*Hermetia illucens*¹ Control in Poultry Manure by Larviciding²

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ABSTRACT

Effectiveness of 5 larvicides at the rate of 1 gal/100 ft² (400 ml/m²) for the control of larvae of *Hermetia illucens* (L.) in manure under caged laying hens was determined. Excellent control was achieved by 0.5% RaVap® consisting of 2 lb/gal Rabon® (2-chloro-1-(2,4,5-trichlorophenyl) vinyl dimethyl phosphate) and 0.2 lb/gal dichlorvos, and 0.5% Zytron® (O-2,4-dichlorophenyl O-methyl isopropylphosphoramidothioate). Ronnel was slower acting but did give satisfactory control at 0.5%. Equivalent control by dimethoate was obtained with a 1% spray but

not with 0.5%. Malathion gave little or no control at concentrations as high as 1%.

In the presence of *H. illucens* larvae, larvae of the house fly, *Musca domestica* L. were absent. Following control of the *H. illucens* larvae, house fly larvae became abundant in the manure. A single larvicidal treatment may be expected to satisfactorily control *H. illucens* because of the slow development of that species. However, frequent retreatments may often be necessary to control the resurgent population of house fly larvae.

Hermetia illucens (L.), the "soldier fly," naturally infests poultry manure, and the larvae often become especially abundant in the manure under caged laying hens. The actions of the larvae in the manure produce an unsightly condition, increase the problem of unpleasant odors, and sometimes cause the manure to spread onto the walkways. In such cases, the producer may attempt control measures. Therefore, data were obtained on the effectiveness of common larviciding chemicals against the larvae of *H. illucens* in poultry manure.

MATERIALS AND METHODS.—The identities, formulations, and sources of chemicals used were: RaVap® EC, consisting of 2 lb/gal Rabon® (2-chloro-1-(2,4,5-trichlorophenyl) vinyl dimethyl phosphate) and 0.2 lb/gal dichlorvos, Shell Chemical Co.; Zytron®, 3 lb/gal EC (O-2,4-dichlorophenyl O-methyl isopropylphosphoramidothioate), Dow Chemical Co.; ronnel, 2 lb/gal EC, Dow Chemical Co.; dimethoate, 2.67 lb/gal EC, American Cyanamid Co.; malathion, 5 lb/gal EC, American Cyanamid Co.

The insecticides were diluted with water to the desired concentrations (0.1, 0.5, and 1.0% AI on a w/w basis) and sprayed onto the manure with a conventional hand-operated compressed-air sprayer at a rate of 1 gal/100 ft² (400 ml/m²).

Two experiments were conducted during September 1969 in 4 adjacent poultry houses (3×100 m) near Pittsboro, N. C. Each house had open sides and 1 row of wire cages on each side of a center concrete aisle. The cages, containing 3 laying hens each, were suspended 1 m above the compacted dirt floor. The manure-containing area was 1 m wide and a section 12 m long was a replicate. A randomized

complete block design was used with each treatment replicated 4 times in Experiment 1 and 3 times in Experiment 2.

The manure had accumulated since mid-July when the houses were cleaned and restocked with birds. The manure was heavily infested with soldier fly larvae, which by their action had mixed and leveled the manure so that it was rather uniformly about 15 cm deep. The manure was infested in this manner throughout most of the houses, and uniform-appearing sections were chosen for the experiments. House fly larvae were not found in pretreatment inspection of the manure.

At 4-, 7-, and 21-day intervals after treatment the manure was sampled. From the center 1/3 of each replicate, 3 samples (0.5 liter each) of manure were spread in white pans in the sunlight and the live larvae were counted. A larva was considered alive if it exhibited any movement. Only larvae of the soldier fly and the house fly were found.

RESULTS AND DISCUSSION.—As shown in Table 1, RaVap and Zytron at 1.0 and 0.5% gave excellent control of the soldier fly larvae in both experiments, but these chemicals at 0.1% gave unsatisfactory control. Ronnel affected the soldier fly larvae more slowly, judged from the partial control at 4-day post-treatment and the excellent control at 7-day and 21-day posttreatment with concentrations of 1.0 and 0.5%. Ronnel gave unsatisfactory control at 0.1%. Dimethoate gave excellent control at 1.0%, partial control at 0.5%, and unsatisfactory control at 0.1%. Malathion gave little control at any of the 3 concentrations used.

Based on these results, nearly complete and rapid control of soldier fly larvae in poultry manure may reasonably be expected with 0.5% RaVap or 0.5% Zytron applied at 1 gal/100 ft². For equivalent results, dimethoate would have to be used at 1% concentration. Ronnel may give equivalent control at 0.5% but is much slower acting.

