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Insects and Mites Found Attacking Cereal Crops in Western Australia

By C. F. H. JENKINS, M.A., Government Entomologist

ONE of the most important factors influencing Western Australian agriculture in the last 20 years has been the development of permanent pastures together with the associated practice of ley farming. Although the increased use of pasture plants, and particularly subterranean clover, has increased the general fertility of many areas it has also accentuated various problems, including those relating to insect control. Summer fallow was a strong deterrent to such pests as the red-legged earth mite, the lucerne flea, and webworm and these and several other creatures have shown a tendency to increase under new farming methods.

In most cases however, suitable counter measures are available although their effectiveness depends upon an accurate knowledge of the particular pest concerned and the thoroughness with which the actual treatments are applied.

The following list includes the best known pasture pests of the agricultural areas:—

The Red-legged Earth Mite (*Halo-
tydeus destructor*).

The Lucerne Flea (*Smythurus viri-
dis*).

The Small Plague Grasshopper(*Austro-
icetes cruciata*).

The Webworm (*Talis pedionoma*).

The Southern Army Worm (*Persec-
tania ewingii*).

The Climbing Cutworm (*Heliothis
punctigera*).

The Brown Looper (*Ciampa arietaria*).

The Day Flying Moth (*Apina callisto*).

Cockchafer Beetles—

(?) *Colpochilodes sp.*

(?) *Heteronyx sp.*

The Black Cricket (*Acheta commodus*).

Cereal Aphis (*Rhopalosiphum maidis)*.

False Wireworm (*Cestrinus punctatis-
simus*).

Fig. 1.—Red-legged earth mite (greatly enlarged)
LUCERNE FLEA AND RED-LEGGED EARTH MITE

Extensive research on these two pests has been carried out by officers of the C.S.I.R.O., over the past twenty odd years. Many of the findings which follow are a result of this work and, particularly, of investigations carried out by Mr. Murray Wallace who is still working on these problems.

Damage to Pastures. Attack by the red-legged earth mite has been shown to affect improved pastures in three ways. Firstly, the total amount of growth in the pasture may be substantially reduced. For example, in a newly established subterranean clover pasture, the yield of clover may be reduced by as much as 85 per cent. and the total yield of pasture by up to 30 per cent. depending upon the composition of the pasture. In established pastures under grazing conditions the differences are not so great but on the average, effective mite control has increased yields by about 14 per cent. Another response to control measures, is a change in the botanical composition of the pastures. The proportion of clovers and grasses is increased whilst there is a corresponding decrease in the amount of capeweed. The significance of this change is at present unknown. Finally, reports from many districts and our own observations in experimental areas show that both sheep and cattle have a strong preference for treated pastures. This response has been observed using different insecticides and irrespective of whether it was the flea or the mite which was being controlled. Again the significance of this apparent change on palatability is not known. (Comparable details have not been worked out for lucerne flea damage but the trends would probably be comparable to those cited for the red mite.)

There is thus ample evidence to show that fewer mites and fleas result not only in a greater bulk of pasture, but apparently also in one which is more palatable and of a slightly different, although not necessarily better, composition.

Cost of Control Treatments. Despite these sometimes substantial effects of mite and flea attack, the evidence available seems to suggest that the difference between cost of treatment and financial gain may vary greatly from year to year and from property to property. Costs of treat-

Fig. 2.—Lucerne flea showing the operation of the “spring.” In A, the spring is folded in the normal position. In B, it is extended after jumping

cement must, therefore, be maintained at as low a level as possible.

Possibility of Eradication. It is important to realise that with the methods at present available, eradication of these pests is not feasible, and in fact is, to all intents and purposes, impossible. This is important because there seems to be a tendency among farmers to spray large areas of land apparently in the hope that by covering such a large area, all fleas and/or mites within the sprayed zone will be eliminated and movement in from outside will be negligible. Unfortunately both these pests have great powers of multiplication and large numbers can quickly develop from the few survivors which will certainly remain after treatment.

Timing of Control Treatments. It has been shown very clearly, at least in the case of the earth mite, that the most serious damage to pastures occurs from three to four weeks following germination. Damage done later in the season, is much less
important although of course it may be quite significant.

It has often been observed by farmers that towards the end of the season, pest numbers in a sprayed paddock may be fairly high whereas numbers in a neighbouring unsprayed area may be lower than they were at the beginning of the season. Recent work by Mr. Wallace has shown that this is quite a normal happening, and that populations which are low at the beginning of the season, tend to increase in subsequent generations whereas high initial population tend to decrease towards the end of the season. The effect of the insecticide is simply to produce a low early season population and so give crops and pastures a brief respite during which seedlings may become firmly established and so better able to withstand the attacks of their various insect enemies.

Methods of Applying Control Measures.

