Entomology

SUGARCANE WHITE GRUBS (SCARABAEOIDEA) AND THEIR CONTROL IN SOUTH AFRICA

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ABSTRACT

Various Scarabaeoidea which have damaged sugarcane in southern Africa are mentioned. There follows an account of population fluctuations of the Melolonthids Hypopholis sommeri Burm. and Schizonycha affinis Boh., which were assessed from monthly soil samples taken in canefields and in adjacent wattle groves in the Natal midlands. Life cycles under field conditions are discussed with comments on biology and feeding habits. An account is given of insecticide trials involving the following chemicals:

1) Dieldrin; 2) BHC; 3) DDT; 4) Chlordane; 5) Chlorfenprop; 6) 0-Ethyl-S-phenyl-ethylphosphonodithioate (Dyfonate); 7) Pirimiphos-ethyl and 8) m-(1-methylbutyl) phenyl methylcarbamate and m-(1-ethylpropyl) phenyl methylcarbamate (Bux).

Most satisfactory and lasting control was given by dieldrin when applied at planting. A transient phytotoxic effect was registered with BHC, and to a lesser extent with dieldrin.

INTRODUCTION

Several species of Scarabaeoidea have been recorded as damaging to sugarcane in southern Africa. Jepson4 regarded the Melolonthid Cochliotis melolonthoides (Gerst.) as the most serious of the 6 principal species recorded from Tanganyika, and it continues to be a pest there. In Rhodesia the Melolonthid Lepidiota (Eulepidia) mashona Arr. has occasionally damaged cane, and insecticide is used regularly against the Dynastid Heteronychus sp. The latter genus has been recorded damaging cane in Mocambique and in South Africa,9 and Dick1 recorded damage to sugarcane in South Africa by Temnorhynchus clypeatus Klug. Sweeney7 gave a comprehensive account of Scarabaeoidea associated with sugarcane in Swaziland. He recorded Heteronychus licus Klug. as constituting 75 to 80% of field larvae present, although at least 6 other species were noted causing restricted damage. In South Africa H. licus has been recorded in the Natal and Pongola areas, and in the Eastern Transvaal insecticide is used against it. In recent years in the Natal midlands, sugarcane has been grown on land that was formerly under wattle, Acacia mearnsii, and 2 beetles in particular, which were known insects of wattle, have become damaging to sugarcane. These are Hypopholis sommeri Burm. and Schizonycha affinis Boh. (both Melolonthidae), the former of which is occasionally a serious pest of wattle.

This paper is concerned mainly with distribution, population dynamics and insecticidal control of H. sommeri and S. affinis (Fig. 1).

H. sommeri is widely distributed in South Africa, where it damages a variety of cultivated plants. Adults are generally brown in colour with a tendency for darker longitudinal striation. The subterranean larvae feed on
soil organic matter and on roots, and the adult beetles may cause serious defoliation. Plants damaged by larvae include turf, and adults are recorded as defoliating various fruit trees, but do not attack the aerial parts of sugarcane.

*S. affinis* also is widely distributed, but is less well established as a pest species of crops other than sugarcane. It has been recorded from wattle but has not been associated with serious damage. Larvae feed on soil organic matter and on cane roots, which may be stripped of rootlets.

*Heteronychus liceas* is widely distributed and has been recorded as damaging a number of crops, including maize and rice. It has been discussed as a pest of sugarcane in Swaziland, and in Nigeria. It is not at present serious in South Africa, but is occasionally troublesome in the Eastern Transvaal.

**MATERIALS AND METHODS**

Investigations were carried out at two sites in particular. Both were on farms in the Natal midlands, one near Mid-Illovo and the other near Seven Oaks. *H. sommeri* predominated at Seven Oaks, and *S. affinis* at Mid-Illovo, and at both sites the respective beetle species had been associated with poor cane growth. Neither area was irrigated.

