SOUTH AFRICAN SUGAR INDUSTRY AGRONOMISTS' ASSOCIATION

3500/18 SOIL INSECTICIDE TRIAL

Object: Screening of candidate soil insecticides applied at planting for control of Heteronychus licas in sugarcane.

CatNo.: 1796

This crop: First Ratoon **Age:** P 12,2 months (21.9.89 - 28.9.90)
1R 11,8 months (28.9.90 - 21.9.91)

Location: Hippo Valley Estates, Section 15, Field 6A.

Soil type: Heavy clay derived from basalt.

Design: Randomised blocks, 4 replications.

Variety/Spacing: N14 in 1,5m rows.

Fertilizer: Applied in accordance with normal estate practice.

Treatments:
1. Suscon parathion ethyl 15% CR granules, 4 kg/ha a.i.
2. Counter (terbufos) 5% granules, 1 kg/ha a.i.
3. Mocap (ethoprop) 10% granules, 2 kg/ha a.i.
4. Suscon Green (chlorpyrifos) 10% CR granules, 4 kg/ha a.i.
5. Control
6. Miral (isazofos) 10% granules, 2 kg/ha a.i.
7. Dursban (Chlorpyrifos) 10% granules, 2 kg/ha a.i.
8. Dieldrin 50% WP, 2 kg/ha a.i.

Conduct:
1. All granular insecticides were spread in a band (20-30cm) across the base of the furrow after the seedcane had been planted but before covering over.
2. Dieldrin was applied by knapsack sprayer at ±123 l/ha in a ±50 cm band across the base of the furrow.
3. Chemicals were applied at planting only, and were not reapplied to the ratoon crop.

RESULTS

Relevant data are presented in the attached tables for the plant and first ratoon crop harvests.

(a) Cane yields: Low yields were recorded from both crops, the higher variability in the plant crop being associated with damage by wild pigs, which did not affect all plots equally. There were no significant treatment effects in either of the two seasons.

(b) ERC yields: Treatments had no effect on cane quality, and as a result there were no significant differences in ERC yields between treatments.

(c) Stalk characteristics: Millable stalk counts and measurements of stalk lengths and diameters showed that the low yields were directly associated with poor stalk populations and reduced cane lengths. There were no significant treatment effects.

(d) Dead heart counts: In the plant crop, dead heart counts were recorded on the 4 control rows of each plot (each 20m length) at fortnightly intervals from 2nd November 1989 to 25th January 1990. In the first ratoon counts were discontinued at the end of December when it was apparent that there were no treatment effects.

Dead heart counts did not reveal any consistent treatment effects in either of the two crops. In the plant crop there was evidence of lower counts in Control, Suscon, and Dursban treatments, and although differences (transformed data) attained significance during December, by the end of January there was no further evidence of treatment differences. In the first ratoon there were consistently lower counts in the control treatment, which was the main reason for counts being discontinued prematurely.

(e) Larvae counts: No larvae counts were made in the plant crop, but in the first ratoon counts were made from 5 pit samples per plot on two occasions, viz. 3rd June and 8th August, 1991. Samples comprised an area of 0,5m x 0,5m across the cane row and excavated to a depth of ±30cm.

Larvae were separated by size into 1st, 2nd, and 3rd instars, but data analysis was confined to totals of 2nd and 3rd instars as it seemed unlikely that the 1st instar larvae present were H.licas (neither adults nor eggs were found).

There were considerably fewer larvae recorded in August than in June, due either to natural mortality and/or to the larvae having moved below the sampling zone. In spite of the high variability associated with such a sampling procedure, there was clear evidence of treatment responses and the Suscon Green treatment caused significant reductions in larvae populations. Mocap also showed some residual effect during the second year of activity, which was surprising in a chemical of normal short duration. There was also some response to Suscon parathion and to Miral in the June sampling, but none in August, and these effects are attributed to random variability.

Results are shown diagrammatically in the bar charts, with Suscon and Mocap controlling larvae by averages of 50% and 24% respectively.

CONCLUSIONS

Soil insecticides applied at planting depth are aimed at control of larvae, not only to reduce damage to the standing crop, but also in an attempt to reduce overall pest populations. However, the results from this and from other field trials (see also 3500/19) show that when dealing with an insect which attacks the crop in both the adult and larval stages, it is not possible to separate successful from unsuccessful treatments in terms of crop yield because of the effect of the adults on tiller production and growth.

