

STREAK DISEASE IN UBA CANE

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

At the first Sugar Week a year ago I drew your attention to two diseases of cane which threatened to assume great practical importance. The greater stress was then laid upon mosaic disease, since this was a disease well known and fully studied in other countries, so that control measures could be recommended without much difficulty and with a considerable measure of safety. But probably of greater immediate importance was the existence of Streak Disease. At that time however I was not in a position to make definite recommendations on a newly discovered disease.

A year's investigations has cleared up many points in regard to this disease, and I am now able to place before you facts and suggestions with a large measure of assurance of their correctness. It is not my intention however to worry you with a theoretical discussion, but rather to devote my time to important practical considerations. In brief I may summarise my theoretical conclusions as follows.

(1) This is a new disease never previously described from any other country and very probably existing in no other country.

(2) It bears many points of resemblance to Mosaic disease, but is quite distinct from it. It is presumed to be caused by the same type of ultra-microscopic agent.

The symptoms of this disease are well known probably to most of you. The narrow irregular streaks occur over all the leaves of a shoot, including the youngest, which should always receive particular attention. When held up to the light the streaks appear almost transparent (they have been described as "windows") unlike Mosaic disease where the light areas will almost always show some green or yellow colouration. I have specimens on view which may be examined by any who are in doubt.

I must remind you that like mosaic this is an absolutely incurable disease. Setts taken from diseased stools will invariably produce diseased plants. There is no way of ridding a plant of the disease once affected. Soil conditions, manuring, burning will all have their particular effect upon healthy and diseased plants alike but they will never cure a plant of Streak. It is by the planting of diseased setts that the disease is primarily spread.

A second method of spread operates however, the disease passing from a diseased to adjacent

healthy plants. The exact mode of this transfer is not fully understood, but the evidence all indicates that the infection passes through the air and not through the soil; there is good reason to suspect sucking-insects of acting as the carrier. The rapidity of this secondary spread varies very greatly in different localities and at different seasons. Frequently I have seen fields where for months there appears to have been no appreciable spread. On the other hand I have incontestible evidence that under certain circumstances the spread may be wide and rapid. It is difficult to theorise on a matter where the fundamental information is lacking, but one can understand that the irregularity of spread may be due to infrequency of the occurrence of the combination of circumstances (i.e. presence of insect carrier, suitable climatic conditions, etc.) which are necessary for the transfer to take place. Anyhow the existence of this secondary infection is an undoubted fact and one exerting a profound influence upon methods of control.

Before proceeding to a discussion of control measures, I must consider the question of whether the circumstances justify attempts at control. On many sides I am met by the contention that the disease has existed in the country almost as long as anyone can remember; that the diseased condition has never done any harm and is unlikely ever to do any. The first contention is unfortunately only too true, and the result is that the infection is now so widespread in many localities as to make control a problem of immense difficulty. The second point requires a full examination. The conception of a disease which merely lowers the growing efficiency of the plant, without producing any pronounced and obvious symptoms, without causing the death of any part, is a new one probably to many planters. But I contend that this type of disease is the more dangerous in that it is unsuspected. Compared with this the aphid attacks for instance, which have been repeatedly reported this year, alarming as the blackened and dying foliage may appear, are only trivial. For disease of the type to which Streak belongs is steadily year by year taking its percentage from the crop on all types of lands and under all kinds of treatment. And by its very insignificance its spread is allowed to take place widely unrecognised.

