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Some Sugar Cane Diseases

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Some Sugar Cane Diseases.

By C. W. Edgerton.

The sugar planter of Louisiana has been quite fortunate up to recent years in having his crop fairly free from any serious fungus disease. To be sure, the sugar cane root rot has probably been in the state for a long time, but this has not been a menace to sugar growing and only in abnormal years has it produced serious damage. Sugar cane is a native of the tropics and for a long time after it was introduced into the United States it did not have the diseases to contend with to which it is subject in its native home. This was probably due, First, to the fact that the early importations of cane were free from the diseases; and Second, that for a long period planters used their own cane for planting. The use of home cane for seed year after year prevented the importation and spread of any of the diseases. But with this crop, as with all others, with the extension of the industry and the increased acreage, chances have arisen for the importation of many of the diseases to which the crop is subject. During the past few years much cane has been imported from the tropics for planting, and, furthermore, there has been considerable interchange of seed among the different planters. While this is necessary in order to get the best cane for our conditions, it has increased the chances for the importation and spread of fungus diseases. As a result, several of the diseases to which cane is subject in its native home have in some manner been introduced and now seem to be quite widely distributed over the sugar raising regions of the state. It would be impossible to tell at present how or when these different troubles were introduced into the state on account of the many importations of cane that have been made by different planters, but it is probable that the troubles have been introduced into different localities direct from the tropics at different times. From the present distribution, it does not seem probable that the diseases were introduced at one point in the state and from there spread to other regions.
Previous to the past year it was not known that we had any other sugar cane disease than the root rot, but now we know that we have three others—the red rot, the rind disease, and the pineapple disease. It was only after complaints of poor stands during the past season that a study of the troubles was undertaken. Of course, the spring was very dry, but this cause alone did not seem to explain all of the failures. Suspecting that some of the tropical diseases might be partly responsible for some of the losses, an attempt was made to find out the true cause or causes. Mr. H. P. Agee, of the Sugar Station, wrote to a number of planters in the different parishes of the sugar district and requested that they send in cuttings that had been planted but did not grow. A number of bundles of these canes were received and were examined carefully in order to find out the cause of their failure to germinate. The examination showed that in cane from nine different parishes eight contained the red rot; seven the rind disease; and one, the pineapple disease; while nearly all of them showed root disease to some extent. The distribution of the first three diseases in the state as far as is known at present is shown in the map in Figure 1. This does not necessarily mean that the diseases do not occur in the other parishes. It is more than likely that some of them are present at least in some of the adjoining parishes, but no specimens have been sent in from these places.

The presence of the red rot in the state had been known for some few months, but the finding of the pineapple disease and the rind disease was a surprise. While the failure to grow could not be said in every case to be due to some of the diseases, as the canes showed considerable insect work and perhaps also the effect of frost and dry weather, it seems quite certain that a considerable percent of the loss was due to the fungus diseases present.

On account of the serious nature of the new sugar cane diseases it seems best at this time to put into the hands of the planters descriptions of the troubles, their present known distribution, and notes on the injuries which they cause in the tropics, and may also cause here, so that the planters may be on the guard for them and take such measures as may seem fit for their control. The Experiment Station is always ready to answer inquiries about the diseases and will be glad to receive
specimens of sugar cane troubles at any time and will be glad to diagnose the troubles and give any methods of control if known. Of course, these troubles are new with us and we need considerable experimental data before we can state the best methods of control.

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**Fig. 1.** Map of Louisiana showing known distribution of the red rot, rind disease, and pineapple disease in the state. C. Parishes in which the red rot, caused by *Colletotrichum falcatum*, is present. M. Parishes with rind disease, *Melanconium sacchari*. T. Parishes with pineapple disease *Thielaviopsis ethaceticus*.

