

SUGARCANE QUARANTINE IN SOUTH AFRICA

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Introduction

In nature plants are normally in a state of equilibrium with disease organisms and insects in any particular environment. This does not necessarily apply to cultivated plants to the same degree as it does to plants in their wild state.

This state of affairs has arisen by the elimination of the more susceptible and intolerant hosts with the survivors being usually highly resistant or tolerant.

The development of the various countries by man, and in many cases the artificial nature of crop cultivation, has upset this equilibrium. More susceptible types of crops have been produced, and with the interchange of plant material from country to country, diseases have been unwittingly disseminated at the same time and hence introduced into continents or countries where they were unknown before. Many of the most disastrous outbreaks of plant disease have been due to the introduction of a plant parasite from some other part of the world.

The ease and speed with which plant material can nowadays be transported from country to country has resulted in a greatly increased movement of material of this nature. At the same time, the need for some form of control to prevent the introduction of diseases and pests has arisen. This has taken the form of quarantine measures, which have served to check the spread of some of the worst threats to the various cultivated crops of the world.

The Application of Quarantine Measures to the Natal Sugar Industry

In Natal there are two facets to the question of sugarcane quarantine. Firstly, there is that system which comes into force when sugarcane varieties are introduced from overseas countries and is the main subject of this paper. This system of quarantine is aimed directly at the prevention of the introduction of exotic diseases and pests into Natal.

The second type of quarantine concerns the testing of new varieties by the staff of the Experiment Station. The measures applied here are indirectly associated with diseases and pests and will be briefly described and explained.

1. The Importation of Sugarcane Varieties and the Associated Quarantine Measures

The earliest introductions of sugarcane varieties into Natal were mainly as a result of private enterprise when the canes were chosen on the basis of their reputation and appearance in other countries. Such importations were not controlled in any way,

and no doubt resulted in the introduction of many of our present-day diseases of sugarcane. One example of this was the destruction of China cane by smut disease.

The quarantining of sugarcane commenced in 1925 with the erection of a glasshouse for this purpose in the Botanical Gardens in Durban. This glasshouse was presented to the Sugar Association by Mr. David Fowler, who very wisely foresaw it as a means of checking the introduction of sugarcane diseases from other countries. The glasshouse was designed by Dr. H. H. Storey who was at the time the Government Mycologist.

Subsequently, however, it was realised that new varieties could be raised from seed and that the importation of varieties need not be confined to those intended for commercial use. Thus it came about that varieties were introduced which were required for use as parents in our breeding programme as well as possible commercial varieties.

The glasshouse is still in use as a quarantine station for imported sugarcanes although a number of changes in procedure have taken place in recent years. The house is divided into 3 cubicles, each with a separate entrance by way of double doors. There is one small cubicle in which the canes are planted on arrival. At subsequent stages the canes are planted in the other 2 compartments which are appreciably larger than the first.

Before proceeding with a description of the quarantine procedure, mention must be made of the system of certificates of health as applied to the importation of sugarcane varieties. Before sugarcanes can be imported into this country, permission must be obtained from the Government to do so, and the supplying country must send with the consignment of sugarcane a certificate stating that to the best of their knowledge the canes are free of disease.

On arrival in Durban, the cuttings are received by an official of the Division of Plant Control and Quarantine who then proceeds to fumigate the sugarcane together with all the wrappings. This fumigation is done by means of cyanide gas in a chamber at the Botanical Gardens. The wrappings are subsequently destroyed.

After fumigation the cuttings are soaked in a fungicide solution for a period of 15 minutes. They are then planted in sterilised soil in drums in the first cubicle of the glasshouse.

These varieties are inspected regularly by the staff of the pathology department of the Experiment

Station, and the whole glasshouse is sprayed with insecticide during every inspection visit. Should any of the varieties show symptoms of disease at this stage, or any subsequent stage for that matter, the affected plants are destroyed immediately. If the disease is one that has not as yet been recorded in South Africa, then the procedure would most likely involve the destruction of all plant material in the particular cubicle. If the disease is one known to us, then possibly only the affected cane will be destroyed. In the latter case, however, the remaining varieties of the particular consignment would be even more closely observed for symptoms of disease.

After a variety has shown continued healthy and vigorous growth in the first cubicle, setts are cut from it and replanted in a drum of sterilised soil in the second cubicle of the glasshouse. This newly planted cane is kept under strict observation, and when it shows signs of developing properly, the ratoon cane, i.e. the original overseas material, is destroyed. Thus we have the system whereby the original imported cane never leaves the precincts of the glasshouse.

The procedure of observation in the newly planted cane is carried on, until such time as enough growth has taken place to allow further replanting. This replanting is done subject to a clear bill of health being given and introduces a further stage in the quarantine procedure.