In both areas wattle and sugarcane were grown in juxtaposition. In order to compare soil populations under the 2 crops, soil was sampled each month from a wattle grove and from immediately adjacent sugarcane, and
records were kept of all scarabs found. Initially pits were dug 50 cm, but from September 1971 a motorised post hole digger was used. Soil was then sampled to the same depth as before, and by taking 20 samples in each crop an equivalent volume of soil was searched. A spiral type auger was used, which did little damage to the excavated insects. Besides being much quicker than manual digging, this method had the advantage of spreading the sample over a larger area.

Insecticide trials were conducted in both areas, the results of which were assessed mainly on insect numbers. Experimental plots were sampled as described above, using manually dug pits initially, and subsequently pits dug by the motorised digger.

All Scarabaeoidea collected from sampling were preserved and returned to the laboratory for identification and counting and, in the case of larvae, measuring of head capsules. Linear dimensions of cuticular structure are often indicative of instar, and therefore the widths of all larval head capsules were recorded. Preservative used was that recommended by Peterson, viz: paraffin (kerosene) 1 part; ethyl alcohol 95%; glacial acetic acid 2; dioxane 1 part. Larvae were identified using the bristle pattern on the raster.

Liquid insecticides were applied to the rows with a knapsack sprayer. To ensure even distribution, granular formulations were mixed with a specified volume of dry field soil before being applied manually to the rows. With plant crops, insecticide was applied to the furrows, and with ratoons the row surface was treated. For one plant crop used in insecticide trials (Experiment 1) full yield results were recorded and analysed.

RESULTS OF BIONOMIC EXPERIMENTS

1) Hypopholis sommeri

Numbers of beetles sampled in sugarcane and in adjacent wattle at Seven Oaks are shown in Fig. 2 (numbers recorded at Mid-Illovo were too small to warrant graphing). From the figure various points are evident:
   a) Larvae could be present most of the year round, showing a relative scarcity any time between September and January, and there was a period each summer when none was found. This was true of both cane and wattle soils.
   b) Soils were sampled on 32 occasions, on 28 of which larvae were present. On 22 occasions greater numbers of larvae were collected from sugarcane soils than from wattle soils.
   c) The samples included very few adults or pupae of H. sommeri.
   d) Highest numbers were recorded between February and April in 1971 and 1973 (in cane). During 1972 numbers in both media were relatively low.

Head capsule widths of larvae sampled are shown in Fig. 3. The figure indicates:
   a) That there were 3 obvious instars, as was particularly clear from the sugarcane records.
   b) The first instar was absent between April and December, but very numerous from January to March. After February the later instars predominated until the following January.
FIGURE 2. Numbers of *H. somersi* sampled each month from sugarcane and wattle soils at Seven Oaks.
Figure 3. Monthly samples of H. sommeri larvae from seven Cane/0 groups according to breed capsule with ten insects.

No. Insect: Jan 1972

Cane

Wattle

Log (n+1)
2) *Schizonycha afinis*

Numbers sampled at Seven Oaks and at Mid-Illovo are shown respectively in Figs. 4 and 5. The following points are evident:

a) Larvae could be present all the year round but were scarce or absent from about December to February.

b) Larvae were similarly plentiful in sugarcane at both places, but less plentiful in wattle (especially at Seven Oaks). Soils were sampled on 63 occasions, on 47 of which larvae were present. On 33 occasions greater numbers of larvae were collected from sugarcane soils than from wattle soils.

c) Adults were encountered throughout the year and, during 1971 at Seven Oaks, they were particularly plentiful in cane. Pupae were seldom encountered, and were never seen during the main winter months of June, July and August.

d) Numbers were highest during 1971 in both areas, and lowest during 1972.

Head capsule widths of larvae sampled are shown in Fig. 6, which indicates:

a) Two fairly clearly defined instars, with indications of a third.

b) A general maturing of larvae from the end of summer (March) until the following summer (November).