**THE RED ROT OF SUGAR CANE.**

The red rot of sugar cane is a disease which is pretty widely distributed in the tropical sugar countries at present, it being known in Java, India, Hawaii, Madagascar, West Indies, and probably in other countries. In places, in certain years, it causes a very large loss. According to Butler (1), it is the trouble in Bengal which nearly ruins the crop in certain seasons. At present also, the trouble seems to be quite widely distributed in the southern United States. I have found it in eight parishes
in Louisiana during the past year. I have also seen specimens from Cairo, Georgia, where the trouble seems to be causing considerable damage. It is also present and doing considerable damage in at least two counties of northern Florida (8). The first specimen of this disease found in the United States, as far as I know, I collected at Audubon Park, New Orleans, in February, 1908. I placed this collection in my herbarium at the time as a Volutella, and it was consequently overlooked when I wrote a short note for Science in May, 1910 (6). The next collection was from the same place in September, 1909. The specimens which I have received from southern Louisiana during the past spring have shown the disease to be quite severe in places and I think responsible for part of the poor stands during the season.

THE CAUSE OF THE DISEASE.

The disease is caused by one of the small imperfect fungi, known to botanists as *Colletotrichum falcatum* Went. It was first described from Java by F. A. F. C. Went in 1893 (13).
Fig. 3. Sugar cane very badly affected with red rot. Notice the discolored rind in the middle joint.
The fungus does not usually fruit profusely in nature, though occasionally the fruiting pustules may be found on dead parts of the plant or in lesions on the main stem. The fruiting pustules appear to the naked eye as very small black specks. Under the microscope, these are seen to be made up of a number of long black setae with a profuse development of spores between them. The spores (Fig. 2) are falcate or curved, and hyaline. The fungus is closely related to *Colletotrichum lineola*, which we have on Johnson Grass and other grasses in the south. It also may be closely related to *Colletotrichum cereale*, the one which causes the anthracnose of cereals in the middle west.

**Appearance of the Diseased Cane.**

The red rot disease is not easily recognized in a field of growing cane for the reason that the disease is almost entirely on the inside of the stalk. The exterior of the cane may look perfectly normal, while the interior may be badly diseased. Where the disease is very severe, according to Butler (1), who has worked on the trouble in Bengal, the leaves may turn yellow and wilt; but it is hardly probable that we will find this condition at present in Louisiana. However, in cane that has been planted or windrowed, the disease may develop so well that it will show on the outside of the cane. Many of the eyes will be dead, and there will be black dead areas extending out from the nodes (Fig. 3). There may also be somewhat sunken dead lesions on the stalks, especially on the upper joints (Fig. 4).

However, the disease is best told by splitting the stalk and examining for the characteristic red color of the tissue. The whole inside of the stalk will not be red, but the color will be more or less irregularly distributed, the red being usually in streaks or bands extending out from the nodal region (Fig. 5). There are also frequently white spots surrounded by the red tissue. These spots were present in the Georgia material and in nearly all of the collections which I have seen from Louisiana. These white spots are local centers of growth of the fungus. A microscopical examination of these spots will show the cells of the host plant to be crowded full of the mycelium of the fungus. In badly diseased stalks, there are strips also of brown tissue, generally just underneath the rind. Often also the pith of the cane will split, leaving a cavity which becomes filled with the
mycelium of the fungus. Fig. 5 is quite characteristic of a badly affected cane stalk. The tissue at the node is dead and had dried out considerable, all of the color being gone. Extending out from this are the strips of red and brown tissue. One of the white spots can also be seen in the discolored tissue.

Fig. 4. Red rot of sugar cane. Shows lesions on the upper joints which contain pustules of Colletotrichum falcatum.

The presence of red rot in cane that has first been attacked by borers cannot be so readily told. Borer attack alone will cause a reddening of the tissue. This red, however, is usually intensified if the red rot is also present. Frequently in this cane also, the disease may be diagnosed by the presence of the
white spots. But to make absolutely certain as to the presence of red rot in borer cane, cultures from the diseased tissues must be made or else the split canes be placed in a moist place and the fungus allowed to develop on the cut surface (Fig. 6).

INFECTION OF THE FUNGUS.

The fungus frequently gains entrance to the cane through borer holes, but these openings do not appear to be essential. In the Georgia material which I have seen there were no borer holes. From the appearance of this cane, the infection must have taken place at the nodes; but this matter has not been worked out as yet, and the methods of infection must be left for another publication. But in much of the Louisiana material, the infection seemed to have taken place through borer holes.