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What then is the amount of the percentage loss which this disease is capable of causing? By a series of carefully controlled weighings carried out some time ago in several localities, I arrived at a round figure of 10 per cent, that is, a field entirely diseased will give a yield of cane 10 per cent less than would have been reaped had the field been entirely healthy, i.e. 90 tons where 100 tons might have been reaped. What evidence I have obtained since then has gone only to make me believe that that figure under estimates the truth. Indeed certain of my planter friends who have paid attention to this subject are inclined to laugh at the lowness of my estimate. However, I prefer to retain that conservative figure until the results are available of an experiment which is now in progress at Umbogintwini, thanks to the co-operation of Messrs. Kynoch, Ltd. But a simple inspection of a field which is partially affected shows quite plainly the stunted nature of the affected stools. In particular is this so in a field of young plant cane, where the healthy plants stand up most markedly above the Streaked. In these circumstances it is surprising to me that so few planters had recognised it as a harmful condition before I drew attention to it.

The effect of this disease is not therefore a devastating one, nor is it a menace to the mere continuation of cane growing as many diseases might well be. But already I believe that the position is that the output of sugar is limited by the quantity of cane available and not by the capacity of the existing mills to crush it. And I can see a time not very far ahead, when, if left unchecked, this disease would affect the greater part of the Uba in the country. I cannot believe that the industry can regard with equanimity a reduction of its possible output by even 10 per cent, and it may well be that that figure is well below actual loss. And regarding it from the individual planter's point of view, I must remind you that the extra 10 tons would have cost him nothing beyond the expense of cutting it.

I wish to be quite clear however that you do not misunderstand me in this matter. There is no question, so far as I can see, that the days of Uba are numbered; that the culture of Uba is on the point of collapse. While the balance of evidence at this early stage in the investigation of a new disease supports this view, the danger that an increase in the deteriorating effect on the cane must not be dismissed as an impossibility. I have however no evidence that the effects of Streak are cumulative and it is quite doubtful whether a Streaked plant twenty years hence will be inferior to a Streaked plant growing now under identical conditions. But I do argue that a 10 per cent loss, operative inevitably year after year, good season or bad, is one that the industry cannot face with equanimity.

I hope, then, I have placed the matter before you fairly without exaggerating its importance, without

minimising the dangers. It is for the individual to decide whether 10 per cent is an amount that he can afford to disregard (always remembering that the loss may well be in excess of that figure.) I understand the decision to found an Experiment Station to indicate beyond anything a determination to obtain efficiency in the cane fields. Streak disease is a first and obvious bar to that efficiency.

As I have mentioned, certain members of my audience, who have made careful observations of this disease, fully support my statements in this matter. For those who have not given it consideration I commend an examination of their fields with the disease in mind, particularly of fields young enough to permit of an easy survey. I suggest that those who have had an unaccountably poor return from their fields investigate the extent of Streak infection in them. I think that such an examination will cause surprise in respect not only of the relative poorness of individual affected stools, but of the great extent of the hold which the disease has upon the Uba of the country. On a recent occasion I made some definite suggestions to the Victoria County Planters for control of the disease in that district. Owing to the relatively low proportion of infection there (particularly in the Umhali district) the problem was not of the magnitude which it assumes in many other localities. I am now able to form some judgment upon the effectiveness of those measures, and to make suggestions to you with a certain amount of confidence.

The solution of the problem may be summed up in a few words; plant nothing but healthy cane. But the supply of healthy cane for planting is not a simple matter. There is a certainty of obtaining a healthy crop only when the cane has been cut from a field absolutely free from Streak, and a reasonable distance from any Streaked cane. It is probable that in a few places such cane exists; control measures must be directed towards building up a supply of such cane, i.e., towards the establishment of nursery plots of healthy cane.

In a district which is reasonably free from the disease this presents no very great difficulty. Much subsequent labour and expense will be avoided if the necessary plot can be planted with cane from an absolutely free area, even if this requires to be purchased. Failing that cane must be carefully selected from the least affected field.

