CONTROL OF *APHODIUS HOWITTI* HOPE (COLEOPTERA: APHODIINAE) IN CANTERBURY

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Summary

In a series of trials, materials used for the control of grass grub *(Costelytra zealandica)* and/or porina caterpillar *(Wiseana* spp.) also satisfactorily controlled *Aphodius howitti.* There appeared to be a fall-off in efficiency of control with many of the materials applied after July though larvae did not start to pupate until the middle of December. In the 1st trial applied on August 29, 1967, no organochlorine materials gave a significant reduction of larvae the year of application, but the following organophosphate materials in certain formulations and application rates did: methidathion, fensulfothion, diazinon, trichlorfon and fenitrothion. The year following application, only the organochlorine materials DDT and lindane reached significance. In the 2nd trial applied on August 31, 1967, DDT did not reach significance that year, but was the only material to do so during the following year. In the 3rd and 4th trials applied on June 26 and July 26, 1968, respectively, the organochlorine materials DDT and lindane, and the organophosphates fenitrothion, diazinon, fensulfothion, parathion, methidathion and trichlorfon in certain formulations and dosage rates reached significance in larval counts the year of application. In the June 26 treatment, the additional organophosphates trichloronate, B5860, dimethoate-oxon and monocrotophos also reached significance.

INTRODUCTION

Aphodius howitti Hope was first recorded in Canterbury in January, 1920. Since then it has spread mainly throughout the lighter and more open soils of the plains, sometimes doing considerable damage to established lucerne and other pastures. There has been some confusion by the layman as to this pest's identity, although in the larval stage, it looks similar to the common grass grub. It does not feed on roots as does the latter, but on the plant above soil level in a manner similar to that of a porina caterpillar *(Wiseana* spp.). Casts also closely resemble those of a porina but soil particles are not webbed together.

As there has been little work carried out or published in New Zealand on this pest, this paper describes two years' trials laid down at Bankside just north of the Rakaia River in Canterbury, using both spray and granular forms of most of the more promising insecticides.

EXPERIMENTAL

The trials summarized in the following tables give results of tests laid down from August 29, 1967, to July 26, 1968. Conditions governing the

	Trial I		Trial II		Trial III		Trial IV	
Pretreatment count mean	77.4		77.4		32.7		11.7	
(per sq. ft) range	42-105		42-105		6-66		3-24	
Replications	4		4		5		5	
Plot size (of an acre)	1/320 (16 ft 6 in. × 8 ft 3 in.)		1/80 (33 ft × 8 ft 3 in.)		1/160 (16 ft 6 in. × 16 ft 6 in.)		1/160	
Soil moisture	High		High		Moderate		High	
Wind speed (mph)	3-5½ (sprays) 5-10 (granules)		3½-6		3 (sprays) 4½ (granules)		2 (sprays) 4 (granules)	
Paddock history	Ten-year-old lucerne stand almost destroyed by *Aphodius*. Oversown the day before treatment with Manawa ryegrass and white clover seed.				Eight-year-old lucerne stand.			
Total rain until first count (in.)	4.04		4.23		3.22		0.55	
Individual falls for one month after treatment (in.)	30/8/67	0.14	3/9/67	0.25	26/6/68	0.01	30/7/68	0.01
	3/9/67	0.25	4/9/67	0.35	28/6/68	0.05	1/8/68	0.01
	4/9/67	0.35	5/9/67	0.80	29/6/68	0.03	2/8/68	0.01
	5/9/67	0.80	6/9/67	0.41	6/7/68	0.02	11/8/68	Tr.
	6/9/67	0.41	8/9/67	0.02	7/7/68	0.18	12/8/68	0.04
	8/9/67	0.02	11/9/67	0.46	8/7/68	0.33	13/8/68	0.05
	11/9/67	0.46	15/9/67	0.04	11/7/68	0.63	18/8/68	0.03
	15/9/67	0.04	28/9/67	0.27	12/7/68	0.02	20/8/68	0.07
	28/9/67	0.27	29/9/67	0.15	16/7/68	0.10	22/8/68	0.05
	29/9/67	0.15			17/7/68	0.30		—
		—		—	18/7/68	0.15		0.27
		2.89		2.75	22/7/68	0.10		—
		—		—	23/7/68	0.34		
					24/7/68	0.36		
					25/7/68	0.05		
						—		
						2.67		
						—		
Assessment:	Six spade squares per plot for all trials.							

