

STUDIES ON COLLAR AND BRANCH CANKER OF YOUNG TEA (*PHOMOPSIS THEAE* PETCH)

I—RECENT OBSERVATIONS ON DISEASE INCIDENCE

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Field observations and experimental evidence indicated that in addition to causing cankers on the stem, *Phomopsis theae* could also infect young, apparently uninjured, succulent, green shoots. Infection of green shoots usually caused small, local lesions, although in some instances the whole shoot was killed. Green shoots are, however, not considered to be important infection sites, because infection rarely progressed beyond the green stem or caused serious damage to the bush. The significance of shoot infection* lies in its ability to produce pycnidia and provide inoculum for stem infection. High shoot infection seems to be associated with high canker incidence. Some observations on clonal resistance are also reported, and control measures briefly considered.

The symptoms of Collar and Branch Canker disease of young tea were described in detail in an earlier paper (Shanmuganathan 1965). Cankers in young tea are generally found on the branches and collar and at the base of twigs, leaf-scars and prune-cuts, and are associated with wounds or injuries caused by mechanical damage. In 1965, however, a completely new form of the disease consisting of a die-back of apparently uninjured, succulent green shoots was first observed. Associated with this were cankers of abnormal severity on the stems of two-year-old plants.

The first occurrence of such die-back of green shoots was noticed on an estate at Halgranoya in May 1965, and again on the same estate in April 1966. Similar occurrences were subsequently seen on several other estates and it became clear that the fungus can infect young green shoots without any apparent injury.

This paper describes the above observations and also reports additional information relating to the distribution of the disease and clonal susceptibility.

Infection of uninjured green shoots

On a visit to an estate at Halgranoya in April 1966, we observed a rather severe die-back of young shoots on two-year-old tea bushes in a new clearing of about half an acre. The clone affected was supposed to have been selected from Betjan jat seedlings (a broad-leaved Assam type) and it was growing on a block of poor quartz soil. To estimate roughly the extent of the damage, 120 plants were taken at random and the number of dead shoots and cankers on them were counted. The results showed that 45% of the bushes had one or more dead shoots, and approximately 70% had stem cankers. Some plants had as many as nine dead shoots or 16 stem cankers. This is an unusually high incidence of the disease.

The distribution of cankers within the clearing was fairly uniform and was in marked contrast to normal incidence when canker infections are generally few and sporadically distributed. The disease was exceptionally severe on the Betjan clone, although neighbouring clones (TRI 2024, St Leonards 3/108 and Kirkoswald 145) also suffered.

* 'Shoot' infection refers to infection of young succulent green stems and 'stem' infection to cankers on the older brown stems.

Causal organism

Several isolations made from dead shoots, collected from different estates, all yielded *P. theae*, showing that this new form of the disease was also caused by the same fungus.

Infection experiment

In July 1966, two-year-old potted plants of clone TRI 2024 were brought into the greenhouse and were not sprayed with any pesticide for about three weeks. During this period, a number of green shoots had developed on these bushes. The plants were then placed in a humid chamber and inoculated by spraying with a suspension of spores of *P. theae*. Inoculum was prepared by washing off the spores from sporulating lesions on artificially inoculated tea stems and suspending them in sterile distilled water. After two days, the plants were removed from the humid chamber and returned to the greenhouse.

Five plants each were treated by one or other of the following methods:

- A — Sprayed with spore suspension
- B — Sprayed with sterile distilled water only
- C — No treatment.

Five to six days after inoculation, discrete necrotic lesions were observed on several young green shoots on the inoculated branches (treatment A). Some of these lesions later extended in both directions along the stem and caused the death of the entire shoot down to the brown wood (Figures 1 & 2). On many infected shoots leaves began to fall by about the tenth day and the fungus sporulated profusely on the stem producing a great mass of spores in the form of white tendrils, just visible to the naked eye.

Plants that received treatment B or C were unaffected and appeared normal. *P. theae* was readily re-isolated from the dead shoots and lesions. The experiment was repeated three times and similar results were obtained each time. This proves that *P. theae* can infect green shoots without any apparent wounding.

