3500/20 BIO-ASSAY TRIAL

TERMINAL REPORT

Cat: 1707

Object: Screening of candidate soil insecticides for control of Black Maize Beetle (*Heteronychus licas*).

Established: 19 December, 1989

Terminated: 8 January, 1990

Location: ZSA Experiment Station, laboratory trial.

Design: Observational, 20 bottles per treatment.

Treatments:

1. Mocap (ethoprop) 10% granules
2. Counter (terbufos) 5% granules
3. Dieldrin 50% WP
4. Dursban (chlorpyrifos) 10% granules
5. Miral (isazofos) 10% granules
6. Mocap (ethoprop) 72% EC
7. Oftanol (isofenphos) 50% EC
8. Control
9. Control

Conduct:

1. A concentrate of each insecticide was prepared by adding the following quantities to 300 gm of dry soil:

Counter 5G	1,800 gm product
Mocap, Miral, Dursban 10G	0,900 gm product
Dieldrin 50 WP, Oftanol 50 EC	0,180 gm product
Mocap 72 EC	0,125 gm product

The granular formulations were finely ground, and the EC formulations diluted in ethanol, before being added to the soil and thoroughly mixed.

2. 5 gm of each concentrate (i.e. 1/60th of the total 300 gm) was then weighed and added to each of 20 bottles containing 150 gm dry soil to give the following mixtures:-

5% formulations : 0,030 gm/150 gm soil = 10 ppm a.i.
10% formulations : 0,015 gm/150 gm soil = 10 ppm a.i.
50% formulations : 0,003 gm/150 gm soil = 10 ppm a.i.
72% formulations : 0,0021 gm/150 gm soil = 10 ppm a.i.

3. 10 ml water was then added to each bottle and left overnight before shaking to provide a uniformly moist soil medium.

4. One adult beetle was then introduced into each bottle (19 December, 1989), together with a small cross-cut section of cane stalk, and the beetles were kept indoors in a semi-darkened room. No attempt was made to differentiate adult beetles by sex or by size.

5. The soil used was a sandy loam derived from paragneiss, containing 19% clay, 6% silt, and 75% sand.

6. The adult beetles used in the trial were obtained from below a loading zone light (HVE, Section 7), and may have been previously exposed to dieldrin in surrounding cane fields. After collection the beetles were kept in a bag of soil for 2 weeks with adequate food, and subsequently only active healthy specimens were selected for the trial.

7. Bottles were checked every four days and counts of dead beetles were recorded. Additional food and/or moisture was added to the bottles as required.

RESULTS

Results are presented in the attached table, and shown diagrammatically in the bar chart.

Mortality was very rapid in all but the Dieldrin treatment, with all beetles killed by the 8th day after exposure. At that stage only 45% mortality had been recorded in the Dieldrin treatment, but this figure increased to 55% by the 12th day and remained unchanged thereafter until the trial was terminated after 20 days.

CONCLUSION

In recent years there has been increasing evidence of a build-up of resistance in H. licas to standard dieldrin treatment, particularly on Section 15 of HVE. In this area severe damage to cane has occurred in spite of routine dieldrin application, both at planting and to ratoons, and in some fields damage has been severe enough to necessitate replanting after the third ratoon harvest.

Sampling in treated and untreated areas in 1989 (ref. 3500/17) showed that numbers of beetles, larvae, and eggs were unaffected by dieldrin treatment even at a high application rate of 6 kg/ha a.i. Fields planted with dieldrin in 1988 showed severe damage in young first ratoon cane at the end of 1989, whereas 3-4 years protection would normally be expected.

The object of this bio-assay trial was not only to determine the effectiveness of alternative soil insecticides in controlling the pest, but also to determine whether or not dieldrin resistance was present, and if so, to quantify it if at all possible. For these reasons a high application rate of 10 ppm a.i. was used for all insecticides, with the intention of testing lower rates at a later date on those insecticides that had proved effective.

Results clearly showed that dieldrin was less effective than all other insecticides tested, and that approximately half of the beetle population was resistant to dieldrin even at a high rate of application.

