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LEAF SCALD OF SUGAR CANE IN CEYLON

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INTRODUCTION

THREE potentially dangerous diseases prevalent in the plantations of Ceylon which merit the attention of the sugar growing industry are ratoon stunting disease, smut and leaf scald. Ratoon stunting disease (RSD), a virus disease, is the most insidious of the three, being almost symptomless and therefore passing unnoticed, although it may all the time be a significant factor in depressing yields. Smut, caused by the fungus *Ustilago scitaminea* Sydow on the other hand cannot fail to attract the attention of the most casual observer on account of the conspicuous black whips; nevertheless the millions of spores which each of these whips produces is a sizeable problem to grapple with in controlling the disease. Leaf scald is a bacterial disease caused by *Xanthomonas albilineans* (Ashby) Dowson. It is relatively easy to detect and within the orbit of a reasonable measure of control provided that adequate vigilance is maintained and suitable precautions are taken.

Leaf scald was established as a disease in the early 1920's. It had been observed earlier but it was only after the investigations of Wilbrink, North and others that it came to be recognised as a disease. Prior to this it had been thought that the disease symptoms were due to varietal weaknesses.

The purpose of this paper is to describe the symptoms of this disease as they appear in Ceylon and to present information obtained from preliminary investigations on the susceptibility of certain varieties imported from the various sugar growing countries for the plantations in Ceylon. Pathogenicity studies are also described.

SYMPTOMS

Leaf scald is known to show a wide variation in its symptoms. The symptoms may remain masked under certain conditions, becoming evident with a change in weather conditions, fertility levels or a



Fig. 2—Striping of leaves—middle portion of leaf.



Fig. 1—Striping of the lower leaves—lower third of leaf.

phase of growth. In Ceylon, affected plants show all or some of the following symptoms :

Striping of leaves. A well defined leaf striping is invariably associated with the disease. These stripes are white or cream in colour, narrow to broad and often extend the full length of the leaf blade, being continued below into the sheath base (Figs. 1 & 2). On close examination, it is possible to observe well defined pencil stripes along the course of veins (Fig. 3). Pencil stripes are easily detected in the young expanded leaves of infected stools.

Chlorosis of leaves. Sometimes the white striping of the leaves is carried a step further to a complete chlorosis of the entire leaf. This is generally observed in young shoots developing from the basal buds of affected stools and consisting of a few chlorotic leaves (Fig. 4).

Withering of leaves. This is the symptom which has given rise to the name of the disease. The tips of the leaves take on a brown, withered or scorched appearance and bend inwards (Fig. 5). The withering of leaf tissues progresses from the tip downwards. The leaves last to unfold are the most conspicuous ones with withered incurved tips.

This is perhaps the most easily detectable symptom encountered here for spotting affected plants in the field where the stalks are six feet or more in height. The characteristic scalded shoots are easily recognised. In a field with a dense growth of stools, the older dead lower leaves may be mistaken for scalded leaves but affected stools can be readily distinguished by examining the apical portions where the withered incurved tips of the young leaves are unmistakable.

Development of nodal buds. A symptom observed in adult stalks is the development to varying degrees of the nodal buds along the length of the stalk. The degree of development of these buds appears to be related to the variety. For instance in C.P. 53-23 fairly large side shoots with several expanded leaves are produced giving the stalks a branched bushy appearance (Fig. 6). In C.P. 44-155 too the buds develop quite considerably to produce somewhat smaller side shoots (Fig. 7), while in H. 37-1933 there is only a feeble development of side shoots and the leaves do not unfold (Fig. 8).

Stunted chlorotic shoots. Affected stools generally produce numerous shoots which do not develop into stalks. These shoots are small, not reaching a height of more than 2 or 3 feet, and consisting of a few small leaves, all showing quite clearly the white striping and chlorosis of the lamina as well as the withering and incurving of leaf tips (Fig. 4). This condition is perhaps aggravated in stools which are also affected by smut.