Distribution of the disease

The disease has now been found to occur more widely in the Udupussellawa District, especially in the Halgranoya area, and in Dimbula, where it is mainly confined to the drier areas. On one estate at Agrapatana, several deaths occurred in 1965, in a four-year-old clearing situated on a poor ridge of soil. It is suspected that infection took place during the early part of the year, when the weather was exceptionally dry. Recently, some bushes were killed by cankers caused by *P. theae* on an estate in Lindula. Here the clone affected was Kenilworth 16/3 and the clearing was in its third year of planting. Field observations indicate that this clone is very susceptible to the disease and it is, therefore, not advisable to plant it in areas with a history of collar canker. On the same estate several other clones were also found to be severely affected by branch canker in the multiplication plots. The cankers on these bushes were mainly on the frames and the indications were that the fungus had gained entry into the stem through injuries caused by sun-scorch, presumably after pruning in hot dry weather. There was a marked variation in the extent of damage on the 17 clones in this plot. Several clones that were severely cankered were unapproved clones. Two clones that appeared to be free from cankers were Kirkoswald 145 and 150, but without further observations we cannot assume that these are highly resistant. Clones TRI 2016, Drayton 1, Drayton 95 and Kirkoswald 136 showed moderate infection.



FIGURE 1 — *Die-back of young shoots caused by P. theae*



FIGURE 2 — Lesions on a young shoot caused by *P. theae*



FIGURE 3 — *A one-year-old tea plant showing a stem canker near ground level, caused by P. theae*

Clones affected

In addition to the clones tested earlier (Shanmuganathan 1965), the following clones have been found to be affected on various estates : TRI 2022, 2116, 2135 & 2142, Diyagama G & 13, Mooloya 27, 107 & 115, Glen Devon 3-113, 5-105 & 8-101 and St. Leonards Betjan clone.

Infections in the first year of planting

The disease has been noticed recently for the first time in clearings in the first year of planting. Cankers on young plants are generally small and outright deaths are few or absent (Figure 3). Nodal infections and die-back of green shoots seem to be the frequent form of attack. Wind damage appeared to provide the main avenues for fungal entry on these plants.

Discussion

Until recently, *P. theae* was considered to be essentially a wound parasite, which meant that the pathogen can gain access into the living tissues of the stem only through a bruise, wound or dead and moribund tissue. The present observations, however, suggest that this assumption is no longer valid. *P. theae* now appears to be a highly versatile fungus capable of infecting plants in a variety of ways. As the incubation period is short and sporulation is prolific, a high inoculum potential can be built up rapidly. Further, as the host is an evergreen perennial plant constantly producing a crop of succulent green shoots, there are grounds to believe that wounds are much less important infection sites than green shoots. As *P. theae* is fortunately not a very aggressive pathogen except under severe drought conditions (unpublished data) and as infection of green shoots seldom progresses beyond brown wood, shoot infections are unlikely to produce great damage. The major significance of these lesions lies in their ability to produce pycnidia and provide spore inoculum for infection of the older stem.

Although green shoots are produced throughout the year, it is not certain whether shoot infection can occur throughout the year. At present very little is known about the conditions which favour shoot infection as well as the factors that influence sporulation. Free water seems necessary for spore germination and this is invariably available throughout the year, because considerable dew formation occurs at night even during the drier months. Host infectibility, however, is likely to vary during the year. There is good evidence (to be published shortly) that it is so in the case of the stem, although one cannot say with certainty whether green shoots will behave similarly.

With regard to the control of shoot infection, there is already some evidence to suggest that periodic sprays with a protectant fungicide can give reasonably efficient control. **Estates are, therefore, advised to spray young clearings suffering from *P. theae* infection with a copper fungicide (containing 50% w/w copper) at the rate of 6 oz in 10-15 gallons of water per acre every fortnight using knapsack sprayers.** This would mean an extension of the routine blister blight spraying into the drier months as well. Removal of dead and cankered branches and twigs may also be necessary to supplement the spray programme, in order to reduce the inoculum potential.

The observations made on clonal susceptibility support those made earlier, *viz* that there is marked variation in clonal susceptibility, and there are good sources of resistance in clonal material already available for selection. It is worth mentioning here, that there are now about 35 clones under observation in three experiments at

three different estates for evaluation of their potential resistance. In one experiment in which plants are inoculated annually with five isolates of *P. theae*, three clones have shown a high degree of resistance. We hope to have more resistant clones from the other experiments. The selection of resistant clones may in the end prove to be the best method of combating the disease.

The appearance of the disease in the first year of planting suggests that young plants will have to be protected from the very early stages.

Reference

SHANMUGANATHAN, N. (1965). Collar and branch canker in young tea caused by *Phomopsis theae* Petch. *Tea Quart.* **36** : 14-21.

(Accepted for publication — 10th September 1966)