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A FIELD TRIAL ON A SUSPECTED DIELDRIN-RESISTANT POPULATION OF BANANA WEEVIL BORER

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SUMMARY

A field trial demonstrated that banana weevil borer (*Cosmopolites sordidus* Germ.) previously suspected to be resistant to control with 0·5% dieldrin spray in a plantation at Narangba in southern Queensland is not resistant. The trial also indicated that a promising alternative insecticide, pirimiphos-ethyl, is available should dieldrin resistance develop.

I. INTRODUCTION

The standard control for banana weevil borer (*Cosmopolites sordidus* Germ.) in Queensland for many years has been the application of sprays of 0·05% dieldrin to the lower part of the pseudostem of banana stools and to the surrounding soil. Following a report by a grower at Narangba in southern Queensland of difficulty in controlling the insect with dieldrin, a series of laboratory tests and a field trial were initiated to check whether resistance to this chemical had developed in Queensland. In a separate paper, Swaine and Corcoran (1973) indicate that laboratory tests showed that the weevil borer on this farm was not resistant to dieldrin. The present paper covers a field trial using the standard control of 0·05% dieldrin spray conducted to confirm the laboratory findings. A candidate alternative insecticide to dieldrin, pirimiphos-ethyl, was included in the trial.

II. METHODS AND MATERIALS

The materials used and the percentages of active constituents in prepared sprays were as follows:—

Lindane—A miscible oil concentrate containing 16% w/v gamma insomer BHC as active constituent; used at 0·1%.

Dieldrin—A miscible oil concentrate containing 30% w/v active constituent; used at 0·05%.

Pirimiphos-ethyl—An emulsifiable concentrate containing 25% w/v active constituent; used at 0·176%.

Adequate replication for statistical comparisons was not possible. The trial comprised two replicates of each of the three insecticide treatments plus untreated controls. Plot size was 25 stools (5 x 5) and treatments using 1 pint of spray per stool were carried out on October 7, 1971, following a pretreatment count of live and dead weevils 2 days earlier. All counts of adult weevils were from four trap sites, each with three rings of fresh banana pseudostem bait, in the middle of each plot. Baits were placed on the ground, covered with a sheet

of plastic and banana leaf trash to retain moisture in the trap environment, and examined 1 week later. Live weevils found under the traps were released at random within the plot and dead ones were removed. Separate records were kept of newly emerged weevils (tinged brown) and older (black) beetles to obtain information on seasonal emergence from pupae in the banana butts below ground level.

III. RESULTS

Figure 1 shows the total number of live weevils for each treatment at each sample date. All three chemical treatments produced a dramatic decrease in numbers of weevils immediately after application, even allowing for the seasonal decrease demonstrated by the graph for the control (untreated plots). Numbers in the treated plots remained low until the seasonal increase in adult numbers as shown in the control plots began in the third week of December. The graph for the lindane treatment followed the control graph very closely from the low point at the end of November and it is obvious that this insecticide was no longer effective after that time. Numbers in the pirimiphos-ethyl and dieldrin-treated plots remained very low throughout December and January, but the rise thereafter indicated a diminished effectiveness of these insecticides. From the end of February there was very little difference between pirimiphos-ethyl, lindane and control plots, although consistently lower counts were recorded from the dieldrin-treated plots up to early May.

