylamino) -3,5-xylyl methylcarbamate), and Hooker HRS-1422 (3,5-diisopropylphenyl methylcarbamate) were the outstanding candidates by this method.

Sixty-five compounds were evaluated as candidate insecticides for control of lice infesting white leghorn hens[5] at the Livestock Insects Investigations Laboratory at Kerrville, Tex., from 1961 through 1969. The materials were selected for poultry lice evaluation on the basis of their performance in screening programs in which stable flies, *Stomoxys calcitrans* (L.), were the test species. Thus, a high percentage was effective.

METHODS AND MATERIALS.—The candidate materials were prepared as acetone solutions of the technical product whenever possible; otherwise, they were prepared in alcohol or water solution or in suspensions. All the candidates are manufactured by commercial companies, but many were supplied by chemists of the Entomology Research Division.

The evaluation procedure used was a direct-application-of-spray technique devised by the senior author (Hoffman 1961) while he was at the Delta Branch Experiment Station, Stoneville, Miss., and was slightly modified subsequently at the Kerrville laboratory. The following steps were included:

(1) Pretreatment populations of lice on each hen were estimated by counting the motile forms observed in 10 openings of the feathers, 2 each at the vent, breast, back, neck, and wings.

(2) The day after the pretreatment count, each hen (4 were treated with each compound) was sprayed individually with exactly 40 ml of a 0.25% concentration of the candidate toxicant with an artist's airbrush or a Schrader® 8937 spray nozzle adjusted to coarse spray. A laboratory air compressor adjusted to 10 psi was used to supply the propellent air. When application was accomplished with 1 gloved and gowned person holding and slowly rotating the bird, and a 2nd person operating the sprayer, complete coverage of the skin and feathers was easily achieved.

[1] Mallophaga: Menoponidae.
[2] Received for publication Apr. 28, 1971.
[3] Mention of a pesticide or proprietary product does not constitute recommendation or endorsement by the USDA.
[4] Present address: Beltsville, Md. 20705.
[5] Mixed species, but principally the chicken body louse, *Menacanthus stramineus* (Nitzsch).

Table 1.—Effectiveness of selected toxicants for control of poultry lice.

Chemical	Effectiveness[a] at indicated % concn				
	0.05	0.1	0.25	0.5	1.0
Bromophos-ethyl	III	III	III	IV	
Carbamic acid, methyl-,sec-butylphenyl ester (mixture of isomers;) Geigy G-35234		IV	IV		
Carbamic acid, methyl-, 4-chloro-2,3-dihydro-2,2-dimethyl-7-benzofuranyl ester; NIA-10559		IV	IV		
Carbamic acid, methyl-,6-chloro-*m*-cumenyl ester; Hercules 7522-H		IV	IV		
Carbamic acid, methyl-, 2,3-dihydro-2-methyl-7-benzofuranyl ester; Bay 62863	III	III	IV		
Carbamic acid, methyl-, 2,3,-dihydro-2,2,4-trimethyl-7-benzofuranyl ester; Niagara NIA-10586		IV	IV		
Carbamic acid, methyl-, 4- (diallylamino) -3,5-xylyl ester; Bay 50282	III	III	IV		
Carbamic acid, methyl-, 3,5-diisopropylphenyl ester; Hooker HRS-1422	IV	IV	IV		
Carbamic acid, methyl-, 4- (dimethylamino) -3,5-xylyl ester; Zectran®	IV	IV			
Carbamic acid, methyl-, ester with (*p*-hydroxyphenyl) acetonitrile; Stauffer R-11782	IV	IV	IV		
Carbamic acid, (2-mercaptoethyl) -, ethyl ester, *S*-ester with *O,O*-diethyl phosphorodithioate; Stauffer R-3423	II	II	III		
Carbamic acid, (methoxyacetyl) methyl-, *o*-isopropoxyphenyl ester; Upjohn U-18120		IV	IV		
Carbamic acid, methyl-, *o*- (4-methyl-1,3-dioxolan-2-yl) phenyl ester; Ciba C-9643		IV	IV		
Carbamic acid, methyl-, 2-methyl-8-quinolyl ester; Geigy GS-13798	IV	IV	IV		
Carbamic acid, methyl-, 2-methyl-8-quinolyl ester, sulfate (1:1) ; Ciba C-11753		IV	IV		
Carbaryl; Sevin®		III	III	IV	
Carbophenothion, Trithion®			III	III	IV
Coumaphos, Co-Ral®	I	III	IV		
Crotoxyphos; Ciodrin®	IV[b]	IV			
Cyclopropane, 1,1-dichloro-2,2-bis (*P*-ethoxyphenyl) ; Monsanto CP-51453	IV	IV	IV		
Deet				I	I[c]

