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Some Diseases of the Avocado and Other Subtropical Fruits

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When there are so many pleasant features that might be considered in connection with the production of avocados and sub-tropical fruits in Florida, I feel somewhat reluctant to present the darker side of the picture. However, it has fallen to my lot to give you a list of some of the troubles that the producer of these products is more than likely to come in contact with, and to point out some of the disagreeable experiences that are apt to result.

I assure you it is not my wish to dampen your enthusiasm for fruit growing in Florida and I hope I will not be accused of presenting a pessimistic outlook for the future. There are certain cold hard facts that we cannot get away from and one is, that practically every cultivated plant we grow, whether fruit, vegetable or flower, has one or more enemies bent on its destruction.

The object then of this paper is to put you on guard as to what you might expect in the way of troubles and to advise you as far as possible how you may avoid some of these. Forewarned is forearmed and the successful fruit grower of today must be fully armed for any occasion. Knowledge of the best varieties to plant, the best location to select and the best fertilizer to apply is not sufficient alone to insure success as a fruit grower. These are only successive stages in the production of a crop. There are still insect pests and plant diseases to be reckoned with before the crop matures, and these are often the deciding factors in the production of a satisfactory crop. A fine healthy tree may be produced with little difficulty, but to mature a profitable crop on this tree is sometimes another question. So it is important for the one who wishes to grow fruits or other crops with any degree of success to know something of the enemies that attack these crops and the methods employed to avoid them.

A great many of our farmers, gardeners and fruit growers rarely think about diseases until their crops are attacked by them and then it is usually too late to repair the damage done. It is just as necessary to know what diseases a tree is likely to have as it is to know the kind and quality of the fruit it produces. With many of our fruits it is just as certain to expect them to be attacked by a particular disease at some period of their development as it is to expect the crop to mature. These are things that should be known and remembered, and long before this particular disease appears remember that certain measures for control must be taken to avoid it. Do not delay with the expectation that probably this season you will escape for you may be sadly mistaken. A great many of our common diseases are so well distributed that we find them well established everywhere that cultivated fruits are grown and where this is true, it is reasonable to expect more or less trouble from diseases each season. It should be kept in mind then that certain control measures are necessary each season to avoid such diseases, and

that these measures must be applied at a certain time to be effective. Prevention is by far the most economical method of handling diseases and to do this effectively one must have some knowledge of the cause and nature of the trouble in addition to the methods employed for its control.

In order to assist the fruit grower in understanding and becoming better acquainted with some of the various troubles he may meet with, the more important information concerning some of the common diseases occurring on the avocado, mango, guava and papaya has been brought together in this paper. In the discussion under each disease the appearance of the injury is described, the cause, if known, is given and such other information as concerns the distribution and conditions under which the disease occurs. While a large part of this information has been collected from other sources, much of it is the result of personal investigation and observations on the diseases mentioned.

Avocado Diseases

The list of avocado diseases continues to grow longer as the progress of our investigations along this line advances. This does not indicate that new diseases develop spontaneously each season, but rather that we are bringing to light those that may have been here for some time and that we are eliminating some of the confusion existing about others. With the rapid growth of the avocado industry during the past few years there has been a better opportunity for the distribution and development of some of the diseases that have been in the background in the past. We are just becoming familiar with some of these at present time. We may still find more diseases and serious ones but the sooner this is done it will be better for all concerned.

At the present time the following diseases may be found on the avocado in Florida, namely, Scab, Black Spot, Blotch, Powdery Mildew, Rusty; Blight and Russet Fruits. Not all of these are fatal but a few have proven rather serious troubles during our short acquaintance with them;.

Avocado Scab

This is a foliage and fruit disease that has developed in Florida within the past few years. It was reported and described by the writer in Press Bulletin 289, Florida Agricultural Experiment Station, 1918, and also reported in the State Horticultural Society Report for the same year.

Scab is probably more troublesome in the nursery on young plants where it has proven difficult to control. It is more common as a foliage trouble on seedling plants; however, many of the budded varieties are susceptible to Scab. During the past two seasons the disease has been noted severely affecting the fruits of both seedling and budded varieties of the avocado. The fruits of the Trapp and Taylor appear to be rather susceptible to Scab and the disease is likely to be a serious factor in the production of these varieties. Scab, however, does not affect the interior of the avocado, but the outward appearance of the fruit is marred, and as the market becomes more discriminating for perfect fruit, the effect of Scab will undoubtedly be more evident. It is

also probable that the disease is responsible for a considerable shedding of the fruit, where severe infections occur just about the time the fruit is setting.

