NECESSITY FOR INTENSIVE STUDY OF SUGAR INSECTS IN SOUTH AFRICA

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Dr. L. B. RIPLEY addressed the Congress on the above subject, as follows:—

At first, some weeks ago, when I was invited to address you I declined on the ground that I knew nothing about sugar growing at all and secondly, although an entomologist, I had never worked personally on the insect pests of sugar. I prefer always to speak on the results of my own research work, and I am naturally diffident about passing on second-hand information about things I do not know too much about. A few weeks ago, however, I had occasion to visit Gledhow to investigate an insect outbreak. While there I devoted more thought to the question of sugar pests, and the more I thought about it the more convinced I became that you really required a thorough entomological investigation of the sugar pests. I always understood a sort of apathy prevailed on this question, the general idea being that the pests were not bad enough for anyone to worry about very much. I came away wholly convinced that this attitude was not justified, and that an investigation was thoroughly necessary. The question must be raised at the outset as to just how much damage you suffer from insect pests. What do you lose per acre per year in sugar owing to the insect population in cane? No one can answer that question until a thorough investigation of the subject has been made. For the purpose of this discussion it is convenient to consider your insect pests under two heads; firstly those that are unseen and inconspicuous, and secondly those that are conspicuous and well known, such as your catterpillar and beetle outbreaks. Turning your attention first to these unseen and unrealised pests, the chances are that much more damage is done by such things than you at present realise. I come to this conclusion by consideration of what has been done in other countries. Before a proper study with wheat was made in America the wheat grower did not know what he was losing. In the case of wattles one of the most serious pests is eelworm, which works under the ground. Several experts and more enlightened growers have recently come to suspect that eelworm may be causing more damage than all the rest put together. In your case you count on getting a certain yield from a certain acreage; as long as you get it you don't worry. If you had a thorough study of all the insect pests of sugar, heavy losses may be revealed in sugar comparable with those caused by codlin moth in the apple industry in England, before the amount of this loss was demonstrated. Until the study is made no one knows what the damage is.

As regards the things that you know about, you have attacking sugar two or three species of leaf-eating caterpillar, at least two species of borer, some sucking insects, e.g., aphids, a leaf roller and binder, which has recently caused concern at Gledhow Estates, and certain beetles. There are various such things that you know about because they are conspicuous; these pests, generally speaking, are kept down by their natural enemies. All such insects have quite a variety of natural enemies. There are insect parasites and certain diseases attacking them. No one has worked on the diseases of your sugar cane insects. I had occasion once to make a special study of the natural enemies of the cutworm. I discovered eleven kinds of disease and about twenty species of insect parasites. These diseases are favoured by wet weather and the insect enemies are favoured by dry weather. When you consider that each of these parasites has its own parasites, secondary parasites and tertiary parasites also—you have an insect population which is interdependent and any effect of climate on one will affect the whole lot indirectly. We may eventually be able to predict these outbreaks and tell you by study of seasonal conditions when you are going to get an insect outbreak. At present we cannot do that for sugar. It has been done for certain other crops. The main point is that your principal insect pests are nothing to worry about generally speaking because under normal conditions their natural enemies keep them well in hand. As long as the present environment remains you have nothing particularly to worry about, but when that environment is altered, for instance by introduction of new canes, then the whole situation becomes altered. So much for the pests that occur now.

The thing we must consider primarily is the question of pests of the future. What chance is there of South Africa suffering seriously from insect pests in the years to come? There are two possible ways of serious insect damage in the future. One way is by the importation of a foreign insect pest. The other way, which is not very well realised perhaps, is by some of our native insects attacking cane. Some of the minor native pests may become serious. Certain insects which occur now in sporadic outbreaks, like borers, caterpillar, and leaf binders, may instead of remaining sporadic, in the course of time become annual pests, which would attack the cane seriously every year. We have numerous examples in the history of entomology where both these things have occurred.

