'BLACK BLIGHT': A LEAF-SPOT DISEASE OF TEA IN THE LOW COUNTRY CAUSED BY *RHIZOCTONIA SOLANI* KÜHN

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Introduction

The spraying of copper fungicides against Blister Blight has not only resulted in reasonable control of the latter but has also suppressed the occurrence of a number of other diseases.

Cercosporella leaf disease caused by the fungus *Calonectria theae* Loos was at one time very damaging on up-country estates. Nowadays, although *Acacia decurrens* continues to show symptoms of this disease, serious outbreaks in tea are not heard of. Similarly, *Rhizoctonia solani* was said to occur then in the Dimbula district. Nothing is heard of this occurrence now. Thus the application of copper fungicides has had a few "blessings in disguise" accompanying it.

On estates in the low country where no blister-blight control is carried out, *Rhizoctonia* leaf-spot can still be a threat. This paper deals with some experimental work on the pathogenicity of the fungus and the symptoms it causes in the field. Suggestions for control by copper fungicides are given. As the disease has no English name yet the expression 'Black Blight' is suggested, in contrast with Black Rot caused by two *Corticium* species and occurring in India.

Literature

Petch (1923) referred twice to *Rhizoctonia* but only in connection with damping-off of nursery plants and a ring-barking on young shoots after pruning. No leaf disease is mentioned.

Gadd (1929 & 1949) mentioned *Rhizoctonia solani* as the cause of damping-off of tea seedlings, and noted the occurrence in the low country on mature bushes. According to him, fructifications of the *Corticium vagum* B and C stage of the fungus are to be found often on apparently undamaged leaves. *Rhizoctonia* is supposed to climb the bush from the soil. Hainsworth (1952) includes "*Rhizoctonia* disease" in a "Table of Secondary Root Diseases of tea after Sarmah". As a synonym the name of the fungus is given as *Macrophomina phaseoli*. This is the conidial stage of another species of *Rhizoctonia*—*Rh. bataticola* (synonym: *Sclerotium bataticola*)—which causes a secondary rot of tea roots.

Venkataramani and Venkata Ram (1959), in South India, found *Rhizoctonia solani* inciting a collar-rot of tea. Attack was only possible when the collar was injured.

Rhizoctonia solani Kühn and the diseases it causes

The genus *Rhizoctonia* is ill-defined as it is a sterile mycelium that produces no spores of any kind. The only characteristics of the mycelium are: a peculiar narrowing of the mycelium hyphae where they branch off and the sclerotia that are produced abundantly. For some species of *Rhizoctonia* it has been found that they can produce a perfect stage with basidiospores. This stage of the fungus is called *Pellicularia* (syn. *Corticium*), for instance: *Rhizoctonia solani=Pellicularia filamentosa.*

Because of the fact that the *Pellicularia* stage of the fungus has not been found on tea yet, this name is not used for its occurrence on tea. *Rhizoctonia* is a soil fungus which can grow over surfaces of plants above soil level only under conditions of very high humidity. Its greatest activity is developed at the soil-surface level. Whether spore production plays a role in any particular case depends on whether a spore-producing form is present or not. Girdling of the stems of young seedlings (damping-off) and of older plants (stem rot, bark canker) are the most common forms of attack. Potatoes can suffer badly from the latter. Root-rots also occur as a result of *Rhizoctonia* attack; sugar beet is attacked as a seedling. *Rhizoctonia* is a universal parasite reported from both temperate and tropical countries. The optimum temperature for growth lies between 25 and 30°C (Smith, 1946).

Rhizoctonia on tea

During August 1961 plants of clone T.R.I. 2023 at the Kottawa sub-station were found to be suffering from a severe leaf-spot disease that could well be called "Black Blight" in comparison with Grey Blight and Brown Blight. However, investigation under the microscope revealed the presence of the brown-blight fungus on all affected leaves and it was supposed that Brown Blight was the disease. Later, samples of the same trouble from other estates showed no brown-blight fungus but a mycelium that had a resemblance with *Rhizoctonia* hyphae. Isolation of the fungus confirmed this conclusion and the fungus was identified as *Rhizoctonia solani* Kühn. In due course the same fungus attack was found on Pelawatta State Plantations, Millakande Estate, Talgaswella Estate and Galinda Estate.

The fungus was isolated from young clonal plants in the nursery and in the field, and also from mature seedling bushes. The leaf-rot developed almost simultaneously at all these estates and it was therefore thought that particular weather conditions had caused this widespread attack.

