Get D. Southwood to talk to agronomists.

SOUTH AFRICAN SUGAR INDUSTRY

AGRONOMISTS' ASSOCIATION

PROGRAMME FOR ANNUAL GENERAL MEETING 5 DECEMBER, 1980

9.30 - 9.45	Chairmans report
	GENERAL
9.45 - 10.15	A grower's viewpoint - Neville Polkinghorn
10.15 - 10.30	An outline of the Entomology programme - Alastair Carnegie
10.30 - 10.50	T E A
10.50 - 11.20	Ecology, behaviour and pheromones - Peter Atkinson
11.20 - 11.50	Biocontrol - Alastair Carnegie
11.50 - 12.30	Visit the biocontrol unit - Graham Bates
12.30 - 2.00	L U N C H
2.00 - 2.30	Management aspects - Rob Smaill
2.30 - 3.00	Serology - Graeme Leslie
3.00 - 3.30	Insecticide use - Richard Heathcote
3.30 - 4.00	Field and mill surveys - Rob Paxton

Should mill survey continue in an area which is already badly infested.
Data on Ethel for Dan Coulson
[illegible] Roberts membership
Write Barrie [illegible] & C. [illegible].
" to all speakers.

SOUTH AFRICAN SUGAR INDUSTRY

AGRONOMISTS' ASSOCIATION

ELDANA BORER - A GROWERS' VIEWPOINT

by

Neville Polkinghorne

1. Attitudes of growers in general to Eldana. resistance to committees / ignorance on part of allies
2. Testing teams.
3. Experiment Station recommendations - implementation and control.
4. Amatikulu Mill Group code of conduct.
5. Effects of drought.
6. A look into the future.

2. Testing teams cannot get around fast enough - more teams - levy the growers

3. 76/77: hygiene - this improved farming procedure
   Seed with Eldana has been a problem
   Stress - common knowledge.
   Varieties
   Amatikulu's "code of conduct": ① age of cane (20 ② seed cane.
Control must be 100%; what laws?
   the drought has changed ideas of hygiene & control of conduct.
Pre-testing: what are the recommendations
   R30-40 /ha; there are also advantages
Irrigation: Water supply
Reliable delivery can be flexible.

SOUTH AFRICAN SUGAR INDUSTRY
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AN OUTLINE OF THE ENTOMOLOGY PROGRAMME

by

Alastair Carnegie

With one or two minor exceptions, Eldana borer is the only pest with which the Entomology Department is at present concerned. Since the programme was intensified about 5 years ago, it has been our commitment to investigate all aspects of the borer's biology with the intention of finding and exploiting any weak point which there may be.

In planning the work programme, attention has been given to (1) surveys, which tell us where the insect is and in what numbers; (2) essential research, which tells us about the insect and how it fits into its environment and (3) control, which is designed to investigate how we may keep its numbers to as low a level as possible.

SURVEYS (Fig 1)

These started as the examination, as opportunity offered, of cane stacks in the field, at loading zones, and finally in millyards. At present mill surveys and systematic field surveys form one of the most expensive parts of the Eldana programme.

We have tried to get whatever spin-off we can from these, such as an assessment of crop loss. We have also recorded historical aspects of the fields concerned in the hopes that certain management practices might show up as being influential over borer numbers.

ESSENTIAL RESEARCH (Fig 2)

This has involved the study of the insect both in the field and in the laboratory. Records have been kept of its relationship with different host plants, plant communities and climatic factors. It has been studied both by day and by night and throughout the year. Various aids, such as light traps, have been used for recording population dynamics. These studies have led on to the investigation of pheromones and, to some extent, have interested us further in the possibilities of nutrition influencing the size and success of populations. Such studies have broadened our understanding of Eldana very considerably.

CONTROL METHODS (Fig 3)

Under this heading are included all activities which may reduce Eldana numbers. The most obvious measure is chemical control, which has received much attention, and which will receive much more. Ecological control (in the form of management) is very important, and we know that certain management practices can influence population numbers. For example, populations of Eldana accumulate as the crop ages, especially after 12 months, and cane under irrigation seems to suffer less than dryland cane. A degree of biological control takes place in any crop, and this must be appreciated before chemical methods become policy. Where natural biological control is inadequate, it may be possible to introduce exotic biological control agents (in the form of parasites, predators or pathogens) and so tip the scales in favour of the grower rather than the pest.

The discussions that follow will, we hope, cover all these points.

