RESEARCH STRATEGIES FOR THE USE OF INSECTICIDES TO CONTROL SUGARCANE PESTS IN SOUTH AFRICA

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There are a number of possible strategies that may be adopted when considering the use of insecticides for pest control. Reported here are the approaches followed in their use against the borer *Eldana saccharina* Walker (Lepidoptera: Pyralidae) and the group of coleopteran soil pests collectively known as white grubs.

Trials against *E. saccharina*

Three approaches to the control of *E. saccharina* are being examined:

- repeated application of insecticides to young sugarcane.
- timing of applications in association with adult moth peaks in older sugarcane.
- treatment of seedcane.

Repeated application of treatments

The rationale behind this approach is that, if an initial infestation could be reduced, subsequent build-up of *E. saccharina* numbers and damage may also be reduced. In these trials azinphos-ethyl was used at a rate of 900 mL formulation/ha. Two trials were conducted. The first was an observation trial, with one treated and one control block (each 0,5 ha). The first (of monthly) treatments was applied when the crop was four months old and the last six months later. Surveys were conducted at monthly intervals. The second trial was replicated (three replicates/two treatments with 46 x 50 m plots), using the same insecticide and rate as in the first trial. The first treatment was applied when the crop was three months old and the last five months later. The results in both trials showed no differences in damage between treated and control plots.

Timing of treatment application

If the neonate larval population resulting from a prior moth peak could be suppressed, subsequent crop damage may be reduced. This has been investigated in trials where sugarcane was treated before, during and after a predicted moth peak. Treatment application was based on moth population trends obtained from a grid of light traps. Treatments comprised the synthetic pyrethroid cypermethrin, and the insect growth regulator flufenoxuron. Rates used were 750 mL and 2,25 L formulation/ha respectively. Superimposed on these treatments was pre-trashing, a practice that has been shown to reduce damage attributable to *E. saccharina.* Results from six trials are summarised in Table 1, which shows the number of treatments (out of 20) in each trial that significantly reduced damage and their association with moth peaks. For each trial, a split plot analysis of variance was done, with timing of application as the whole plot, and insecticide treatment as the sub-plot.

In these trials, a greater percentage of effective treatments were applied during or after a moth peak (Table 1). In another trial, no moth peak was recorded from the nearest light trap, but all treatments significantly reduced damage. This indicates the

Table 1
Association between moth peaks and effective treatments in six insecticide timing trials.

Trial number	Treatments applied before moth peak		Treatments applied during moth peak		Treatments applied after moth peak		Total number treatments
	No. of treatments	No. significant	No. of treatments	No. significant	No. of treatments	No. significant	
1	10	0	5	1	5	5	20
2	0	0	20	3	0	0	20
3	5	0	5	4	10	5	20
4	0	0	15	3	5	1	20
5	10	3	5	4	5	1	20
6	5	2	5	0	10	0	20
Totals	30	5	55	15	35	12	
% significant	17		27		34		

problems encountered when associating light trap catches with trial results. Despite such problems, these results suggest some association between moth numbers and treatment effect. Moreover, they confirm that the use of insecticides can influence damage caused by *E. saccharina.* The trial analyses were based on numbers of internodes bored. In comparing treatment and control values, treatments on average reduced the number of internodes bored by 46%.

Seedcane treatment

To provide alternatives to the current insecticide registered for sett dipping (phoxim), trials were conducted with a number of promising alternatives obtained from preliminary screening trials. Insecticides were tested at three rates: 0,25, 0,50 and 0,75 g ai/L. Bundles, comprised of 20 setts, each 70 mm long (two bundles per treatment) were immersed for 5, 10 or 15 minutes at each concentration of insecticide. Mortality was assessed 24 hours after treatment. The treatments consisted of a water control, water plus wetter, phoxim, cypermethrin, permethrin and chlorpyrifos. Results showed no clear effect of immersion time or rate on mortality; however, efficacy of insecticides differed. Phoxim was the least effective insecticide and the synthetic pyrethroids the most effective.

The use of methyl bromide as a seedcane treatment was also investigated. Methyl bromide was tested at two rates: 10,06 and 32 g/m^3. Bundles of stalks were fumigated in a sealed room for four hours. After fumigation, the room was ventilated for 24 hours and the cane sampled. Larval mortality at both rates was 100% (nil in the control), while germination averaged 39% (39% in the control).

White grub

The approach to white grub control is aimed at both larvae (grubs) and adults (beetles). Trials against larvae comprised replicated randomised blocks (plot size 6 rows by 10 m, with 6 replicates). Six treatments were used, selection being based on previous trials. Treatments were applied using knapsack sprayers, or trickled into furrows in the case of granules. Sampling comprised counting grubs in each of three pits (300 mm cubed) per replicate, three and six months after applying treatments. Results showed that no treatment except ethoprophos reduced larval numbers compared with the control, where three months after treatment application, grub counts were significantly lower than in the control (Table 2). However, the effect did not last, as shown in the sampling at six months.

Table 2
Results from testing five insecticides against white grub larvae. Values are mean number of grubs per pit.

Treatment	Pre-treatment surveys	Post-treatment surveys	
		3 months	6 months
Control	3,9	3,8	2,4
Chlorpyrifos	4,5	2,5	0,9
Ethoprophos	4,1	0,9	1,8
Aldicarb	5,9	2,9	1,9
Isazofos	6,3	1,9	1,8
Terbufos	4,1	1,5	1,5
LSD (5%)	2,83	2,26	1,4

White grub adult flights occur over a short period from October to December. Because of this it was thought that treating for adults might be feasible, and an observation trial was conducted to test this. In the trial, three blocks of cane were treated by surface application of isazofos (2 L/ha) over the period of beetle flight. Block 1 was treated monthly for three months, block 2 for two months and block 3 was treated once. Results are summarised in Table 3. Samples for larvae were taken at monthly intervals, beginning one month after the first treatment application and continuing for four months. Results showed that where the treatment was applied subsequent larval numbers were lower than in the corresponding control block. Lowest numbers were recorded from the blocks treated two and three times.

Table 3
Average numbers of grubs recovered from five pits from each block for each sampling date. Values have been transformed using log (grub number + 1).

Time of treatment application		Sept	Sept, Oct	Sept, Oct, Nov	Control
		Block 1	Block 2	Block 3	Block 4
Pre-treatment	Mean	0	0	0,08	0,08
	SEM	0	0	0,08	0,08
Post 1 (October)	Mean	0,03	0,11	0	0,23
	SEM	0,03	0,07	0	0,16
Post 2 (November)	Mean	0,32	0,19	0,31	0,98
	SEM	0,10	0,09	0,09	0,15
Post 3 (December)	Mean	0,51	0,47	0,41	1,11
	SEM	0,09	0,11	0,08	0,0
Post 4 (January)	Mean	0,57	0,32	0,39	0,70
	SEM	0,09	0,10	0,09	0,09

Conclusions

Of the approaches for control of *E. saccharina* in standing cane, the timing of insecticide applications showed the most promise, with the greatest effect being obtained from treatments applied during or after a moth peak.

The synthetic pyrethroids were the most effective treatments for dipping seedcane; fumigation with methyl bromide was equally effective.

Assessment three months after application showed that ethoprophos was the most effective treatment against white grubs.

An observation trial suggested that treating for white grub adults may reduce subsequent grub numbers in treated fields.