DAMAGE TO THE CANE.

The damage which is done by the red rot occurs in two forms.

First—Canes that are affected with the disease have the sugar content, especially the sucrose, very much decreased. As the value of the crop depends upon the amount of sugar in the stalks, the decrease due to the disease becomes very important. Analyses that have been made in Java, Bengal and the Hawaiian Islands show that the saccharose content is decreased by from \( \frac{1}{4} \) to \( \frac{1}{3} \) by the action of the fungus. Consequently a severe attack of the disease means a big loss to the crop.

Second—The fungus grows in the stalks that are to be used for planting and kills the eyes, thus preventing germination and causing a poor stand. This seems to be the worse of the two injuries at present in Louisiana. But a poor stand means a short crop with no profits.

TREATMENT OF THE DISEASE.

The treatment of the disease should be conducted in two ways—First, all material in the field known to be diseased should be destroyed, and, Second, the cane to be used for planting should be as carefully selected as possible. As the fungus does not fruit to a very great extent, it does not spread very fast in the field. If perfectly healthy canes were planted each time, the disease would cause but little damage. However, when diseased cane is planted, the disease spreads upwards into the young
Fig. 5. Split cane showing red rot of sugar cane. Notice streaks and bands of discolored tissue passing out into the internodes from the nodes. Also notice the white spot surrounded by the discolored tissue.
stalks and the eradication of the trouble is impossible. The most desirable thing would be to select carefully all the cane to be used for planting, throwing out any that show any external

![Image of split stalk of cane affected with the red rot.](image)

**Fig. 6.** Split stalk of cane affected with the red rot which has lain in a moist place for two days. The mold or mycelium in the nodal region is that of *Colletotrichum falcatum.*

signs of disease or any that are attacked by borers. This method of selection would, however, hardly be profitable on account of the large amount of time it would take to select the seed. Per-
Fig. 7. *Melanconium sacchari*. A. Spores. B. Germination of spores.

Fig. 8. Sketch of sugar cane stem affected with rind disease. Shows the long, kinky, black hairs at C, which are in reality masses of spores. (After Cobb in Bulletin No. 5 of the Experiment Station of the Hawaiian Sugar Planters' Association.)
haps the method which Mr. Rooldenbery has undertaken in Georgia to free his cane from the disease is the one which will give the best results. He has very carefully selected enough cane for planting a few acres. From this he expects to get enough healthy seed for planting his crop the following year.

THE RIND DISEASE.

The only mention of this disease as occurring in the United States, as far as I can find out, is a remark made by Dr. Stubbs during a meeting of The Louisiana Sugar Planters' Association and published in the Louisiana Planter of May 21, 1910 (12). The statement is as follows:

Dr. Stubbs: "I want to say that seven or eight years ago I had a letter from Dr. Watts, in one of the West India Islands, asking if we had what he called the rind fungus, and I told him no, but at the same time I had strong suspicions that we had. In that same letter he asked me to send him some pieces of cane and I went out into the cane field and got him some pieces suitable to ship through the mail to him, and two or three weeks after that I received a letter from him saying that we had the rind fungus."

How wide the distribution of the disease in the United States is at present cannot be said. I know of its presence in seven different parishes in Louisiana, but no study has been made on the trouble in other localities.

The disease is very common in tropical sugar countries, however, and in some years causes considerable damage. For instance, in 1895, in Barbados (10), the cane crop was reduced from 50,000 to 60,000 hhd to 36,000. The loss to the sugar planters of the West Indies during a period around 1895, due to this disease, was immense. However, they have since controlled the disease more or less by using varieties which are resistant to it. While they formerly depended upon the Bourbon cane almost entirely, this has now given away to other canes, because it is very subject to the rind disease. But still, today, with the more or less resistant varieties, there is a considerable loss in the tropics due to this disease. Dr. Cobb, in the Hawaiian Islands, estimated the amount of diseased cane left in a 200-acre field after harvest (10). If this had been sound cane and had
been harvested, it would have meant a ton more of sugar to the acre. A loss of this dimension is certainly worth considering.

