THE SITUATION REGARDING *ELDANA* BORER (*E. SACCHARINA* WALKER) DURING 1978/79 AND ASSESSMENTS OF CROP LOSS

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Abstract

Mill survey data for the borers *Eldana saccharina* Walker (Pyralididae) and *Sesamia calamistis* Hampson (Noctuidae) are given for the 1978/79 season. Results indicate an increase in *Eldana* incidence in cane south of the Tugela River, but otherwise a stabilised situation. Measurements of crop loss due to *Eldana* indicate that cane quality is adversely affected, and that about 0,1 % loss of recoverable sugar can be expected for each 1 % of stalks damaged by the pest.

Introduction

Since 1970 in the South African sugar industry there has been a gradual increase in numbers of the pyralid cane borer *Eldana saccharina* Walker and in the area affected by it. Mill yard surveys have been used to monitor the situation[1] and the purpose of this paper is to present the data obtained for *Eldana* and for the less important *Sesamia calamistis* Hamps. during the past season. Estimates of loss caused by *Eldana* have been made and the data are presented and discussed.

Methods

Mill surveys

These have been described previously by Smaill[1]. A further six mills now have resident mill inspectors and results obtained at these mills are included in this report.

Crop loss

Estimates of crop loss were obtained by taking a sample of approximately 100 stalks of cane, either from consignments in the Amatikulu mill yard or from the field. These stalks were trashed, examined externally and separated into two categories, viz. damaged and undamaged. Bullshoots, dead stalks, and stalks of extreme lengths were discarded. A sub-sample of 4 to 10 stalks, depending on numbers available, was then taken from each category and analysed in the Experiment Station millroom at Mount Edgecombe. Sixty-two further samples of 50 stalks each were similarly processed by the Central Board at Amatikulu mill.

TABLE 1

Damage due to stalk borers, and the incidence of *Eldana* and *Sesamia* at the mills with resident inspectors during the 1978/79 season

Mill	% Stalks damaged	*Eldana* per 100 stalks	*Sesamia* per 100 stalks
Malelane	1	0,18	< 0,01
Pongola	9	1,09	< 0,01
Umfolozi	3	0,25	< 0,01
Empangeni	6	0,76	0,06
Felixton	3	0,20	< 0,01
Amatikulu	26	3,52	0,08
Darnall	10	0,19	0,06
Gledhow	15	0,13	0,09
Glendale	9	< 0,01	0,18
Tongaat	11	< 0,01	0,30
Mount Edgecombe	14	Nil	0,23
Illovo	13	Nil	0,59
Sezela	2	Nil	0,04
Umzimkulu	8	Nil	0,03
Mean	9	0,45	0,12

TABLE 2

The average quality and mass of undamaged and damaged stalks taken from 19 sites in the field

Measure	Undamaged	Damaged	% Difference	Standard error of % difference
D.M. % cane	30,42	28,59	6	1,0
Fibre % cane	15,05	14,79	2	0,8
Brix % cane	15,36	13,80	10	0,7
Non pol % cane	1,35	1,52	−13	2,3
Pol % cane	14,01	12,28	12	1,4
ERS % cane	12,49	10,70	14	1,6
Pol % D.M.	46,09	42,94	7	0,5
Purity	91,16	88,89	2	0,3
Cane g/stalk	690,00	709,00	− 3	2,4
ERS g/stalk	85,70	75,60	12	2,6

TABLE 3

The average quality and mass of undamaged and damaged stalks taken from 49 consignments of cane at the Amatikulu mill by the Experiment Station

Measure	Undamaged	Damaged	% Difference	Standard error of % difference
D.M. % cane	30,31	28,66	5	0,7
Fibre % cane	14,55	13,66	6	1,0
Brix % cane	15,76	14,99	5	0,8
Non pol % cane	1,52	1,78	−17	6,6
Pol % cane	14,23	13,21	7	1,1
ERS % cane	12,67	11,57	9	1,4
Pol % D.M.	47,03	46,15	2	0,5
Purity	90,32	88,04	3	0,6
Cane g/stalk	660,00	634,00	4	1,9
ERS g/stalk	83,30	73,10	12	1,9

TABLE 4

The average quality of damaged and undamaged stalks taken from 62 consignments of cane at the Amatikulu mill by the Central Board

Measure	Undamaged	Damaged	% Difference	Standard error of % difference
D.M. % cane	26,72	26,19	2	1,1
Fibre % cane	12,14	13,84	−14	2,4
Brix % cane	14,57	12,35	15	1,2
Non pol % cane	2,18	2,70	−24	3,1
Pol % cane	12,40	9,65	22	1,8
ERS % cane	10,65	7,55	29	2,4
Pol % D.M.	46,32	36,82	21	1,7
Purity	84,84	77,12	9	1,0

Results

Figure 1 provides a comparison of the levels of *Eldana* at eight mills in the two seasons, 1977/78 and 1978/79, in terms of percentage of consignments infested. Table 1 includes levels of damage, of *Eldana*, and of *Sesamia* borer for the 1978/79 season at all mills at which resident inspectors operated.