The second replanting is carried out at the Experiment Station under conditions known as open quarantine.

In the past, canes removed from the quarantine glasshouse have been planted in short lines in the field, but now the material is planted in 2 drums, the setts for one of which are treated with hot water as a precaution against ratoon stunting disease. The untreated cane planted in the second drum acts as a reserve in the event of the death of the other setts as a result of heat treatment, and is destroyed when the treated cane develops satisfactorily, as is the remaining cane of that particular variety in the quarantine glasshouse.

The canes are kept under strict observation during the first few months of their life at the Experiment Station, and eventually become included in the collection of varieties. All imported varieties, apart from those used purely for breeding purposes, are tried in single lines and any promising ones are selected for further trials.

Thus it will be seen that the quarantine procedure as applied to the importation of varieties is carried out very thoroughly—the whole process from introduction to removal to Mount Edgecombe takes about 2 years. The result of this has been that to the best of our knowledge, no disease has escaped our notice

during the 30 odd years of the existence of the quarantine facilities.

A new phase in the history of sugarcane quarantine was entered into during 1958, with the beginning of more active participation in the procedure by the Division of Plant Control and Quarantine. Previously this division, as represented by the Officer-in-Charge of the Natal region, was required to be present at the various operations connected with the passage of varieties through the stages of quarantine in the glasshouse.

The Division of Plant Control and Quarantine decided in 1958 to remove the first stage of sugarcane quarantine station at Stellenbosch. This was an administrative move, being part of a scheme to centralise the quarantine activities of the Division. The imported material will be held at Stellenbosch for as long as is deemed necessary, and then sent to Durban for a further period of quarantine. The length of time will probably be about 12 months in each case. While in quarantine in Stellenbosch the cane will be inspected from time to time by members of the Experiment Station staff.

In the opinion of several sugarcane pathologists, the carrying out of quarantine procedure under glass is too artificial, in view of the fact that the symptoms of certain diseases might be masked by the somewhat unnatural conditions. Furthermore, sugarcane is a plant which is very susceptible to leaf conditions other than those due to diseases, and under glasshouse conditions these are very often amplified, so that varieties may quite easily be unjustifiably destroyed on account of suspicious leaf spots or stripes observed by untrained personnel. For these reasons, pathologists would prefer to see a more lengthy open quarantine stage, in an area sufficiently far removed from cane so as to constitute no threat in the way of introduced diseases. In this connection, the procedure envisaged in Natal is that of primary quarantine in the glasshouse, with subsequent stages, i.e. from the first replanting onwards in open quarantine in an area isolated from commercial cane fields. Unfortunately, the land necessary for the latter stage would be very difficult to find nowadays, so that the procedure will probably remain very much the same as it is to-day.

2. Quarantine Measures as Applied to Variety Testing

As is the case in some other sugarcane growing countries of the world, the varieties available to planters for commercial planting are gazetted by Government, and the cultivation of varieties other than those on the approved list render the grower liable to prosecution. If there were no such control over the cultivation of sugarcane varieties, the resultant indiscriminate planting would no doubt lead to numerous problems, not the least of which

would be a deterioration in the overall disease position of the industry. In other words the varieties would not be sufficiently tested, and their capabilities would be relatively unknown.

We have therefore the position in Natal, in which the South African Sugar Association as represented by the Experiment Station is the only body which imports sugarcane varieties from overseas. Furthermore, the Experiment Station is the only body which plants varieties, not included in the approved list, for testing purposes. Such plantings, albeit by the Experiment Station, are controlled by the issue of quarantine permits by the Division of Plant Control and Quarantine, and allow us to experiment with unreleased varieties on private farms, as well as on land owned by the Sugar Association. The latter applies to the 3 farms at Mount Edgecombe, Chaka's Kraal and Mtunzini which are covered by individual permits.

It has long been the policy of the Experiment Station to test promising varieties in various climatic and soil type areas of the industry. At the present time this involves the laying down of experiments on private planters' land and therefore requires the necessary quarantine permit to allow the cultivation of unreleased varieties.

These trials include the ordinary variety trials, where yields and sucrose are tested, as well as the disease trials, such as those dealing with gumming disease and red rot disease.

When the experimental work on these quarantine trials has been completed, the permit is duly cancelled and the test varieties are finally removed.

Summary

The quarantine procedure as applied to sugarcane in Natal is described with the view to acquainting those connected with sugarcane agriculture with one aspect of the work of the Experiment Station which is perhaps not so well known.

It will be realised that the quarantine procedures fulfill a very important role in protecting the industry from the ravages of some of the most serious diseases present in other countries. Among these can be included Fiji disease and leaf scald disease.