AJMC/HDN
2 December 1980

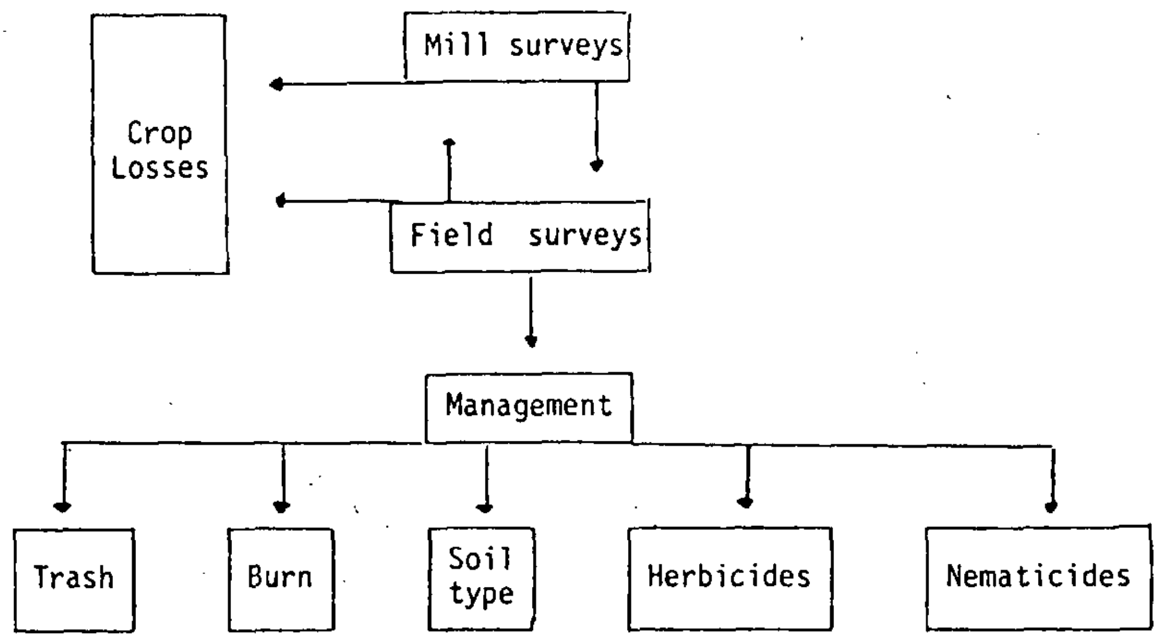

FIG 1 : ELDANA SURVEYS AND THEIR SPHERES OF INFLUENCE

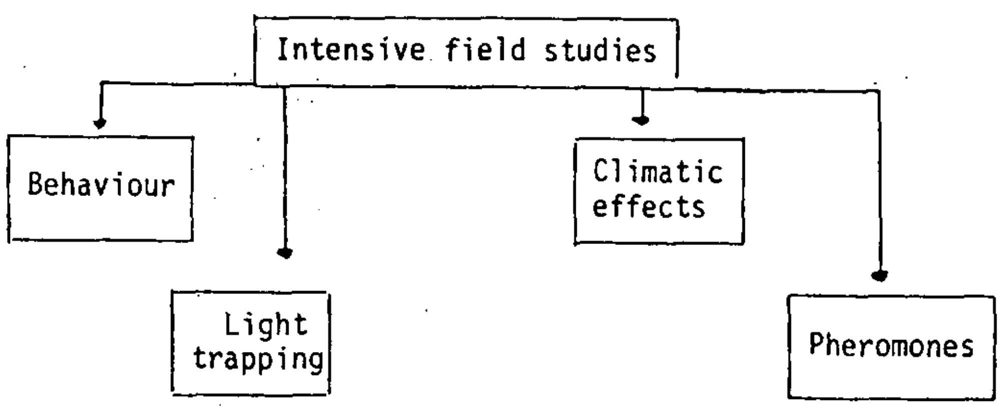

FIG 2 : FACTORS IN ESSENTIAL RESEARCH

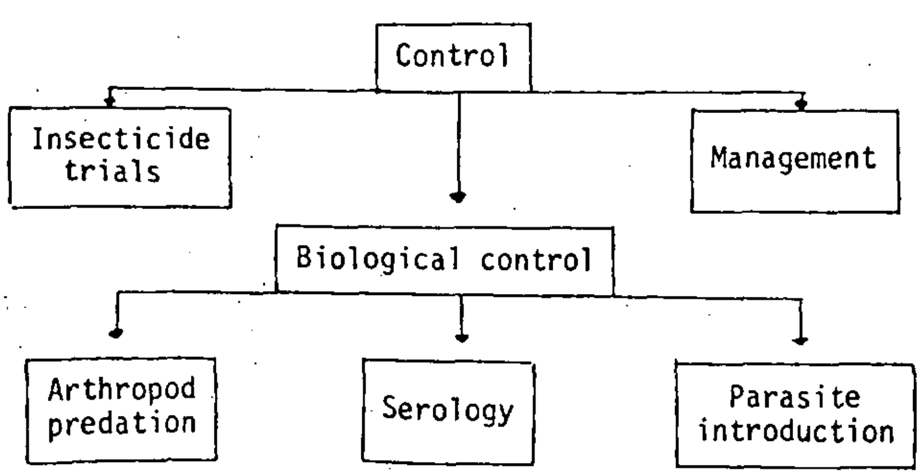

FIG 3 : CONTROL ASPECTS

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NOTES ON ELDANA ECOLOGY AND BEHAVIOUR

by

P.R. Atkinson

1. The insect is distributed throughout Africa, except the deserts, highlands, and the Cape. It occurs in Madagascar and a few Indian Ocean islands.
2. In Natal it extends southwards along the coast.
3. Its natural hosts appear to be the Cyperaceae although large grasses may be natural hosts in central and West Africa.
4. In Natal the number of species of natural host which are utilised decreases from north to south. South of about Stanger only one species is used, *Cyperus immensus*.
5. In the north of Natal there is a large area of natural hosts associated with the Zululand Coastal Plain. Where this area ends, at about Mtunzini, sugarcane has tended to be heavily infested.
6. Light traps show very low densities of moths in natural habitat, high densities in sugarcane, which suggests that cane is a favourable host for some reason.
7. Light traps are used to study the possibility of migration, which however, is extremely difficult to prove.
8. At night the adult moths display and mate in the canopy of the cane, although by day they rest in the trash at the base.
9. Wind, rain, and temperature affect this night-time activity.
10. The pheromones of Eldana are only now being studied. They do not seem to offer much potential for exploitation, but nothing much is known yet.

PRA/HDN

1 December 1980

SOUTH AFRICAN SUGAR INDUSTRY
AGRONOMISTS' ASSOCIATION

ELDANA BORER AS A CONDIDATE FOR APPLIED BIOLOGICAL CONTROL

by
A.J.M. Carnegie

INTRODUCTION

Most naturally occurring insect populations may be said to be in a state of natural control. This means that without artificial control their numbers are kept at around an equilibrium level. Broadly speaking, factors which alter the numbers of an insect are of two types:

(1) density independent ie. they act independently of the insect's numbers, for example climatic factors, temperature, rain, frost etc.

(2) density dependent ie. their effect increases or decreases with the insect's numbers, for example the effects of parasites, predators, disease and the availability of food. Density independent factors tend to deflect the insect's numbers from the equilibrium level, for example seasonal increases and decreases, while density dependent factors tend to regulate the insect's numbers at around the equilibrium level. However, not only may the equilibrium itself be altered to new higher or lower levels as a result of slight environmental changes, but there is some evidence that the insect's numbers may fluctuate, either cyclically or at random, around the equilibrium level. (An insect with a very clear cycle, of 9 years periodicity, is the larch tortrix moth of Europe). With an innocuous insect a sudden population explosion may go unnoticed, but with an economically important one even a small rise in population may be associated with crop loss. The aim of biological control is to lower the equilibrium level, preferably to below the threshold of economic loss.

Applied biological control involves the deliberate introduction into a community of some living agent which, by feeding, parasitising or infecting, will reduce the numbers of a particular member of that community. This usually involves the introduction of a predatory or parasitic insect which is aimed at some candidate insect - very often a crop spoiler.

The success or failure of such introductions depends on numerous factors, including reproduction rates of introduced species and victim, searching ability, mobility, accessibility, vulnerability and many others. There have been notable successes and numerous failures. One of South Africa's most notable successes concerns the Eucalyptus snout beetle, which was inadvertently introduced from Australia with gum seedlings. This pest spread rapidly and threatened gum plantations all over the country, until its egg parasite (a minute wasp) was deliberately introduced from Australia and brought the pest under control, so that its numbers remained below an economic threshold. The success of this venture caused some surprise, because a large continental area was involved. Successes are more commonly associated with insular conditions ie oceanic islands or "ecological islands", where the insect populations are isolated or restricted. The Commonwealth Institute of Biological Control has advised us that they do not consider Eldana to be a good candidate, and since we are about to initiate an expensive and quite possibly unrewarding project aimed at the biological control of Eldana, an assessment of this pest as a candidate is appropriate.

DISTRIBUTION OF ELDANA

Available records over the last hundred years show that Eldana is restricted to the African continent and to certain adjacent islands, including Madagascar. It seems to be a tropical and subtropical species and is probably endemic to coastal areas of Natal, where a relatively mild climate permits its survival. It is doubtful whether it occurs at all under the colder conditions of the highveld or the Cape. Sugarcane does not appear to be a good host plant, and its invasion may be a result of population pressure from surrounding indigenous vegetation. However, its adaptation to sugarcane as a host plant can be rapid, and it is recognised as a pest of sugarcane in both West and East Africa, and during the 1960's in Uganda a considerable amount of good investigatory work was done on its biology and relationship with natural enemies. During the late 1970's this has been followed by further research in Ivory Coast, West Africa.

NATURAL ENEMIES OF ELDANA

Strictly speaking an insect's natural enemy is one which exists with it and attacks it under natural conditions. The good work of such natural enemies may be augmented by the introduction of suitable agents which may attack the candidate pest without in any other way upsetting the balance of the community.

Known natural enemies of Eldana exist here, for example several species of common canefield ants; but in the course of the last 10 years we have never confirmed the presence of any natural parasite of Eldana. If one exists, it is certainly not doing a conspicuously efficient job.

The Commonwealth Institute of Biological Control listed Eldana parasites which included 7 wasps, 6 flies and a few nematodes. However, almost all of these were recovered only after extensive screening in both East and West Africa, and very few were common or specific. Where a parasite is common to other stalk borers as well, it almost always shows a preference for them rather than for Eldana. Its tough texture, activity and ability to produce a repellant alkaline fluid help Eldana resist parasitisation as a larva, and the cocoon which it spins before pupating repels pupal parasites. For example, the wasp parasite *Apanteles sesamiae* (which we have also in southern Africa) and which is mainly a paraiste of the borer *Sesamia calamistis*, will attack Eldana but is repelled by its activity and by the fluid which Eldana ejects. Similarly, the wasp parasite *Pediobius fervus* will in East Africa parasitise the pupal stage of Eldana if it is exposed from the cocoon.

More recently, in Ivory Coast, two promising egg parasites have attracted attention, and have been particularly noticeable in maize plantings which, under West African conditions, are heavily attacked by Eldana. These are *Telenomus* sp. (Scelionidae) and *Trichogrammitoidea eldanae* (Trichogrammatidae).

After some years of corresponding and exchanging information with entomologists in West Africa, we have arranged to introduce both these parasites into S. Africa for testing against Eldana under our conditions. To this end we have established at Mount Edgecombe a biocontrol unit in which we are rearing four moth species, the eggs of which will serve as suitable laboratory hosts for propagating large numbers of our candidate parasites. At the same time we have stationed temporarily in Ivory Coast an entomologist whose commitment it is to collect, study and breed up local Eldana parasites for consignment to us here; and the first consignments have already arrived.

Our plan is to study these parasites under our conditions, bulk up their numbers and make experimental field releases. If they show satisfactory signs of being a useful addition to the local fauna, we will then release large numbers of them and study their impact on field populations of Eldana. If we are fortunate, they may become self-propagating in the field and suppress Eldana populations below a sub-economic threshold. If they are not usefully self-propagating, it may still be possible to rear them artificially in vast numbers and release them in areas where Eldana populations warrant it, and so suppress their numbers as required.