Sites for insecticide trials are carefully selected in areas of commercial cane where considerable beetle damage is evident. Because of high beetle populations in surrounding areas, all plots in these trials are subjected to excessive damage and insecticides placed at depth have no apparent effect on adult beetle activity. Although many beetles must be affected by the chemicals and must ultimately die, this does not lessen the damage to the plots concerned which are immediately invaded by fresh populations. As a result it has proved impossible to measure the yield response to applied chemicals because all plots are equally devastated during the early growth stages and produce uniformly low yields. For the same reasons counts of dead hearts per plot do not reveal treatment differences, because excessive tiller mortality takes place uniformly at the trial site regardless of insecticide treatment.

The results from this Soil Insecticide Trial show uniformly low cane and ERC yields, due in part to reduced irrigation frequency in two successive years of water shortage, but mainly because of the effects of adult beetles in reducing millable stalk populations and restricting cane growth. Because yield differences cannot be expected under such conditions, the effects of treatments on larvae populations were evaluated in terms of larvae counts obtained from pit samples, and these revealed that Susocn Green was exhibiting good control of larvae during its second year of activity, with Mocap also showing some residual action.

Suscon Green is now used successfully in Australia to control a range of white grub species in sugarcane, and it has also proved successful in other parts of the world in controlling soil-dwelling larvae of various beetle species. The product has been designed to remain insecticidally active in the soil for a three-year period, the release of the active ingredient (chlorpyrifos) involving a leaching process in moist soil. It is encouraging to note that it is also effective against H.licas larvae, and as a result of these and other results this product has now been temporarily registered for use on sugarcane in Zimbabwe.

The product has certain limitations, apart from its high cost, the most important being that it will only be effective if applied below the sett at planting and adequately covered to a depth of about 10cm. It is unsuitable for ratoon applications because of the problem of applying it at depth (see 3500/19 results), so that its use is likely to be restricted to new plantings only.

KEC/Nov'91
vdr

3500/18: PLANT AND 1st RATOON CROP HARVEST DATA, 1990 & 1991

TREATMENT MEANS

TREATMENTS	CANE T/HA		ERC % CANE		ERC T/HA		STALKS/HA/1000		STALK LGTH (m)		STALK DIAM (cm	
	P	1R	P	1R	P	1R	P	1R	P	1R	P	1R
1	64,75	74,39	11,81	13,46	7,79	10,02	82,38	109,65	1,78	1,63	2,55	2,49
2	64,27	69,35	12,63	13,39	8,05	9,40	84,40	104,80	1,75	1,58	2,55	2,50
3	59,41	65,60	10,96	13,52	6,48	8,89	87,68	104,08	1,74	1,50	2,51	2,52
4	64,32	61,40	11,50	13,47	7,46	8,34	88,73	103,10	1,61	1,48	2,58	2,59
5	66,90	69,17	11,38	13,51	7,72	9,36	86,83	102,48	1,73	1,65	2,67	2,56
6	57,26	70,19	12,46	13,35	7,20	9,44	79,38	107,25	1,73	1,64	2,53	2,51
7	61,82	69,08	11,32	13,52	6,96	9,36	85,58	107,18	1,73	1,51	2,51	2,59
8	69,39	69,52	12,12	13,46	8,42	9,38	87,08	107,58	1,75	1,56	2,55	2,53
Trial mean	63,51	68,59	11,77	13,46	7,51	9,27	85,25	105,76	1,73	1,57	2,56	2,54
Significance	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.
S.E.plot ±	11,23	8,45	1,11	0,40	1,67	1,26	15,89	4,70	0,14	0,15	0,06	0,08
S.E.treat mean ±	5,61	4,23	0,56	0,20	0,83	0,63	7,94	2,35	0,07	0,08	0,03	0,04
C.V.%	17,68	12,33	9,44	3,00	22,24	13,59	18,64	4,44	8,38	9,89	2,52	3,26