Fig. 9. Rind disease as found on Louisiana canes. Notice the black pustules near the nodes.

CAUSE OF THE DISEASE.

This disease is caused by another of the small imperfect fungi, known as Melanconium sacchari. The fruiting pustules of
this fungus develop abundantly on the stalks, especially on those left in the field or those that have been planted or windrowed. The pustules develop underneath the epidermis of the rind tissue, being in the form of small pycnidial-like cavities. The small, linear, dark-colored spores (Fig. 7) are produced in these pustules in abundance. As the pustule becomes filled with the spores, they are forced out of a small opening at the top. As the spores are held together with a mucilaginous substance, they ooze out in the form of long black strings or hairs (Fig. 8). They have the appearance of being long black hairs, but are in reality nothing but masses of spores. However, if the surrounding air is very moist, these long black strings of spores will not be formed. The spores will be in black shining masses or inky drops at the apex of the pustule. This latter condition is a common one in Louisiana where the stalks are lying on or in the ground. This condition is illustrated in Fig. 9. But when one of these stalks is placed in an only slightly moist place the spores begin to issue in the black strings.

**INFECTION OF THE DISEASE.**

Infection always takes place, according to statements of those who have worked on the trouble in the tropics, through wounds of some kind. These wounds may be due to the attack of insects, as borers, etc.; to the stripping of stalks, or through the ends of stalks used for planting. As the spores develop so abundantly, they are almost sure to find their way into any injury that is present.

**EFFECT OF THE DISEASE ON GROWING CANE.**

As I have not seen the rind disease on growing plants in Louisiana, only having seen it in the seed cane, I will take the liberty of inserting a few paragraphs from Bulletin No. 7, of the Experimental Station of the Hawaiian Sugar Planters’ Association, by L. Lewton-Brain, on the effect on the plants in the field.

"Usually the first symptom is seen in the leaves. The outer leaves begin first to dry up prematurely and turn yellow at the tips, and the drying spreads until the whole leaf is dead. Leaf after leaf may follow in this way, until the whole tip of the stick is dry and dead."

"By the time the dying of the leaves has become a noticeable feature, we can usually find other evidence of the disease."
Examining carefully the outside of the stalk, one sees on one or two of the joints dark discolored patches, evidently abnormal. These show where the fungus is working.

"Splitting open such a cane, we find that the tissue under the blotches is all discolored and evidently diseased. The normally whitish ground tissue is bright or dark red or reddish brown. Whenever it is possible to trace the discoloration to its starting point, this will always be found to be a wound of some sort. The wound may be a borer hole, a leaf hopper puncture or a wound made in stripping, the borer wounds being perhaps the most favorable to the fungus, especially in the older parts of the stalk."

"In the next stage the discolored areas become somewhat sunken, lose their color and become a dirty dull yellow. The tissues underneath have been drained of their contents and killed by the fungus, hence the shrunken appearance of the stem."

"If the disease proceeds further, we find the whole cane discolored and brown. It is very light in weight, the internodes are shrunken, and we see a number of small, black, kinky, hair-like bodies projecting from the stem. These will be seen to have been formed below the rind, which they have burst through in getting to the outer air. These kinky threads are really masses of spores of the fungus. (See Fig. 8.)

EFFECT ON SEED CANE.

Seed cane that is affected with the rind disease generally has an abundance of the black fruiting pustules on the surface. The interior of the cane stalk is variously colored; in material that I have seen, red, yellow, brown, and even greenish colors have been noticed. The tissue dries out rapidly so that the whole cane shrinks and becomes light in weight. The eyes of the cane are killed and there is little or no germination.

It may be that the varieties of cane grown in Louisiana are more or less resistant to the disease and the affect on the growing cane may not be noticed. If this is the case, the damage which it will do will be confined almost entirely to the cane after it is cut. This means that the damage will be to the cane that is used for seed. If the spores are on the seed when it is planted in the fall, or if they are in the piles of windrowed cane, they will
attack the cane and in many cases will kill the eyes and prevent germination. Considerable cane showed this affect during the past season.

CONTROL.