Many insect parasites warrant testing against Eldana, but the greatest hope of success lies with those which are known to be natural parasites under field conditions.

AJMC/PMO
19.11.80

SOUTH AFRICAN SUGAR INDUSTRY
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ELDANA AND CANE MANAGEMENT

by

Rob Smaill

Eldana has become considerably more widespread and severe in its intensity over the last two seasons. We have had two rather dry years and there appears to be a tie-up between rainfall and Eldana as can be seen from Fig 1. This is the rainfall for Amatikulu and Darnall and their corresponding Eldana numbers. The same effect can be seen in a trial at Pongola where irrigation was stopped on one plot and continued on another. The cane was surveyed every month and Fig 2 shows the mean result of seven months surveys. Fig 3 shows the same effect except that the water was provided by a spring and the trial surveyed for four months.

Many growers have observed that Eldana appears to be associated with soil type. Fig 4 is drawn from survey results and demonstrates a relationship between soil parent material and Eldana numbers. Parent material is a poor index of soil properties, of which available moisture holding capacity appears to be the most important.

Use of nitrogen fertilizer generally increases the levels of many pests. Fig 5 shows the results of two trials in the Amatikulu area. As nitrogen increased so did the Eldana population. Three more trials have been laid down on what could be termed a poor, medium and good soil. These will probably be harvested in May 1982.

Another agricultural chemical which affects Eldana population size is Roundup. Fig 6 shows what resulted nine weeks after spraying a variety trial with Roundup at 1 ℓ/ha. This particular case is not of practical importance but it does demonstrate that some agricultural chemicals can have a marked effect on Eldana numbers.

We are often asked if heavily infected cane should be ploughed out. Fig 7 shows there is no advantage to be gained in ploughing out. The exception is if there is a ratoon failure.

Comparison of burning and trashing and their effects on Eldana was the subject of seven trials. Results are variable but there appears to be a relationship between the soil moisture status and the result. In the trial illustrated in Fig 8 the soil was wet and burning was the best treatment. In the trial illustrated in Fig 9 the soil was dry and trashing was the best treatment. Possibly the treatment which was most favourable for the plant was the least favourable for the Eldana. In most of the trials where burning only could be compared with burning and removing all crop residues (or hygiene), there was no additional advantage to the hygiene.

Varietal resistance to Eldana could offer an ideal solution, but there is at present no variety which is completely resistant to Eldana. Table 1 shows some trends that can be noted from the results of nine variety comparisons. However, results are very variable and what appears to be comparatively resistant in a variety trial might completely succumb in commercial fields.

Pre-trashing is the subject of a large number of trials at present, and results to date indicate some chance of using it as a control method. Pre-trashing generally reduces Eldana levels but it also reduces sucrose yield unless the infestation was particularly heavy.

Cutting cane at a younger age remains the most effective method of reducing Eldana levels. Fig 10 shows the dramatic increase in Eldana numbers after 15 months of cane age. This take-off point will alter from area to area and from season to season.

RJS/HDN
2 December 1-80

TABLE 1

ELDANA AND VARIETIES

N52/219 J59/3 N11	Susceptible
NCo 376 N55/805 NCo 310 CB36/14	Variable
N12 N13	might be "Resistant"
NCo 334 N53/216 N7 N8	"Resistant"

