

# TEA MITE PESTS

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Strictly speaking, mites are not insects, but are included in a separate order, the *Acarina*, whereas insects are classified together in the order *Insecta*.

Mites are more nearly related to the Spiders than they are to insects, the chief distinguishing features of the three groups being:—

- (1). Insects have *three* recognisable body regions, head, thorax and abdomen; are normally equipped with three pairs of legs, and may also bear wings.
- (2). Spiders have *two* recognisable body regions, the head and thorax fused together forming one, and the abdomen; and they have four pairs of legs and no wings.
- (3). Mites have all three regions more or less consolidated into *one*, and have normally four pairs of legs.

Spiders as a class are entirely predatory, and the contrivances adapted to their purpose are both varied and beautiful. The *Acarina*, however, have a wide range of food material and habits. The ticks, included in this group, are of course well-known blood parasites of vertebrate animals, while the diseases known as mange and scabies are due to microscopic mites; and there are a few curious forms which are parasitic in the nasal cavities of birds, and in the bronchial passages or lungs of seals, monkeys and snakes. Besides land mites, there are many that live in both fresh and salt water, and in both types are to be found many that prey on their own kind or on small insects.

A large number of mites support themselves by feeding on living plants, and it is here that we encounter mites as plant pests. Those that feed on tea are four in number: Red Spider (*Tetranychus bioculatus* W.M.), Purple Mite (*Eriophyes carinatus* Green), Scarlet Mite (*Tenuipalpus obovatus* Down), and Yellow Mite (*Tarsonemus translucens* Green) of which only the first-named is at all visible to the naked eye. The character of damage done by all is similar in nature, and arises from the method of feeding. All these mites are possessed of needle-like stylets which are inserted into the substance of the leaf, and liquid nourishment thereby extracted. The specific effect in each case can be distinguished one from another, and so gives a clue to the species of mite at work; but whatever the species, if present in large numbers, the attack may result in leaf-shedding.

The development of mites is generally much the same; that is to say, first, eggs are laid; hatching is generally followed by three stages of growth before the adult stage is reached. The first stage is called the larva, which, except in the curious family *Eriophyidae*, to which Purple Mite belongs, possesses only 3 pairs of legs. The next two stages are known as nymphs, passing to the final or adult stage.

It will now, perhaps, be convenient to consider the several mite pests in turn.

## RED SPIDER

*(Tetranychus bioculatus Wood Mason)*

As indicated before, Red Spider belongs to the group *Acarina*, and is not a spider at all. It is very closely related to similar species in other parts of the world that prey on a wide variety of crops, and which are also known as Red Spider.

*Distribution.*—Our particular species has been recorded from tea in India, Ceylon, Java, Trans-Caucasia and Japan. In Ceylon it is to be found everywhere, but rarely in destructive numbers.

*Host Plants.*—Besides tea, Red Spider has been found on many different plants and doubtless there are many more, so far not recorded. Light\* gives the following list:—

N. E. India	Java	Ceylon
Cotton	Rubber	Camphor
Jute	Coffee	<i>Grevillea</i>
Castor	Dadap	<i>Aristolochia</i>
Indigo	Lamtoro	<i>Eugenia jambolana</i>
Orange	<i>Ixora</i> .	
Mulberry		
<i>Hibiscus</i>		

Apples and sweetpeas may be added to the list for Ceylon.

## LIFE-HISTORY

Eggs of Red Spider are scarlet, spherical objects, with a short filamentous process standing up on the top of the egg. They are laid on the leaves where they may be quite easily seen with a hand lens.

As soon as the larva hatches it starts to feed. The abdominal portion of the mite, which is considerably larger than the anterior end, is wine-coloured, the front part or cephalo-thorax being a brighter red. In development the mite passes through the usual stages. At maturity, the males are seen to be different from the females which are broadly ovoid in shape, the former being smaller and somewhat pointed behind.

\*Light, S. S.—“Mites as Pests of the Tea Plant”, *The Tropical Agriculturist*, Vol. LXVIII, No. 4, p. 5.

The life-cycle may be tabulated as follows:—

Larval stage	8 days	} Average temperature 71°-72°F.
1st Nymphal stage	4 ,,	
2nd Nymphal stage	2-3 ,,	
<b>Total</b>	<b>14-15 days.</b>	

After reaching the final stage, the females are not quite ready for oviposition, but require a day or two for this. Therefore a complete cycle requires a minimum of 15 days at the temperature shown above. Under natural conditions at elevations of 4,500 feet and upwards, it is probable that a full cycle requires at least three weeks in the open. The females are capable of laying from 40-50 eggs each. They may lay unfertilised eggs which give rise to males only.