The data shown in Tables 2, 3 and 4 comprise results obtained from three sources, viz. samples taken in the field, samples taken at the mill by Station staff, and samples taken

at the mill by Central Board staff. They refer to the average quality of the cane from each source, and the mass of cane and estimated recoverable sugar per stalk from the first two sources.

Discussion

Borer incidence

When compared with the results obtained in the previous season, those for 1978/79 generally showed a lower level of *Eldana* borer. However, there were several individual exceptions. Felixton mill had an increased incidence but the level remained low and the increase was not serious. Pongola mill showed a lower overall level but there was a rise at the end of the season. Gledhow mill showed a similar rise at the end of the season.

The most serious development was the increase in incidence of *Eldana* in cane progressively southwards. Firstly, the focus of infestation in the Amatikulu area shifted southwards. Secondly, there was a three-fold increase in levels of *Eldana* at Darnall mill, and thirdly, *Eldana* was recorded for the first time at Tongaat and Glendale mills in low numbers, and at Gledhow mill in larger numbers.

It can be seen from Table 1 that only at Amatikulu mill did the cane have a high level of *Eldana* infestation and of damage. Cane at Pongola and Empangeni mills was moderately infested. Malelane, Umfolozi, Felixton, Darnall, Gledhow, Glendale, and Tongaat mills all had low levels of *Eldana* infestation with low or moderate levels of damage. Mount Edgecombe and Illovo mills had moderate levels of *Sesamia*, no *Eldana* and moderate levels of damage, while Sezela and Umzimkulu mills had low levels of *Sesamia*, no *Eldana* and low levels of damage.

Despite the increased incidence of *Eldana* southwards, the general stabilization of incidence levels is encouraging. This may be due to cutting cane at a younger age, and also to a general awareness of the situation having resulted in growers following the cultural practices recommended by the Experiment Station, i.e. good field hygiene with a minimum of crop residues.