RJS/HDN
2 December 1980

Fig 1. Mill Eldana Levels Compared with Annual Rainfall

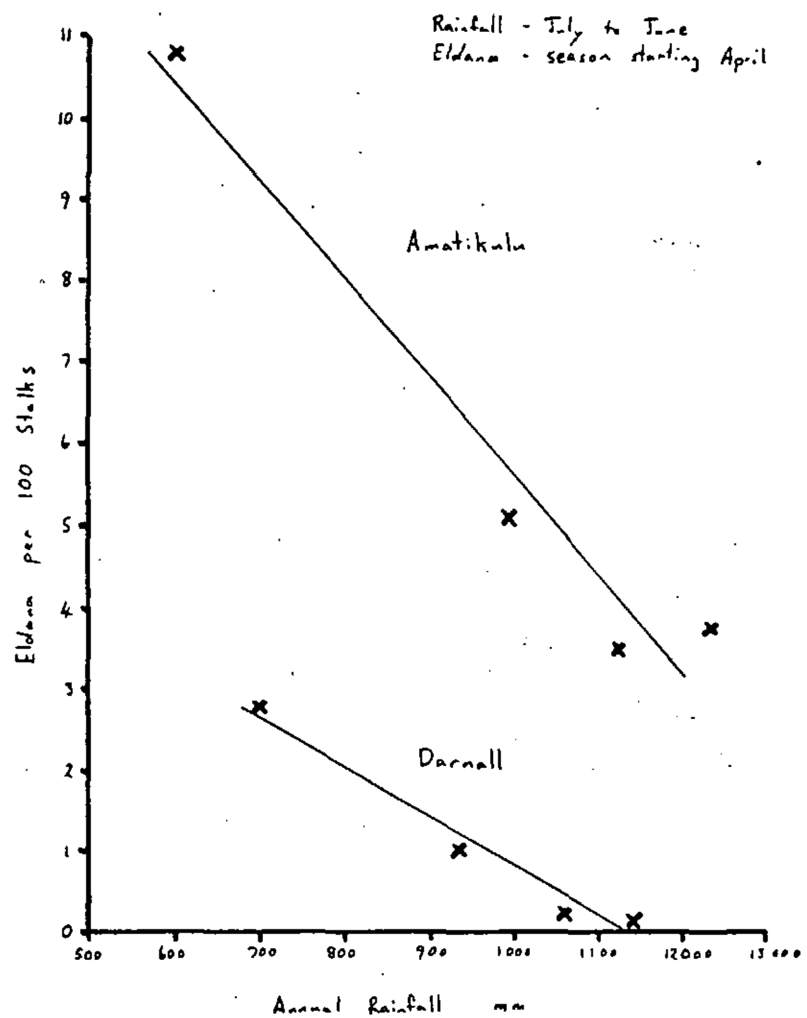


Fig 2. Eldana and Moisture
Pongola

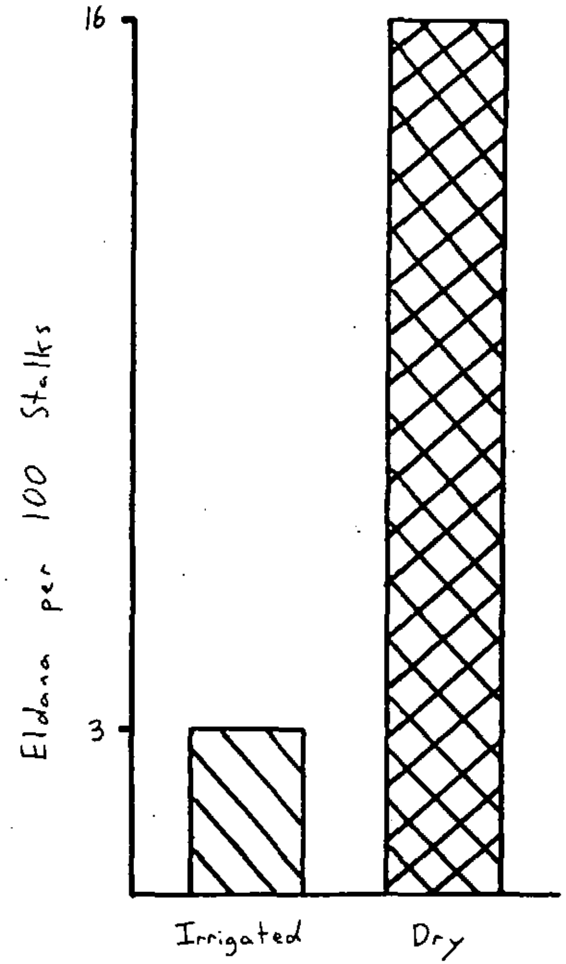


Fig 3. Eldana and Moisture
Renken

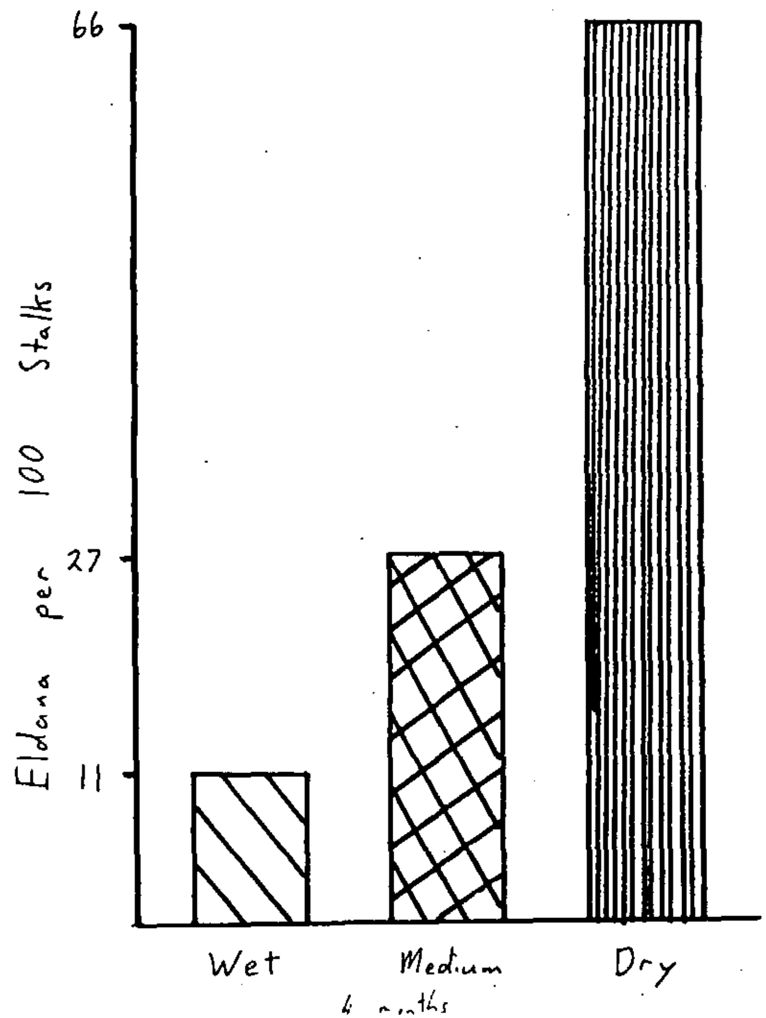


Fig 4. Eldana and Soil Parent Material
Amatikulu field surveys 1978

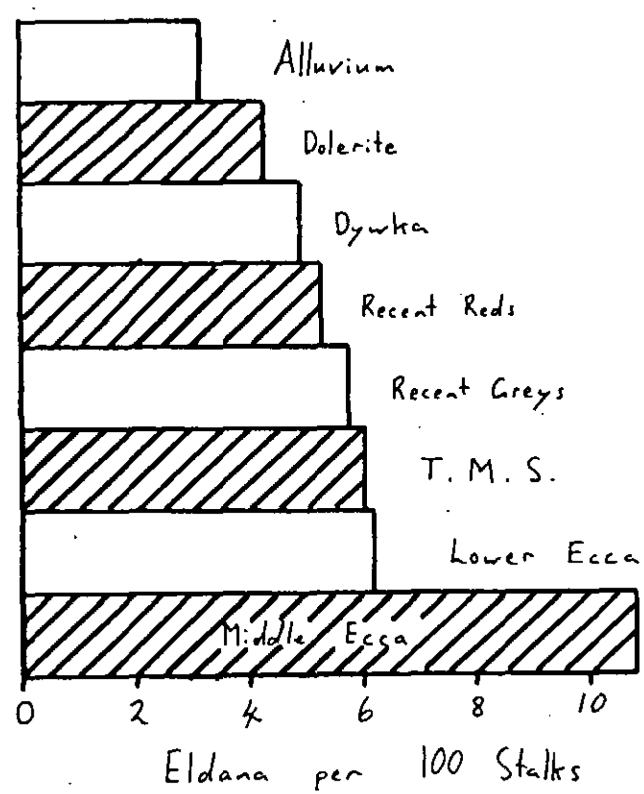