DISCUSSION OF BIONOMICS EXPERIMENTS

The experimental sites included only two areas, about 80 km apart, but it is evident that the one species in particular was far more plentiful in one area than in the other. Spot checks in other areas have shown the different species to be locally abundant.

The apparent scarcity of *H. sommeri* pupae and adults in the soil sampled could have been due to natural larval mortality, or it could have been because the larvae pupate at a greater depth than that to which soil was sampled, and because the adult leaves the soil shortly after emergence from the pupal stage. Jepson states that some Scarabaeoidea pupate at a depth of 95 cm. Although, in our investigations, regular sampling was done to a depth of only 55 cm, on several occasions, as a check, pits were dug to 100 cm, but nothing was ever found below 60 cm, at about which level there was a marked change in soil texture. Checks were made also by using an extended motorised auger operated from the power take off of a vehicle, but no pupae were unearthed. Except possibly in the case of pupae, the depth factor was not considered to be an important source of sampling error. In November each year adult *H. sommeri* sporadically became very numerous on wattle foliage, although they did not remain so throughout the summer months. They were not seen feeding on sugarcane leaves.

With *S. afinis* the pupal stage was again not commonly encountered, and this may also have been due either to natural larval mortality or to inadequate depth of sampling. Adults were, however, encountered throughout the year, and they may remain dormant in the soil for a considerable period before flying. In Fig. 5 are shown mean monthly counts for *S. afinis* adults collected in the Mount Edgecombe light trap, and it is evident that they have a very definite flying period. (*H. sommeri* adults have not been taken in this trap.)
FIGURE 5. Numbers of S. affinis sampled each month from sugarcane and wattle soils at Mid-Iilovo. Broken line represents numbers of adults caught each month in Mount Edgecombe light trap.
FIGURE 6. (79w) Monthly samples of 5 different lilies from 4 emoji, grouped according to head capsule width. Monthly samples of 5 different lilies from 4 emoji, grouped according to head capsule width.
With both species sugarcane seemed to be a better host plant for larvae than did wattle, although adult beetles were not observed feeding on any part of the sugarcane plant. There were striking differences between the condition of soil in canefields and that in adjacent wattle plantations, and wattle soils were very much drier once the surface litter and leaf mould was penetrated. Under conditions of normal seasonal rainfall larvae of both species were about as plentiful in the cane interrows as among the roots nearer the setts, but under drought conditions the larvae appeared to seek the vicinity of the stool base, and it was under such conditions that most damage was caused. A comparison of numbers of *S. aflatns* during drought conditions showed significantly higher numbers to be present in the rows than in interrows (*P < 0.01*). Both species damage the cane plant mainly by stripping it of its smaller rootlets. Damage to stool bases, such as that caused by *Heteronychus* and other species, was not the main cause of poor growth.

During 1972 numbers of both species were relatively low, both at Mid-Iillovo and at Seven Oaks, although there is no obvious reason for this. A possible sampling error resulting from larval populations moving vertically with a fluctuating moisture level can be disregarded, because, when monthly rainfall figures are superimposed on the population graphs, there is no constant relationship (even allowing for a time lag). However, 1972 was a comparatively dry year, and followed a good period of rain which culminated in particularly wet periods between December 1971 and February 1972. During the latter half of 1971 many larvae sampled were dead or dying from an infection, and this must have had a progressive controlling effect; (*Monilia* sp. was identified, but was considered secondary, and in November 1973 *Candida* sp. was tentatively identified).

Adults of both species fly and oviposit during the summer months, and the subterranean larvae mature during the remainder of the year. In insectary studies with *H. sommeri* Prins* found that there were 3 larval instars, which agrees with these field studies. He also recorded very variable periods between hatching and pupation, from 257 to over 600 days. This would make possible a 1-season or 2-season life cycle. However, Fig. 2 shows a period each summer when no larvae were sampled, which suggests a 1-season cycle to be more usual, although third instar larvae were recorded in late summer (Fig. 3) and were presumably from eggs laid the previous year. The period during which *H. sommeri* adults emerge from the pupal stage, leave the soil and fly seems fairly restricted.