If carefully carried out the selection of planting material should serve to eliminate almost all the Streak disease. In an experiment recently started, a quarter of an acre was planted with healthy cane, selected from a field which contained about 5 per cent Streak. The selection was done by my assistant, Mr. Mackay, who separated the diseased from the healthy cane, as it was cut by a boy, who subsequently topped the cane in each pile. This plot is now growing, and there is no single case of Streak

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disease. This selection then must be done with the greatest care, but, however carefully done, there will almost inevitably be some Streak in the young plant cane. I explain that by the probability that, when cut, certain canes will have contracted the disease too recently to show the symptoms, and so escape the most vigilant inspection. The whole of the infected setts must be dug out at once and the spaces filled up with healthy setts. The young cane shoots show the markings plainly from the moment that they unfold and so are readily detected. Delay in "roguing" through the field will certainly add to the subsequent work. After about three weeks a second "roguing" through will be necessary, for in all probability infection will have passed to previously healthy plants from the diseased ones, before they were dug up. This process should be certainly repeated twice more, before it is assumed that the field is cleaned.

Although this roguing process should occupy a boy not more than a day to do two or three acres, it is clearly an expense to the planter. The great importance from planting from an absolutely healthy instead of a very nearly healthy field is obvious. And I believe that it is worth while for the individual to go to this expense in regard to certain nursery fields, in order that he may ensure an absolutely healthy field for future plantings. I read recently that in Java this system is practiced in the hill-nurseries, particularly in regard to mosaic disease, which spreads probably more readily than Streak. It was stated that the owner of a nursery had rogued out 80 per cent of his cane for mosaic disease, preferring to stand this heavy loss than lose his reputation for supplying healthy setts.

No such high percentage is to be contemplated in our case, if the original selection is properly carried out; but I do not wish to hide the fact that some expense is inevitable, and that the roguing process must be carried out thoroughly and ruthlessly. But given a perfectly clean nursery plot, future operations will be much simplified. Care must be taken to discover that infection has not spread into the edges from neighbouring fields, but otherwise the cane from the plot can be planted with full confidence that there will be no disease in the plants from it.

The procedure outlined is in the case of lightly infected areas I believe perfectly feasible, and has been adopted to my knowledge by several planters and by at least one large company. But as regards those areas where the percentage of infected cane is high my limited experience of the disease does not justify me in saying that they will be successful. It would be at least necessary to establish nursery plots in isolated positions away from the infected cane. Furthermore there is the danger that the plantings from the nursery plots, unless in large continuous areas, would soon become infected from the

adjacent old diseased cane. However even so the owner would have the advantage of the extra yield in his plant and early ratoon crops, even though later crops may be reduced by the disease.

One important bearing of this lies in the fact that there are certain estates which do at present maintain nursery plots at points distant from their fields. Such plots should of course be kept absolutely free from Streak. But it is within my knowledge that at least one such plot is to a large extent Streak diseased, so that one of the greatest advantages to be gained from this rather expensive procedure is lost. I commend to the owners of such nurseries the importance of replanting them with absolutely healthy cane.

A factor which will have an important bearing upon future control measures is that of the sources whence healthy seed can be obtained. In this connection I think that I could undertake, if so desired, a system of certification after inspection of fields believed by their owners to be free from Streak disease. This would be a matter for co-operation probably with the Experiment Station. However at the moment I make the suggestion that a classification somewhat as follows might be adopted.

A. 1 Cane from an absolutely clean field in an absolutely clean area.

A. 2 Cane from a field absolutely clean at time of cutting, but one from which diseased cane had been rogued, or one lying within 400 yards of diseased cane.

B. Cane selected from a field having less than 2 per cent of diseased stools.

Thus an A. 1 certificate would practically guarantee the cane to give a perfectly healthy stand. Both A 2 and B would require careful watching, and B. at least would certainly require a small amount of roguing. It is a matter of interest that in certain parts of Queensland a system of this kind is adopted, and its value for controlling several important diseases is fully recognised.

I must at this point deal with the practice of interplanting mealies in young plant cane. Now mealies are certainly susceptible to a type of Streak disease which in all probability is transferable between it and sugar cane. To this maize is very readily susceptible, and I believe that there is a great danger of the disease passing freely from the maize to the cane; and indeed there is some evidence in support of this contention. In my opinion therefore this practice is likely to encourage the spread of Streak disease; and I doubt very much whether on simple agricultural grounds it can be justified.