Suppose we consider first the question of importation. There seems to be a general idea prevalent that the only way a sugar cane pest can come in is by the importation of cane for experimental purposes. I consider that idea erroneous; in fact the danger of importing pests in your canes is not as

great in my opinion as importing them accidentally just through the channels of ordinary commerce. A lot of insects can stow away on a big boat by accident or design. They are not necessarily associated with any particular type of cargo; they may just come. On the coasts of England they have frequently collected tropical butterflies which have come to England for the one summer only being brought in accidentally by general shipping. It seems to me it will be only a matter of time before some sugar insect is accidentally imported into South Africa. We have in the world generally about 280 species of insects which are reported as serious pests of sugar. Most of those do not occur in this country now, but only a few of them. Of the whole 280 some are much more likely to be imported than others, and about 25 have been listed as particularly liable to be transhipped from one country to another in the course of ordinary shipping. We have been fortunate in the past but that does not guarantee that we are going to be equally fortunate in the future. In spite of all reasonable precautions which the Government is taking at present, in the course of time you are pretty sure to get certain pests brought into the country. Whether or not they take to the country and thrive is another question, but the chances are that the great majority of them would thrive in South Africa; in fact many insects not known as pests in their native country may become serious pests when imported into another country. We have for example the Eucalyptus snout beetle, that is not known as a pest in Australia. Any imported insect, even though it may not be a pest in its country of origin, unless its parasites are imported with it, is likely to get away and become serious. The chance of importing such a pest with your canes is very small. Those canes are fumigated at the port of export and again here, and are put in quarantine. Mr. Dodds told me that a certain mealie bug from Barbadoes reached this port alive a little while ago, but of course he did not get free. It is more probable that a cane pest will come in through the ordinary shipping without coming through the channel for importation of cane. You have read about the importation of the Mediterranean fruit fly into America; it has cost them millions of dollars to eradicate it. Perhaps you don't realise that the Mediterranean fruit fly has been intercepted at ports in California nearly a hundred times, but it did eventually get into Florida. There where they have one of the most rigid inspection organisations in the world a pest did get in, and it cost them a good many millions to get rid of it. So although everything humanly possible may be done a pest is certain to get in sooner or later. They had entomologists on the job and found the thing after it had been in Florida two to three months; if it had been much longer I don't think they would ever have got rid of it. It was only because they had an entomologist on the job that it was found soon after its importation and it was therefore possible to eradicate it. What happens if you get a sugar pest in South Africa? You have no sugar entomologist in South Africa. The chances are it would be in the country a year or two before anyone knew about it. If someone happened to see it and sent it for determination we might intercept it, but the probability of that is remote. The chances are any insect pest getting in would be here a long time before being found out and would have become established. This is one reason for having an entomologist on the job; to look out for these things.

Now let us consider the more important point of developing native insects into pests. By changing the environment on a large scale you are pretty certain to upset the present order of things and stir up a sort of revolution among the insect population, and who will come out on top no one can tell. I understand you are considering putting in P.O.J. and other canes in place of Uba. Mr. Pearce informs me that if you really set about it and mean to do it, it would take only three or four years to replace the Uba. Wherever you change the variety of plant over a wide area suddenly you are almost certain to alter the insect population to a very marked extent. You are familiar with the idea that a slight change in variety makes a big difference often in the susceptibility of a plant to some disease or insect. You know all about streak resistant and mosaic resistant canes and so on. You have heard also about insect resistant varieties, jassid resistant cotton, for instance, and many others. Now why are some varieties resistant to insect attack? This question cannot be thoroughly answered because we do not know completely, but there are two main factors. Firstly there is the mechanical one. One variety may be resistant simply because of some mechanical condition. When the late Mr. Claude Fuller investigated your leaf binder in cane he found it attacked only Uba and no other canes, and this he concluded was due to mechanical reasons only. The Uba rolled up easily and furnished suitable protection for the larvae, and the others did not. Soft canes favour borers. Certain varieties of wheat resist Hessian fly because of their hardness. In America we had a certain walnut resistant to bugs, because there happened to be a small spine at the point where the insect normally laid its eggs. Now when you alter your canes and put in others you not only alter your mechanical factors but the chemical factors. For example at Cedara we have a row of seedling apples so close that the branches interlace and in the case of some varieties the branches are covered with wooly aphis but in others there is no aphis. The immunity is due to some subtle chemical factor. When you put in a new cane you alter the smell, the taste, and the feeding value. Some insects thrive more on some varieties than others. The new canes may upset the nutritive factors. There are still other factors—climatic factors are upset. If you grow a broad leaf in place of a narrow leaf plant you alter the humidity,