Although light trap records show that *S. aflatns* has a restricted flight period, adult beetles were unearthed throughout the year. They were always paler in colour than those collected in the light trap, and it appears that after emerging from the pupal stage they spend a considerable time in the soil as dormant adults, awaiting conditions which stimulate flight. No detailed life history studies of *S. aflatns* have been made, but the absence of third instar larvae early in the year (late summer) suggests that the cycle does, in at least some cases, take more than one season to complete.

**INSECTICIDE TRIALS**

Natural biological agents may on occasion kill large numbers of larvae, e.g. the pathogen mentioned earlier, and such birds as may be active in fields...
when ploughing is in progress (the heron *Bubuleus ibis* and the hadedah ibis *Hagedashia hagedash* among others). However, there is no reliable form of biological control. Heavy losses have resulted from white grub attacks, especially in Swaziland, and dieldrin is used there regularly at planting.

Insecticide trials were conducted against *Hypopholis sommeri* at Seven Oaks and against *Schizonycha affinis* at Mid-Ilovo. At Seven Oaks a plant crop was treated, and subsequently the following ratoon at harvest; and at Mid-Ilovo a second ratoon was treated following the harvest of the first ratoon. In addition a plant crop was treated at Eston (near Mid-Ilovo). Results were assessed mainly on beetle numbers, yield figures being obtained in one case only.

*Treatments and dosages*

1) Dieldrin 50% wettable powder; 2 kg active ingredient per hectare in 650 litres water.
2) Mixed isomers of hexachlorocyclohexan (BHC) 50% wettable powder; 5,5 kg a.i. per ha in 650 l water.
3) DDT 50% wettable powder; 2,3 kg a.i. per ha in 650 l water.
4) Chlorfenvinfos (Birlane) 10% granular; 0,8 kg a.i. per ha incorporated into soil.
5) Chlordane 50% emulsifiable concentrate; 1 l a.i. per ha in 1000 l water.
6) A 3:1 mixture of m- (1-methylbutyl) phenyl methylcarbamate and m- (1-ethylpropyl) phenyl methylcarbamate (Bux) 10% granular; 2 kg a.i. per ha, incorporated into soil.
7) O-Ethyl-S-phenyl-ethylphosphonodithioate (Dyfonate) ec; 4 kg a.i. per ha in 600 l water.
8) Pirimiphos-ethyl (PP211) 10% granular; 3 kg a.i. per ha, incorporated into soil.

These trials are most conveniently considered as 4 separate experiments.

*Experiment 1:* Dieldrin, BHC, DDT, Birlane

This trial was implemented in October 1969 when planting sugarcane variety NCo 382, at Seven Oaks on ground which for many years had been under wattle. The design was a 6 x 6 Latin square which allowed for 2 sets of control plots. Plot size was 80 m² with 5 cane rows per plot.

*Experiment 2:* Chlordane, Bux, residuals of Dieldrin, BHC and DDT

The same site was used as for Experiment 1, treating the first ratoon after harvest. Dieldrin, BHC, and DDT plots were left as residuals. One set of control plots was treated with Chlordane, and the plots formerly treated with Birlane were treated with Bux (there being no apparent residual effect from the Birlane).