individual trials at application are given in Table 1. Pre-treatment and post-treatment sampling was carried out by counting live larvae found in spade squares (7 in. × 7 in. × 7 in.). Post-treatment counts were made in absence of treatment plans by officers working independently. The four trials were all located on the same property on a relatively uniform soil type (Chertsey shallow silt loam). Trials I and II were in a paddock adjacent to Trials III and IV, the pasture being 10-year-old lucerne for the first two trials and 8-year-old for Trials III and IV.

RESULTS

Trial I (Table 2) indicates that two months after application methidathion spray and fensulfothion granules gave reasonable control, while diazinon and trichlorfon sprays, and fenitrothion granules gave a low degree of control. Other materials gave no significant reduction of larvae.

The following year the re-infestation was lighter and very patchy. However, another count was carried out on September 11 to 17, 1968.

TABLE 2: TRIAL I APPLIED 29/8/67

(Gr = Granule. Sp = Spray)

	Count 1, 25/10-3/11/67		
Treatments (lb)	*Total Live 24 samples*	*Stat. Mean*	*Sign. cf. Control*
methidathion Sp 1	77	4.34	***
fensulfothion Gr 1	96	4.88	***
Diazinon Sp 1	137	5.79	*
trichlorfon Sp 1	150	5.99	*
fenitrothion Gr 2	159	6.24	*
fenitrothion Sp 1	195	6.82	NS
diazinon Gr 2	211	7.13	NS
trichlorfon Gr 2	211	7.20	NS
fenitrothion Gr 1	218	7.26	NS
DDT prills 2	218	7.37	NS
B5860 Gr 2	225	7.34	NS
lindane prills 2	225	7.36	NS
diazinon Gr 1	228	7.54	NS
DDT super. Gr 2	238	7.59	NS
malathion Gr 2	250	7.86	NS
trichlorfon Gr 1		7.95	NS
Control	259	7.90	—
DDT Sp 1	260	8.02	NS
trichloronate Gr 1	264	8.08	NS
B5860 Gr 1	287	8.43	NS
DDT Gr 2	295	8.57	NS

Count 1: LSD 5% 1.63, 1% 2.17, 0.1% 2.83. SE 0.578.

Notes NS = Not Significant
* Significant at the 5% level
** Significant at the 1% level
*** Significant at the 0.1% level
SE = Standard error of treatment mean

N.B. All plots topdressed with superphosphate at the rate of 2 cwt/acre

TABLE 3: TRIAL II APPLIED 31/8/67

Treatments	*Count 1: 5/11/67* *Total Live 24 Samples*	*Stat. Mean*	*Sign. cf. Control*	*Count 2: 17/9/68* *Total Live 36 Samples*	*Stat. Mean*	*Sign. cf. Control*
DDT super. Gr 2 lb/ a.i. DDT	165	6.41	NS	2	0.95	***
Phenol Sp 4 lb a.i.	233	7.61	NS	110	5.05	NS
Sulphur super. (400 lb/ton) 2 cwt	248	7.82	NS	81	4.38	NS
Sulphur super. (400 lb/ton) 1 cwt	262	8.06	NS	82	4.45	NS
Potash 2 cwt	295	8.56	NS	130	5.60	NS
superphosphate 2 cwt	254	7.89	NS	60	3.80	NS
Control	283	8.32		115	5.25	

Count 1: LSD 5% 2.66. SE 0.441.
Count 2: LSD 5% 1.72, 1% 2.35, 0.1% 3.20. SE 0.578.

As the grub population was very low on replicates 1 and 2, it was not until these two replicates were ignored in the analysis that any treatment gained significance in the remaining two replicates. These materials were all in the organochlorine group and reached significance from control in grub reduction as follows: lindane prills, DDT granulated superphosphate and DDT spray almost at the 1% level, and DDT granules at the 5% level. DDT formulated as prills was the only organochlorine material that did not reach significance the year following application.