Fig. 5. Eldana and Nitrogen Fertiliser

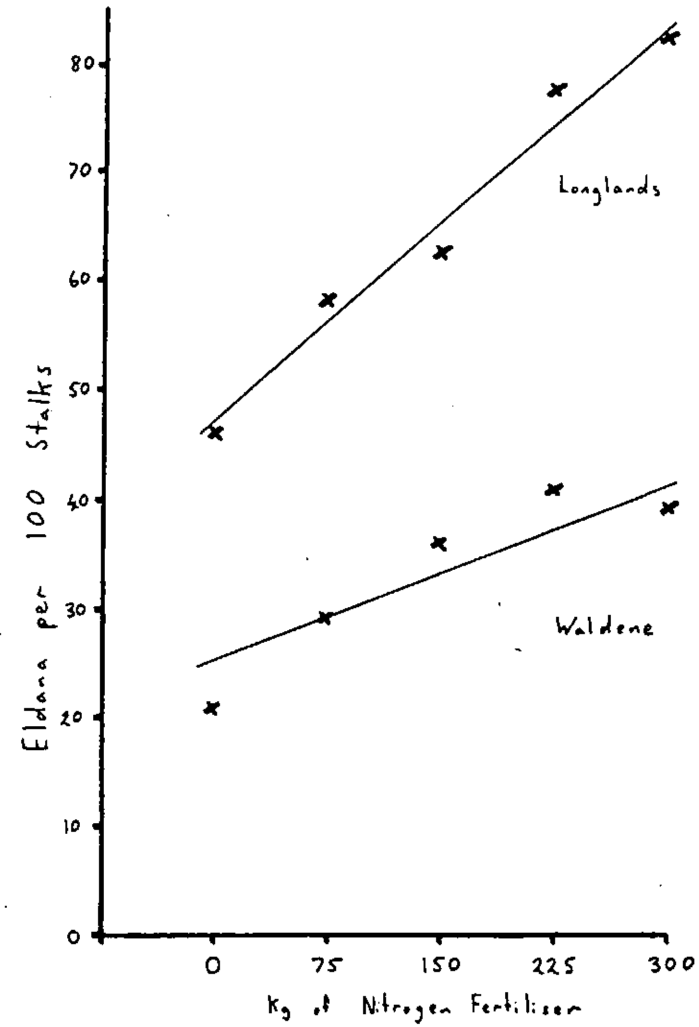


Fig 6. Eldana and Ripeners

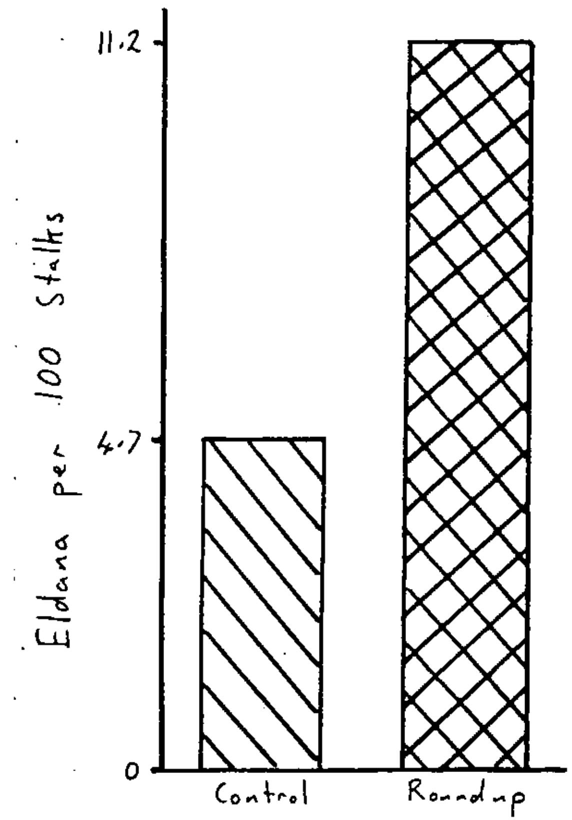


Fig 7. Eldana and Ratoon

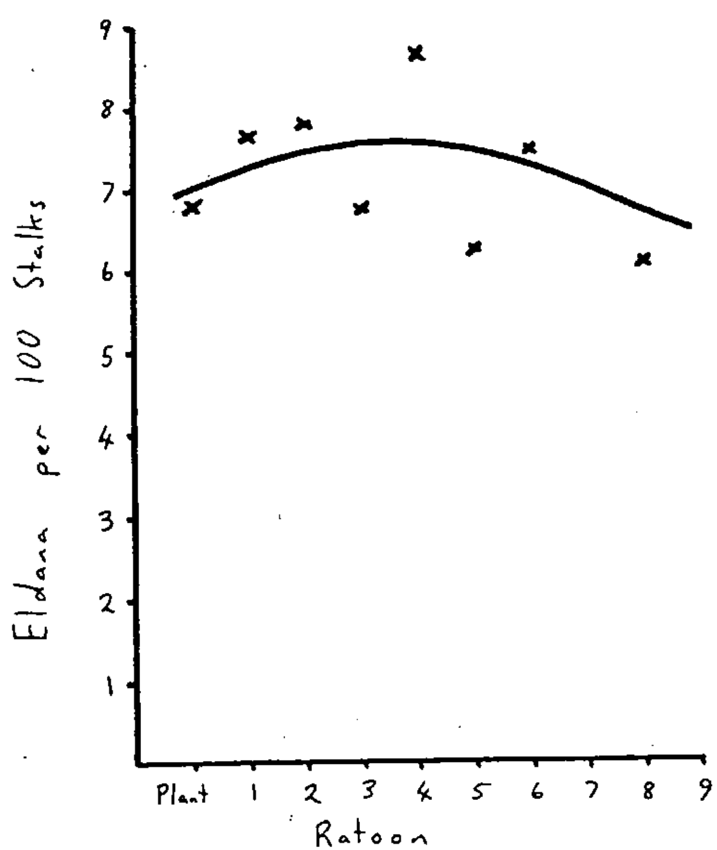


Fig 8. Harvest Trial - Grandpre

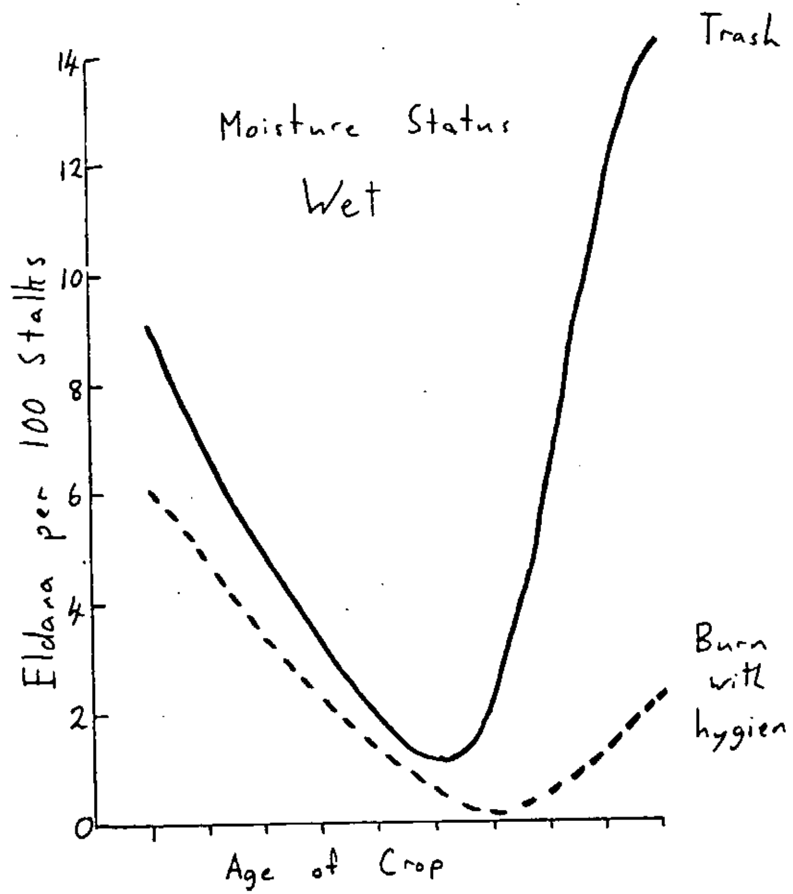


Fig 9. Harvest Trial - Mandiza

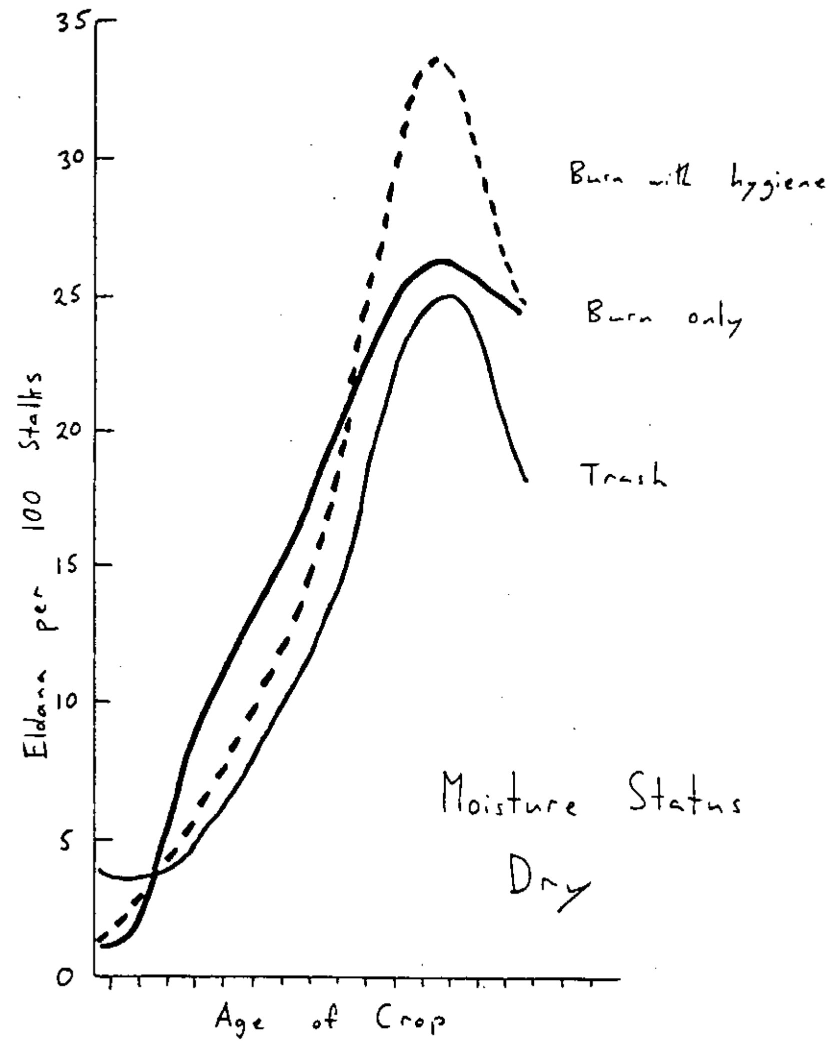
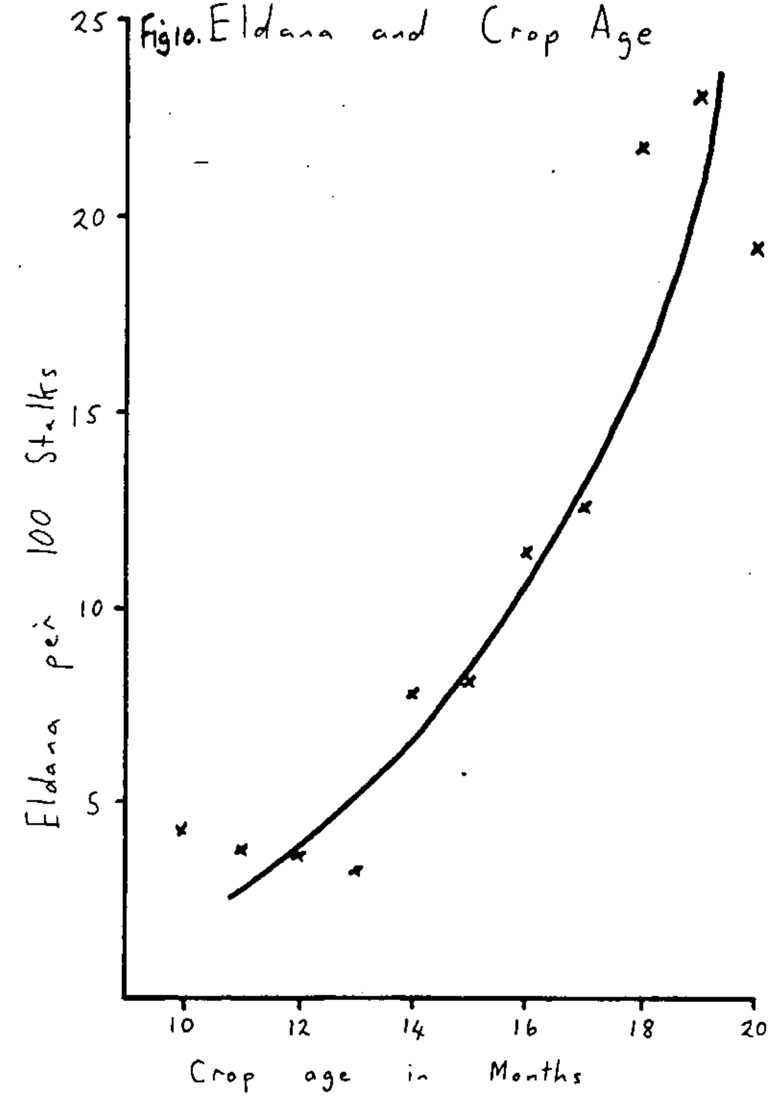