3500/18: CUMULATIVE DEAD HEART COUNTS

TREATMENT MEANS

1. PLANT CROP

TREATMENTS	2.11.89		to 17.11.89		to 30.11.89		to 14.12.89		to 28.12.89		to 11.1.90		to 25.1.90	
	x	log x	x	log x	x	log x	x	log x	x	log x	x	log x	x	log x
1	36,50	1,49	56,25	1,72	106,00	2,00	148,25	2,15	177,00	2,23	238,50	2,36	300,75	2,47
2	33,00	1,49	53,25	1,72	137,25	2,11	181,25	2,23	214,75	2,31	293,50	2,45	342,25	2,52
3	38,00	1,48	71,50	1,79	134,50	2,07	169,75	2,20	190,50	2,26	254,75	2,39	299,00	2,47
4	22,00	1,33	37,25	1,56	88,00	1,92	131,00	2,10	149,50	2,15	207,00	2,31	256,75	2,40
5	28,25	1,39	47,75	1,60	86,00	1,87	116,00	2,01	148,25	2,13	202,50	2,27	249,50	2,38
6	39,75	1,58	69,50	1,82	131,25	2,11	172,25	2,23	199,75	2,29	261,25	2,41	311,75	2,49
7	26,50	1,33	50,25	1,63	98,00	1,92	125,00	2,04	148,00	2,13	199,00	2,28	251,75	2,39
8	42,00	1,57	53,50	1,70	110,25	2,02	151,00	2,16	177,25	2,23	241,75	2,37	302,50	2,47
Trial mean	33,25	1,46	54,91	1,69	111,41	2,00	149,31	2,14	175,63	2,22	237,28	2,35	289,28	2,45
Significance	-	-	-	-	-	-	-	*	-	*	-	-	-	-
L.S.D. (5%)	-	-	-	-	-	-	-	0,15	-	0,13	-	-	-	-
S.E.plot ±	12,97	0,16	16,39	0,12	30,65	0,13	33,77	0,10	35,17	0,09	47,78	0,08	49,46	0,07
S.E.treat mean ±	6,48	0,08	8,19	0,06	15,32	0,06	16,89	0,05	17,59	0,04	23,89	0,04	24,73	0,04
C.V.%	39,00	10,79	29,85	7,07	27,51	6,32	22,62	4,90	20,03	4,01	20,14	3,55	17,10	2,83

2. FIRST RATOON

TREATMENTS	15.11.90		to 29.11.90		to 13.12.90		to 27.12.90	
	x	log x	x	log x	x	log x	x	log x
1	80,50	1,90	138,00	2,12	252,25	2,38	327,00	2,49
2	92,00	1,92	154,25	2,17	273,00	2,43	344,75	2,53
3	74,50	1,81	118,50	2,05	213,25	2,31	263,75	2,40
4	98,25	1,93	153,75	2,16	253,25	2,39	310,25	2,48
5	54,75	1,69	86,75	1,92	159,50	2,20	219,75	2,34
6	61,25	1,73	104,25	2,00	214,25	2,31	282,50	2,43
7	55,75	1,72	108,50	2,00	213,75	2,31	282,25	2,43
8	110,50	2,03	184,75	2,26	321,50	2,51	403,25	2,61
Trial mean	78,44	1,84	131,09	2,08	237,59	2,35	304,19	2,46
Significance	*	-	*	*	-	-	-	-
L.S.D. (5%)	38,39	-	57,72	0,21	-	-	-	-
S.E.plot ±	26,09	0,16	39,23	0,13	67,27	0,14	83,94	0,13
S.E.treat mean ±	13,05	0,08	19,62	0,07	33,64	0,07	41,97	0,07
C.V.%	33,26	8,65	29,93	6,34	28,31	5,80	27,59	5,44