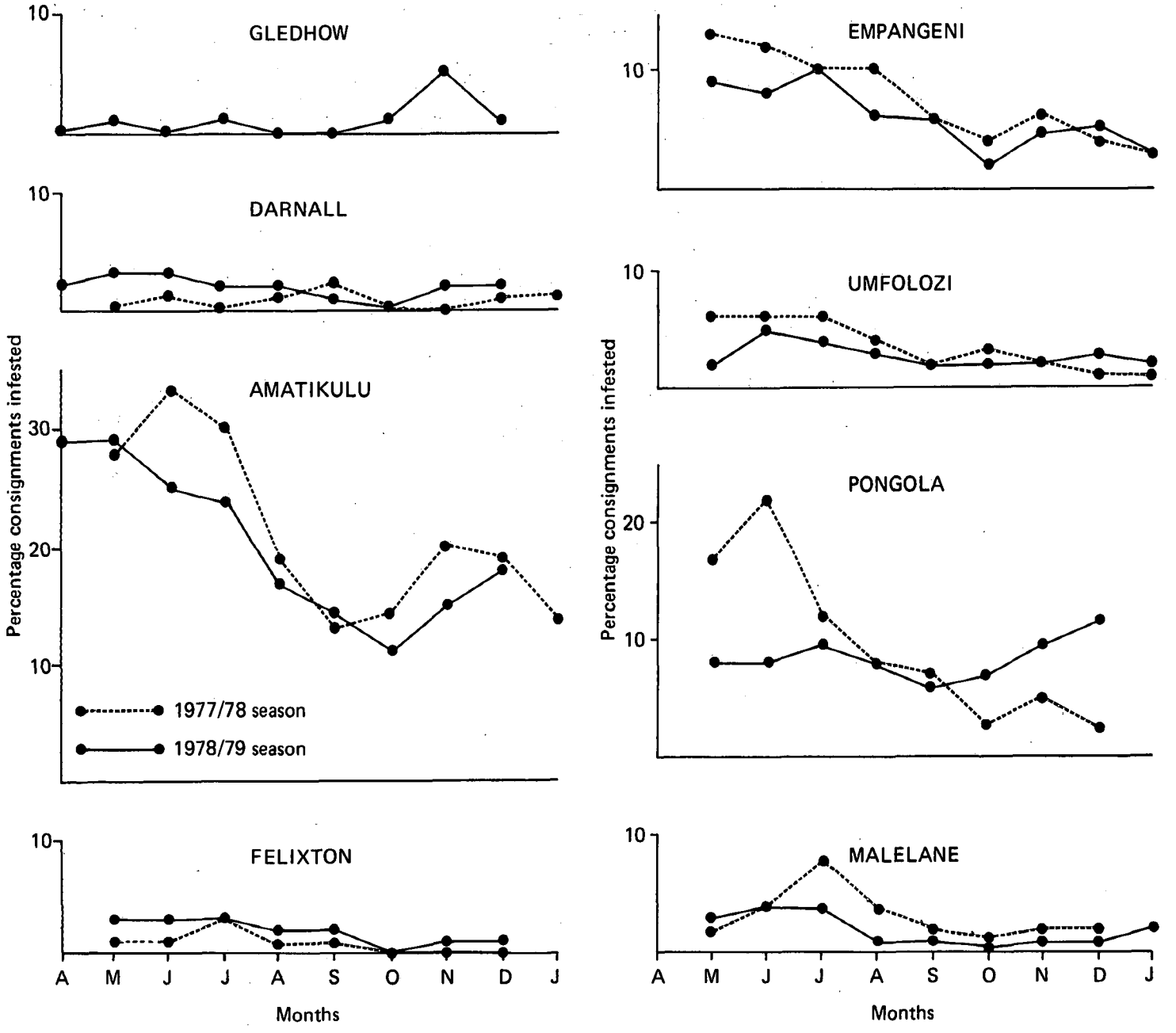

FIGURE 1 Percentage of consignments infested with Eldana borer at eight mills.

Crop loss

Eldana is mainly a stalk borer, but it can also be considered as a shoot borer, a stubble borer, and very occasionally as a top borer. As a shoot borer it damages the base of the spindle, causing a dead heart effect, and this may result in a gappy stand of young cane, but generally compensatory growth occurs and there is no serious permanent loss.

Eldana causes a deterioration in the quality of sugarcane. Affected cane has an increased fibre content, a low sucrose (pol) content, there is less juice, and what juice there is has a lower purity. These effects can be measured fairly easily. Also important, but not so easy to measure accurately are the following:

1. the loss of mass which is due to cane tissue being eaten, followed by impaired crop growth;
2. the death and disintegration of cane stalks such as occurs under a severe attack, and which cannot be recorded, i.e. a complete loss;
3. the weakening of affected stalks which results in more breakage and subsequent side shooting, with an associated deterioration in quality. Gaps due to breakage may cause late tillering, which can also contribute to a decrease in the quality of the crop;
4. the losses caused by damaged and infested seedcane. Damaged seedcane may lead to poor germination. Infested seedcane may lead to an infected crop and possibly a spread of the infestation;
5. the additional processing costs incurred due to poor cane quality.

In order to account entirely for items 1, 2 and 3 listed above, it would be necessary to measure cane yields and quality in a large number of plots or fields affected by *Eldana*, and in a similar number not affected by *Eldana*. Unfortunately, the results would not be useful in helping to estimate losses due to *Eldana* in other plots or fields, because the amount of damage varies greatly from site to site.

It was therefore decided to consider the effects of *Eldana* damage on the basis of the proportion of stalks damaged by the pest. When bored and unbored stalks are compared, it must be assumed that each pair of stalks was identical before the *Eldana* bored into one of them. For this reason it is necessary to sample very carefully in order to limit errors due to the non-uniformity of cane stalks, and the possibility that the incidence of damage varies with the type of cane stalk.

The mean data obtained for samples taken from 19 sites in the field are shown in Table 2. It appears that the mass of undamaged and damaged stalks was similar, but the quality of the damaged stalks was clearly inferior to that of undamaged stalks. The combined effects of lower sucrose content and lower juice purity were a 12 per cent reduction in the mass of recoverable sugar per stalk, and the standard error of this difference (2,6) indicates that the reduction did not vary excessively among the 19 samples studied.

Table 3 refers to the samples taken at the mill by Experiment Station staff. A slight reduction in stalk mass due to *Eldana* damage was accompanied by a significant reduction in quality, leading to an average decrease in recoverable sugar per stalk of 12 per cent, the same decrease observed for the field samples. Once again, the variability in the effects of *Eldana* from sample to sample was not excessive.

The mean analytical results obtained for 62 samples taken by the Central Board are shown in Table 4. For these samples the mean mass of stalks was not determined, but the analytical data indicate that *Eldana* damage caused more severe deterioration than it did in either of the experiments conducted by the Station. Fibre % cane, sucrose % cane, ers % cane and juice purity were all more adversely affected by *Eldana* in these samples.

From the three sets of data shown in Tables 2, 3 and 4 it may be inferred that the yield of recoverable sugar will be reduced by at least 0,1 % for every 1 % of stalks damaged in the crop. The results refer to a limited number of samples taken over a restricted period during the crop. Further work will have to be done before crop losses can be assessed with any degree of assurance.

Conclusions

Although the incidence of *Eldana* in sugarcane continues to move southwards, there appears to have been some stabilization of *Eldana* infestation levels in general. Crop losses due to *Eldana* are a combination of a wide range of direct and indirect effects. If these can be estimated from the mass and quality of undamaged and damaged stalks, it appears that a 0,1 % yield loss can be associated approximately with every 1 % of stalks damaged by *Eldana*.

REFERENCES

1. Smaill, R. J. (1978). Mill yard surveys of the lepidopterous cane borers *Eldana saccharina* Walker and *Sesamia calamistis* Hampson. SASTA Proc 52: 139-142.
2. Ishver, S. *et al* (1965). Further studies in correlation between stalk and joint infestation by sugarcane moth-borer, *Diatraea saccharalis* (Fabricius) in Puerto Rico. ISSCT Proc 12: 1373-1382.