Fig 10. Eldana and Crop Age



SOUTH AFRICAN SUGAR INDUSTRY
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ASSESSMENT OF SEROLOGICAL RESULTS

by

Graeme Leslie

INTRODUCTION

The serological project was designed to identify the natural predators of *Eldana saccharina* which occur in the arthropod community of sugarcane fields in the sugar industry in South Africa.

The technique employed for identifying such predators was cross-over electrophoresis. This technique relies on the movement of charged molecules through a gel medium in an applied electric field. Because of the opposite polarity of antibodies and antigens these two components of a serological reaction move towards one another under the conditions noted above. At zones of correct antigen/antibody concentration a precipitate is formed in a positive reaction. With this technique 1 525 individual arthropods have been tested.

RESULTS

An objective of this project was to produce a range of antisera sensitive to the various developmental stages of *E. saccharina*. To this end antisera to "young larvae","old larvae" and to larval haemolymph were produced. An anti-egg serum is in the process of being developed. However some of these sera were not specific enough to be useful in field tests. The exception has been the haemolymph antiserum. This antiserum, besides being very sensitive, was specific to *E. saccharina*. Most tests were conducted with this antiserum. As an additional precaution against cross-reaction the antiserum was diluted before use. This has the effect of reducing any possible cross-reactivity without reducing the serum's sensitivity.

The results to date are presented in Tables 1 and 2. Table 1 shows the results of tests conducted on arthropod samples collected from sugarcane which was badly damaged by *E. saccharina*.

Table 2 shows the results of similar tests which were conducted on samples collected from cane having a moderate level of *E. saccharina*. Table 2 includes also results from samples of the sedge *Cyperus immensus*.

Results of positive tests (Table 1) show that the following orders contain the more important predators of *E. saccharina*: Hymenoptera 14%, Araneida 15% and Orthoptera 18%. Of all arthropods tested the order Hymenoptera contained the highest number of positives. This was boosted by the ant *Dorylus* sp., of which 35% of individuals tested proved positive. Tests on the very common ant, *Pheidole* sp. showed that 4% of individuals tested had fed on *E. saccharina*. This figure is much lower than the positive values recorded for *Dorylus* sp. However, as mentioned earlier, *Pheidole* is a very common ant. The implication is that *Pheidole* sp. may attach *E. saccharina* over a much bigger area of cane than does *Dorylus* sp. which is a comparatively rare ant.

Another very common ant found in association with sugarcane is *Paratrechina* sp. It is interesting to find only one positive reaction from 119 individuals tested. The remaining four genera of ants that gave positive results are much less common than *Pheidole* sp. While some are certainly more abundant than *Dorylus* sp. none gave percent positive values resembling that for *Dorylus* sp. It may be concluded that their influence on *E. saccharina* is much less than that of *Dorylus* sp. or *Pheidole* sp.

Of the spider families tested the Thomisidae gave the largest number of positive results (30%). Twenty percent of the Theridiidae which were tested proved positive. Numbers of spiders tested were much smaller than those of ants. It should be noted that numbers of arthropods tested reflect their distribution in sugarcane, because no attempt was made to select arthropods for collection.

If the spider families recorded are divided into (a) the web-spinners and (b) the hunters, it can be shown that percent positive results for each group are 17 and 15 respectively. Marginally more positive results are associated with those spider families whose usual habit is to spin webs for prey capture. At this stage it can only be speculative, but this probably reflects predation on the adult stage of *E. saccharina*. The cursorial spiders probably eat young larvae before they bore into the sugarcane stick. Studies have shown that newly emerged larvae remain on the surface of a stick for at least nine days before penetrating it. Such larvae are vulnerable to attack, not only by cursorial spiders, but by many predacious beetles and bugs. However it cannot be stated that cursorial spiders would exclusively eat the young larval stage of *E. saccharina*. Mating pairs, or "calling" individuals of *E. saccharina* adults are also vulnerable to attack by roaming spiders.

Similar numbers of Orthoptera have been tested. The largest number of positive results (11%) were recorded from the cockroaches. Of the crickets tested 7% proved positive. Cockroaches are general feeders. Crickets are more usually herbivorous, though they are capable of eating other arthropods and occasionally do so. Because of the foraging habit, the cockroaches are most likely to eat *E. saccharina* eggs where they are laid on the cane trash. A similar rôle is probable for crickets.

Of the remaining arthropods tested, positive results were obtained from the Isopoda, Heteroptera and Coleoptera. Out of 46 isopods tested 4% proved positive, a surprisingly high figure. However most isopods are scavengers, and some are carnivors. Probably while foraging it would be possible for individuals to feed on *E. saccharina* eggs or on carrion. Such results may reflect the abundance of *E. saccharina* in the field. The isopods, as well as many other scavengers may fortuitously consume eggs or carrion because of their abundance.

The percent positive results obtained for the Heteroptera and Coleoptera were twelve and ten respectively. Both these orders include many predacious species which are capable of feeding on *E. saccharina*. It is surprising that the percent positive results are not higher.

No positive results were obtained from the Homoptera, Chilopoda or Dermaptera.

The results obtained to date from samples collected in moderately damaged sugarcane (collected from Tongaat and South Coast cane) are given in Table 2. Results from sampling the wild host *C. immensus* are also presented. The numbers tested so far are small, so conclusions must be tentative.

Both the Formicidae and the Araneida showed 5% of those tested to be positive. The only other order from which a large enough sample has so far been taken is the Coleoptera. Out of 31 individuals tested only one proved positive. Of equal interest are those arthropods that have given no positive results despite their moderate sample sizes. They include the ant *Dorylus* sp. the cricket group (Saltatoria) and the spider family Thomisidae.

Of 30 *Dorylus* sp. individuals tested, none has proved positive. An examination of data for this ant from heavily damaged sugarcane suggests that 1 in 3 should prove positive. The fact that this ratio is not evident from samples collected from a moderately damaged field would suggest this ant is not a selective predator of *E. saccharina*. However the 30 negative results could simply reflect the low population of *Dorylus* sp. in that particular field. A similar explanation could apply to the results of tests on the Thomisid spiders.

The lack of positive results for crickets tested probably confirms the earlier suggestion that crickets feeding on *E. saccharina* do so simply because of its high density. The population of crickets in sugarcane is fairly uniform.

Very few arthropods collected from *C. immensus* have been tested. So far the only samples to prove positive are those of the Coleoptera. Further tests are planned.

Studies have begun on the biology of the ant *Dorylus* sp. Nests of this ant have been examined in the field and the following observations have been made :

(a) The ants are found in small groups some 2 cm below the soil over an area of 0,5m².

(b) The largest groups have been found directly under stools of sugarcane.

(c) In sugarcane several individuals have been found in the fresh borings made by *E. saccharina* larvae.

(d) If this last observation is a common event this ant is probably a predator of larvae inside the stick.

The literature indicates that this ant is both extremely aggressive and exclusively carnivorous. A colony rarely stays in the same place for any great length of time. This is because no single area can supply the food requirement indefinitely.

SUMMARY

Serological tests on stomach contents have been conducted on arthropods collected from badly damaged sugarcane. More recently samples have been collected from moderately damaged sugarcane as well. Results have shown ants, spiders and cockroaches to be the most frequent predators of *E. saccharina*. The ant *Dorylus* sp. is the single arthropod type that shows the greatest frequency of predation. This predation is probably on larvae inside the sugarcane stick. Another ant, *Pheidole* sp. showed a much lower level of predation. However, this is the most common ant; *Dorylus* sp. is comparatively rare.