From the work that has been done on this disease in the tropics during the past twenty years, a few conclusions in regard to the control of the trouble may be drawn.

First: The Use of Resistant Varieties. Some varieties of cane are very susceptible to the disease, while others are highly resistant. The Bourbon cane, for instance, was so susceptible that for a period the cane crop in Cuba was very much reduced. Since that time, however, more resistant varieties have come into use in that country.

It is impossible to tell, at present, how resistant our varieties are on account of the lack of any data on the point.

Second: The Cleaning Up of the Fields. The disease develops very abundantly on old cane material that has been left in the field, and it is not an exaggeration to say that there may be millions of spores developed on each stalk. If there is a considerable amount of these old stalks and other cane trash left on the ground the spores will become so abundant in the field that every planted cane will be exposed to infection. If, however, the fields are thoroughly cleaned up in the fall a large amount of this infectious material will be destroyed. On some plantations in countries where the diseases are particularly severe the owners make a practice of using Saturday afternoons for destroying all the old worthless and diseased stalks by running them through the mill. Of course, this would probably not be profitable in Louisiana at present, but all means in reason should be taken to get rid of the old diseased material in the fields.

Third: The Treatment of the Seed. This point will be taken up after the discussion of the next disease, as it applies equally well with the two troubles.
THE PINEAPPLE DISEASE.

The pineapple disease is perhaps the most serious of all the sugar cane diseases. The trouble is widely distributed in all the sugar-growing countries of the tropics and in all cases does a large amount of damage. Previous to this, however, we have not had the disease to contend with in Louisiana, as it has now just appeared in the state. It is not known to occur in any other state, and is only known to be presented in one parish in Louisiana. Some seed cane sent in from St. Mary parish in April contained a small amount of this disease. However, from the limited amount of the disease found in the cane received, it is probable that it has not become firmly established even in that parish as yet. But there is a strong likelihood of it developing rapidly and spreading to other parts of the state. The presence of this disease in the state is indeed a very serious matter. Of course, there is a small chance that the fungus will not be able to stand our winters and therefore will be of little economic importance, but such good luck as this can hardly be hoped for. The wisest course for the Louisiana sugar planter is to be prepared for the worst and be prepared to take such measures as are possible for the control of the trouble and for preventing its spread.

THE CAUSE OF THE DISEASE.

The disease is caused by another one of the small imperfect fungi, known to botanists as Thielaviopsis ethaceticus. The fungus is an extremely rapid growing one and forms spores in abundance. Two kinds of spores are produced. There are first some small linear to oval, hyaline to brown ones (Fig. 10, a-d), which are produced inside the hyphal threads and are pushed out in chains. These are called the micro-conidia. They develop very abundantly on cut surfaces of affected sugar cane stalks, and perhaps also to some extent imbedded in the tissue of the host plant. These spores are blown around to other cane by the wind or are carried by insects. They germinate at the first opportunity and if they are in contact with another stalk produce the disease in it.

Then the fungus produces some larger, thick-walled, dark-colored spores, called the macro-conidia (Fig. 10, e-f). These are borne in chains at the end of the conidiophores, but they
are not borne within the fungus threads, as are the micro-conidia. These serve as resting spores. According to Cobb, they do not germinate immediately, but seem to need a period of rest. If a diseased cane is split, in the matter of a day or so, the cut surface will become black in color, due to the abundance of these spores.

**INFECTION OF THE CANE.**

This disease gains entrance to the stalks of cane entirely through wounds in the rind. These wounds may be due to the injury of insects or they may be the cut ends of the stalks. After the fungus has once gained entrance to the stalk it spreads very rapidly, decomposing the cane tissue and killing the eyes.

**APPEARANCE OF THE DISEASED STALKS.**

A stalk affected with this disease does not usually show on the outside. The exterior of the rind may be perfectly sound in appearance, while the interior may be badly decomposed. On splitting the stalk, however, the disease can usually be told (Fig. 11). If the disease has progressed to any extent, the center of the stalk will be more or less decomposed. The sugar-containing cells have been disintegrated, and the fibro-vascular bundles of the central region will be seen to be more or less free. This central cylinder, or "pipe," as it is called, is generally nearly black in color. If the disease has not progressed far, however, this black color may not be present, but it will develop in a few hours if the split stalk is left in a moist place, as this black color is due to the presence of the macro-conidia.