The data for rainfall and sunshine were obtained from Pelawatta State Plantations. The graphs constructed from these data (Fig. 5) indicate that rainfall has been exceptionally high from July onwards. During the two years 1960 and 1961 the rainfall has been above 20 inches per month for any considerable period of time only during August, September, October, November 1961. This is exactly the period during which the *Rhizoctonia* attack developed. Similarly, a rather more prominent attack was observed in the low country in 1933, when the rainfall was high as compared to the previous year, as indicated by the graphs (Fig. 5).

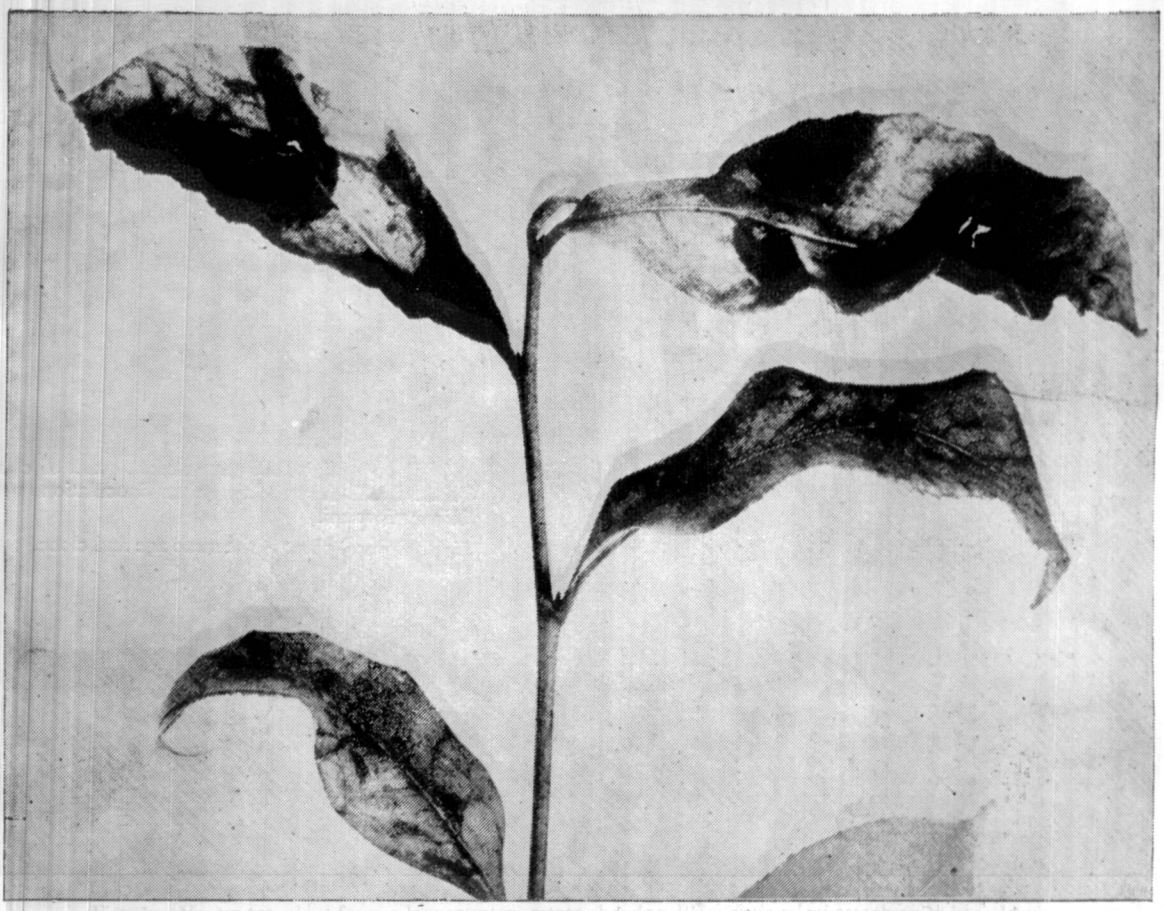

Fig. 1. Young tea plant from a low country estate showing *Rhizoctonia solani* attack on the top leaves.