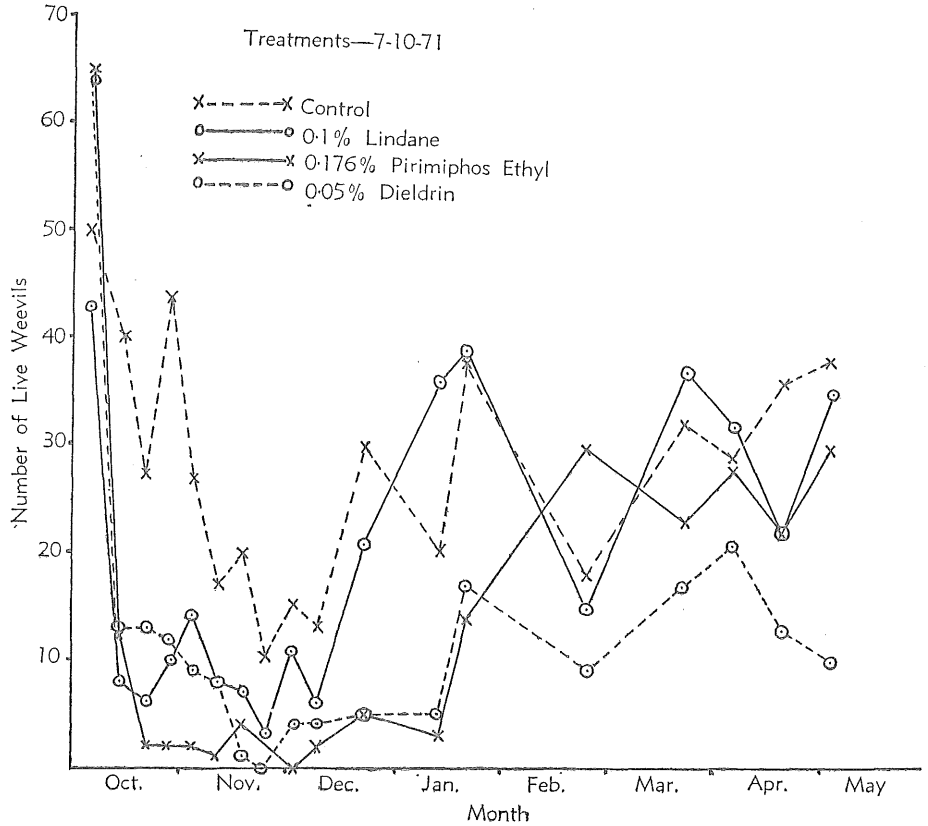

Fig. 1.—Effect of treatments on weevil numbers.

Table 1, which gives total weevils and percentage of dead weevils per treatment, confirmed the rapid effect of the insecticides indicated by Figure 1. It also supported the indication from Figure 1 of the relatively short persistence of the 0·1% lindane spray. The percentage of dead weevils for lindane indicated an effective persistence of 2 months only, from October 7 to December 9. Pirimiphos-ethyl gave good kills until December 22, indicating a persistence of approximately 3 months. Dieldrin had a persistence of approximately 5 months, as indicated by the figures for percentage dead up to February 24, but the degree of control had fallen as early as the end of December, 3 months after application.

TABLE 1

TOTAL NUMBER AND PERCENTAGE OF DEAD BANANA WEEVIL BORERS IN INSECTICIDE TRIAL

Date	Control		0·1% Lindane		0·176% Pirimiphos-ethyl		0·05% Dieldrin	
	Total Weevils	Dead (%)	Total Weevils	Dead (%)	Total Weevils	Dead (%)	Total Weevils	Dead (%)
5–10–71 (pretreatment)	50	0	43	0	65	0	64	0
14–10–71	40	0	20	60·0	39	69·2	29	55·2
21–10–71	27	0	13	53·8	22	91·0	19	31·6
28–10–71	44	0	12	16·7	18	89·1	15	20·0
4–11–71	28	3·6	20	30·0	5	60·0	11	18·2
11–11–71	19	10·5	13	38·5	2	50·0	13	38·5
18–11–71	20	0	8	12·5	10	60·0	3	66·6
25–11–71	11	9·1	4	25·0	4	50·0	3	100
2–12–71	15	0	11	0	5	100	11	63·6
9–12–71	14	7·1	8	25·0	3	33·3	6	33·3
22–12–71	30	0	21	0	7	28·6	6	16·7
13–1–72	22	9·1	36	0	3	0	6	16·7
20–1–72	38	0	39	0	15	6·8	19	9·5
24–2–72	18	0	17	13·3	30	0	10	10·0
22–3–72	33	3·2	37	0	23	0	17	0
5–4–72	31	6·5	33	3·1	29	3·5	21	0
19–4–72	36	0	22	0	22	0	13	0
3–5–72	38	0	35	0	30	0	10	0

Insecticides applied in 1 pint spray per stool on 7–10–71.