There was a dramatic invasion of house fly larvae

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(Table 1) following control of the soldier fly larvae. Only 3rd-stage larvae of the house fly were counted, and these were rarely found in the 4-day and 7-day posttreatment samples. House fly larvae were abundant in the 21-day counts in all treatments in which soldier fly larvae were controlled. House fly larvae were absent, or nearly absent, in the untreated areas and in the treated areas in which soldier fly control was poor.

These results are consistent with the findings of Furman et al. (1959). They demonstrated that the presence of active *H. illucens* larvae in poultry manure prevented development of house fly larvae. This effect was shown to be due to a physical change in the medium, not to predation. The experiments involved adding manure infested with *H. illucens* larvae to house fly breeding areas of manure under caged poultry and data were not obtained with a natural infestation. The data on the invasion of the house fly following control of *H. illucens* in this report are also consistent with the findings of Kilpatrick and Schoof (1959). They demonstrated that insecticidal treatment of privies resulted in few *H. illucens* larvae and a concurrent increase in house fly larvae. The action of the *H. illucens* larvae caused the human excrement in the privies to be semiliquid and physically unsuitable for development of house fly larvae.

These data indicate that control of *H. illucens* larvae in poultry manure is likely to result in creation of a new problem—house flies. Very few, if any, repeated treatments would be necessary for *H. illucens* control, since that species develops slowly and apparently has only 1 generation/year (Copello 1926, Furman et al. 1959). However, once larviciding is done for controlling the soldier fly, it is likely that treatment will have to be repeated frequently to control the house fly.

Thus, larviciding for soldier fly control can become self defeating and should not be done without serious consideration of the possible consequences. The poultry producer has to decide whether he is more concerned with the problem of soldier fly infestation in the manure or the annoyance of the house fly to him, and possibly to his neighbors. If larvicides are used for soldier fly control, there will probably be destruction of the population of manure-inhabiting mites which prey on the eggs and early instars of the house fly (Axtell 1968). Without these biological control agents there will be no basis for using an integrated fly control program based on selective adulticiding and encouragement of a heterogeneous manure fauna (Axtell 1969, 1970). Therefore, the producer becomes committed to 1 course of action—larviciding. This method is more expensive and time consuming than the integrated control program. The integrated approach has been observed to reduce the soldier fly problem, but data are not available to quantitate the observation.

Under most circumstances we do not recommend larviciding for control of flies in caged-poultry houses. In most cases the integrated control program should be adequate. In some cases it may be de-

Table 1.—Survival of *H. illucens* larvae and invasion of house fly larvae following a single larvicide treatment of poultry manure, Pittsboro, 1969.

		Avg no. larvae at days posttreatment ^b					
Chemical	(Concn ^a (%)	<i>H. illucens</i>			House fly		
		4	7	21	4	7	21
<i>Experiment 1—Treated Sept. 4</i>							
RaVap	1.0	6	3	11	0	0	187
	0.5	4	8	18	0	0	96
	.1	76	26	51	0	0	33
Zytron	1.0	2	1	0	0	0	220
	.5	13	0	0	0	0	309
	.1	72	20	47	0	0	59
Untreated	0.0	134	82	77	0	0	0
<i>Experiment 2—Treated Sept. 29</i>							
RaVap	1.0	8	0	1	0	0	54
	.5	17	13	6	0	0	96
	.1	59	26	37	0	0	74
Zytron	1.0	2	0	0	0	0	149
	.5	11	3	0	0	0	189
	.1	74	38	58	0	0	0
Ronnel	1.0	38	4	1	0	0	244
	.5	38	7	1	0	0	107
	.1	84	38	29	0	1	48
Dimethoate	1.0	1	0	0	0	0	102
	.5	15	22	28	1	7	175
	.1	62	42	67	4	24	1
Malathion	1.0	60	58	69	0	9	0
	.5	58	49	38	0	0	1
	.1	78	60	66	0	0	2
Untreated	0.0	90	79	49	0	0	0
	0.0	75	90	70	0	0	0
	0.0	91	59	50	0	0	0

^a Sprayed on the manure at the rate of 1 gal/100 ft² (400 ml/m²).

^b Avg based on no. live larvae per (0.5-liter) sample, 3 samples/replicate, 4 replicates/concn in Experiment 1; 3 replicates/concn in Experiment 2.

sirable to supplement the integrated program with larviciding of a few small areas of the manure where larvae are exceptionally abundant.

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