Appearance

The disease forms definite spots or patches on the young tender leaves and shoots and severe attacks may cause the affected leaves to curl or become distorted. Infection takes place only on young tender growth and as the leaf tissue hardens it becomes immune to the disease. However, the older leaves will frequently be found bearing Scab spots that were formed when the tissue was young. The spots are generally small, circular to irregular in outline and they vary from one-sixteenth to one-eighth of an inch or more in diameter. They are purplish brown to dark in color and may appear scattered over the surface or several may grow together forming irregular areas. The spots penetrate the leaf tissue being visible on both sides of the leaf. They are usually more prominent on the upper surface of the leaf in which case the under surface of the spot may be slightly bulged and marked by a purplish discoloration. The centers of the older spots are composed of dry, dead cells, more or less spongy and brownish in color. Sometimes the dead center tissue falls away leaving a small hole in the leaf. In the early stages of development the surfaces of the spots may show a whitish growth, the fruiting parts of the fungus. As the spots grow older the surfaces become brown or black due to invasion of other fungi.

On the young shoots, twigs and leaf petioles, the spots appear darker and more elevated. They are more or less oval in shape with comparatively smooth surfaces and in general outline may resemble one of the soft scale insects.

On the fruit the same oval-shaped, raised type of spot occurs that is found on the twigs. The spots may be scattered or clustered together forming an irregular scabby mass. Severe infections on fruits frequently cause a roughened or russet appearance similar to the effects of Citrus Scab on grapefruit. In this case the markings are light brown in color. The quality of the fruit is not affected by Scab, however, the appearance is marred and fruits badly attacked are undersized and misshapen.

Cause

Avocado Scab is a fungus disease. The fungus has been isolated from the diseased spots on leaves, studied and identified as **Cladosporium citri** which also causes the Scab of citrus plants. The fungus from Avocado Scab appears to be identical with the fungus from Citrus Scab and it will produce typical Scab infections on the tender growth of either citrus or avocado. However the writer has not succeeded yet in producing typical Avocado Scab with the strains of the fungus isolated from Citrus Scab. Only a limited number of attempts have been made up to the present and all of these have given negative results. It is probable that all strains of **Cladosporium citri** are not pathogenic to the avocado but that certain strains have recently adapted themselves to this host. Such strains are parasitic to both avocado and citrus. **Cladosporium citri** has the habit of passing from host to host in the citrus group and it may follow the same trend with the avocado. Many varieties of the avocado and even individual plants show

a marked resistance to Scab, but it might be only a question of time until all of our prominent varieties are susceptible to this disease.

In certain sections the disease is so well established that the growers will be compelled to rely on control measures rather than to attempt eradication. In localities where the disease does not occur precautions should be taken against its introduction.

Control

The control of Avocado Scab will divide itself into two phases; namely, control of the disease in nurseries and control of the disease on fruits. The control of the disease in the nursery seems to be the larger task and as yet probably a beginning has only been made. Thus far we have not been situated so that we could conduct a satisfactory experiment of this nature. Some of the nurserymen have tried out spraying for the control of this disease with varying degrees of success. Apparently ammoniacal solution of copper carbonate gives a greater degree of efficiency than Bordeaux mixture for the control of Scab on nursery stock, and one large avocado nursery in the State relies on this fungicide to keep their stock clean.

As a means of controlling the disease in the nursery the following outline may be suggested. If the old leaves are badly affected with Scab, spray thoroughly with Bordeaux mixture, 4-4-50, before any new growth puts out. The object of this spraying is to thoroughly cover the Scab spots and catch any accidental spores that may be on the foliage. It is merely a clean-up spray. When the new foliage begins to put out, spray with ammoniacal solution of copper carbonate and follow every week or ten days until the new growth hardens. This schedule of spraying may have to be repeated throughout the season whenever new growth appears.