Table 2, which gives the total weevils and percentages of newly emerged weevils, shows that up to 50% of the rise in weevil numbers which began in mid December was due to newly emerged insects and not merely to a seasonal increase in activity of adults during the warm summer months. While there was an understandable overlap of generations throughout the summer months, the build-up to a high point of 42·1% newly emerged weevils for the control plots on January 20, followed by a decline to 11·1% on February 24 and then a rise to 44·5% newly emerged on April 19, indicated that there were two main emergences or generations during the summer period. The other main emergence occurred during September from overwintering stages in corms below ground level. That this was completed by the time the trial began on October 5, 1971, was shown by the absence of newly emerged weevils in the control plots.

TABLE 2

TOTAL NUMBER AND PERCENTAGE OF NEWLY EMERGED BANANA WEEVIL BORERS IN INSECTICIDE TRIAL

Date	Control		0·1% Lindane		0·176% Pirimiphos-ethyl		0·05% Dieldrin	
	Total Weevils	Newly Emerged (%)	Total Weevils	Newly Emerged (%)	Total Weevils	Newly Emerged (%)	Total Weevils	Newly Emerged (%)
5–10–71 (pretreatment)	50	0	43	0	65	0	64	0
14–10–71	40	0	20	0	39	0	29	0
21–10–71	27	0	13	0	22	0	19	0
28–10–71	44	0	12	0	18	0	15	0
4–11–71	28	0	20	0	5	0	11	0
11–11–71	19	0	13	12·5	2	0	13	0
18–11–71	20	15·0	8	0	10	10·0	3	0
25–11–71	11	10·0	4	0	4	25·0	3	33·3
2–12–71	15	0	11	0	5	0	11	0
9–12–71	14	21·4	8	12·5	3	33·3	6	0
22–12–71	30	10·0	21	14·3	7	14·3	6	16·7
13–1–72	22	22·8	36	19·4	3	33·3	6	0
20–1–72	38	42·1	39	12·8	15	20·0	19	31·6
24–2–72	18	11·1	17	29·4	30	36·7	10	40·0
22–3–72	33	36·4	37	29·8	23	56·5	17	41·2
5–4–72	31	19·4	33	36·4	29	17·2	21	42·7
19–4–72	36	44·5	22	27·3	22	27·2	13	23·1
3–5–72	38	23·7	35	34·3	30	23·4	10	30·0

Insecticides applied in 1 pint spray per stool on 7–10–71.

IV. DISCUSSION

The trial demonstrated that the banana weevil borer previously suspected of being resistant to dieldrin on the Narangba farm is not resistant to that insecticide. This finding confirms previous laboratory findings based on micro-drop application tests against weevils from the same farm and against a population not previously exposed to dieldrin (Swaine and Corcoran 1973).

Effective persistence of the standard 0·05% dieldrin spray in this particular trial was somewhat less than had been anticipated. Braithwaite (1958), in a similar trial in northern New South Wales, reported effective control with 0·05% dieldrin spray over a period of 10 months after a single application, even in a year in which rainfall was higher than normal. However, the soil types on the steep banana-growing slopes in the Narangba area are very erodible and the exceptionally heavy rains received during the course of the trial may have had a bearing on the persistence of the insecticide treatments. For example, it was observed that the heavy rain of over 12 in. on February 12/13, 1972, as a result of cyclone "Daisy", caused sheet erosion in the trial plots with a loss of up to 2 in. of soil from the bottom areas of the slope. It is reasonable to assume that such erosion would remove considerable amounts of insecticide applied to the soil.

The resurgence of weevil numbers during January suggested that where high initial populations exist a second application of insecticide might be desirable during that month rather than in autumn, as has been recomended previously.

Pirimiphos-ethyl is currently in field use in South America against the banana-weevil borer resistant to dieldrin (B. A. B. Edwards, pers. comm. 1972). The field performance of this insecticide in the present trial, while somewhat less satisfactory than that of the standard dieldrin treatment, is of considerable interest in view of the possibility of resistance to dieldrin occurring in Queensland.

V. ACKNOWLEDGEMENTS

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