#### RED SPIDER AS A PEST

As a pest, Red Spider is usually associated with dry weather conditions. In North-East India there is a well-defined dry season every year, and Red Spider is often very severe; lime-sulphur spraying is carried out every year as a routine operation which is partly aimed at this mite.

In Ceylon, however, it rarely becomes a nuisance. In only one place, of small area near Nanu-Oya, does it appear in some vigour from year to year. However, in August, 1936, it was reported from several estates in the area south-east of Kandy as causing some concern. No records from here had been received since January, 1930.

The attack causes the leaves to turn a dull reddish bronze, and then to brown, when leaf-fall will occur. The whitish deposit, due to cast skins, along the margins of the leaves is clearly visible.

#### PURPLE MITE

(*Eriophyes carinatus* Green)

Purple Mite, like Red Spider, may be said to be fairly ubiquitous in Ceylon. It is also found in North India and in Java. Curiously enough, it has only been recorded up to the present from one food

plant, and that is tea. Although in times of drought defoliation of some bushes may follow its attacks, it cannot be considered one of the more important pests. Badly affected leaves turn a bronze colour, and both surfaces will be found dusted with fine, white specks, betraying the cause, for these specks are the cast skins of the mites.

Purple Mite belongs to a family of mites which are peculiar, in that they possess only two pairs of legs instead of the normal four pairs. These legs are somewhat small and are situated at the fore-end of the body. When they move about they drag clumsily their comparatively long, pear-shaped bodies after them. It is to be supposed that a smooth surface offers less resistance to their passage than a hairy one so that leaves in which the underside is hairy harbour fewer mites than when it is smooth: if both surfaces are smooth, there is little difference in density of population.

#### LIFE-HISTORY

There is no record to date (October 1936) that the eggs of Purple Mite have been discovered. Such an acute observer as E. E. Green had been unable to find them, and as recently as 1927, Light\* stated that they had not up to then been recorded.

The eggs of this mite were first seen by Mr. D. J. William in the laboratory at St. Coombs. They are laid freely on either surface, and appear as minute, circular watch-glass shaped objects on the leaf. Being only about 1/300th. of an inch across, and translucent as well, it is hardly surprising that they are difficult to detect. Under a powerful hand lens they may just be discerned as minute blisters of the same colour as the leaf, when on the upper surface: but on the under side a microscope is necessary to identify them. Six days after deposition, hatching takes place.

*Larva.*—The larva is a naked, shiny, pear-shaped object, in colour a pale amethyst. The skin has very fine transverse striations on it which are present in all stages.

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\* *Ibid.*

*Development.*—As it grows, the mite casts its skin three times before becoming full grown, that is to say, it passes through three immature stages. The second stage, after two or three hours' interval, is marked by the outgrowth of five longitudinal symmetrically-placed thin waxy ridges on the abdomen. These are shed at the second moult, to reappear once more rather thicker, but broken: and in the last, adult stage, the new continuous ridges attain their maximum size. They are white in colour and show up in contrast with the purplish body colour, and so give the mite its characteristic appearance, and on account of which Green named it "*carinatus*" (=keeled).

The males and females may be distinguished by the relative lengths of the abdomen compared with the whole body: in the male it is about half the total length, in the female two-thirds.

Although pairing is necessary for the continuation of the species, it has been shown in the laboratory here that virgin females may lay eggs, and these develop into males: that is to say, parthenogenetic offspring are males, as in the case of Red Spider. About 2 days must elapse before the females are ready to lay, although in some cases a shorter period may suffice.

*Life-Cycle.*—The life-cycle of this mite from the time the egg is laid until sexual maturity is about 13 days at an average temperature of 74°F. The average time for each stage is as follows:—

Egg, incubation period	...	6 days.
Larval stage	...	1 day.
2nd stage	...	2.1 days.
3rd stage	...	1.7 days.
Total	...	11 days.

As the pre-oviposition period (*i.e.*, the time that elapses between the time the mite becomes full grown and the time it is ready to start egg-laying) is about 2 days, the complete cycle under laboratory conditions is 13 days, and in the open probably nearer three weeks than two. The highest number of eggs laid by one female, so far

observed, is 13, during the first ten days of the life of the mite (died at 12 days). Another laid 9 eggs in the first nine days, and lived another ten before dying, but without laying more. Further observations indicate that the Purple Mite is considerably less prolific than the other tea mites, but that the rate of mortality in early stages is low.

#### SCARLET MITE

(*Tetranychus obovatus* Down)

Scarlet Mite appears to be the least numerous of the four tea mites in Ceylon. It also occurs on tea in India and Java.