I fear that my proposals may appear to you to be somewhat formidable. But as I have outlined them they are the minimum which can be hoped to cope with the problem. As regards those areas which are comparatively Streak-free. I believe that they are justified on economic grounds and are likely to keep those districts Streak-free. I am also quite

satisfied that it will pay those estates which keep isolated nursery plots to keep them Streak-free even at considerable expense. But I can hardly expect to convince at once the owners of large areas of Streaked cane that there is justification for the expensive operations which would be required to clear the disease from their fields. But I have placed before you as fairly as is possible at the present stage the loss which this disease entails and the procedure for its control and I recommend this matter for your most careful consideration.

DISCUSSION ON THE PAPER.

Mr. Rapson expressed his appreciation of Mr. Storey's able paper. He was one of those unfortunates who had Streak disease in his cane. During the last year he had taken Mr. Storey's advice and done all he could do eliminate it. He could assure the planters that there was a very great difficulty in front of them before they could eliminate streak disease. Mr. Storey could tell them how much trouble he had gone to to get an "A 1" certificate. He had not got it this year but he was going to get it next year. On every occasion that he had detected streak disease in his plant cane it had started from one end of the sett or the other. In no case had he been able to detect streak disease in the sett of cane having started from the centre.

Mr. Ladlau stated he looked upon Mr. Storey as a most careful and conscientious man, but they all know that he had only been here two years, and that last year had been a very bad one as regards rainfall. They had suffered from a severe drought. He was now carrying out the instructions Mr. Storey had given him. At the same time he had a belief that there was more streak disease noticeable this year on account of the drought. Mr. Storey had told them that he thought perhaps it was spread by an insect. He (the speaker) thought that in a rainy season those insects were drowned and the disease did not spread as much. He had a stool of ratoon cane growing in an antheap. It was quite a big stool of streaky cane, and alongside of it was a stool without any sign of disease. He had been watching those two stools since the cane was cut last October and it had not spread to the next stool. To all appearances both were of the same size and weight. He invited Mr. Storey to come and see the cane as it was very noticeable and he would like to know why it had not spread.

Mr. Storey replied that the question of the spreading of the disease was a very difficult one and he could not answer all the questions put to him. He could not answer Mr. Rapson; as to that observation of his, he could not say whether he could confirm it. It was not a point that had occurred to him. If that observation could stand full critical examina-

tion then it was an exceedingly interesting point and one that he could not explain at present. With regard to Mr. Ladlau's statement, they knew that cases of diseased and healthy stools standing side by side for a long period frequently occurred. Mr. Warner had pointed out to him one particular stool where presumably a healthy and a diseased sett had been planted side by side which had come up with healthy and diseased shoots intermingled. The ratoons from those plants were still coming up half healthy and half diseased. The occurrence of secondary infection was infrequent; under certain circumstances it undoubtedly did take place and was operative to a very great degree, but under other circumstances it undoubtedly did not take place and may not take place for several years. He hoped the past exceptionally dry season may have been exceptionally favourable to the spread of the disease and that the future seasons would be less favourable to it. But that did not affect the fact that on many estates 80 to 90 per cent of the cane had streak disease and the ratoons would grow streak disease and all the plantings. That no season whatever could have any effect upon. He hoped that in future the secondary spread by insect or any other means would be less operative than it had been this season, but the other fact remained and was not affected in any way by seasons.

Mr. Staniland remarked that they knew broken branches frequently brought disease to trees; so in regard to Mr. Rapson's statement he asked if it was not possible for the disease to have entered through the jagged ends of the cane. If so, he suggested that experiments be made by sealing the ends of various pieces of cane before being placed in the ground to see what effect it would have. By that means it may be possible to control the disease.