*Experiment 3:* Dieldrin, BHC, Birlane

A second ratoon (NCo 376) was treated at Mid-Ilovo shortly after harvest. The plant crop (untreated) had yielded well, but the first ratoon had been largely discarded due to poor growth attributed to the large numbers of *S. affinis* larvae in the soil. The design was a repeated 4 x 4 Latin square so that there were 8 replicates. Plot size was 70 m² with 5 cane rows per plot. It was intended to record any yield differences, but the field was harvested and results therefore had to be assessed from periodic soil sampling for beetles.
### TABLE 1. Numbers per treatment of scarab beetles (larvae, pupae and adults) in plant cane at Seven Oaks: treated 21/10/69

<table>
<thead>
<tr>
<th></th>
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</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>H</td>
<td>S</td>
<td>O</td>
<td>T</td>
<td>H</td>
</tr>
<tr>
<td>Dieldrin</td>
<td>2</td>
<td>0</td>
<td>0</td>
<td>2</td>
<td>0</td>
</tr>
<tr>
<td>Birlane</td>
<td>7</td>
<td>2</td>
<td>12</td>
<td>21</td>
<td>0</td>
</tr>
<tr>
<td>DDT</td>
<td>5</td>
<td>1</td>
<td>31</td>
<td>37</td>
<td>3</td>
</tr>
<tr>
<td>BHC</td>
<td>3</td>
<td>1</td>
<td>9</td>
<td>9</td>
<td>0</td>
</tr>
<tr>
<td>Control 1</td>
<td>11</td>
<td>11</td>
<td>34</td>
<td>56</td>
<td>9</td>
</tr>
<tr>
<td>Control 2</td>
<td>21</td>
<td>5</td>
<td>17</td>
<td>43</td>
<td>8</td>
</tr>
</tbody>
</table>

H = *H. sommeri*; S = *S. afer*; O = unidentifiable and other scarabs; T = total.

### TABLE 2. Numbers per treatment of scarab beetles (larvae, pupae and adults) in first ratoon at Seven Oaks: treated 2/12/71

<table>
<thead>
<tr>
<th>Treatment</th>
<th>November 1971 (pre-treatment)</th>
<th>Beetle numbers</th>
<th>November 1973</th>
<th>Grand total (post-treatment)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>H</td>
<td>S</td>
<td>O</td>
<td>T</td>
</tr>
<tr>
<td>Dieldrin (residual)</td>
<td>2</td>
<td>1</td>
<td>1</td>
<td>4</td>
</tr>
<tr>
<td>BHC (residual)</td>
<td>0</td>
<td>1</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>Control</td>
<td>144</td>
<td>15</td>
<td>17</td>
<td>167</td>
</tr>
</tbody>
</table>

H = *H. sommeri*; S = *S. afer*; O = unidentifiable and other scarabs; T = total.

### TABLE 3. Numbers per treatment of scarab beetles (larvae, pupae and adults) in 2nd ratoon cane-at Mid-Illovo: treated 7/11/69.

<table>
<thead>
<tr>
<th></th>
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<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>H</td>
<td>S</td>
<td>O</td>
<td>T</td>
<td>H</td>
</tr>
<tr>
<td>Dieldrin</td>
<td>1</td>
<td>171</td>
<td>18</td>
<td>190</td>
<td>5</td>
</tr>
<tr>
<td>Birlane</td>
<td>0</td>
<td>148</td>
<td>12</td>
<td>160</td>
<td>4</td>
</tr>
<tr>
<td>BHC</td>
<td>1</td>
<td>114</td>
<td>18</td>
<td>133</td>
<td>8</td>
</tr>
<tr>
<td>Control</td>
<td>0</td>
<td>150</td>
<td>18</td>
<td>177</td>
<td>16</td>
</tr>
</tbody>
</table>

H = *H. sommeri*; S = *S. afer*; O = unidentifiable and other scarabs; T = total.
Experiment 4: Dieldrin, Dyfonate, PP211

A field which had suffered damage by S. affinis at Eston was used. Treatments were applied at planting, which took place the day after pre-treatment soil sampling for beetles had been done. The design was a repeated $4 \times 4$ Latin square of 8 replicates. Plot size was 70 m$^2$ with 5 cane rows per plot. At the time of writing the trial is still in progress.