In colour, it is sometimes bright scarlet or orange, but much more often a dull-brown to blackish, with perhaps an elongate red spot a little forward of the centre; it is therefore usually inconspicuous, especially also as it is smaller than Red Spider. Green named it "Scarlet Mite", but in Java it is known as the "Orange Mite". For several years, at least, this mite had not caused any damage, but in 1899 Green could write as follows:—

"Apparently a very injurious pest. The branches — and whole bushes — are almost denuded of leaves, the bark shrivelled and hidebound. The terminal buds have ceased growing. In some instances the trees have been actually killed. The mites are crowded on the under surface of the leaves, and their attack results in a brownish scurfy discolouration extending along the midrib and on each side of it, the base of the leaf being particularly affected, causing its premature detachment."

For some reason or other, Scarlet Mite now takes a very humble position in the list of tea pests.

#### DESCRIPTION

*Life-History*.—The eggs of Scarlet Mite are laid on the under surface of the leaf. They are broadly oval in shape, and bright red in colour. The incubation period of the egg is greater than in any of the other tea mites, and varies from 10 to 14 days at an average temperature of 75°F.

The three-legged larva takes from 5 to 7 days to reach the first nymphal stage: and the whole cycle may be set down as follows:—

	Average	Average Temperature
Egg stage	12 days	75°F.
Larval stage	5½ "	74°F.
1st nymphal stage	6 "	72°F.
2nd " "	9 "	69°F.

The complete cycle averages 33·4 days (between the limits 31 and 36 days) at an average temperature of 73°F.

The fully-grown mite is very flat, and has a somewhat creeping manner of moving about; whereas the other Red Mite or "Red Spider"; is very active and can travel quite fast. There is very little obvious difference in the sexes.

*Number of Eggs.*—Virgin females also lay eggs, and these eggs develop into females: this is different from the case of the other three mites, in which only males result. Under special circumstances virgin females may produce male offspring, but so far this has not been observed.

### YELLOW MITE

(*Tarsonemus translucens* Green)

Like the other mites, Yellow Mite is wide-spread on tea, but probably makes its presence felt to a larger extent than any of the others. It is scarcely yellow at all, but a translucent pale ivory colour, and it has a pair of yellowish spots on the body.

There are two periods in the year when they may be prevalent, January-March and August-November, September being the month when most attacks are recorded. While the other three mites are found on the older leaves, it is the flush that most delights *Tarsonemus*, and the effect is to turn it yellowish and sickly looking,

the young leaves sometimes falling off resulting from this. In large numbers therefore it is capable of doing real harm. It is often at its worst in rainy and sunless weather so that conditions which are not favourable to the plant seem to have the opposite effect on the mite. Conversely, good growing weather quickly enables the plant to shake off the attack, and the mite population diminishes.

The young leaves which are chosen as food will show later on a rough brown discolouration on the under surfaces, often in streaks or patches placed longitudinally on either side of the midrib, and this is a diagnostic character of a past attack by Yellow Mite.

The following is a summary of its life-cycle:—

Egg stage	...	2½ days	} at 69°F.
Larva	...	2½ ,,	

After the larval stage it passes immediately into the adult stage, and is ready to start egg-laying in about two days. The average number of eggs laid by several females in the laboratory was observed to be 26 over a period of some fifteen days. This mite has also been proved to be able to lay fertile eggs without the assistance of the male, and they have all developed into males.

#### TEA MITES AND THEIR CONTROL

The presence of mites in sufficient numbers to cause damage always appears to be associated with weather conditions which adversely affect the tea bush; so that in the majority of cases a change in the weather for the better is sufficient to enable the plant to shake off the attack. The mites do not, however, completely disappear, so that they may be considered to be always present, and able to take advantage of conditions favourable to itself. In some cases these conditions may repeat themselves year by year at certain seasons when these mite attacks can then be anticipated. In such chronic cases sulphur-dusting may be employed. The best time to do it is somewhere between pruning and tipping, when a liberal dose of about 50 pounds per acre should be applied. If it becomes necessary to dust while the tea is in plucking, there should be two applications made at an interval of a week, each of about 8 to 10 pounds per acre.

The first dusting should be done after plucking, and no leaf for manufacture should be removed for two weeks after the second application, in order to avoid risk of tainting.

The simplest method of dusting is to use small, coarse bags, and these are carried and beaten with a stick over the bushes. If possible it should be done in dry weather, as rain removes a quantity of the sulphur thus applied. A dusting machine causes the dust to adhere more firmly, and to that extent is better. ॥