Of the spiders, the Thomisidae proved to be the most frequent predator of *E. saccharina*. This family has a cursorial habit. They probably attack young larvae or adult moths while the latter are mating or "calling".

The Blattaria (cockroaches) are foragers, moving over and under the sugarcane trash. It is in such positions that the adult *E. saccharina* moth oviposits. Thus the positive results from tests on cockroaches probably reflects predation on eggs.

GWL/HDN

1 December 1980

TABLE 1

RESULTS OF SEROLOGICAL TESTS ON ARTHROPODS COLLECTED FROM BADLY DAMAGED SUGARCANE IN THE AMATIKULU AREA

ARTHROPOD TYPE	NUMBER TESTED	PERCENT POSITIVE
ISOPODA	46	4
HOMOPTERA	20	0
HETEROPTERA	42	12
COLEOPTERA	49	10
BLATTARIA TYPE 1*	24	8
TYPE 2	37	27
TYPE 3	30	7
SALTATORIA	40	23
CENTIPEDE	13	0
CHELONETHIDA	8	14
DERMAPTERA	2	0
HYMENOPTERA (WASPS)	10	0
HYMENOPTERA (ANTS)		
PHEIDOLE SP.	300	4
PARATRECHINA SP.	119	1
PLAGIOLEPIS SP.	22	9
SOLENOPSIS SP.	46	6
DORYLUS SP.	269	35
POLYRHACHIS SP.	24	4
ACANTHOLEPIS	35	14
ARANEIDA		
DRASSIDAE	31	11
SALTICIDAE	17	0
THOMISIDAE	42	30
SELENOPIDAE	6	0
THERIDIIDAE	14	21
SACARIIDAE	13	8
CLUBIONIDAE	6	0
ARGIOPIDAE	3	33
AGELENIDAE	2	0
SPARASSIDAE	1	0
LYCOSIDAE	21	14

* Blattaria have been separated into three categories; types still have to be identified

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TABLE 2

RESULTS OF SEROLOGICAL TESTS ON ARTHROPODS COLLECTED FROM MARGINALLY DAMAGED SUGARCANE AND *CYPERUS IMMENSUS* COLLECTED FROM TONGAAT AND SOUTH COAST AREAS

ARTHROPOD TYPE	SUGARCANE		*C. IMMENSUS*	
	NUMBER TESTED	PERCENT POSITIVE	NUMBER TESTED	PERCENT POSITIVE
ISOPODA	9	0	8	0
HETEROPTERA	4	0	5	0
HOMOPTERA	5	0	0	-
COLEOPTERA	31	3	4	25
BLATTARIA TYPE 1*	0	-	0	-
TYPE 2	3	0	1	0
TYPE 3	2	0	0	-
SALTATORIA	6	0	1	0
CHILOPODA	0	-	0	-
DERMAPTERA	3	0	2	0
CHELONITHIDAE	3	67	0	-
FORMICIDAE				
PHEIDOLE SP.	12	33	0	-
PARATRECHINA SP.	28	0	0	-
LEPTOGENYS SP.	3	0	0	-
PLAGEOLEPIS SP.	2	0	0	-
POLYRACHNIS SP.	4	0	0	-
DORYLUS SP.	30	0	0	-
ARANEIDA				
LYCOSIDAE	9	0	4	0
THOMISIDAE	9	0	4	0
SALTICIDAE	5	0	1	0
THERIDIIDAE	11	0	0	-
SICARIIDAE	2	0	0	-
SELENOPIDAE	2	0	0	-
DRASSIDAE	7	14	1	0
PHOLOCIDAE	2	0	0	-
AGELENIDAE	1	0	0	-
ARGIOPIDAE	3	66	0	-
MISC. FAMILIES	5	0	2	0

*Blattaria have been divided into 3 categories; types still have to be identified.

GWL/HDN

SOUTH AFRICAN SUGAR INDUSTRY
AGRONOMISTS' ASSOCIATION

INSECTICIDE USE AGAINST ELDANA

by

Richard Heathcote

INTRODUCTION

Before one can even begin to discuss chemical control, or indeed any form of control of a pest one must have at least a basic knowledge about its behaviour, biology and habitat to enable one to determine the methods of chemical control which are most likely to succeed.

Eldana eggs and first instar larvae are found under dead leaf sheaths fairly low down the cane sticks. The young larvae then enter the cane stick and remain there until the adult emerges to mate and to lay eggs.

It should be noted that all life cycle stages remain concealed in or on cane stalks except for the adults which are free flying and can be found on the cane canopy at night, where they mate, or in amongst the trash, where they rest by day.

It should also be noted that Eldana is primarily a pest of mature cane, though it can have a serious effect on germinating and ratooning cane.

One is thus looking at chemical control of a more or less concealed pest in mature cane.

CHEMICALS - MODE OF ACTION

Chemicals can be classified in several different ways but mode of action is probably the most relevant in the Eldana context. There are thus three main groupings; contact, stomach and systemic.

Contact and stomach insecticides must be contacted or ingested to exert their effect, though many chemicals have both a ~~control~~ contact and stomach action.

Systemic insecticides are those which are absorbed by the plant and translocated to varying degrees through the plant. However it should be noted that most systemic chemicals are only translocated within the actively growing parts of the plant where they are effective against sap sucking insects such as aphids.

It should also be noted that few currently available chemicals have a residual action beyond about three months depending on environmental conditions.

CHEMICALS - METHODS OF APPLICATION

The method of application is largely determined by the formulation of chemical used and by the fact that one is treating more or less mature cane.

There are many different formulations of insecticides available but as far as methods of application are concerned these formulations are dusts, granules and water borne chemicals.

Dusts are seldom used nowadays due to the toxicity hazards to the operator of the equipment and the drift potential; however, they present a possible method of Eldana control.

Granules are unlikely to be effective due to the problems of application and persistence. It would be difficult, if not impossible, to get them to contact Eldana as granules. They could of course be incorporated in the soil but since this would presumably have to be done after harvesting they would have to be highly persistent to be effective in mature cane. This also assumes that the concentration of chemical in the cane stick would be sufficient to kill the larvae.

Water borne chemicals come in many different formulations but in common with oil borne chemicals, they have to be sprayed onto the cane. The spraying could be done with ground based equipment and with methods such as knapsacks, mistblowers and hand-held ULV sprayers, though these would be less attractive than aerial sprays. Unfortunately aerial spraying trials to date have been less than satisfactory due to the problem of achieving a good spray coverage of the cane sticks rather than the canopy.

SUMMARY

Use of insecticides to control Eldana is thus not merely a case of finding a suitable insecticide; it will involve selection a chemical which is suitable for the method of application that is envisaged. It is the method of application which is likely to prove the most difficult aspect of the whole problem and one which may only be overcome with a good deal of further work with close attention to the methods by which efficacy of the method is judged.

RH/HDN
2 December 1980

SOUTH AFRICAN SUGAR INDUSTRY
AGRONOMISTS' ASSOCIATION

ELDANA - MILL & FIELD SURVEYS

by

R.H. Paxton

It will be appreciated that the now widespread incidence of Eldana in the lower lying areas of the industry, and the economic significance of such an infestation, demands for numerous reasons careful and continuous evaluation and monitoring of the situation in all areas. This has resulted in the establishment of the Mill and Field Survey teams which we will discuss today.

It was during the 1975/76 milling season that Mill Survey teams were introduced at all mills throughout the industry. Prior to this identification had been done on an ad hoc basis, in the field and at loading zones and railway sidings. The mill teams now operating at mills receiving cane from Eldana infested fields, consist of four or five African inspectors. They are trained in the first instance in recognition of Eldana and Sesamia larva, by the Entomology Department at the Experiment Station, and are under Mill management for discipline, payment and administration. The cost of the teams are covered through the Experiment Station budget.

In areas on the coast where Eldana has not yet been found, but is present in the indigenous vegetation, control at the mills is exercised by 'one-man' survey teams. At all other mills, periodic visits from Experiment Station staff who examine cane in the millyard, provide the necessary control. If Eldana is identified at any of the mills where a more intermittent inspection is taking place, then the team is immediately upgraded to a full size inspection team.

