SOME OBSERVATIONS ON SUBTERRANEAN GRASS CATERPILLAR

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Summary

Subterranean grass caterpillars (*Oxycanus* spp.) may damage pasture where grass cover over summer has been dense enough to allow survival of young caterpillars. Control by chemicals applied after damage shows up has been variable. Further restrictions on the use of DDT and lindane — the most effective chemicals — make it essential to treat pasture while the caterpillars are small.

CONTROL BY NATURAL MEANS

SINCE female moths of subterranean grass caterpillar (*Oxycanus* spp.) lay many viable eggs shortly after coming out of the ground, subterranean grass caterpillars must in normal circumstances suffer heavy mortality. Where conditions for survival are very favourable, a large population increase is possible in one generation — *i.e.*, in one year. On the other hand, where conditions for survival are unfavourable, the population may decline to very small numbers. Caterpillars may be too few to cause any visible pasture damage, yet on emerging might lay enough eggs to give rise to a damaging infestation the following year.

Caterpillars are several months old before they are able to establish deep protecting holes in the ground. While they are confined to the surface and top layer of soil, they have a hard struggle for existence, especially if the vegetative cover is thin or dry. The population of subterranean grass caterpillars appears to be regulated largely by their ability to survive summer drought, survival being favoured by summer rain or adequate cover of dry grass. This view is supported by the following observations:

- (1) Where large subterranean grass caterpillar holes are dug up, it is usual to find a live caterpillar. This indicates that death is not common among large caterpillars. (Overpopulation, however, may cause deaths or migration.)
- (2) Where a divisional fence has been erected in early summer and the two paddocks grazed differently, caterpillar attack has often been observed on only one side of the fence. Indeed, it has been possible to produce this effect at will by leaving the one paddock ungrazed over summer.
- (3) Hay paddocks are frequently attacked the winter following hay-making.
- (4) Trees blown down in summer and removed in autumn often leave their outline in eaten-out pasture. Similarly, ground has been eaten out just where harrows have lain.

A light covering of straw or even of wattle (*Acacia* spp.) pods which are not blown off until February have often been observed to allow subterranean grass caterpillar attack beneath, uncovered pasture next to it being free of attack.

These observations in Nelson suggest that protection from summer sunshine is more important for survival of caterpillars than provision of green feed.

- (5) In districts which usually have good grass growth in spring, but which are subject to summer drought—*e.g.*, Canterbury plains, central Marlborough and Nelson adjacent to Tasman Bay—the moth is characteristically early flying (September-October). In districts which enjoy more summer rainfall—*e.g.*, Murchison and Takaka—the flight is later and more spread. In the wettest districts where drought is rare—*e.g.*, Westland—flight is widely spread with late flying species well represented. In such districts subterranean grass caterpillar is more constant from one year to the next than in drier districts.
- (6) In the drier parts of Nelson, spring flying species are normally the common ones, with *O. cervinatus* dominant, but when heavy rain has fallen the previous October-November the flight is protracted into November or even December. The very late flying (February) *O. signatus* is more numerous in a season following heavy rains the previous January-February.
- (7) In Nelson, subterranean grass caterpillar attack is most common on slopes facing south-east. At Gore, where summer drought is less severe, this does not apply; slopes of northerly aspect are often attacked over large areas. In Nelson, severe attack on northerly faces is rare, occurring only in consequence of very heavy grass growth.

CONTROL BY FARM MANAGEMENT

In view of the above, there is little hope for better control of subterranean grass caterpillar through changes in farm management. On the contrary, an increase in caterpillar numbers is to be expected with improving fertility and better pastures. In regions of fertile soil and regular rain, close grazing in summer is a means of reducing attack. Continued close grazing cannot be recommended in many regions owing to risk of poor pasture growth and soil impoverishment. Close grazing reduces feed reserves and denies the use of short-rotation ryegrass, timothy or red clover.

Greater use could perhaps be made of pasture species not readily attacked—*e.g.*, cocksfoot (*Dactylis glomerata*), *Phalaris tuberosa* and white clover (*Trifolium repens*). Dormant white clover seed germinates on damaged ground in September, and better resists attack of late pupating caterpillars than oversown ryegrass. Where adequate seeding of white clover has taken place, even severely damaged pasture may fully recover in less than a year.