temperature and light conditions in the field. Every insect has a certain optimum temperature; if you alter the temperature the insect is affected; and in some cases it may die out or be detrimentally affected; in others it may develop much more. You not only affect the pest itself by all these factors, but the parasites as well.

Now you can understand what I mean when I say that by the introduction of new varieties of cane suddenly over large areas you are likely to stir up a revolution in the insect population. It may be in our favour or it may be very much against us. The main point is that the situation requires very careful watching and I think your danger of suffering from insect pests in the future is far greater from this sort of thing than from the importation of foreign insects. That is the point that needs to be watched particularly.

I would like to mention briefly some of the methods that might be taken to combat any insect outbreak. Considerable research has been made lately on the application of poison dust over wide areas. They are dusting poison in Europe by aeroplanes. We have a greatly improved apparatus for applying dust from the ground. Some of the dusts are very economical and can be used over small acreages at low cost. The Germans are very much in the fore in devoloping this sort of apparatus just now. They are using it for dusting forest insects at a cost of something like 10/- an acre. I mention this point so that you will see that there are possibilities of combating serious outbreaks by such means. But I think the main methods of combating sugar insects will be cultural. Every cultural operation in cane has some effect on cane insects one way or the other. The effect may not be obvious but it is there. For instance for bagworm control we recommend five or six different cultural practices that will keep bagworm down. If I were to tell you what those things were you would not see in a single case how they could affect the bagworm. The point is that the effect of the agricultural practice is not obvious. When you have an entomologist, as I hope you will, studying this point he will probably be able to find out quite a number of cultural practices that could be employed to reduce insect damage.

In closing, the one point I want to impress upon you particularly is that the Sugar Industry of this country really does require entomological assistance, and that your very excellent Experiment Station cannot be considered completely staffed until you have your Entomologist there. He should make a study of all the insects found on cane; he should watch out for imported insects. There should be a collection at Mount Edgecombe of all the sugar insects of the world, and all the sugar insect literature in the world. He should also make a study of the effect of the introduction of these new canes, and the effect of cultural practices on the insect population.

Prevention is much cheaper than cure in such cases.

CHAIRMAN: Dr. Ripley has given us an address which should cause us to think a great deal. He has pointed out a very big danger. I would like to ask one question to start the discussion. What methods are or can be employed to control or check the importation of insects? Evidently something is done in other countries. California keeps a sharp look-out for these things and turns them back as "undesirable immigrants" and it would be interesting to hear what measures could be taken.

Dr. RIPLEY: It is merely a matter of inspection systems at ports. You have Mr. Kent in this area and Mr. McClean, both of whom can give you more details than I can.

Mr. KENT: The system we work under in Durban is as near perfection as can be arranged for the inspection of cane coming in. There is a very close working arrangement between the Sugar Association and the Department of Agriculture. We do not admit any canes unless at the request of your officials. The canes come in generally by post. They are unpacked in the laboratory and then fumigated and inspected very closely, and Mr. McClean takes them under his charge and they are disinfected. They are also looked over again and are then grown in your quarantine greenhouse, and frequently inspected by myself and Mr. McClean. After that they are issued out to the open quarantine station and they are still watched there. On top of that we have Mr. Dodds with a general watchful eye and other officials also, so I don't think you need worry so far as actual imported insects on cane itself are concerned. The points you have to watch are the stowaways. There are so many lines imported commercially in which you would never think of looking for insect infection which may become potential enemies to sugar cane agriculture.