Then, if the whole stalk is not as yet affected, there will generally be a sharp boundary between the diseased and the healthy joints. The fungus grows very rapidly through the internodes, but is halted for a time at each node. Figure 11 shows this quite well, the upper nodes being badly affected, while the lower one is still sound. Of course, the stopping of the fungus by the node is only for a time. It soon is able to pass this point and then rapidly grows through the next internode.

Another characteristic point in regard to this disease is the odor given off by the affected stalks. The odor is described as similar to that of ripe pineapples, and on this account it has received the name of "the pineapple disease." The disease does also affect pineapples in the tropics, but it did not get its name
Fig. 10. Thielaviopsis ethaceticus. A. Conidiophores bearing the hyaline micro-conidia, as found in pure cultures. B. Some of the hyaline micro-conidia. C. Conidiophores bearing the brown micro-conidia, as found in a diseased stalk. D. A long chain of the brown micro-conidia. E. Macro-conidia, as produced in pure culture. F. Macro-conidia, as found in a diseased stalk.
from this. The odor is supposed to be due to acetic ether, the same as in the pineapple. However, in all the canes which I have had, the odor could be readily told from that of pineapples. The odor is an ethereal one, sometimes quite strong and penetrating, and is, in fact, very pleasant to the smell.

CONTROL.

As the fungus grows in the soil, and is more or less at home there, it is a disease quite difficult to control. In tropical countries, where the fungus is everywhere present in the soil, the only thing that can be done is to treat the seed cane with some fungicide as Bordeaux Mixture, thus prohibiting the entrance of the fungus into the stalk. But for the Louisiana planter there are some other points which should be observed. The disease, at present, only has a very limited distribution in Louisiana, and in sections where it is present it has not completely infected the soil. Because the disease is not yet doing a great deal of damage is no reason why the planter should be unconcerned over it. A planter that does not have the disease as yet should be on guard for it and take all measures possible to keep it off his plantation and also off the surrounding plantations. It is easier to keep a disease out of a region than to get rid of it after it has once obtained a foothold. We should take into consideration not only the methods for the control of the disease in fields where it is already present, but also the means of preventing its spread to regions not yet infected.

The disease may be spread into new regions in a number of ways, a few of which are as follows:

1. By the Exchange of Cane for Planting. There has been considerable exchange of cane by planters during the last few years. This has especially been the case since the introduction of some of the newer and better varieties as D-74. The planters have been desirous of trying the new varieties and have obtained them wherever they could. In the future, the planter should be on his guard in regard to this. He should not obtain cane from other regions unless he is positive that the pineapple disease is not present in the region from which he is obtaining it. If he gets some seed cane from some planter that has the pineapple disease, he can expect nothing else than to plant the pineapple disease on his plantation.
Fig. 11. Split stalk of cane affected with the pineapple disease. The two upper joints are affected, while the lowest joint is still sound. Shows the black "pipe" through the center of the stalk.
2. By the Shipping of Cane to Mills. The disease may be carried to the mills in the cane and obtain a foothold in the region adjacent to the mills. If the owner of a mill is in a region where there is no pineapple disease, it would probably be better for him to refuse to take cane that comes from an infected region. Cane grown in an infected region should be ground as near to the place where it was grown as possible.

3. By Means of Insects. Insects, doubtless, are important in spreading and increasing the severity of the disease. All means possible should be taken to prevent the insect work. Active measures should be taken against the borers and the poo-a-pouche. Furthermore, all sugar cane material in the field should be cleaned up as far as possible, thus reducing the amount of infectious material which a large number of insects might work on. The insects working on this material are liable to carry the spores of the fungi to other plantations and in that way spread the disease. The cleaning up of the fields has already been touched on in the discussion of the rind disease.

TREATMENT OF CANE CUTTINGS.

