

THE YEAR'S PROGRESS IN CANE DISEASE INVESTIGATIONS.

(Paper by H. H. STOREY, B.A., Government Mycologist, Durban.)

At each of the last Annual Sugar Conferences it was my task to draw your attention to a separate new and important cane disease. I am glad to be able to report this year that I have nothing new to add to the list. Nevertheless there is still a vast amount to be learnt concerning Mosaic and Streak diseases, and the year has been fully occupied in clearing up many points concerning them. The work with Mosaic has dealt mainly with the resistance of varieties and other detailed matters, and no great interest attaches to them at present. The main investigation however, has been directed towards the determination of the nature and manner of spread of streak disease.

A paper describing in detail the work which has been done upon Streak disease is now in the printer's hands, and copies will be issued to all members as soon as ready. A short summary of the conclusions reached may be of interest at present.

In the first place, it is definitely concluded that this is one of the so-called "virus diseases," a clearly marked group in plant pathology. This may at first sight appear to be a point of academic interest only; but when one has decided, on some of its properties, that a disease belongs to a certain group, one can predict other properties which are not readily subjected to test. This allows one to suggest the most hopeful measures of control, and to prosecute investigations in the directions most likely to lead to useful results.

In all the work which I have carried out, I have encountered no case where a plant once fully diseased has thrown off the disease and developed healthily. Spraying or sett disinfection have never been known to cure a virus disease, and are unlikely to affect Streak. Since the organism causing the disease is within all the tissues of the plant, it is inconceivable that the external application of chemicals could affect it. That point is so clear and obvious, that I consider that to attempt to test it would be to waste energy which might more profitably be employed upon other work.

Following suggestions made to me, I carried out experiments in digging up cane stools, which had recently developed the disease, and replanting them in the Herbarium grounds. Of a dozen such cases, all the originally diseased canes have remained diseased and the disease has spread rapidly to other shoots previously healthy.

The possibility of transmission of Streak through the soil was tested by the following experiment. On a site adjacent to the Umbogintwini Streak plots healthy cane was planted and certain setts covered

with wire gauze cages, so that the shoots developed entirely within the cages. The gauze varied in size from one extreme with holes one-eighth of an inch square to the other with holes one hundredth of an inch square. After three months all the uncaged plants had become diseased; one plant in a cage of the largest mesh was diseased, all the remaining caged plants were healthy. This experiment showed that the disease was transmitted through the air by some agency, which was unable to pass through wire-gauze of sufficient fineness.

The streak disease affecting maize is well known probably to most farmers upon the Natal Coast. In many respects this plant appeared to be a more suitable object for study than cane; it was thought that if the mode of transmission of the maize disease could be worked out, the investigation of that of the cane disease would probably be simplified. The work upon maize Streak culminated during the past year in the discovery of an insect carrier, a leaf-hopper previously unknown and undescribed, *Balclutha mbila*, Naude. Much has been learnt concerning the details of the process of disease transmission by this insect, but these points are not of general interest at the present. It may merely be said that hoppers reared on healthy maize are unable to produce the disease, but that a proportion of those hoppers which have fed on a Streak plant, even for so short a period as an hour, became capable of transmitting the disease to every maize plant upon which they subsequently feed.

Transmission experiments with cane proved to be a matter of much greater difficulty. The hoppers which were proved to be able to infect maize failed to produce the disease in cane. Hoppers fed under experimental conditions on diseased cane failed to infect cane. This evidence appeared therefore to suggest that *Balclutha mbila* was not the carrier of the cane disease. The trial of all other likely insects failed to give any infection with streak.

In the experimental plots at Umbogintwini when Streak was spreading with great rapidity, *Balclutha mbila* was very abundant. Individuals collected here were found experimentally to infect both cane and maize.

There is little doubt therefore that *Balclutha mbila* is the actual carrier of Streak in the Natal canefields. But it is only under certain conditions that the hoppers can become infective. What are those conditions is clearly a very important subject for research, and I hope that during the coming year this point will be determined.