CONTROL BY CHEMICALS

APPLIED AFTER DAMAGE IS EVIDENT

Some work has been done in each of the last ten years in comparison of chemicals applied to pasture showing damage. Subterranean grass caterpillar holes were dug up 1 to 4 weeks after application, and an estimate made of the proportion still occupied by live caterpillars.

DDT and lindane have consistently outperformed other chemicals. Lindane is quicker acting, but no better than DDT judged by caterpillars surviving 4 weeks after application. Dieldrin and endrin are also good, but, in relation to cost, distinctly inferior to DDT and lindane. Organo-phosphorus insecticides are fair to poor. Carbo-

phenothion is ineffective, and so is carbaryl even at 40 lb a.i./acre. "Zectran" is better but very disappointing in view of its wonderful control of late stages of leaf-roller caterpillar (*Epiphyas* spp. syn. *Tortrix* spp.).

Granular DDT is much inferior to spray or dust application of DDT, but lindane granules offer some hope.

The degree of control with every treatment appears to vary considerably. The kill of caterpillars is never complete even with the best chemical.

On several occasions, sheep have been stocked heavily on infested ground to close all subterranean grass caterpillar holes, and then removed. In frosty weather few holes were open for ten days or more, but in rain or in warm overcast weather nearly all the holes were re-opened the first night. If this correctly indicates the eating habits of the caterpillars, it may help in understanding variability of control, especially with chemicals of short persistence.

Results from one trial are given in Table 1. Rates were chosen to give a similar cost of material per acre in all treatments. This trial is considered to give a true indication of the merits of the different treatments.

The following year this trial was repeated but with more treatments which included DDT, lindane and "Telodrin" in both granular and spray application. Although this trial was of high sensitivity (L.S.D. 0.9 units) it failed to show any treatment with a pasture rating (out of 10 units) significantly better than untreated. Pasture continued to be eaten out in all plots. Indeed visible caterpillar holes continued to become more numerous on all plots.

No explanation can be offered why control should be so good one year and so poor the following year.

APPLIED BEFORE DAMAGE IS EVIDENT

In view of limited success in treating late stages of subterranean grass caterpillars, and of further restrictions in the use of sprays and dusts of chlorinated hydrocarbon insecticides, control of cater-

TABLE 1: CONTROL OF SUBTERRANEAN GRASS CATERPILLAR DAMAGE

<i>Treatment</i>	<i>Mean Pasture Rating</i> (10=complete cover 0=bare ground)
DDT 2 lb ppi/acre, sprayed	8.0
Lindane 10 oz a.i./acre, sprayed	7.5
Dieldrin 10 oz a.i./acre, sprayed	6.2
Lindane 2 oz a.i./acre, bait	5.3
"Zectran" 12 oz a.i./acre, sprayed	5.0
Ronnel 1 lb a.i./acre, sprayed	5.0
"V-C 13" 1 lb a.i./acre, sprayed	4.7
Dichlorvos 8 oz a.i./acre, sprayed	4.3
Endrin 5 oz a.i./acre, sprayed	4.2
Malathion 1¼ lb a.i./acre, sprayed	4.2
Carbophenothion 1 lb a.i./acre, sprayed	3.5
<i>Bacillus thuringiensis</i> powder 4 lb/acre	3.2
Untreated	3.1
Least Significant Difference for $P < 0.05$	1.5
Treated, May 25, 1962; judged July 28, 1962.	

pillar infestations must now be attempted by treating pasture before damage is evident.

There is an obvious difficulty in knowing where treatment is required; few people have the skill to assess an infestation while the caterpillars are small. (The writer is quite unable to do this.)

There are now three ways in which subterranean grass caterpillar infestations might be controlled:

- (1) Application in granular form of DDT or other effective chemical soon enough to act in the soil against small caterpillars.
- (2) Spraying of the more promising chemicals among those whose residues are permitted on pasture. Various insecticides which are not effective enough against large subterranean grass caterpillars may give useful control if applied when the caterpillars are small.
- (3) Application of baits. There is a good chance of suitable baits being eaten in drought or after pasture is eaten out, but there is clearly a difficulty in getting the caterpillars to eat bait when there is ample green ryegrass — their preferred food. If baits are made with an insecticide which is effective in the soil, they will have some useful effect, even if they fail entirely as baits.