RESULTS OF INSECTICIDE TRIALS

Experiment 1

Beetle numbers sampled at different intervals following treatment are shown in Table 1. A marked suppression in numbers occurred in dieldrin-treated plots and, to a lesser extent in those treated with BHC. A seasonal increase in numbers occurred in March 1971, but a residual effect of both these chemicals was still apparent when the field was harvested in November of that year. No controlling effect was evident from either Birlane or DDT.

Experiment 2

See Table 2. Final figures from the previous experiment were regarded as pre-treatment counts. No effect (compared with control) was noted from applying either chlordane or Bux to a ratoon. A continued residual effect from dieldrin in the plant crop was apparent (4 years after the original application). There was a marked natural mortality (see also Fig. 2).

Experiment 3

See Table 3. Initially the percentage reduction in beetle numbers in dieldrin-treated plots was higher than in the others, and at the time of the final sampling, numbers had increased in all but the dieldrin-treated plots. However, the figures do not suggest that any practical measure of control was achieved by treating the ratoon.

Experiment 4

Pre-treatment counts, and counts made 2 months after treatment are shown in Table 4. A marked reduction in numbers had occurred in all but the control plots, with PP211 and Dyfonate appearing slightly better than dieldrin.

<table>
<thead>
<tr>
<th>Treatment</th>
<th>(a) September 1973</th>
<th>(b) November 1973</th>
<th>% decrease of total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>S. affinis</td>
<td>Others</td>
<td>Total</td>
</tr>
<tr>
<td>Dieldrin</td>
<td>35</td>
<td>13</td>
<td>48</td>
</tr>
<tr>
<td>Dyfonate</td>
<td>27</td>
<td>14</td>
<td>41</td>
</tr>
<tr>
<td>PP 211</td>
<td>27</td>
<td>22</td>
<td>49</td>
</tr>
<tr>
<td>Control</td>
<td>19</td>
<td>5</td>
<td>24</td>
</tr>
</tbody>
</table>

Phytotoxicity

Four months after planting the cane in Experiment 1 it was noted that growth differences between certain plots existed. Growth measurements were made then (February 1970) and again 9 months after treatment (November 1970) (Table 5). Results show a suppression of growth in the BHC and dieldrin.
treated plots at the time of the first assessment, but this was not progressive, and had all but disappeared when the second measurements were made.

**TABLE 5.** Shoot counts and stalk length from different treatments in Experiment 1.

<table>
<thead>
<tr>
<th>Treatment</th>
<th>February 1970</th>
<th>November 1970</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Height (cm)</td>
<td>No. of shoots</td>
</tr>
<tr>
<td>BHC</td>
<td>9.6</td>
<td>131</td>
</tr>
<tr>
<td>Dieldrin</td>
<td>10.1</td>
<td>142</td>
</tr>
<tr>
<td>Birlane</td>
<td>10.8</td>
<td>168</td>
</tr>
<tr>
<td>DDT</td>
<td>10.0</td>
<td>170</td>
</tr>
<tr>
<td>Control (two sets)</td>
<td>10.8</td>
<td>186</td>
</tr>
<tr>
<td>Mean</td>
<td>10.4</td>
<td>164</td>
</tr>
<tr>
<td></td>
<td>Height (cm)</td>
<td>No. of shoots</td>
</tr>
<tr>
<td>BHC</td>
<td>85.8</td>
<td>194</td>
</tr>
<tr>
<td>Dieldrin</td>
<td>83.1</td>
<td>201</td>
</tr>
<tr>
<td>Birlane</td>
<td>86.9</td>
<td>204</td>
</tr>
<tr>
<td>DDT</td>
<td>90.8</td>
<td>203</td>
</tr>
<tr>
<td>Control (two sets)</td>
<td>89.7</td>
<td>207</td>
</tr>
<tr>
<td>Mean</td>
<td>87.7</td>
<td>203</td>
</tr>
<tr>
<td>CV %</td>
<td>6.0</td>
<td>14.9</td>
</tr>
<tr>
<td>SE of treat. mean</td>
<td>0.25</td>
<td>10.0</td>
</tr>
<tr>
<td>LSD (0.05)</td>
<td>0.65</td>
<td>25.5</td>
</tr>
<tr>
<td>(0.01)</td>
<td>0.88</td>
<td>94.7</td>
</tr>
</tbody>
</table>

