

HELOPELTIS IN CEYLON.

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The fact that this very serious pest of tea, causing so much loss of crop in India, Java and other tea-growing countries, actually attacks tea in Ceylon may be a cause for alarm to those who are not aware of the insect's true status in this country. That no account of *Helopeltis* as a pest of tea in Ceylon has been published for many years has been a further inducement to the writing of this article.

Helopeltis antonii was described by Signoret, a French entomologist from Ceylon in 1858; the food plant on which it was found is not mentioned in Signoret's account, but Green (*Insect Pests of the Tea Plant*, 1890, 71-8) thought that it was probably cacao. The first definite record on tea was in the Kelani Valley, near Yatiyantota, in 1883. The pest became abundant in this district in 1892, leading to a suggestion for concerted action at a meeting of the Kelani Valley Planters' Association in 1893. In 1890 much damage was reported in Kalutara; in 1891 *Helopeltis* was observed in the Balangoda district, and infestation of estates in Morawak Korale was recorded in 1889. Galboda, Nawalapitiya, Rakwana and Galle districts have also been visited by this pest.

Recent enquiries have elicited the following general facts with regard to the present distribution of *Helopeltis*. Attacks of some severity occur annually in the Morawak Korale district, every estate probably being affected to a greater or less extent. Regular occurrence is reported in Rakwana, but the outbreaks are probably less serious. From information supplied by a planter of many years' experience in this district, I gather that *Helopeltis* was much in evidence during 1921-26, less noticeable in 1927 and only slight in 1928. These two districts are evidently the main areas of infestation at the present time. Periodical attacks, often, however, of very slight intensity, occur in the Kelani Valley, Kalutara and Galle and possibly in Galboda. It will thus be seen that *Helopeltis* has become reduced considerably in recent years, and is now no longer a pest of importance, except in the two principal districts mentioned above.

The adult bug is about a quarter of an inch long, black, with reddish thorax (forepart of the body), this region being surmounted by a characteristic knobbed spine, nicknamed the "drumstick." Wings are functional in the adult stage, the younger forms, or nymphs as they are called, possessing only the rudiments of wings. The eggs are laid singly or in groups of two or three, embedded in the tissues of the young stems, generally above the fish leaf; a pair of hair-like processes alone projects from the stem.

The insects feed principally at night. As soon as the sun rises they apparently disappear from the bushes. It is curious to see how in a field showing evidence of severe injury not more than a few hours old, shortly after the heat of the sun strikes the bushes hardly a bug is visible, except for an occasional adult flying from bush to bush. The natural supposition is that the bugs have retreated to jungle or other wild growth in the neighbourhood, but this is evidently not usually the case. Green pointed out that this theory had never been proved and was extremely doubtful. I myself have examined jungle, scrub and marsh land bordering on attacked fields two or three hours after sunrise, and have not found a trace of the bugs. Actually, in the case of the nymphs at any rate, the insects conceal themselves low down in the centre of the bush. To quote Green again—"A minute examination of the centre of the bush produces no better result, though it is almost certain that they are somewhere there." Smee (*Nyasaland Prot. Dept. Agric. Bulletin No. 4, Entomological Series, 1929*) also observes this habit of lying concealed in the bush in connection with *Helopeltis bergrothi* in Nyasaland. What adds to the difficulty of detection is that shaking or beating the bush does little towards dislodging the nymphs.

The season most favourable to *Helopeltis* is the period between the S. W. and the N. E. monsoons, i.e., July to September, dry, windy weather at that time being particularly suitable to its development. The N. E. monsoon causes a decline in the numbers of the insect, and a revival occurs in February-March, which, generally speaking, is less severe since *Helopeltis* does not thrive in a severe or prolonged drought.

The attack of *Helopeltis* is particularly serious in that the insect feeds only on the young shoots. By means of its long proboscis, or "rostrum," it sucks out the cell sap from the leaf and, to a lesser extent, from the stems, leaving a series of spots, each marking the place of a feeding puncture. In the leaves the tissue of the spot turns brown and dries up to a thin transparent film. The spots, when numerous, run into one another, causing a larger discoloured area which often cracks, forming a hole in the leaf. This damage to the leaves results in their crumpling up, the flush often turning quite black. A dotting of the leaves with fine spots, much smaller than those produced by the adults, indicates damage by immature bugs.