At this stage it is uncertain whether under any

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circumstances Streak can be transferred from maize to cane. But maize is held to favour the spread of Streak when grown in proximity to cane, since it appears to be a highly favourable food-plant for *Balclutha mbila*, and is likely to encourage the multiplication of the carrier of Streak.

This work forms a good example of the devious paths by which results may be obtained in scientific research. The study of maize has led to the solu-

tion of a sugar-cane problem. Without the previous work upon maize it is unlikely that the relationship of *Balclutha mbila* to Streak in cane would have been discovered. I therefore make no apology to the Sugar Association for a paper devoted largely to maize.

In thanking Mr. Storey for his paper the Chairman stated he felt sure the work which had been done would be most beneficial to the Industry in the future.

QUESTIONS ON STREAK DISEASE.

The next business which was proceeded with was the answering of various questions contained in the official question and answer programme issued to each member.

By special request Mr. Rapson was asked to give a specific reply to the question: "How may Streak disease be certainly diagnosed by the planter?"

Mr. Rapson replied:—The answer to that primarily is by the leaf. Streak disease is apparent in every leaf that has Streak disease in the cane. It has an elongated stripe right along the leaf and the whole of the leaf is so marked. You can finally determine Streak disease from any other leaf marks if you take out the heart leaf from a sett. By examining that you will find that if the sett is clean right through that heart leaf will be clean. But if it is a diseased sett it will also be diseased to the minutest portion of the heart leaf.

Mr. Storey gave the following reply to the same question, namely:—By examining the youngest, partly unfolded leaf of the shoot. If this bears, evenly distributed over its whole length, narrow colourless Streaks, then the plant has Streak disease. If there are no markings on this leaf, then the plant is healthy. If an odd marking or two only is to be seen, the plant is almost certainly healthy, although in a rare instance it might be a case of a new infection just starting. The Streaks are best seen by holding the leaf up to the light.

The Uba leaf is apt to bear many colourless spots upon its older leaves. These are not Streak disease unless the youngest leaves are also affected.

Question No. 7.—"What method is recommended for the selection of cane in the control of Streak?"

Mr. Storey replied: Selection should be done in a field as low as possible in Streak disease, preferably under 10 per cent diseased. The method of selection must be chosen so as to ensure the rejection of all canes the leaves of which are Streaked, and of all canes from a stool which shows any Streaked shoots. Whatever method be employed, it must be such that the selection is carried out before the leaves have been removed or allowed to wilt. It is suggested that specially trained boys be sent through the fields to cut out the cane of all stools

which are wholly or partly diseased, or to mark these stools in some way such as by tying up or cutting the tops off. The remainder of the field may then be cut for planting. The diseased canes, if of suitable age, may then be sent to the mill. Alternatively, the boys may be sent through the fields to cut out healthy canes, or top setts from healthy canes. In such cases the boys should be required to bring these canes out on to the headlands complete with their leaves, which should be cut off only after inspection by an overseer.

Question No. 8.—"Why do Streak diseased plants appear in the young cane, even if selection has been carefully carried out?"

Reply by Mr. Storey: The diseased plants in this case are due to:—

- (a) An error in selection, diseased canes having been allowed to be planted.
- (b) So-called "latent infections." It is likely that some apparently entirely healthy canes had in fact contracted Streak disease a short time before they were cut, but too recently for any symptoms to have shown. Setts cut from these canes would produce Streaked shoots.
- (c) Secondary infection from neighbouring diseased canes. If the insect-carrier is present, this is liable to happen, particularly on the edges of the field near to old diseased cane. If there are old roots from the previous crop still shooting, these are likely to act as sources of infection. Great care should be taken to eradicate them.

Question No. 9.—"When should roguing be carried out in Streak control?"

Reply by Mr. Storey: Roguing should begin as soon as the majority of setts have sent up shoots above ground. It should not be postponed. All diseased plants should be removed and the gaps filled. The next roguings should be at fortnightly intervals. It is likely that no diseased plants will be found at the third or fourth roguing. If many diseased plants are found after the fourth roguing, it is probably inadvisable to carry on roguing fur-