**Yield results**

Full yield data were obtained for the plant crop in Experiment 1, but there was no statistically significant evidence that treatments had affected yield. However, dieldrin-treated plots had a lower ers% cane than control (P < 0.05), as did BHC-treated plots although the difference was not significant.

**DISCUSSION OF INSECTICIDE TRIALS**

In the plant crop dieldrin controlled white grubs and a residual effect of up to 4 years was recorded. Although it did not control them satisfactorily when applied to ratoon cane it is interesting that, in the soils under discussion, a long residual effect was recorded. In the areas concerned, sugarcane may be grown for 20 months without cutting, and several ratoons may be taken before replanting.

One of the objectives of these trials was to find an alternative to dieldrin. Reasons for wanting one are (a) owing to its mammalian toxicity and persistence its agricultural use may be prohibited, and (b) there is a danger of white grubs becoming resistant to it. Since these trials were started, severe restrictions on the use of dieldrin have been imposed, and use of both BHC and DDT for agricultural purposes has been all but forbidden. As alternatives, Dyfonate and PP211 show some promise, but future sampling of Experiment 4 may well show their effects to be transient, allowing a build-up of white grubs in the next generation. Chlordane and Bux have not yet been tried on a plant crop, but they were ineffective when applied to a ratoon.

The trials were aimed mainly at *Hypopholis sommeri* and *Schizonycha affinis* but there were a number of other scarab species present, which are included in the results. Included also are any scarab specimens which were unidentifiable because of damage inflicted during sampling. The site used for Experiment 4 yielded only 4 *H. sommeri*, but besides *S. affinis* there were present many larvae which have been tentatively identified as *S. finbriata* Bryke.

It is interesting that there was recorded no suppression in yield from white grub attack, for in the instances which originally drew attention to this problem,
heavy losses were evident, including the failure of a first ratoon. Spot checks
done at that time suggested that populations were much higher then than at
the time of the insecticide trials. It is possible also that drought conditions
accentuated the symptoms of damage.

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Co, Mr A. M. Mason and Mr T. C. Eggers respectively, whose co-operation
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GUSANOS BLANCOS DE LA CAÑA DE AZUCAR
(ESCARABAEOIDEA) Y SU CONTROL EN SUD AFRICA

A. J. M. Carnegie

RESUMEN

Se mencionan varios Escarabajoideos que han dañado la caña en el Sud
de Africa. Luego continúa una relación de fluctuaciones de población de
dos Melolóntidos Hypopholis sommeri Burm. y Schizonypha affinis Boh., los
dos que fueron determinados de muestras mensuales tomadas del suelo de los
cañaverales y en plantaciones de Acacia mearnsii adyacentes en las tierras
medias de Natal. Se discute sobre los ciclos biológicos bajo condiciones de
campo, con comentarios sobre biología y hábitos de alimentación. Se da una
relación de pruebas de insecticidas que abarca los siguientes productos
químicos: 1) Dieldrin; 2) BHC; 3) DDT; 4) Clorofenvinfos; 5) Clordano;
6) O-etil-S-fenil-etilfosfonoditioato (Dyfonate); 7) Pirimifosetil y 8) m-(1
metilbutil) fenil metilcarbamato y m-(1 etilpropil) fenil metilcarbamato
(Bux). El control más satisfactorio y de mayor duración fue dado por dieldrin
cuando se aplicó durante la plantación. Se registró un efecto fitotóxico
transitorio con BHC, y en menor extensión con dieldrin.