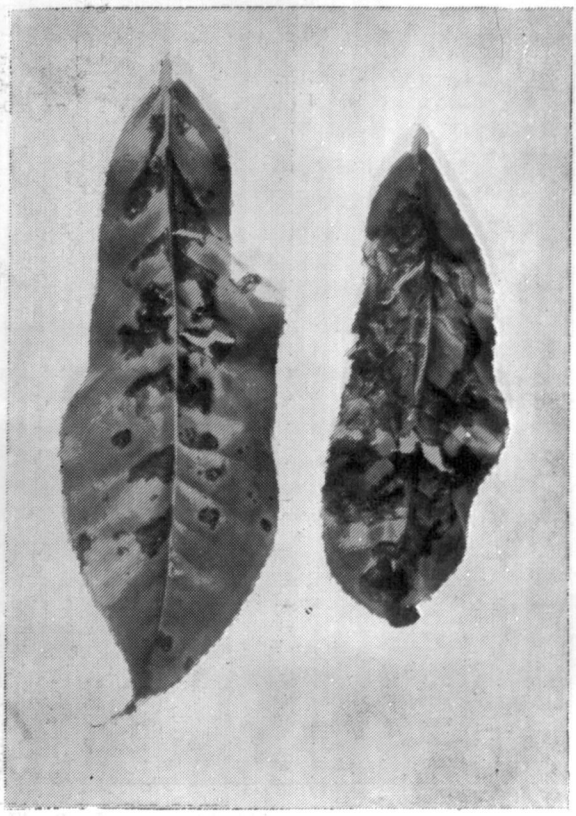

Fig. 2. Leaves attacked by *Rhizoctonia solani*. Note black necrotic lesions similar to scorch.

Fig. 3. *Left.* Two and a half year old tea plant of clone T.R.I. 2025, thirty days after inoculation with *Rhizoctonia solani*.

Right. Control plant of the same age and clone.

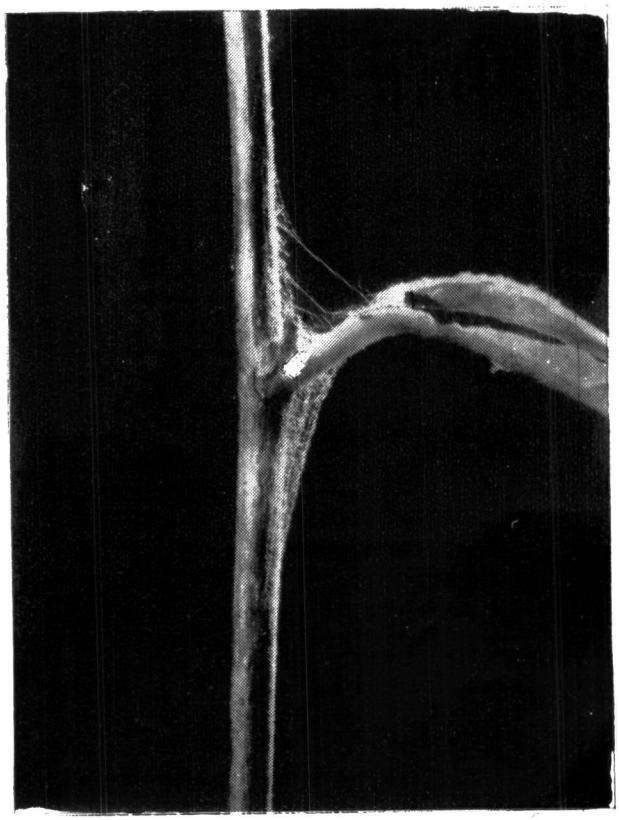

Fig. 4. Cob-web like mycelium of *Rhizoctonia solani*. on twig of young tea plant two weeks after inoculation.