In Trial II (Table 3) there were no statistical differences between any materials the year of application, but DDT granulated superphosphate gave a significant reduction in numbers of larvae at the 0.1% level the year after application.

In Trial III (Table 4) all materials except the granular form of methidathion gave a reduction of larvae at the 0.1% level the year of application. The order of efficiency can be seen by the raw figures in the table.

Trial IV (Table 5) was applied one month later than Trial III, and, except for methidathion granules and DDT granulated superphosphate, all materials gave a significant reduction of larvae at the 0.1% level compared with control. Individual levels of efficiency can be seen by the raw figures in the table.

TABLE 4: TRIAL III APPLIED 26/6/68 — SAMPLED 18/9/68

Treatments (lb)	*Total Live 30 Samples*	*Stat. Mean*	*Sign. cf. Control*
lindane Sp 2	0	0.70	***
fenitrothion Sp 2	0	0.70	***
DDT Sp 2	1	0.80	***
trichloronate Gr 2	2	0.90	***
lindane Gr 2	3	1.00	***
lindane Sp ½	3	0.98	***
trichlorfon Gr 2	3	0.98	***
fenitrothion Gr 2	3	0.94	***
diazinon Sp 2	4	1.04	***
diazinon Sp 1	5	1.16	***
diazinon Gr 2	5	1.08	***
fensulfothion Gr 1	6	1.24	***
parathion Gr 2	7	1.10	***
methidathion Sp 1	9	1.36	***
methidathion Sp 2	11	1.38	***
diazinon Gr 1	12	1.54	***
methidathion Sp ½	13	1.48	***
B5860 Sp 2	22	2.06	***
dimethoate-oxon Sp 2	25	2.02	***
DDT super. Gr 2	25	2.16	***
trichlorfon Sp 2	30	2.00	***
monocrotophos Sp 2	36	2.64	***
B5860 Gr 2	41	2.76	***
methidathion Gr 1	87	4.06	*
methidathion Gr 2	101	4.42	NS
Control + super. 1½ cwt	167	5.60	
Control	156	5.60	

LSD 5% 1.25, 1% 1.66, 0.1% 2.16. SE 0.442.

TABLE 5: TRIAL IV APPLIED 26/7/68 — SAMPLED 20/9/68

Treatments (lb)	*Total Live 30 Samples*	*Stat. Mean*	*Sign. cf. Control*
fenitrothion Sp 2	0	0.70	***
parathion Gr 2	0	0.70	***
methidathion Sp 2	0	0.70	***
diazinon Sp 2	5	1.12	***
lindane Sp 2	6	1.18	***
fensulfothion Gr 1	8	1.36	***
trichlorfon Sp 2	9	1.48	***
diazinon Gr 2	23	2.24	***
DDT Sp 2	24	2.24	***
fenitrothion Gr 2	27	2.34	***
lindane Gr 2	47	3.04	***
methidathion Gr 2	139	5.28	NS
Control	148	5.40	
DDT gran. super. 2	159	5.46	NS
Control + super. 1½ cwt	175	5.94	NS

LSD 5% 1.07, 1% 1.46, 0.1% 1.87. SE 0.376.

No pasture responses were seen as a result of treatments in any of the four trials. Further work is still to be carried out on this aspect.

DISCUSSION

These trials show that *Aphodius* can be controlled satisfactorily with the organochlorine preparations tested with the exception of DDT prills. From the tables it can be seen that there is a decrease in control the year of application with later-applied materials. The late June application gave good results with all organochlorines, the late July gave a non-significant result for granulated DDT superphosphate, and no organochlorine material reached significance the year of application in the late August application. It therefore appears that, for best results the organochlorines must be applied not later than July if control the year of application is required. The results also indicate (with the exception of DDT prills) that the organochlorines gave good results the year after application. These trials will be sampled again in 1969 to see whether a three-year control can be expected.

If a non-persistent material is required, the tables show that several of the organophosphate materials would give excellent results the year of application but only if applied before August. Lower rates of application will be investigated in 1969 trials with the most promising materials.

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