After the soil is thoroughly infected with the disease, perhaps the only thing that will insure a good stand of cane is the treatment of the cane with some fungicide. Both the pineapple disease and the rind disease enter the seed through wounds and the cut ends of the stalks. The rind is impervious to the attack of these fungi. The object desired in treating cane cuttings is to thoroughly cover them with some compound that is poisonous to the fungi causing the diseases. For instance, as has been shown by Cobb (3), if the cut ends of the stalks are dipped in tar and carbolic acid and then planted, the fungi not being able to grow where these substances are present, will not be able to get to the interior of the stalk. Of course, the dipping of the ends is not practicable on a large scale on account of the expense involved. In order to treat the cane on a large scale and to treat it rapidly, we must have some solution in which the whole stalk can be placed, one which will not kill the eyes of the cane but one which will prevent the attack of the fungi. The only solution which we have at present which approaches this requirement is Bordeaux Mixture. This is a copper-lime compound which is very poisonous to fungi and will not pene-
trate the eyes of the cane so as to hurt their germination. The treatment of sugar cane cuttings with this solution is not only practicable but is highly profitable in tropical sugar countries. Of course, special machinery and special tanks are used so that a large amount of seed can be run through the solution in a short time. Whether the treatment of the seed would be profitable to the Louisiana planter in normal years is a question, but I am convinced that it would have been profitable during the past
dry season. And if the pineapple disease spreads over the state and does as much damage as it does in the tropics, the treatment of the seed will not only be profitable but it may become a necessity.

THE ROOT ROT DISEASE.

The root rot disease has been well treated in Bulletin 100 of the Louisiana station and only a few points need be mentioned here. The disease is caused by one of the higher fungi, one of the mushrooms, known to botanists as *Marasmius plicatus*. This disease attacks both the cuttings and the growing cane. On the growing cane, it kills the roots and grows in between the lower leaf sheaths. The leaf sheaths are not shed as is the case with healthy cane, but remain glued together around the stalk. If some of these are pulled apart, a network of white mycelium will be seen between them. In August, or perhaps during other seasons, if the weather conditions are suitable, the little mushrooms, the fruiting part of the fungus, develop on these leaf sheaths.

On the cane which is used for seed, this disease will also develop. I have seen it to some extent in nearly every batch of cane which has been sent me this year. The mycelium enters the cut ends of the stalks and grows through them. The disease is readily told by the presence of the white strands of mycelium which may be on or in the stalks. Sometimes the eye is killed before germination, and sometimes the young plant is killed after germination. Figure 12 illustrates a cutting that had germinated but the young plant had been killed by the fungus. The stalk was split and allowed to lie in a moist place for twenty-four hours. This brought out the mycelium so that it would show better in the photograph. This shows the mycelium within the stalk and also on the young plant.

This disease is widely distributed in the state and probably has been for a long time. In some places it does considerable damage, but in normal years the loss has not been large. This year it has caused considerable loss both in the plant cane and in the stubble. The dry weather has put the cane in a more
or less unhealthy condition and the cane has been very sus-
ceptible to the disease. (For further discussion of this disease
see Louisiana Bulletin No. 100.)

OTHER CANE ROTS.

While the fungi causing the four diseases previously dis-
cussed were the most frequent and the most prominent in the
cane cuttings that were received, there were some other organ-
isms present which undoubtedly rotted some of the cane and
should be studied further. As it is the intention of the station
to continue the study of the sugar cane diseases, the study of
these will be taken up as time permits.

SUMMARY.

During the past season the sugar planters of Louisiana have
had considerable trouble in obtaining good stands of cane. The
investigations of the Experiment Station have shown the trouble
to be due primarily to several fungus diseases.

These diseases have been much more severe this year than
in previous years on account of the very dry spring. The dry
weather reduced the vitality of the cane and made it more
susceptible to the diseases.

The diseases present in the state are the red rot, the rind
disease, the pineapple disease, and the root rot.

The red rot, rind disease, and root rot are widely distributed
over the state, but the pineapple disease is at present only
known in one parish.
LITERATURE.


5. ——— Notes on some diseases of the pineapple. Hawaiian Forester and Agriculturist 4: 123-144. 1907.