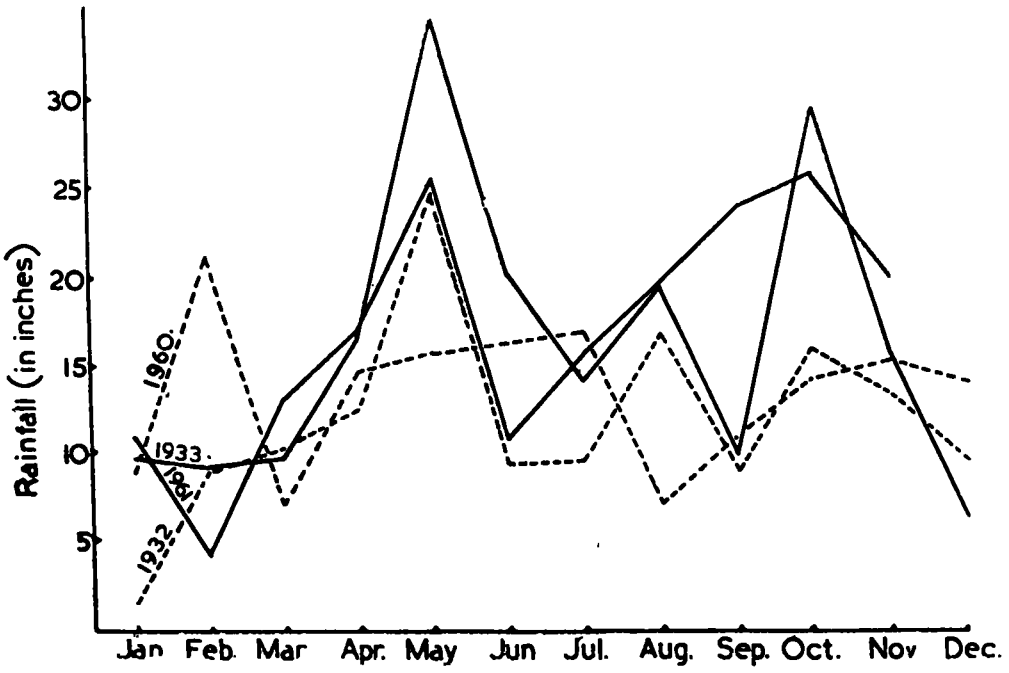

Fig. 5 Distribution of rainfall in the Kalutara district during 1960-61 and Ratnapura district during 1932-33. The continuous lines represent the rainfall curves for the years when *Rhizoctonia* attack was most prominent.

Symptoms

The first thing that attracts attention in the field is the appearance of irregular black spots on rather young leaves on branches hanging low, near the soil. The spots are situated near the base of the leaf and along the mid-rib. They develop until the greater part of the leaf is necrotic (Fig. 2). The leaf then dies completely and the petiole gets detached from the stem, but many affected leaves do not drop because they stay attached by means of the cobwebby mycelium of the fungus that spreads all along the stem.

When the rainy weather continues, the disease may climb higher in the bush and even kill young leaves and whole shoots right in the top of the young clonal plant (Fig. 1). In the mature bush, flush can be killed under similar circumstances. The final result is severe defoliation.

Experimental evidence of pathogenicity

In order to prove that we had indeed isolated the right fungus causing this disease, we did some infection experiments.

Both at Millakande Estate and at St Coombs plants were inoculated by placing pieces of agar with mycelium on the leaves. The plants were put under plastic covers in order to maintain high humidity. The pots were placed in a plant house maintained at low-country temperatures (St Coombs) and in a shed in order to exclude sunshine (Millakande).

The result was that in both cases some of the leaves were infected and dropped. (Fig. 3). A spread of cobwebby mycelium over the plant was noticed (Fig. 4).

The fungus was re-isolated again from the diseased plants.

Control measures

It is well known that copper fungicides are effective against *Rhizoctonia solani*. On one estate the advice to spray a copper fungicide was given in time to control the disease, but no experimental results are available as regards the necessary concentration and frequency of application.

However, a similar disease, occurring in N.E. India, called Black Rot caused by two *Corticium* species has been successfully controlled by copper sprays (0.25% of a 50% copper fungicide) (Sarmah, 1960). It is therefore safe to assume that *Rhizoctonia* on tea in Ceylon can also be controlled by spraying copper. How many copper sprays will be necessary cannot be predicted. Future field trials during the next *Rhizoctonia* attack will give the answer to this question.

TABLE 1.—*Sunshine (in hours) recorded at Pelawatta (Kalutara District)*

	1960	1961
January ...	170 ...	191
February ...	161 ...	121
March ...	230 ...	210
April ...	214½ ...	164
May ...	210 ...	123
June ...	229 ...	139
July ...	174½ ...	121
August ...	217 ...	148
September ...	184 ...	112½
October ...	211 ...	140
November ...	134 ...	142
December ...	177 ...	—

From the records of rainfall and sunshine (Fig. 5 and Table 1) of Pelawatta State Plantations it would appear that in 1961 the climatic conditions conducive to attack were at least 20 inches of rainfall per month and sunshine hours below 150 per month. *Rhizoctonia* attacks have not been correlated before with exceptionally wet weather conditions. It is therefore too early to conclude that the above mentioned figures have any generally applicable value. Forecasts for *Rhizoctonia* will not be feasible until we have many more data but in an experimental way we can use the margins of 20 inches rainfall and 150 hours sunshine as a guide to judge when to spray against this destructive fungus.

Summary

During the second half of 1961, a leaf-spot of tea occurred due to an attack of *Rhizoctonia solani* Kühn on a number of low-country estates in fields where no blister-blight control is carried out.

This paper deals with earlier records, some experimental work on the pathogenicity of the fungus and the symptoms it causes in the field. Suggestions for control by copper fungicides with spray-timing based on weather data are given. As the disease has no English common name yet the expression 'Black Blight' is suggested.

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