Low-volume sprays and aircraft have been effectively used to apply materials for lucerne flea and red-legged earth mite control. The sprays should be carefully applied so that patches are not missed here and there as the pest can spread rapidly from such places and re-infest sprayed areas. Aerial treatments have given quite satisfactory results and in those instances where complaints have been investigated the reason for unsatisfactory control has usually been associated with unsuitable weather conditions at the time of spraying, difficult terrain or too low a gallonage per acre.

Frequency of Treatment. Where heavy mite and flea infestations are observed early in the season, and where obvious damage is likely to occur, control measures are fully warranted. On the other hand, the wholesale spraying of infested or lightly-infested crops or pastures as practiced by some farmers as a general preventive measure, is neither economical nor desirable.

The Use of Systemics. A number of recently developed organic phosphorus insecticides have a systemic action which renders the seed of treated plants toxic to certain types of pests. Seed treatments with various systemics have rendered clover toxic to red-legged earth mite and lucerne flea, and it is probable that similar techniques could be adapted for cereals. At the present stage however, such treatments cannot be recommended on a field scale and they have not been proved effective for caterpillars such as webworm and the army worm.

LITTLE PLAGUE GRASSHOPPERS

The chief grasshopper pest in this State is the little plague grasshopper of the eastern wheatbelt. Outbreaks are confined to the lighter rainfall areas and so damage is mainly confined to volunteer pastures and cereal crops. The fact that bad grasshopper outbreaks often coincide with poor seasonal conditions means that although high grade pasture may not be attacked the feed which is destroyed can ill be spared and its loss may turn a moderate drought into a major catastrophe.

The little plague grasshopper is a native insect, which has been favoured by certain types of agricultural development in the outer wheatbelt. Grasshoppers have always been present in the districts in question but their breeding grounds were originally
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limited to bush clearings, roadsides and other more or less restricted areas of bare, hard soil. The wide-spread clearing which was sponsored in the early financial depression of 1929 provided the grasshoppers with vast breeding grounds and precipitated the major grasshopper plagues of the nineteen thirties and early forties.

Control Measures. The extensive cultivation, under government subsidy, of grasshopper egg-laying sites, the general improvement in the status of agriculture in the outer areas and recent developments in insecticides and equipment have led to a considerable improvement in the grasshopper problem in recent years.

The use of poisoned bran bait has been almost completely supplanted by dieldrin spraying and low-volume applications, both with ground equipment and aircraft, have given excellent results. The rates recommended vary from 2 oz. to 4 oz. of dieldrin per acre.

CATERPILLARS

Various types of caterpillars may appear in plague numbers at irregular intervals. The occurrence of the insects is greatly influenced by seasonal conditions and cultural activities and the principal species will be dealt with in approximately their order of importance.

Webworm.

The webworm moth is a native insect which lays its eggs in dry stubble and pasture paddocks about mid-autumn. As grasses and cereal crops emerge following the first rains, the caterpillars commence feeding and in favourable years may cause extensive damage. The egg-laying moths are not attracted to bare ground and so fallow crops are immune from webworm damage. The increasing tendency to plough in pasture land for cereal cropping however, has created favourable conditions for webworm activity in many areas. Careful investigations have been made into the habits of the moth in order to devise suitable cultural measures which may reduce the danger of webworm attack.

It has been found that early crops are less liable to damage than late-sown crops and that where planting can be delayed a fortnight or longer after ploughing the liability of damage is further reduced. An additional cultivation before planting may also be helpful.

An aspect of the webworm problem which is often overlooked is the possible effect of the caterpillars on a balanced pasture. As the insects attack only the grasses, they may help to cause clover dominance in what otherwise would be a good mixed stand. To give some idea of the number of webworm caterpillars which can be present in an area it may be mentioned that sampling done in a barley grass paddock at Goomalling revealed a population of half a million insects per acre.

Cutworms.

Two species of cutworm moths are important pasture pests. The best known is the climbing cutworm (Heliothis punctigera) but perhaps the most spectacular is the southern army worm (Persectanta ewingii). Mass formations of these caterpillars may develop in feed paddocks and then move on a broad face into adjacent clean areas and standing crops. Mechani-
cal barriers such as trenches and deep plough furrows will retard the progress of army worms and may be employed in association with chemical dust and sprays.

The climbing cutworm is mainly a pest of legumes, and lupin, and pea-growers will be well acquainted with the depredations of the insect. Cultural methods have little effect upon this particular species as the moths fly into the paddocks and lay their eggs on the maturing crop. Where large caterpillar populations develop, insecticide treatments are often essential.

The Day-Flying Moth.

Although this insect is of minor importance as a pasture pest and negligible as a crop pest, it has been included because the large black caterpillars of the day-flying moth are often so numerous in clover pastures as to attract the farmer’s attention. They feed mainly upon capeweed and Erodium and only under exceptional circumstances are of sufficient importance to warrant any counter measures.