The method of survey at mills where inspection teams are operating is for the team to select 20 sticks at random from each consignment, from stacks, hilos or trailers. The inspector examines each stick of the sample for borer damage. If borings are present, he splits the stick and records the presence of Eldana or Sesamia, keeping the larva of the pest for checking by the team from the Experiment Station which visits each mill once during the week. At the 'one-man' stations, the inspector goes through the same procedures, but of course the number of consignments he can inspect during his shift is limited.

In areas where Eldana has not been identified previously, a positive first time identification at a mill will result in a visit to the farm concerned by an Experiment Station based Field Survey team and the field from which the infected cane originated, and adjoining fields will be surveyed.

The distribution of information from the mill surveys is comprehensive, as can be seen from the attached chart. The results are distributed in the first instance to the grower by his Extension Officer, but only after the identification of the larva has been confirmed by the weekly visiting Station team. The results are also passed to the Entomology and Biometry Departments at the Experiment Station, and are used for monthly reports to the Experiment Station Committee and for other statistics and evaluations. The results are also summarized on a monthly basis and fed back to growers, Extension Officers, and Eldana Committees where these exist, showing the number of stalks damaged from fields crushed during the month, and the percentage of samples where Eldana has been identified.

The Itinerant Team from the Experiment Station has been mentioned. This team visits all mills North of Durban up to and including the Umfolozi mill each week, checking on the inspection teams operating there, identifying the larva which have been kept for their confirmation and providing the local Extension Officer with a list of farms from which Eldana has been confirmed during the previous week. This team is supplemented by an additional team which visits all other mills checking on the one-man teams periodically, and examining cane in the millyards.

There are many uses to which the information gathered from the mill surveys can be used, but one of the most graphic is the annual production of Eldana maps of Mill Group areas. The various colours show different degrees of infestation and the movement of the pest from area to area, and the level of intensity of each farm is indicated.

It is accepted that one of the best methods of controlling Eldana is to harvest cane as young as possible. We regularly confirm that it is older cane which has the highest levels of infestation and is the source from which the pest is spread. There is no difficulty of course in cutting cane young in irrigated areas and in this way Eldana levels have been kept low in the North. However, in our dryland areas priority needs to be given to cutting that cane with the highest levels of Eldana, and in an effort to provide growers with this information, the Field Survey Teams were formed.

The teams operate under the control of Eldana Committees, made up of grower and miller representatives, with assistance from Extension staff and when necessary, members of the Entomology Department. The teams are based in the areas in which they work, under the supervision usually of local mill staff, who programme their monthly operations in conjunction with their Extension Officer.

The prime function of these teams is to survey fields on the farms in their areas, which the grower has indicated are likely to be harvested in the near future, giving the grower the levels of Eldana infestation in each field, on the assumption that the fields of the highest infestation will be harvested first. The teams survey on average 10 fields each day and are able to visit each farm in their areas about once every three months.

In the Amatikulu area, where levels of infestation have been high for a number of years now, there are in fact three Field Survey teams, under the direct supervision of John Lewis from the Experiment Station.

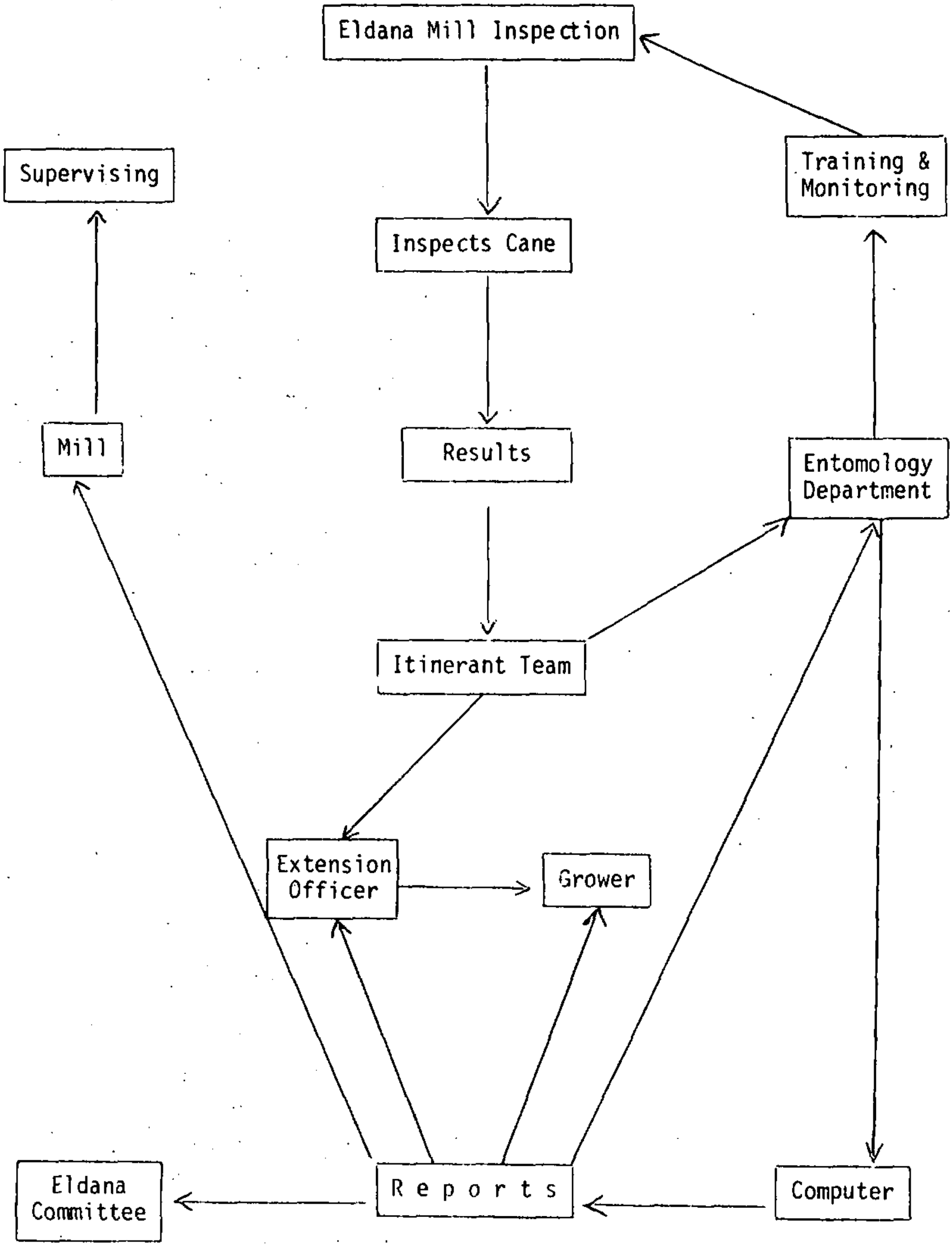
Field Survey teams are now based at the Tongaat, Gledhow and Darnall mills, in addition to the three teams in the Amatikulu area. We also have a Station based Field Survey Team which can be moved around the industry as and when necessary, and on occasions checks on the mill based Field Survey teams. The objective of the survey is to get an indication of the level of infestation over whole fields with acceptable precision. Teams are supplied with Field Maps and each field is surveyed on its merits, according to its shape and size. The target is 100 stalks in an average sized field, which could be obtained from 10 stalks per row from 10 rows entered in a field with long rows, or 5 stalks per row from 20 rows in a field with many short rows, or what usually happens, a combination of the two alternatives. The cane stalks fo examination in are brought out of the field and examined in front of the supervisor who then records the results, in terms of Eldana per 100 stalks.

The operational system for Field Survey teams, which is attached shows that, as for the Mill Survey Teams the distribution of information is comprehensive. The grower receives the information directly from the team on the day the survey is completed. The results are passed to the Eldana Committees for the information and necessary action, and of course to the Entomology Department at the Experiment Station.

The Field History form which is shown on the Field Surveys Operational Sheet, is the collection of information of management techniques used by growers in fields that have been surveyed. This is an attempt by the Experiment Station to see if there is any correlation between field practice and levels of Eldana. The information collected includes fertilizer applied, herbicide used, variety, ratoon, age at harvest, burnt or trashed, dryland or irrigation and soil type. The information sheets are posted to growers in the Pongola and Amatikulu area and returned to the Experiment Station. As yet the information confirms only that age of cutting is the one management factor which positively influences the levels of Eldana infestation.

RHP/HDN
2 December 1980

OPERATIONAL SYSTEM - MILL SURVEYS



OPERATIONAL SYSTEM - FIELD SURVEYS