PESTS OF TEA NURSERIES; A WARNING.

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On many occasions reports of various pests attacking seedling plants have been received which, on investigation, have shown the attack to be in such an advanced condition that the eradication of the pest or the saving of the remaining plants has been a well-nigh impossible proposition. This emphasises the fact that a large proportion of tea-planters are not familiar with the nature or the seriousness of the pests producing this damage, and as a consequence they neglect to report the occurrence until it has reached an alarming stage. It seems, therefore, that a useful purpose may be served by describing briefly the methods of attack of the chief nursery pests, so that some discrimination may be made between the several kinds, and by showing what precautions may be taken in order to save as many of the plants as possible from ultimate extinction.

The chief pests of tea nurseries in Ceylon are Eelworm, Scarlet Mite, Cutworm and Red Borer. These will be dealt with separately in that order.

Eelworm.—This pest is a minute, transparent worm, the male of which is worm-like in form, and lives freely in the soil. The female, on the other hand, is worm-like only in the earlier part of its life, soon boring into a root of a tea seedling and settling down to become a swollen, pear-shaped organism quite unlike a worm. In this condition it feeds on the tissues of the root, and finally produces a mass of eggs in the cavity of its body, which hatch into minute worms that escape into the soil, and wander about until they in turn enter the roots of a seedling.

The females alone cause the damage, and they alone are the means of infection of fresh plants.

Eelworm attack can be readily recognised by pulling up a few sickly plants. The roots, especially at the base, are noticeably swollen into galls or nodules, resulting from irritation of the tissues by the continued feeding of the female worms, which lie embedded in the tissues just beneath the surface.

Eelworm is indeed an important pest, capable, as it has often shown, of entirely exterminating a whole nursery of plants. A serious feature is that there is at present no known method, applicable to tea estates, of curing a plant already attacked by the worm. It therefore remains to take the matter in hand as soon as signs of eelworm appear in the nursery, and to do all that is possible to prevent the infection of the still healthy plants. The following method is

advised:—

Pull up and burn *all* plants in beds showing infection. Turn over the soil and fork in a good dressing of lime all over the beds. To protect the remaining beds, dig around them a trench 1 foot deep (the depth required depends on the construction of the beds) and about 6 inches wide; this should be packed with lime.

Although, as in the case of Shot-hole Borer, no method is known of satisfactorily destroying the pest without injuring the plants, a certain number of the infected plants frequently survive attack, and it is probable that a dressing of artificial manure (general mixture) may be of benefit to the healthy plants in helping them to resist attack, should they ultimately become infected. It is suggested that the manure be applied after the trench has been constructed.

Owing to the difficulty of determining the presence of eelworm in the soil, it is not easy to tell whether the earth in the proposed site for a nursery is already infected. For this reason it is advisable that the ground should be dug over and exposed to the air as long as possible before laying down a nursery. A minimum of one month is suggested, and during this period the earth should be forked over several times. Another precautionary measure is to pull up and examine the roots of various weeds growing in and around the proposed nursery. If these show signs of Eelworm, it may be taken for granted that the soil is infected.

Scarlet Mite.—This minute red mite feeds on the under sides of the leaves, attacking especially the base of the mid-rib, so that the leaf becomes constricted at that point, with the same effect as is produced by the normal leaf-fall of deciduous trees. Thus in the case of young seedlings bearing only a few leaves, it is frequently not long before they lose every leaf through the agency of Scarlet Mite. The typical appearance of seedlings attacked by Scarlet Mite much resembles the effect produced by eelworm. Half of the leaves have fallen, and the remainder are small and often distorted, the whole plant being so stunted in growth as to appear dwarfed when compared with normal, healthy plants of the same age. Infestation by Scarlet Mite may be distinguished by a brown discoloration at the back of the mid-rib, especially near the base, and, of course, the presence of the tiny scarlet mites themselves.

If the presence of this pest is spotted at an early stage, there is a much greater chance of saving the plants than in the case of eelworm, for it is believed that if the attack has not proceeded too far, the mites may be successfully dealt with by spraying, and the nursery ultimately saved. Infected plants should be sprayed thoroughly with a sulphur-soap mixture of the following composition:—

Flowers of sulphur	...	6 ozs.
Soft soap	...	1½ ozs.
Water	...	1 gall.

