Entomology

THE ECOLOGY OF WHITE GRUB OF SUGARCANE, COCHLIOTIS MELOLONTHOIDES GERST, WITH NOTES ON LIGHT TRAP CAPTURES OF THE ADULT BEETLES

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ABSTRACT

The white grub of sugarcane, Cochliotis melolonthoides, was first recorded in northern region of Tanzania by Jepson¹. Although the white grub was then regarded as a minor pest of sugarcane in northern Tanzania it has, for the last several years, caused heavy losses. Light trap catches of the adult beetles in this study indicated that the pest has two swarming periods each year occurring during the long and short rain periods in March to May, and September to December, respectively. This species has three larval instars but it was observed that the generation always overlapped.

INTRODUCTION

The white grub of sugarcane, Cochliotis melolonthoides, (Coleoptera: Melolonthoides) was first recorded in the slopes of Mt. Kilimanjaro in the northern region of Tanzania by Jepson¹. He found Compsomeris mansuetus, C. felina, C. lachesis, and C. caelebs to be effective hymenopteran parasites. He also found elaterid larvae to be predating on white grubs. Passalid larvae of Didimus sansibaricus were also found to be predating on Cochliotis and were common locally. About 0.5% of Cochliotis larvae dissected were found to contain an unidentified nematode.

Six species of chafer beetles have been recorded at the Tanganyika Planting Sugarcane Company at Moshi in the northern region of Tanzania. These in order of their relative importance were (1) Cochliotis melolonthoides (Gerst), Anomala exitalis (Per), Heteronychus tunuestriatus (Feirm), Anomala (Gerst), Entyposis impressa (Kolbe), and Adoretus versutus (Har).

The most serious pest, C. melolonthoides, has three larval instars with the third instar causing the greatest damage. These larvae are generally found immediately beneath cane stools in infested fields. Normally, only cane roots are eaten by the grubs although in some cases the base of the cane stalk is also eaten and larvae may tunnel into it. Infested cane shows signs of water
stress and lodging occurs in severely infested cane, and infested cane may
deteriorate to such a degree that harvesting becomes uneconomic.

*C. melolonthoides* in northern Tanzania had been observed to reduce
yield from 125 tons/ha of plant cane and 60 tons/ha of ratoon crop, to an
average of 50 tons/ha in both plant cane and ratoon crop.

BIOLOGICAL OBSERVATIONS

The life cycle of the white grub was observed in this study to follow
a general pattern. Adult beetle have two swarming periods. The first and
smaller swarming period was observed from the end of March until the end
of May, with a peak in April. The second, and larger swarming period began
after the middle of September and continued until early December with a
peak occurring in October.

Before the adults emerged at about 18.30 hours during swarming they
emitted a whizzing sound. The sound was immediately followed by an almost
simultaneous emergence of thousands of adult beetles. Copulation took place
during swarming although a few adults were observed to emerge from the
soil in copula.

Swarming was always observed to take place around eucalyptus trees
and lasted for about twenty minutes. Afterwards all the adult beetles burrowed
in the soil. Females were observed to burrow a considerable depth in the
soil before ovipositing after swarming. This depended on the soil texture
and moisture. In hard dry soil the eggs were found only about 30 cm. below
soil surface, whereas in fine moist soil they were found as deep as one meter
below the soil surface. The variable depth of oviposition might explain the
overlapping of generations observed in the field. The eggs near the soil surface
where temperature was much higher probably hatched earlier, and the larvae
developed faster.

Although the larvae fed on sugarcane roots, in this study larvae were
also maintained in the laboratory for three weeks in petri dishes without food.

Larval population density studies were conducted at the sugarcane estate
by digging out soil samples. Each sample pit measured 1.0 meter by 0.5 meter
wide, and 0.25 meter deep. Taplay(2) examined 18 pits over 2 hectares, while
Jepson(1) examined 10 pits and concluded that 2,000 to 16,000 grubs per hectare
constituted a light infestation, 16,000 to 40,000 grubs/ha as medium infestation,
and over 40,000 grubs/ha heavy infestation. In this study, after examining
an average of 50 pits/ha every year for a period of 2 years, grub population
per hectare was estimated to be between 200,000 and 300,000 grubs per hectare.

Pupation was observed to take place about 10 cm. below the soil surface.
TABLE 1. Light trap catches of *Cochliotis melolonthoides* adult beetles (together with rainfall in mm) for the period June 1967 to June 1970.