Brown Loopers.

The habits of the brown looper caterpillars are somewhat comparable to those of the army worm, for when the insects are present in large numbers they may advance in mass formation and cause heavy damage to pastures. As the popular name “looper” suggests, the caterpillars have a characteristic habit of arching their backs during progress, and this easily distinguishes the species from the more orthodox cutworms.

COCKCHAFFERS

Spasmodic damage from cockchafer beetles or pasture grubs has been known in the lower Great Southern for very many years. In 1955 however, quite serious outbreaks occurred in the Kojonup-Boyup Brook zone and in 1957 the problem had further intensified.

Investigations show that possibly two species of cockchafer beetles are involved and that neither of them have similar habits to the pasture grub of Eastern Australia. The larger of the local species is probably a member of the genus Colpochilodes and the smaller variety has been tentatively attributed to the genus Heteronyx. *Colpochilodes* have the remarkable habit of flying in mid-winter and the life cycle apparently takes two years to complete. This would account for the occurrence of plagues in alternate years and the peak outbreaks of 1955 and 1957. Damage reported in 1959 was rather less than in the two previous outbreak years.

Unlike the Eastern States species, the grubs are entirely subterranean and insecticide sprays and dusts have failed to give field control. It is hoped, however, that the correct timing of these applications in relation to egg-laying and hatching may finally prove satisfactory. A detailed study of this problem has been carried out at Marradong and various further trials are planned for the coming autumn.

No practical control recommendations are yet available but insecticides (particularly dieldrin) applied in the early autumn, i.e., before egg-laying has occurred, prevented the survival of the young grubs.

The reason for the increase in cockchafer damage in recent years is not known for certain. It is probably linked with the great increase in clover pastures however,
as a similar sequence has been observed in Victoria, South Australia and Tasmania.

Many cockchafers are popularly known as dung beetles as the adults are attracted to animal droppings, and show a preference for areas rich in nitrogenous material. It is possible that the heavy stocking of clover areas plus the high soil nitrogen may provide conditions attractive to adult beetles and favourable to grub development.

**BLACK CRICKETS**

Black crickets have very specialised requirements and consequently can only reach plague numbers in certain restricted areas. Under favourable circumstances, however, they may develop in enormous numbers and completely denude adjacent crops and pastures. Heavy soils, subject to winter flooding and deep summer cracking, provide the best habitat for the black cricket and consequently the flats to the west of Harvey are one of the main local sources of infestation. Insecticides normally used for grasshopper control have given good results against crickets, but it is only in very limited areas that any action has been found necessary.

**CEREAL APHIS**

In some countries it is not uncommon for aphis to do damage to cereal crops and quite widespread infestations have occurred in Western Australia. In 1953, aphis were recorded in Mullewa, Carnamah and Goomalling and numerous complaints were received in 1959, the main reports coming from the Great Southern and districts to the east. The aphis cluster on the flag and developing cereal heads and may cause some accumulation of honey dew and sooty mould. I know of no instance where serious losses have been caused by aphis however, and control measures have so far never been warranted. Aphis may be involved in the transmission of certain virus diseases and should these gain access to the State then aphis infestation could be a much more serious problem.

**WIREWORM**

The larval stage tenebrionid beetle is sometimes found associated with germinating wheat crops and complaints of damage have been received from Merredin, Dumbleyung and certain other wheatbelt areas. So far damage has been very restricted, the grubs confining their attention to germinating grain. No control measures have been tested locally as the creature has not proved of sufficient importance. South Australia has reported comparable damage in recent years and Lindane - Superphosphate mixtures at planting time have proved beneficial.

**TO SPRAY OR NOT TO SPRAY**

There is a growing tendency amongst farmers to carry out large-scale spraying against pests as a routine measure whether tangible gains are assured or not. If spray treatments cost 10s. per acre then the farmer should feel reasonably sure that he will increase his return by something in excess of 10s. per acre when he sprays a crop or pasture.

The possibility of spot-spraying with ground equipment should always be considered before large-scale aerial treatments are undertaken. Quite often, a careful survey of grasshopper, red mite and lucerne flea infestations will show that the plague areas are scattered and that an overall treatment would be unnecessarily extravagant.

Even when the necessity for spray treatments has been definitely finalised, the pros and cons of ground versus aerial
spraying should be carefully considered. Under satisfactory conditions good results can and have been obtained from aerial spraying, but if the weather conditions or the terrain are unsuitable, aerial applications may prove to be very disappointing as well as expensive.

At current rates the cost of material for the control of red-legged earth mite and lucerne flea using 1 oz. DDT (4 pint 20 per cent. concentrate) plus 1 oz. Malathion (4 tablespoonsful of 50 per cent. concentrates) is approximately 3s. 2d. per acre. Webworm control at 8 oz. DDT would cost approximately 10s. per acre.

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