Experiment Station,
S.A. Sugar Association,
Mount Edgecombe.

Mr. du Toit (in the chair) said that Mr. Thomson had stated that during the past thirty years no disease of any importance had been introduced into the country. He wanted to know if ratoon stunting disease had been introduced or had appeared suddenly without anyone knowing where it had come from.

He also wanted to know how soil was sterilised for use in the greenhouse and why the wrappings from cane on their arrival in Durban were first sterilised and then destroyed.

Mr. Thomson said that as far as ratoon stunting disease was concerned, this disease was widely spread throughout Natal and the Experiment Station had come to the conclusion that it was not a new introduction but had been here for many years. To the best of their knowledge, it had not come in during quarantine years. The soil was sterilised at the Experiment Station by steam. Destruction of the wrappings was a routine procedure and it was not done by the Experiment Station, but by the Government Officials.

Mr. Halse said that as soon as his office was notified that the Experiment Station was ready to plant introduced canes, the parcels were taken to the fumigation chamber at the Botanical Gardens and everything was fumigated. The cane was then taken out and checked and the wrappings were then destroyed. Cuttings were then treated with Aretan or other suitable fungicide and planted by one of the Experiment Station staff when one of his own officials was present. He thought that over the past thirty years no cane disease had left the quarantine greenhouse. If any sign of any disease was present then the cane was immediately destroyed in the greenhouse. No disease could ever leave the quarantine station.

Dr. Dick stated that it was now considered probable that gumming disease had been present in Natal long before the symptoms in N.Co.310 became obvious. It might have remained concealed in varieties such as Uba and Co.281 in which obvious symptoms are not so readily produced.

Mr. A. C. Barnes thought that the procedure which would be safest would be to introduce new canes from stations which already had them in quarantine and could certify with confidence and safety that these canes were indeed free from pests and disease. This would not apply in the case of several expeditions which were sent from Australia to New Guinea and the special quarantine measures mentioned would have to be applied in cases such as this. Mr. Thomson's paper did not touch upon the plant quarantine procedure which is essential to the safety of general agriculture in any country, particularly in South Africa, which had for some time been dependent upon the introduction of new varieties from other countries. Plants related to sugarcane could very well introduce pests which might attack the sugarcane itself.

Mr. Thomson said that a system whereby canes for export were first passed through a quarantine station would provide an additional safety factor. However, the system of health certificates from the supplying

country and the post-entry quarantine measures applied by the importers should provide the necessary control.

Mr. Barnes asked if the introduction of all plant material would come through only one point, i.e. Cape Town.

Mr. Halse pointed out that plants came through all ports, including airports. There was a Plant Control Officer at each port and no plant could come into the country without a plant control permit. In nearly all cases, plants had to have a health certificate attached to them. Any plant arriving without a permit was seized by the customs officer and if there was no health certificate attached to that plant, it was destroyed immediately. If the plant was accompanied by a health certificate it was held at Botanic Gardens until a permit was issued. He mentioned the case with tomatoes, seeds of which were introduced into the Union under certain conditions. A certificate had to be submitted from the Department of Agriculture of Country of Origin, stating that the seed was produced by plants officially inspected in the field and found free from Bacterial Canker of Tomato (*Aplanobacter michiganense*) or that this seed was produced in an area where this disease is not known to occur. The Phytosanitary Plant Certificate must be dated for the current year.

Mr. Barnes said that what he had in mind was the importation of plants channelled through one point.

Mr. Dodds said that Mr. Thomson mentioned the destruction of China cane by smut disease. He wanted to know whether the identity of this variety called China cane had been confirmed. He was present at the opening of the glasshouse in 1923 and he recalled that it was a very enthusiastic and well attended event, although certain planters at that time objected to the proposal of replacing Uba cane. Dr. Dodds thought that it was rather a wonderful record that over the past thirty years that no known disease had slipped through the quarantine system. Furthermore, with all the varieties of which specimens have been exported from this country to other countries there had been no reported case of any disease having been definitely apparent. He recalled that some years ago when some Australian varieties were exported from here to East Africa, there were vague symptoms of ratoon stunting disease. On a subsequent visit he examined these same canes and there were no similar symptoms whatsoever. In another case the cane had died before being planted in an overseas country and it had been attacked by scavenger insects, but they were able to convince the recipients eventually that these insects had not been imported from this country.

Mr. Coignet asked what measures were taken to safeguard against the introduction of disease from Swaziland and Portuguese East Africa.

Mr. Thomson said that there was a scheme in hand whereby Swaziland would be included in our quarantine service and all varieties would come through us. In Portuguese East Africa it was rather a different proposition but they claimed to be able to control this for themselves. He hoped that Portuguese East Africa and Swaziland would come into our system of control. As far as canes coming down from them to us was concerned, we thought that we were reasonably safe.