Mr. Storey stated that he had a good deal of evidence against the idea that it passed in through the cut end of the sett. He had quoted the case of an experimental plot which had come up entirely healthy. That plot was comparing healthy and diseased cane. All that cane had been cut with the same knife yet the selected healthy plants had not produced a single case of streak disease. There was a good deal of other evidence also. A certain plot of newly introduced canes had been under his observation for a year with monthly inspections. Streak disease began to appear in those canes after about six months. The cane had been cut with knives which were dipped in disinfectant between each cutting. They were clean for six months and then started to produce streak disease. They were still occasionally producing streak disease. The ground in which they were planted was virgin land which had not been under cane before. He thought they were up against a great deal of similar evidence.

Mr. Johnson asked if all the variations of the leaf which came about through drought could be termed

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streak disease. In Zululand during the last three years they had certainly had a great deal of drought. They had seen this streak in the leaf for some years but when they had a good season and a vigorous growth the streak practically disappeared. He had watched this for years and had had no conception that it was considered as a disease. He had looked upon it as an impoverished plant which could not get the necessary rainfall to bring forth the vigorous growth that was to be expected in a cane field.

Mr. Storey replied that there were many marks on cane leaves but there was only one type classed as streak disease. Those were the ones which no seasonal change affected. Throughout the two years he had been here he had kept certain plants under observation and there had been no change, and he thought there was ample confirmation from other planters that no change of soil or season affected the particular streaks to which he referred. Of course there were many other marks which simulate streak disease very closely.

NATIVE LABOUR SUPPLY AND SOME FACTORS ON WHICH ITS EFFICIENCY DEPENDS

(Paper by Dr. G. A. PARK - ROSS, Durban.)

Before proceeding to the subject matter of this address I wish to explain what I mean by labour efficiency.

I intend with one reservation to adopt the standpoint, of most of you, and to define the term "efficiency" applied to native labour as the set of conditions which gets work properly done at the lowest cost.

Costs must include not only wages, but all expenses for recruiting or otherwise procuring labour, for housing it, feeding it, supervising it, and caring for its health, and lastly it must embrace losses due to days not worked whether on account of sickness, disputes, or any other cause which can be classed as avoidable.

Within limits you can regard your labourer as a machine, costing so much, producing so much, but here my reservation comes in, you are not to reckon on depreciating him, that is discharging him from your service in a physical condition poorer than when he came to you.

Nothing has done more to prejudice the sugar industry in the recruiting areas than the spectacle of men returning broken down in health by work they should never have been allowed to undertake. I do not for one moment suggest that any of you in the industry at the present time ask any of your employes to do more work than a healthy man could easily do, but I invite you to consider what is the physical condition of some of the labourers you do employ, and are the conditions at your Estates those best suited to keep the healthy man in the pink of condition, and to prevent the weakling breaking down.

Your cane is your main source of revenue, your labour is by far your heaviest expense.

You exercise the utmost care in the selection and cultivation of your cane; have you ever considered if it would not be equally advantageous to give the same attention to the selection and care of your labour?

I suggest that many of you have never given anything like the same amount of thought to ways and means of effecting labour economies as you have given to the selection of manures for your farms, or even oil for your machinery.

Leaving the Indian out of the picture, you depend for your labour on two main classes, the local boy, usually a Zulu, and the recruited Native who comes on contract.

Of the two the local Zulu is physically an efficient man, and when he chooses can give the better day's work. He is used to local conditions, he has a fair vitamin reserve against scurvy, and as a result he stands unscientific feeding and bad housing for months without breaking down. He does not worry you much by turning ill on your hands. As soon as he feels unwell he departs for home. He works for no one if his home crops are good, and the hut tax not too pressing, and if his home is near your estate he absents himself to attend marriages, beer drinks, and faction fights, irrespective of any loss his absence may cause you.

These are some of the points for and against the local man. Most of you are driven to employ con-