Table 1. (Continued)

Chemical	Effectiveness[a] at indicated % concn				
	0.05	0.1	0.25	0.5	1.0
Dicapthon, Amer. Cy. 4124			I	I	
Dichlorvos; DDVP		III	III		
Dimethoate; Cygon®		II	III	IV	
Dioxacarb; duPont 1519		IV	IV		
Dioxathion; Delnav®			III	III	IV
Formamidine, *N'*-(4-chloro-*o*-tolyl) -*N,N*-dimethyl; Ciba C-8514			III		
Formothion	IV	IV	IV		
Malathion	IV	IV	IV		
Methomyl		IV	IV		
4-Morpholineacetonitrile, *alpha*-methyl; Wyandotte W-24	I	I	I		
Naled; Dibrom®		II	IV		
Phosphonic acid, (1-hydroxyvinyl) -, dimethyl ester, diethyl phosphate; Monsanto 12432			I	III	III
Phosphonodithioic acid, ethyl-, *S*-[[(p-chlorophenyl) thio]methyl] *O*-ethyl ester; Stauffer N-2860		IV	IV		
Phosphonodithioic acid, ethyl-, *O*-isobutyl ester, *S*-ester with *N*- (mercaptomethyl) phthalimide; Stauffer N-4543		IV	IV		
Phosphonodithioic acid, methyl-, *S*- (4-chloro-*m*-tolyl) *O*-ethyl ester; Stauffer R-10778	IV	IV	IV		
Phosphonothioic acid, ethyl-, *O*- (2-chloro-4-nitrophenyl) *O*-isopropyl ester; Stauffer N-2404		IV	IV		
Phosphonothioic acid, ethyl-, *O*-ethyl *O*- (2,4,5-trichlorophenyl) ester; Bay 37289		IV	IV		
Phosphonothioic acid, methyl-, *O*-methyl *O*-[*p*- (methylthio) phenyl] ester; Bay 30237		IV	IV		
Phosphonothioic acid, methyl-, *O*- (*P*-nitrophenyl) *O*-phenyl ester; Monsanto CP 40294	IV	IV	IV		
Phosphoramidic acid, methyl-, 2,4-dichlorophenyl propyl ester; Dowco® 175	IV	IV			
Phosphoramidothioic acid, *O*-ethyl *S*-methyl ester; Bay 65258	IV	IV	IV		
Phosphoramidothioic acid, isopropyl-, *O*-ethyl ester, *S*-ester with 2-mercapto-*N*-methoxy-*N*-methylacetamide; Velsicol FCS—13	III	III	III		
Phosphoramidothioic acid, methyl-, *O*- (4-*tert*-butyl-2-chlorophenyl) *O*-methyl ester; Dowco® 109			I	III	
Phosphoric acid, 1- (4-bromo-2,5-dichlorophenyl) -2-chlorovinyl dimethyl ester; Shell SD-8972		IV	IV		
Phosphoric acid, 2-chloro-1- (2,4-dibromophenyl) vinyl dimethyl ester; Shell SD-8436	I	IV	IV		
Phosphoric acid, 2-chloro-1- (2,4,5-trichlorophenyl) vinyl diethyl ester; Shell SD-8448	IV	IV			
Phosphoric acid, 2-chloro-1- (2,4-dichlorophenyl vinyl diethyl ester; Compound 4072, Supona®		III	IV		
Phosphoric acid, 2-chloro-1- (2,4,5-trichlorophenyl) vinyl dimethyl ester; Shell SD-8447; Gardona®		IV	IV		
Phosphorodithioic acid, *S*-[[(3,4-dichlorophenyl) thio]methyl]*O,O*-diethyl ester (25% EC) ; Geigy G-27365		IV	IV		
Phosphorodithioic acid, *S*[[(3,5-dichlorophenyl) thio]methyl] *O,O*-dimethyl ester; Geigy G-35157	III	III	IV		
Phosphorodithioic acid, *O,O*-diethyl ester, *S*-ester with *N*- (2-bromo-1-mercaptoethyl) phthalimide; Hercules 13843	III	III	IV		
Phosphorodithioic acid, *O,O*-diethyl ester, *S*-ester with 3- (mercaptomethyl) -2,4-thiazolidinedione; Stauffer R-7239	III	III	III		
Phosphorodithioic acid, *O,O*-dimethyl ester, *S*-ester with 3- (mercaptomethyl) -2,4-thiazolidinedione; Stauffer R-7240		IV	IV		
Phosphorodithioic acid, *O,O*-dimethyl ester, *S*-ester with *N*- (1-mercaptoethyl) succinimide; Hercules 13462		IV	IV		
Phosphorodithioic acid, *O*-ethyl *O*-methyl ester, *S*-ester with *N*- (mercaptomethyl) phthalimide; Stauffer R-5723		IV	IV		
Phosphorodithioic acid, *O*-isopropyl *O*-methyl ester, *S*-ester with *N*- (mercaptomethyl) phthalimide; Stauffer R-5725	IV	IV			
Phosphorothioic acid, *O*- (2,5-dichloro-4-iodophenyl) *O,O*-dimethyl ester; Ciba 9491			IV		
Phosphorothioic acid, *O*- (2,4-dichlorophenyl) *O,O*-diethyl ester; Nemacide®		I	I	I	
Phosphorothioic acid, *O,O*-dimethyl ester, *O,O*-diester with 4,4'-dithiodiphenol; Bay 64995		III	III	IV	
Phosphorothioic acid, *O,O*-diethyl *O*- (3,5,6-trichloro-2-pyridyl) ester; Dursban®			IV		
Phosphorothioic acid, *O,O*-diethyl ester, *S*-ester with *N*- (mercaptomethyl) phthalimide; Stauffer R-1505		IV	IV		
Promecarb; UC-9880	III	III	IV		
Promecarb; Schering 34615	IV	IV			
Ronnel; Dow ET-57				III	III
Tetrasul; Animert V-101	II	II	II		