KEC/Feb'90

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Results of beetle counts after start on 19 December, 1989

Trial terminated after counts on 8 January, 1990

TREATMENT	FORMULATION	23 Dec (day 4)		27 Dec (day 8)		31 Dec (day 12)		4 Jan (day 16)		8 Jan (day 20)	
		No. dead	% dead	No. dead	% dead	No. dead	% dead	No. dead	% dead	No. dead	% dead
1. MOCAP (Ethoprop)	10G	16	80	20	100	20	100	20	100	20	100
2. COUNTER (Terbufos)	5G	16	80	20	100	20	100	20	100	20	100
3. DIELDRIN	50WP	3	15	9	45	11	55	11	55	11	55
4. DURSBAN (Chlorpyrifos)	10G	15	75	20	100	20	100	20	100	20	100
5. MIRAL (Isazofos)	10G	16	80	20	100	20	100	20	100	20	100
6. MOCAP (Ethoprop)	72EC	12	60	20	100	20	100	20	100	20	100
7. OFTANOL (Isofenphos)	50EC	17	85	20	100	20	100	20	100	20	100
8. CONTROL	-	0	0	0	0	0	0	0	0	0	0
9. CONTROL	-	0	0	0	0	0	0	1	5	1	5

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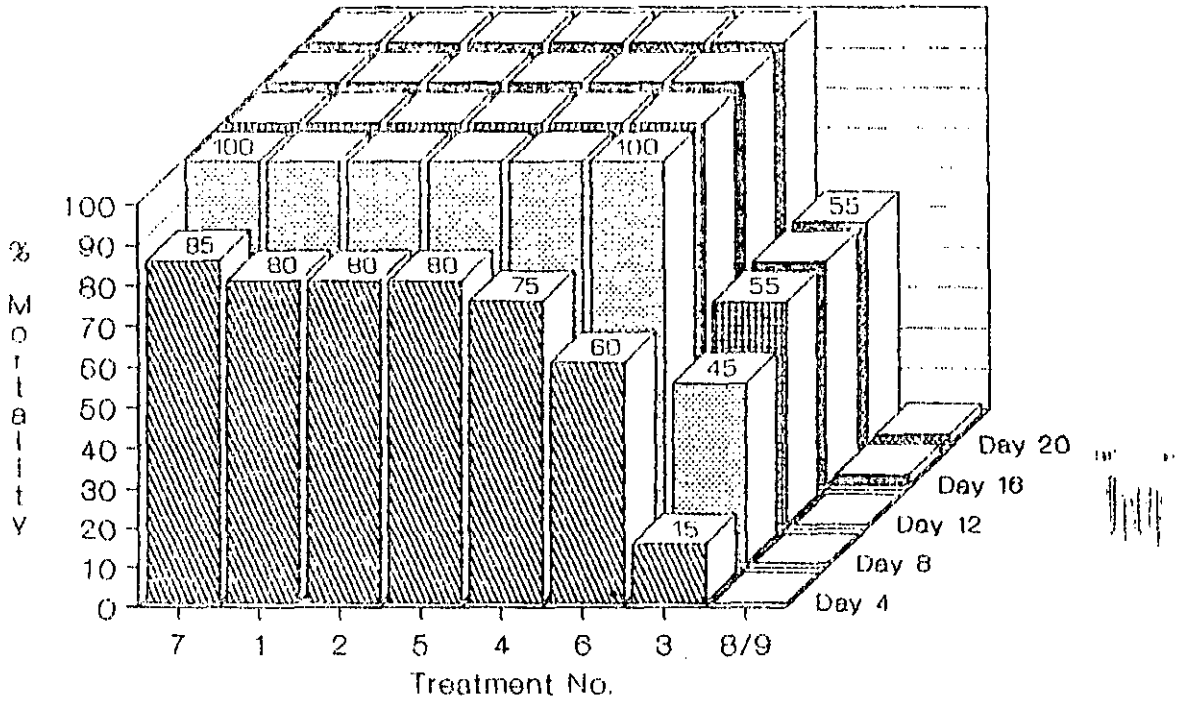
BEETLE MORTALITY %



(See text for treatment details)