LABORATORY EVALUATION OF INSECTICIDES AGAINST LARVAE OF PASTURE SCARABS

By J. W. TURNER, B.Agr.Sc., and MARIANNE S. ROUBICEK, M.D. (Vienna)

SUMMARY

Twelve insecticides, incorporated into a limited soil habitat, were tested for kills of final instar larvae of *Othnonius batesii* Oll., *Sericesthis vigilana* Sharp and *Rhopaea magnicornis* Blkb. "Dursban" at 1 and 5 p.p.m. and diazinon and parathion at 5 p.p.m. gave high mortalities of *O. batesii*. A wider range of chemicals, including lindane, diazinon and aldrin each at 1 p.p.m., gave high mortalities of *S. vigilana* but very high dosages were required for equivalent kills of *R. magnicornis*.

I. INTRODUCTION

The pasture scarabs *Othnonius batesii* Oll., *Rhopaea magnicornis* Blkb. and *Sericesthis vigilana* Sharp are three of the more important pests of pastures in south-eastern Queensland. *O. batesii*, the black soil scarab, is most commonly encountered in the grey to grey-brown soils of heavy texture which supported brigalow (*Acacia harpophylla*) scrubs prior to clearing and pasture establishment (Turner and Shaw 1969). *R. magnicornis* is a pest in highland areas of south-eastern Queensland, principally in deep red lateritic clays and clay loam soils (Saunders 1958). *S. vigilana* occurs in habitats similar to those of *R. magnicornis;* particular records are from the Ravensbourne and Toowoomba districts of south-eastern Queensland.

The importance of these pests has warranted the study of means of combating their damage. The present trials were designed to investigate, in the laboratory, the effect that various insecticides incorporated in soil might have on final instar larvae of the pest species within a limited soil habitat.

II. METHODS

The insecticides used, together with rates of application, are given in Tables 1–3. The chemicals were mixed into oven-dry soil, the rates of application being based on parts per million of active constituent in the oven-dry soil. After incorporation of the insecticides, the moisture content of the soil mixtures was raised to approximately 30%.

Plastic dishes, $3\frac{1}{2}$ in. in diameter and $1\frac{1}{4}$ in. in depth, with tight-fitting lids were used as holding containers. Before use, a hole 1 in. in diameter was punched in the base of each container and filled with a plug of plaster of Paris (Figure 1). Six small holes were punched just below the lip of each container to allow ventilation.
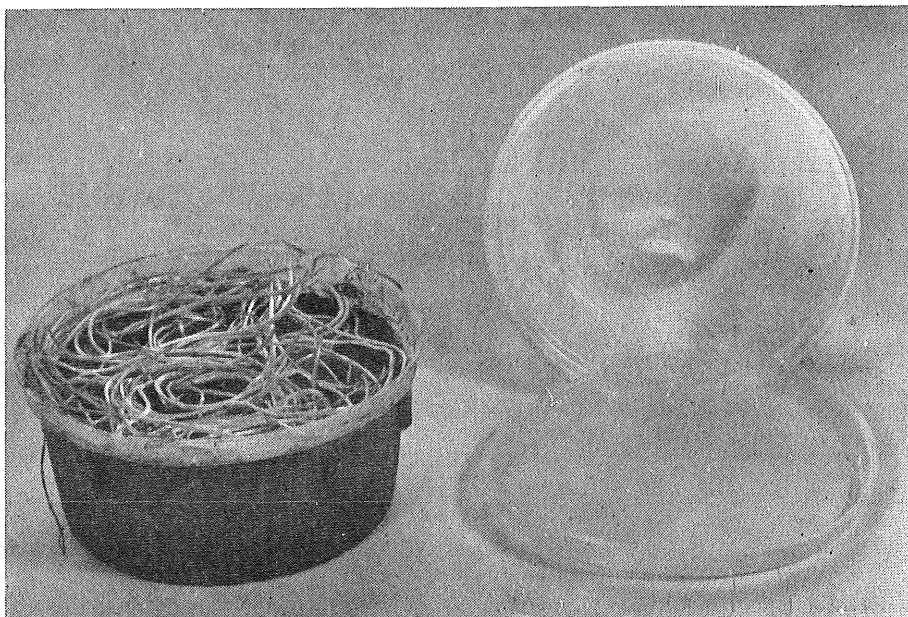

Fig. 1.—Plastic dishes used for testing soil insecticides against pasture scarabs. Left, container wi.h oat seedlings as food for the scarabs. Right, lid and base of container, showing plaster plug in the bottom.

Germinated oat seed was added as food for the larvae (Figure 1), fresh food being provided at each assessment of living larvae. The moisture status of the soil was maintained by soaking the plaster of Paris plug in water three times a week.

In the tests with the larger species, *O. batesii* and *R. magnicornis,* one larva per container was used. With *S. vigilana,* 5 larvae per container were used.

III. RESULTS

The percentage of mortality which occurred in each of the treatments was adjusted by using Abbots' formula (Finney 1947) to allow for mortalities in untreated controls. The percentage mortalities (adjusted) for *O. batesii* larvae are given in Table 1, for *S. vigilana* in Table 2 and for *R. magnicornis* in Table 3.