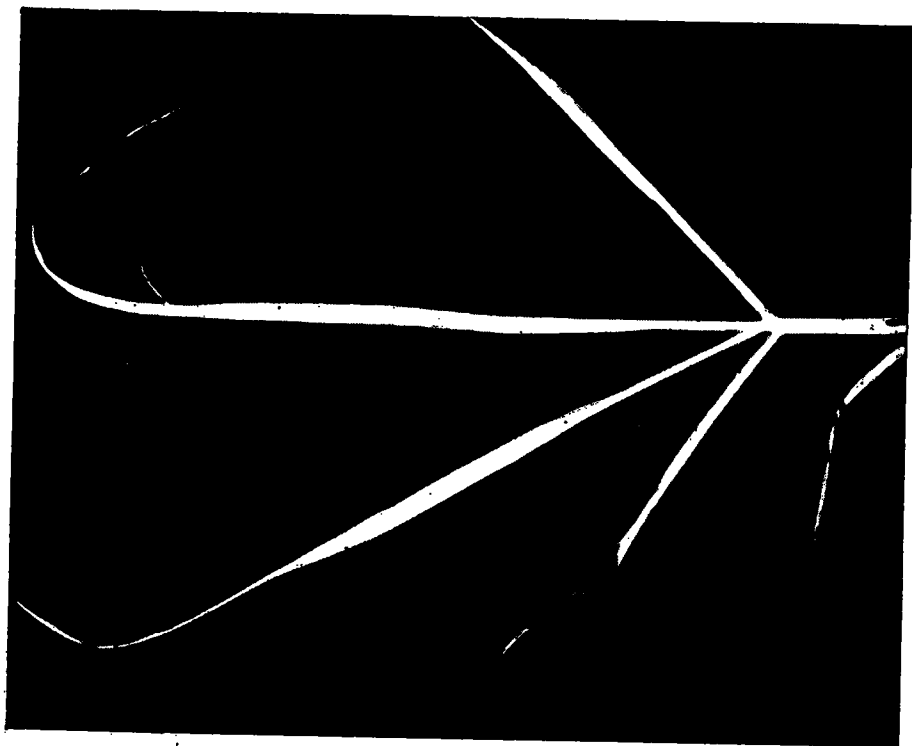


Fig. 4—Chlorotic shoot from an infected stool.