Injury, very similar to that due to *Helopeltis*, is caused by a variety of bugs that are occasionally found feeding on tea, notably, species of *Disphinctus*, and possibly also *Callicratides rama* (see later). *Helopeltis* injury is frequently confused with the *Cercospora* leaf disease, but they differ in several details. *Helopeltis* causes rather angular spots which are transparent in the centre; *Cercospora* spots are round and opaque.

In badly attacked fields it is usual to see nearly every bush affected to some extent. Thus, in severe outbreaks, when each bud as it appears is immediately punctured and killed, the effect on the bushes may be readily imagined; flushing ceases entirely and the yield is affected correspondingly. In Morawak Korale, even at the present time, the total yield from infested fields may drop by over 50 per cent. during the worst periods.

This state of affairs may continue for as long as a month, and the loss of vitality to the bush is evident in the after effect. Badly attacked bushes are said not to recover completely until pruning; those lightly attacked may recover in 4-6 weeks. On very old tea of poor quality the effect is apparently cumulative, so that their condition becomes gradually worse and worse, leading to their eventual removal from the soil. The bushes are usually not attacked until nine months to a year after pruning. Opinion is universal that only small-leaved, low jât tea is severely attacked. Bushes of good jât are not injured sufficiently to affect the crop to an appreciable extent. Green asserted that pure Assam indigenous tea was practically immune and, in the case of hybrids, the greater the proportion of China strain the more liable were the bushes to attack. Another quotation from Green (*Royal Botanic Gardens Circular, Ser. I, No. 21, 1901*) furnishes a striking example of the discrimination shown by *Helopeltis*. He says, referring to an estate in Kalutara—"Two adjoining blocks, without any intervening boundary, were planted; the one with indigenous Assam plants, the other with a low jât hybrid. It was possible to walk up between the two adjoining rows and see the tea on one side quite healthy, while every bush on the other hand was badly blighted."

CONTROL MEASURES.

Although parasites of some importance in the form of wasps and Myrithid worms, as described from Java and India, may attack *Helopeltis* in this country, no record of such a discovery exists. It is probable, therefore, that parasites are not a factor of importance in controlling *Helopeltis*. Birds do not readily attack the bugs, possibly on account of some repugnant fluid that the latter are capable of excreting, a common feature in this order of insects.

Since windy weather favours attacks, the planting of wind belts would appear to be a sound proceeding. But this must be done with caution, for it has been found in Java that wind belts sometimes cause more harm than good by harbouring the insects that are driven into them, thus acting as a source of infection to the tea.

The encouragement of shade trees cannot be recommended as a control measure, although some planters are of the opinion that light shade is beneficial. It has been said that heavy shade is worse than useless and definitely encourages the insects. I have been informed

by one planter in Morawak Korale that many years ago the field with the finest cover was the most badly attacked on the estate. A similar statement was made by Peal, in Assam, who wrote that attacks were worst under large trees and on the edges of forest land.

Pruning, as already suggested, has the effect of checking the insect for nine to twelve months, so that in very severe cases where bushes have been so affected as to cease yielding for protracted periods, pruning must be resorted to. In an eighteen months pruning cycle this procedure would probably interfere little with the normal routine, but in a longer cycle pruning might have to be carried out considerably earlier than usual and, if this were repeated often, the bushes would certainly suffer. I do not think that special emphasis need be laid on the burning of prunings. In any case careful burying would probably serve as well, but neither process appears to me to be worth while applying expressly for the purpose of control.

Insects of the type of *Helopeltis* do not readily come to light, thus the use of bonfires for this purpose, which was at one time considered, may be rejected as useless.