<table>
<thead>
<tr>
<th>Month</th>
<th>1967 Adults</th>
<th>Rainfall</th>
<th>1968 Adults</th>
<th>Rainfall</th>
<th>1969 Adults</th>
<th>Rainfall</th>
<th>1970 Adults</th>
<th>Rainfall</th>
</tr>
</thead>
<tbody>
<tr>
<td>January</td>
<td>–</td>
<td>2.40</td>
<td>–</td>
<td>6.70</td>
<td>–</td>
<td>21.10</td>
<td>–</td>
<td>–</td>
</tr>
<tr>
<td>February</td>
<td>–</td>
<td>7.20</td>
<td>6</td>
<td>50.30</td>
<td>–</td>
<td>20.10</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>March</td>
<td>–</td>
<td>39.10</td>
<td>172</td>
<td>158.00</td>
<td>154</td>
<td>97.60</td>
<td>416</td>
<td></td>
</tr>
<tr>
<td>April</td>
<td>–</td>
<td>80.10</td>
<td>17</td>
<td>419.30</td>
<td>70</td>
<td>45.30</td>
<td>271</td>
<td></td>
</tr>
<tr>
<td>May</td>
<td>–</td>
<td>82.50</td>
<td>–</td>
<td>121.10</td>
<td>–</td>
<td>18.30</td>
<td>–</td>
<td></td>
</tr>
<tr>
<td>June</td>
<td>–</td>
<td>11.20</td>
<td>–</td>
<td>28.30</td>
<td>–</td>
<td>0.50</td>
<td>–</td>
<td></td>
</tr>
<tr>
<td>July</td>
<td>–</td>
<td>31.20</td>
<td>–</td>
<td>3.90</td>
<td>–</td>
<td>0.00</td>
<td>–</td>
<td></td>
</tr>
<tr>
<td>August</td>
<td>–</td>
<td>13.00</td>
<td>–</td>
<td>20.20</td>
<td>–</td>
<td>14.80</td>
<td>–</td>
<td></td>
</tr>
<tr>
<td>September</td>
<td>–</td>
<td>45.90</td>
<td>27</td>
<td>4.00</td>
<td>18</td>
<td>3.20</td>
<td>–</td>
<td></td>
</tr>
<tr>
<td>October</td>
<td>215</td>
<td>17.80</td>
<td>318</td>
<td>14.50</td>
<td>434</td>
<td>35.00</td>
<td>–</td>
<td></td>
</tr>
<tr>
<td>November</td>
<td>109</td>
<td>39.80</td>
<td>117</td>
<td>126.30</td>
<td>72</td>
<td>87.60</td>
<td>–</td>
<td></td>
</tr>
<tr>
<td>December</td>
<td>1</td>
<td>29.30</td>
<td>3</td>
<td>110.10</td>
<td>–</td>
<td>7.30</td>
<td>–</td>
<td></td>
</tr>
</tbody>
</table>

Total: 325  399.50 (mm)  660  1062.70 (mm)  748  350.80  688
LIGHT TRAPPING OF ADULT BEETLES

Adult beetles were trapped using a Robinson-type light trap operated between 18.00 hours and 6.30 hours. The trap was fitted with MB/U, 200/250 volt mercury vapor bulb, and tetrachlorothane was used as a killing agent.

The results of the total monthly capture of the adult beetles from June 1967 to June 1970 are shown in Table 1. From this table the two clearly defined peaks were evident each year. These peaks were directly associated with periods of high rainfall.

CONTROL METHODS

In the course of this study, birds (storks) were found to be good predators of the grubs. The storks were only found following harrowing after cane harvesting. When the tractors worked later in the same but grub-free fields during levelling or hilling, not one single stork was observed.

The only grub parasite observed in the course of this study was Cordyceps. This fungus was found widely spread at the estate, especially along the moist irrigation canals. In contrast to the finding of Jepson, high population of elaterid beetle larvae were found to reduce germination by attacking the buds of planting material, but there was no evidence that these elaterids were pre-dating on white grubs.

DISCUSSION

White grub infestation showed variations among different fields and also within individual fields. Infestation was observed to be much heavier in poorly developed canes.

Observations tend to indicate that adult females preferred open young cane fields rather than the fields with mature cane for egg oviposition. From the light trap data it seems that two populations of C. melolonthoides do exist simultaneously: those emerging during the long rains (March-April) and those emerging during the short rains (October-November). Larval samples taken at the end of September 1968, 1969, 1970 and 1971 showed that over 90% of the existing larval population were first larval instars. These were obviously the first instar larvae from adults swarming in September.

Similar sampling in December showed that 60% of the populations were third and final instars. The remaining 40% being a mixture of first and second larval instars. Third larval instars must have been derived from March-April swarming adults, while first and second larval instars must have been derived from October-November swarming adults. It would also appear that March-April larval population suffered heavy-mortality during the cold, wet periods of March, April, May, June and July.
REFERENCES


LA ECOLOGIA DEL GUSANO BLANCO DE LA CAÑA DE AZUCAR COCHLIOTIS MELOLONTHOIDAS GERST, CON NOTAS SOBRE LOS ESCARABAJOS ADULTAS ATRAPADOS.

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RESUMEN

La primera constancia de la presencia del Gusano Blanco* de la caña de azúcar en la zona norte de Tanzania, fue aportada por Jepson¹. A pesar del insecto que está considerado como una plaga de menor importancia en el norte de Tanzania, ha llegado a ocasionar grandes pérdidas durante estos últimos años. Escarabajos** adultos atrapados en este estudio mediante trampas con luces, indican que esta plaga tiene dos ciclos de enjambres cada año. Sucedan durante los períodos lluviosos de larga y corta duración, de marzo a mayo y de septiembre a diciembre respectivamente. Las larvas pasan por tres mudas, aunque las generaciones siempre se traslan.

* Gusano de manzeca, gallina ciega, nixticuil, caculo, quetspeque, pao-de-galinha.
** Mayate, chicharron, gallego, besouro da caña.