Mr. O. J. JOHNSON: In listening to Dr. Ripley I have had cold shivers down my back! (Laughter.) If these pests come along as Dr. Ripley suggests it is a bad job for all of us. I have another grouse, and that is, I believe Dr. Ripley is engaged at the Cedara Station. I believe the Government are financing that station. He has been telling us how he has been discovering certain insects in wattles and apples trees, and that is all paid for by the Government. My grouse is that the Government is doing very little to give us any assistance to find out these pests. I maintain it is up to the Government to assist us as they do the wattle growers. We have our Excise to pay on sugar and are work-

ing for the benefit of the country as well as ourselves, yet the Government have neglected us. They should provide a man to protect us from these pests.

Mr. ASKEW: The Wattle Industry does not pay any excise whereas we pay £1 a ton. Therefore we are doubly entitled to Government assistance.

Dr. RIPLEY: The Wattle Industry has no entomologist; they have been howling for one for five years. We hope they will get one soon.

Mr. DODDS: I need hardly say how much I welcome Dr. Ripley's excellent address (hear hear). I was very sorry when he first of all stated that he could not see his way to come and speak to us, and when he happened to pay a visit to the Experiment Station a few Sundays later I was very glad of the opportunity to tell him to come down here and make some of these people's flesh creep, because I thought it would do them good! Ever since Mr. Van der Merwe who was then Government Entomologist, was transferred from Durban, I have felt that we have been in a very dangerous position having nobody on the spot who could come to our assistance sufficiently rapidly in case of an emergency of the kind Dr. Ripley has mentioned. I am very glad therefore to have had Dr. Ripley express to you far more eloquently than I could the need for an officer of this nature. I hope the Industry will take it to heart. As he says, at present none of the insects that we have infesting the cane, do very obvious destructive damage, and those of you who are only accustomed to the Industry in this country can hardly realise the very serious dangers that do exist. But those who have seen for example the outbreak of borer in Louisiana a few years ago, as I did and your Chairman did, can realise what damage an insect pest can do to a sugar industry.

CHAIRMAN: In that connection I would like to bear out what Mr. Dodds has said about the possibility of extensive damage. I saw that infestation of borers which he speaks of, and it was not a case of an occasional stick here and there infested with borer, but you could take any stick from any pile, split it down the middle and see half a dozen of these things. At one time it got so bad you could not pick up a stick of cane without finding it riddled with insects. Some of it was like a sponge. I can give figures of the actual tests of that cane; it was running with an average of 8% sucrose and average juice purity of 67. There were other causes possibly but the insect infestation had a very great deal to do with it. I mention that to you as an example of what a really first class epidemic of insects can do to cane. These things that Dr. Ripley has pointed out are not things that might happen one day and cause a little bit of trouble, but they might come and if not met at once will bring real disaster.

Mr. DODDS: I would like to add to your figures for that season in Louisiana and remark that the output of sugar fell off from over 300,000 tons to a little more than 40,000 tons in that year.

Mr. BECHARD: I would like to ask Dr. Ripley what he thinks of the chances of natural control of *Aphis maidis*.

Dr. RIPLEY: The possibility of control there rests with getting Mosaic resistant cane. By that means control is practically assured.

Mr. DODDS: There is one point we have noticed with the introduction of the new canes at the Experiment Station. We find that they are far more widely attacked by white ants than is Uba cane. I would like to ask Dr. Ripley whether he thinks there is any serious danger of white ants becoming an active pest in the soft canes.

Dr. RIPLEY: So far as I know we have no definite information on that point. That is one of the things that ought to be investigated. There are no data so far as I am aware indicating that soft canes suffer more from termite attack than the Uba. However, it may be so.