On account of the fact that the eggs are laid in the stems of the flush and the insects feed on the young leaves only, hard and repeated plucking has been suggested as a likely measure to lessen the trouble. Some planters who tried this in Green's time stated that it brought no relief; one even declaring that most damage was caused where hard plucking had been carried out. Green, writing in favour of the method, argued that this adverse effect might be apparent at first, since the adult bugs would probably be driven to attack the buds as they appeared, but that when this initial generation had died out, few young ones would be left, since nearly all the eggs would have been removed with the young stems. Green's argument certainly seems reasonable. My advice, therefore, is to give hard plucking a fair trial, experimentally.

A method that has been commonly practised in the past and which is still generally followed is that of hand collection. When *Helopeltis* first developed into a pest of importance coolies were often paid so much per hundred, for insects captured. Hand collection is still recommended, to be stimulated, where necessary, by the institution of a scale of payment. But in very severe attacks it is apparent that collection has little effect. Collection might be assisted by the use of sticky screens placed beneath the bushes to catch the insects shaken off; this is a matter for experiment. For ease in handling, the screens could take the shape of a shallow bag attached to a hemispherical wooden or bamboo frame, provided with a wooden handle. This apparatus might also be used for catching the flying adults.

It is probable that more can be done by cultivation and manuring than by any other method of control. The fact that only low jât tea and bushes in poor condition are attacked severely, and the testimony of planters who have tried manuring for *Helopeltis*, support this idea. It is believed that the increased use of manures and general cultivation have been largely responsible for the reduction of the pest in the Kelani Valley and elsewhere. But it must be realised that tea 40-50 years old, which is often nearly "played out," cannot be expected to show a rapid response to cultivation. In many cases, where such tea occurs, unlimited cultivation would probably fail to produce immunity from insect attack. Planters should experiment in varying the constituents of manurial mixtures, carefully noting and following up the most favourable combinations.

***CALLICRATIDES RAMA*. KIRBY.**

This green Capsid bug is frequently found associated with *Helopeltis*, often in considerable numbers. In the first consignment of *Helopeltis* that was sent to me for examination, in 1928, fully 30-40 per cent. of the insects were *Callicratides*, and in Green's records occurs a case where the latter were five times as abundant as the *Helopeltis*! This species is found commonly on tea in various districts, single specimens usually being taken; I have seen it in some abundance in the Balangoda district.

There is, however, much uncertainty about the true significance of *Callicratides*. Green has no records of definite injury, and the present Government Entomologist (Dr. Hutson) tells me that when he has confined specimens of *Callicratides* with tea shoots, no spotting of the leaves has been observed, although there has been appreciable injury to the stems. Smee, (1929, *loc. cit.*) who adds a note on this species to his paper on *Helopeltis*, states that in captivity the insects did not feed on tea, but were found to feed readily on a species of bean grown as a cover crop for the tea. The life history, after hatching from the egg, lasted from 14-16 days. The adult *Callicratides* is about one-third of an inch long, green, with hyaline (glassy) wings and the wing veins are very pronounced. The eggs are similar to those of *Helopeltis* and are also laid in the young stems.

SUMMARY.

1. Helopeltis, although an important pest of tea some 30 years ago in the Kelani Valley and other districts, has since been so reduced that only two districts are still affected to an extent that calls for attention.
2. Outbreaks are most severe in the season July-September, minor attacks occurring in December-February.
3. The bushes are attacked usually at nine months to one year from pruning.
4. During severe attacks the bushes cease to flush and for several weeks the yield may be reduced by 50 per cent. or more.
5. Serious defoliation is confined to bushes of low jât or those in very poor condition.
6. Shade is of little benefit. The insects do not come to light. The disposal of prunings cannot be considered a measure of control worthy of attention.
7. Hard plucking should be given a trial on an experimental scale.
8. Hand collection as a routine measure is recommended with the added suggestion of payment during severe periods. The use of sticky screens should be tried.
9. The application of manures and general cultivation will probably provide the greatest check to this pest with a likelihood of permanent results.

In conclusion, I wish to express my unqualified thanks to Dr. Hutson for compiling records from the Division of Entomology, and also to various planters who have aided me by correspondence.