3500/18: LARVAE COUNTS FROM SOIL SAMPLES

TOTALS OF 1st and 2nd INSTAR LARVAE

1st Sampling 3.06.91
2nd Sampling 8.08.91

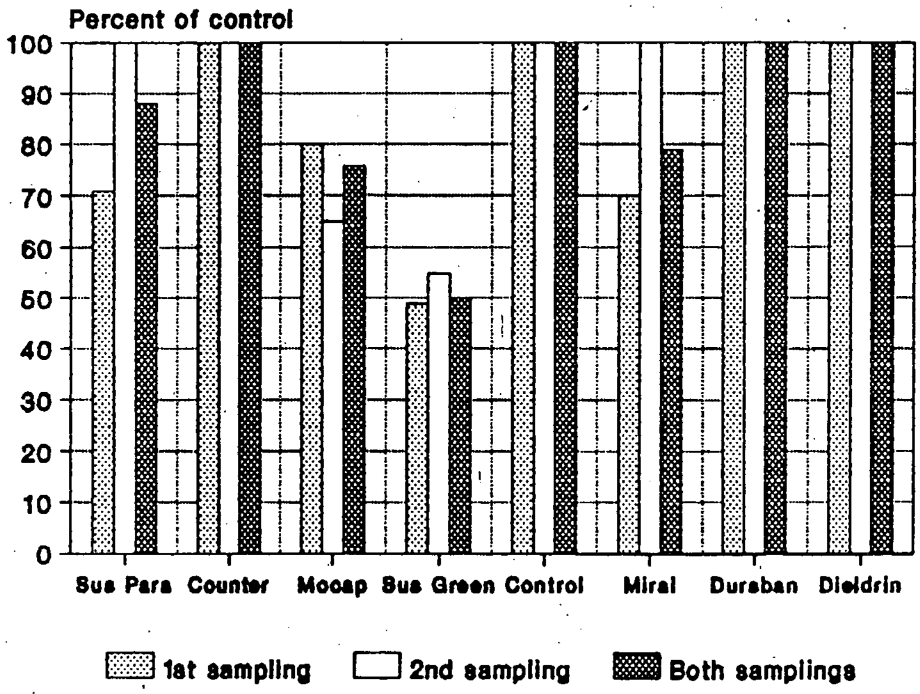
TREATMENT	MEAN LARVAE PER SAMPLE (X)			TRANSFORMED SQ.RT.(X+1)		
	1st Sampling	2nd Sampling	Both Samplings	1st Sampling	2nd Sampling	Both Samplings
Suscon Parathion	8,55	6,55	15,10	2,89	2,55	3,86
Counter (terbufos)	12,15	5,10	17,25	3,47	2,19	4,12
Mocap (ethoprop)	9,65	3,30	12,95	3,05	1,78	3,54
Suscon Green	5,85	2,80	8,65	2,41	1,65	2,94
Control	12,05	5,10	17,15	3,38	2,20	4,09
Miral (isazofos)	8,40	5,20	13,60	2,83	2,25	3,64
Dursban (chlorpyrifos)	14,60	5,95	20,55	3,77	2,36	4,52
Dieldrin	15,00	6,30	21,30	3,85	2,48	4,59
L.S.D. P = 0,05	5,59	N.S.	6,94	0,85	N.S.	0,88
P = 0,01	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.
Trial mean	10,78	5,04	15,82	3,21	2,18	3,91
S.E. Plot ±	3,80	2,20	4,73	0,58	0,47	0,60
S.E. Mean ±	1,90	1,10	2,36	0,29	0,23	0,30
C.V. %	35,28	43,76	29,87	17,96	21,37	15,25

LARVAE NUMBERS EXPRESSED AS PERCENTAGES OF CONTROL VALUES

TREATMENT	LARVAE AS % OF CONTROL			% REDUCTION OF LARVAE		
	1st Sampling	2nd Sampling	Both Samplings	1st Sampling	2nd Sampling	Both Samplings
Suscon Parathion	70,95	128,43	88,05	29,05	-28,43	11,95
Counter (terbufos)	100,83	100,00	100,58	-0,83	0,00	-0,58
Mocap (ethoprop)	80,08	64,71	75,51	19,92	35,29	24,49
Suscon Green	48,55	54,90	50,44	51,45	45,10	49,56
Control	100,00	100,00	100,00	0,00	0,00	0,00
Miral (isazofos)	69,71	101,96	79,30	30,29	-1,96	20,70
Dursban (chlorpyrifos)	121,16	116,67	119,83	-21,16	-16,67	-19,83
Dieldrin	124,48	123,53	124,20	-24,48	-23,53	-24,20

3500/18: SOIL INSECTICIDE TRIAL

2nd & 3rd INSTAR LARVAE AS % OF CONTROLS



PERCENT REDUCTION OF LARVAE POPULATIONS