[a] I = < 90% control at 1 day posttreatment; II = < 90% control at 7 days posttreatment; III = > 90% control at 14 days posttreatment; IV = > 90% control through 27 days posttreatment.
[b] Class IV also at 0.025%.
[c] Class I also at 2.0%.

(3) During the posttreatment observation period (28 days) each hen was confined individually in a typical suspended wire cage-layer cell. Birds exposed to the same treatment were placed in adjacent cells, but those treated with different materials were separated by 2 empty cells. Reinfestation was limited to lice that hatched from viable eggs present on the test hens at the time of treatment.

(4) Posttreatment counts were taken as for the pretreatment counts but at 1, 3, 5, 7, 10, 14, 21, and 28 days after treatment. The same person did all the counting in any 1 test.

(5) If the 0.25% concentration was effective in controlling the lice, subsequent tests were usually made at lower (or sometimes higher) concentrations to establish the concentration that gave >90% control for 27 days posttreatment.

The 4-point arbitrary system of classification effectiveness used was:

Class I = < 90% control at 1 day posttreatment
Class II = < 90% control at 7 days posttreatment
Class III = > 90% control at 14 days posttreatment
Class IV = > 90% control through 27 days posttreatment.

RESULTS.—Table 1 shows the results. Malathion, which was used as a standard throughout the testing, routinely provided Class IV results at a 0.05% concn. However, at a 0.025% concn the results were variable and averaged Class III. At least 14 candidate compounds gave control equal or superior to that obtained with malathion. Crotoxyphos, Zectran®, and Hooker HRS-1422 (Table 1) were completely effective in controlling lice even at 0.025%. Some toxicants with short residual life, such as dichlorvos, gave good initial kill of motile lice but did not provide protection for 28 days.

REFERENCE CITED

Hoffman, R. A. 1961. Experiments on the control of poultry lice. J. Econ. Entomol. 54: 1114–7.

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