Tea nursery destroyed by Eelworms. Surviving tea plants on upper right; remainder of nursery fern only.

PLATE II.

The soap is dissolved in a quart of water (hot), and with this the sulphur is worked up into a paste, which is then stirred up with the remainder of the water. The fluid should be strained into the spray-machine, and kept stirred or agitated well during the spraying. A rather fine nozzle should be used.

At the end of a week, if the mites do not show evident signs of disappearing, a second spraying should be administered. It is suggested that on the first occasion all beds near the infected portion of the nursery should be treated.

Infection of nurseries usually occurs, probably, through mites that have strayed from neighbouring bushes or from weeds growing around the nursery. Where the presence of Scarlet Mite is detected in the neighbourhood, very young seedlings should be protected by dusting over plants and beds with flowers of sulphur.

Cutworm.—This insect is almost too well-known in both tea nurseries and garden plots to need description. Suffice it to say that the blackish grub lives in the soil and gnaws through the stems of seedlings just below the soil level. Where plants are found damaged in this way, it is almost invariably through the agency of cutworm.

Where the seedlings are already in the process of growth, the use of leaf-baits provides a simple method for trapping the grubs. Cabbage and sweet potato leaves have proved successful in this connection.

A more satisfactory method of control is to rid the soil of cutworms before the plants have begun to show. This is done by means of a poison bait, which is placed out on the beds before the seeds are planted, or at least before the appearance of the shoots. The grubs are attracted to the bait, feed on it and are poisoned.

The following is a suggested recipe for the preparation of the bait:—

Copper arsenite	...	1 lb.
Bran	...	25 lbs.
Jaggery	...	3½ lbs.
2 or 3 oranges or limes		
Water	...	1 gall.

Dissolve the jaggery in the water (hot) and add the juice of the limes or oranges. Mix together thoroughly the bran and copper arsenite, and with the liquid work this up into a stiff mash. The bait should be either broadcast over the beds or placed in small heaps at intervals between the plants; it has not yet been ascertained whether one method has any advantage over the other. Copper arsenite is extremely poisonous, and on this account it must be used with caution, especially as far as fowls are concerned. This substance is obtainable from the Colombo Commercial Co., the present price being Re. 1-25 a lb.

Red Borer.—A pest of common occurrence in many parts of the tea area, but one which seldom attains to serious proportions, and is thus easily dealt with. It occasionally attacks seedlings. The borer itself is a reddish caterpillar about 1½ inches long when full-grown, and its work is conducted in woody tissues. Thus only the older seedlings are attacked, at a stage when they are almost ready for planting out. The young caterpillar bores into one of the younger shoots, and tunnels down the centre of the main stem, which is frequently found hollowed out, even below the soil level. The fact that the boring is conducted in the centre of the stem (so that the main food-conducting tissues are not injured) allows the plant to continue to all appearances in a normal condition for some time. When the damage is first observed, the plants should be inspected daily for the presence of the borer, which is usually detected easily by the small heap of wood-pellets, cast out from the tunnel, lying at the foot of the plant. Another indication that the caterpillar is at work is the wilting and browning of the leaves on infested plants.

The only method of dealing with Red Borer in general use at present is to cut back the affected plants until the insect is reached; this is then destroyed. Alternatively, where (as in the case of seedlings or young plants in clearings, and occasionally in mature bushes), the main stem is tunnelled, and it may be inadvisable to cut it right back, a sharply-pointed piece of wire, inserted in the entrance hole of the borer, may be used for destroying the caterpillar inside the stem.

The most important thing in dealing with nursery pests is to report the attack when the plants first begin to look unhealthy, so that measures may be advised and applied at once, in order to give the plants a reasonable chance of escaping destruction.

As regards treatment, " prevention is better than cure " applies to all the pests quoted, even to some extent in the case of Red Borer, for the destruction of the caterpillar in each individual seedling prevents the formation of a moth which may ultimately carry infection to other plants. If cure must be applied, apply it early, and save many plants at the cost of few.