Mr. Halse pointed out that all importations from Swaziland and Portuguese East Africa came under the Government Department as well.

Mr. W. Hempson said that planters in the Eastern Transvaal had enquired if it was possible to get cane from here.

Mr. du Toit wondered if it was unlikely that in the case of ratoon stunting disease it had not passed through our quarantine service. He wondered if they could be sure that no disease had come through during the past thirty-three years. In the Industry, gummosis was largely confined to N:Co.310, which had in recent years been distributed throughout the Industry. The fact that the disease was now widespread does not prove that it had been present for such a long time. He said that some other diseases had been discovered fairly recently and he could not tell if they had been in the country all the time, or whether they had been introduced. If it was true that no disease had come through since the quarantine regulations had been introduced, why then was it necessary to increase these regulations? He thought that gummosis had been discovered by accident. At one time the Experiment Station had been interested in leaf variegation, and he had had a sample submitted to him and was told by the supplier that these had had stripes, which had later disappeared. Some months later the supplier said that he had a whole field of such cane. He related that Mr. King and himself went and had a look at this field and it was not leaf variegation but obviously there was something drastically wrong with that field. Samples were taken and Mr. King identified the disease as being gummosis. We know that symptoms disappear, but may come out more pronounced under certain conditions. Would such a disease show up as well in a glasshouse? Would it even be identified by the authorities? He was not sure that we could be certain that we had not given out diseases to other countries. As far as ratoon stunting disease in South Africa was concerned, it was first discovered in Australia in cane sent from here. The fact that the symptoms apparently appeared and then disappeared in East Africa did not mean that the cane was free from the disease.

Mr. Thomson said that apparently symptoms of ratoon stunting disease had been found in some canes

we sent to Australia. We have a system of health certificates stating that as far as the suppliers knew and to the best of their knowledge, the cane was free from disease. In-coming cane specimens were placed in the glasshouse for a period of two years and checked every fortnight, grown through two or three generations, and then sent out into open quarantine experiment stations. The slightest departure from normal noticed, whether it be a spot or a stripe or the stunting of the cane, caused the health of the plant to be questioned immediately. He was convinced that if gumming had been introduced some symptoms would have appeared during this period of quarantine. He was convinced that gummosis had been in existence on wild grasses and other varieties for many years.

Dr. Dodds said that as far as ratoon stunting disease was concerned, the symptoms were very uncertain, and internal discolouration of the nodes could arise from various causes. He pointed out that not all the canes introduced into this country had gone through the quarantine station and that some had been brought in illegally, so that it was possible that this disease had been introduced in this way. Also in the early days cane was introduced from the island of Mauritius in quantity without precautions so it is possible that ratoon stunting and other diseases had been introduced in this way.

Mr. King said that up to now only the quarantine of cane setts had been mentioned and he wanted to know if there was any question of seeds and fuzz being placed under quarantine. He thought that it was possible that gummosis came through the importation of fuzz. He said that when he was at the Experiment Station some of these seeds were actually disinfected and planted on agar solution, and they certainly attained a very good growth of various diseases. He said that at the present time our own fuzz was being produced in this country, but any importation should be carefully watched.

Mr. Thomson said that no disease was carried in the seed itself, but from the fuzz you could get fungus and bacterial disease. If there was any chance of any further fuzz coming into the country, the necessary precautions in the form of surface sterilisation of the fuzz would have to be carried out.

Dr. Drett said that with regard to the introduction of gummosis, this disease was present in the early days in Mauritius and one would naturally expect that some of the early bulk importations from that country might have been responsible for the introduction of the disease here. In the early records there was mention of gummy matter in canes after they had been harvested in Natal, and it was very probable therefore that gummosis had been introduced many years before the quarantine glasshouse was established.

Mr. K. Alexander thought that it was a pity that the Government had seen fit to centralise the quarantining of all types of plants at the Cape. Sub-tropical plants such as sugarcane were consequently being tested out of their normal habitat, and he considered that sugarcane could be better tested in Durban where the Experiment Station staff could have ready access to the specimens.

Dr. Dick said that there was a large boundary to the north where there could be no adequate control and disease could be brought in through small patches of cane grown in these northern areas.

Mr. Halse reported that many years ago he and Dr. Maclean went up to the northern districts and found that there were many patches of diseased cane and should those areas ever be opened up to cane growing, such as the Makatini flats, all cane in those areas would have to be eliminated. He said that in the past in various native reserves, patches of unauthorised cane had been dug out but it was not possible to stop all importations from the wide open frontiers to the north. However, if the cane was grown commercially in those areas then existing cane fields there would have to be destroyed.