TABLE 1

Othnonius batesii: PERCENTAGE LARVAE KILLED

30 final instar larvae per treatment

Treatment	Mortality (%)*	
	14 Days Post-treatment on 1.xii.67	28 Days Post-treatment on 15.xii.67
Dursban † 5 p.p.m.	100·0	100·0
Diazinon 5 p.p.m.	100·0	100·0
Parathion 5 p.p.m.	100·0	100·0
Dursban 1 p.p.m.	96·4	96·4
Lindane 5 p.p.m.	64·9	86·2
Parathion 1 p.p.m.	66·4	85·5
Trichloronate 5 p.p.m.	72·8	81·4
Diazinon 1 p.p.m.	37·4	49·7
Lindane 1 p.p.m.	11·8	11·8
DDT 5 p.p.m.	0	4·5
DDT 1 p.p.m.	0	0
Aldrin 5 p.p.m.	0	0
Aldrin 1 p.p.m.	0	0
Trichloronate 1 p.p.m.	0	0

* Mortality adjusted according to Abbots' formula $P^1 = C + P (1–C)$, where C = control mortality, P = treatment mortality and P^1 = proportion of those killed by insecticide alone.

Control mortality	15·0	26·6

† 0, 0-diethyl-0-3, 5, 6-trichloro-2-pyridyl phosphorothioate.
Dursban is a trade name

TABLE 2

Sericesthis vigilana: PERCENTAGE LARVAE KILLED

30 final instar larvae per treatment in each trial

Trial 1			Trial 2		
Treatment	Mortality (%)*		Treatment	Mortality (%)*	
	25 Days Post-treatment on 17.iii.67	40 Days Post-treatment on 4.iv.67		14 Days Post-treatment on 10.iv.67	28 Days Post-treatment on 2.v.67
Lindane 5 p.p.m.	100·0	100·0	Dursban 5 p.p.m.	100·0	100·0
Diazinon 5 p.p.m.	100·0	100·0	Aldrin 5 p.p.m.	100·0	100·0
Bayer 5081 5 p.p.m.	100·0	100·0	Diazinon 1 p.p.m.	98·8	100·0
Lindane 1 p.p.m.	94·6	100·0	Aldrin 1 p.p.m.	92·4	100·0
Fensulphothion 5 p.p.m.	88·0	100·0	Heptachlor 5 p.p.m.	86·1	100·0
			Diazinon 0·5 p.p.m.	98·8	98·9
Diazinon 1 p.p.m.	90·3	93·0	Dursban 1 p.p.m.	67·4	89·9
Chlorfenvinphos 5 p.p.m.	16·9	28·9	Bayer 5081 1 p.p.m.	1·8	7·7
Fensulphothion 1 p.p.m.	0	0			

* Mortality adjusted according to Abbots' formula.

Control mortality	7·0	19·7		0·6	7·0

TABLE 3

Rhopaea magnicornis: PERCENTAGE LARVAE KILLED

50 final instar larvae per treatment in Trial 1, 20 in Trial 2

	Trial 1			Trial 2	
	Mortality (%)*			Mortality (%)*	
Treatment	14 Days Post-treatment on 27.ii.68	28 Days Post-treatment on 12.iii.68	Treatment	14 Days Post-treatment on 20.iii.68	29 Days Post-treatment on 4.iv.68
			Diazinon 20 p.p.m.	94·5	100·0
			Parathion 20 p.p.m.	76·1	100·0
Dursban 10 p.p.m.	7·2	41·2	Dursban 20 p.p.m.	67·5	89·5
Dursban 5 p.p.m.	2·1	13·7	Parathion 10 p.p.m.	84·8	82·6
Lindane 10 p.p.m.	0	0	Diazinon 10 p.p.m.	78·3	82·6
Lindane 5 p.p.m. ..	0	0	Diazinon 5 p.p.m.	62·1	71·2
UC 30045† 10 p.p.m.	2·1	9·2	Lindane 20 p.p.m.	21·8	46·7
UC 30045† 5 p.p.m.	0	2·2	Dursban 10 p.p.m.	20·3	33·7
			Parathion 5 p.p.m.	25·9	27·7
			Aldrin 20 p.p.m.	24·3	25·6
			Aldrin 10 p.p.m.	18·9	25·6
			Aldrin 5 p.p.m. ..	13·5	19·9
			Heptachlor 20 p.p.m.	20·3	15·6
			Heptachlor 10 p.p.m.	9·8	15·6
			Lindane 10 p.p.m.	0	9·7
			Heptachlor 5 p.p.m.	0	4·7
			Carbaryl 20 p.p.m.	2·1	2·8
			Carbaryl 10 p.p.m.	0	2·8
			Carbaryl 5 p.p.m.	0	0

* Mortalities adjusted according to Abbots' formula.

Control mortality	2·0	8·2		7·5	12·5

† Methyl 2-isopropyl-4-(methylcarbamoyloxy) carbanilate.

IV. DISCUSSION

The experimental procedure employed in these trials did not allow a direct comparison with field usage. In addition, factors such as the possibility of a greater fumigant action of the insecticides when the soil-insecticide mixture is held in small containers must be recognized. Under these conditions, however, the data show that except for *S. vigilana* relatively high dosages of chemicals are required for pest kills. The likelihood, therefore, of obtaining economic field control of final instar larvae of the three species with present insecticides appears doubtful.

REFERENCES

FINNEY, D. J. (1947).—"Probit Analysis". (Cambridge University Press: Cambridge.)

SAUNDERS, G. W. (1958).—White grubs and their control in dairy pastures. *Qd agric. J.* 84:85-8.

TURNER, J. W., and SHAW, G. D. (1969).—Black soil scarab in South Queensland. *Qd agric. J.* 95:204-7.