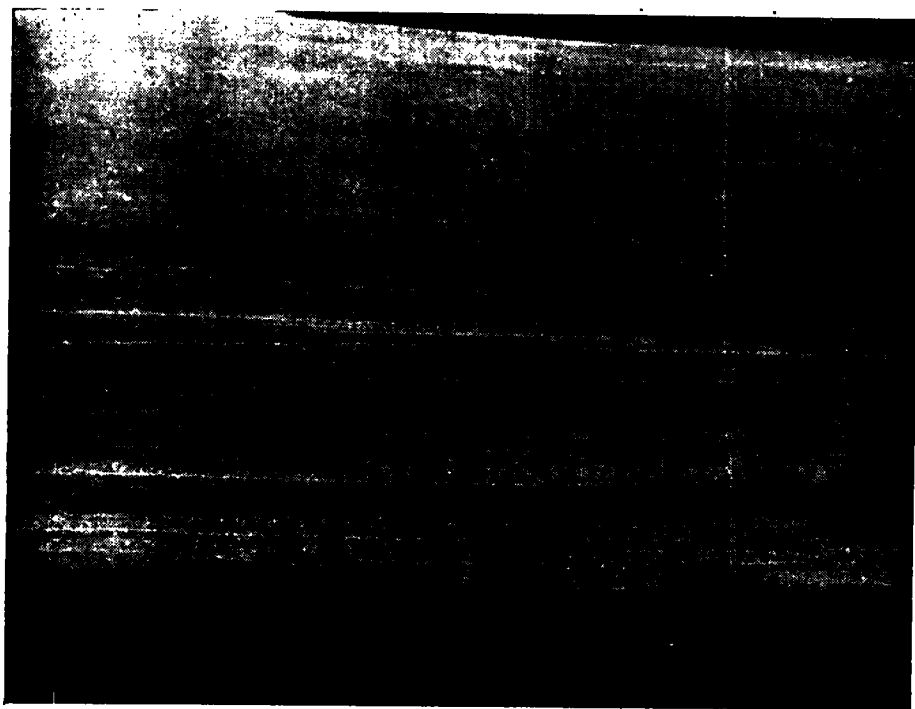


Fig. 3—Narrow "penol" stripes.

Shortening of internodes. Affected stalks show a shortening of internodes which is most pronounced in their apical thirds and best seen in medium to large size stalks (Fig. 7).

INOCULATION TESTS

Although leaf scald was identified recently on symptomatological evidence, it was considered advisable to confirm this by inoculation tests.

The bacterium occurs in abundance at the stem apices of infected shoots. The most convenient tissue for isolating the organism was found to be the region just behind the apical meristem. A fresh infected shoot of Co. 453 was used as the source of the pathogen. The stem apex was surface sterilized with alcohol and a portion of the internal tissue dissected out. This was crushed in sterile water and the bacterium allowed to stream into it. The bacterial suspension thus obtained was dispersed in plates of "Wilbrink's" medium with the following composition: distilled water, 1000 cc; peptone, 5 gm; potassium phosphate (dibasic), 0.25 gm; magnesium sulphate, 0.25 gm; cane sugar, 10 gm; agar 15 gm. Creamy translucent colonies were obtained on incubation at room temperature which provided the inoculum for the tests.

The test variety used for the inoculations was Co. 453 in which the stalks were cut back and the fresh surfaces smeared with a suspension of the bacterium. Another method of inoculation tried out was to inject the bacterium with a hypodermic syringe into developing buds of the same variety. The new shoots produced were characterised by the symptoms of chlorosis and the occurrence of white stripes on the leaves, typical of the disease.

SCREENING OF VARIETIES

Preliminary work on the screening of commercial varieties for determining their reactions to the disease was initiated at Kantalai in June, 1961. The introduced varieties included in the tests were planted out in 30 ft. × 10 ft. blocks.

Stalks showing characteristic symptoms of the disease were collected from the field and the juice extracted from their apical portions with a crusher. The extract provided a source of inoculum with the bacterium in a virulent condition. Stalks of the test varieties were cut back and inoculated with the infective sap. Observations



Fig. 6 Extensive development of nodal buds in C. P. 52-23.



Fig. 5—Apical portion of infected shoot characterised by withered incurved tips.

were made periodically for development of symptoms. On the basis of these tests and observations, the varieties were classified into three groups as follows :—

Resistant to highly resistant : B. 40-98 ; Co. 339 ; Co. 527 ; Co. 775 ; College 39 ; N : Co. 292 ; N : Co. 376.

Moderately resistant to moderately susceptible : B. 37-172 ; Co. 785 ; Co. 853 ; Co. 875 ; C.P. 29-116 ; H. 37-1933 ; H. 39-3633 ; N:Co. 310.

Susceptible to highly susceptible : Co. 453 ; Co. 622 ; Co. 1150 ; C.P. 4364 ; C.P. 44-155 ; C.P. 53-23.

CONTROL

The use of resistant varieties will doubtless constitute the most satisfactory method of control. Although the disease is present in Ceylon, it has not assumed serious proportions. Therefore, the use of disease-free cane and the elimination of infected stools so as to minimize potential infection are practical measures to keep the disease under control. No country has achieved complete success in eradicating the disease once it has established itself.

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Fig. 7—Moderate development of nodal buds in CP 44-155.
Note—shortening of internodes.



Fig. 8.—Feebly developed nodal buds in H. 37-1933.