For the control of Scab on fruits, probably Bordeaux mixture will give satisfactory results. The first spraying should be made into the bloom about the end of the blooming period, using 3-3-50 Bordeaux mixture. A second spraying should follow a month later and a third one month after the second, using the 3-3-50 Bordeaux mixture in each case. This is only a tentative schedule and may be subject to change, depending upon the results of an experiment we are conducting this season for the control of Scab on fruits.

Avocado Fruit Spotting

Under spotting may be included several types of injury on the avocado other than Scab. One characteristic type of spotting was reported before this Society in 1918. This was temporarily referred to as fruit spotting until the cause could be established and more recent investigations seem to place it among the anthracnose. Since anthracnose has been previously used for another and different type of injury on the avocado and in order to avoid confusion. the name Black Spot will be used to designate this disease in the future. It was previously designated Black Spot by Mr. Hamilton Michelsen, of Miami, and many of the avocado growers recognize the disease by this name.

Black Spot

This is a serious trouble on the seedling fruits in certain sections of the 6 State, and occasional specimens have been observed on the budded variety Trapp. So far the disease seems to be confined to the lower East Coast and during the past two years it has caused serious injury to the seedling crop in that section. In some cases ninety per cent or more of the fruits on a tree will show the disease and the greater part of the infected fruits are worthless for shipping purposes. Some seedling fruits show a considerable degree of resistance to the disease while others are highly susceptible. It appears on fruits that are approaching maturity, forming a characteristic spot that is easily recognized.

Appearance

The injury appears in the form of definite spots scattered over the surface of the affected fruit. These spots are round, brown to dark brown or black in color, and vary from one eighth to one-half of an inch in diameter. They are composed of hard, dry, corky tissue which penetrates the skin of the fruit down to the meat. The surfaces of the spots are slightly sunken, often cracked or fissured, and in some cases a zonated effect is observed. When once formed the spots do not appear to increase in size on the surface of the skin, but a decay of the meat below may follow, especially in the ripened fruits. Affected fruits may show from a few to many spots of various sizes and frequently spots grow together forming irregular patches, the surface of which is deeply cracked or broken. Severe attacks on less mature fruits may cause them to become misshapen or undersized.

Cause

The spotting is caused by a fungus, a species of **Colletotrichum** which has been repeatedly isolated from the diseased tissue of the spots. The fungus has also been inoculated into healthy fruits and in several instances it produced spots typical of those formed under natural conditions. The fungus also forms spots in the dark green bark of young shoots and on fruit stems, very similar to the spots produced on the fruit. Spots on the fruit stems are generally evident some time in advance of infections on fruits. Another fungus which is yet unidentified is often found associated with this **Colletotrichum** in the spots, but all attempts to produce infection with this fungus have given negative results.

Control

No definite system of control for Black Spot has yet been worked out, however, experiments are in progress this season with that end in view. Preliminary spraying experiments with (Bordeaux mixture, ammoniacal solution of copper carbonate and lime sulphur made last season gave negative results in the way of control, but this was largely due to the fact that the sprayings were made too late in the season to prevent the disease. It is probable that Bordeaux mixture will readily control the disease if the

spraying applications are made before the fungus gains entrance to the fruit.

This may necessitate two or three sprayings, beginning when the fruit is about one-third grown and continuing at monthly intervals, or less; until the fruit is nearly mature.

Avocado Blotch

During the investigation of the Black Spot disease another type of spot has been observed which is quite different from Black Spot, although the two are generally found together. This type of spotting will be referred to as Blotch, a name suggestive of its general appearance. Blotch frequently precedes Black Spot and on certain individual trees it is more prevalent and more serious. Thus far it has only been observed on seedling fruits, and quite often the entire surfaces are affected with the disease. Spots of the Blotch type are smaller and much more numerous than those of Black Spot, and they usually develop earlier than the latter. Both types may be found at the same time on a single fruit.

Appearance

Mature spots of this type appear as small, slightly sunken, irregular blotches, usually black in color, but often showing a white fuzzy fungus growth at the centers. Fully developed spots may vary from one-eighth to one-fourth of an inch in diameter. The beginnings of such spots are indicated by pale green areas, showing one or more brown or black spots, smaller than a pin head. Gradually the pale green areas become brownish to black and develop into irregular sunken areas typical of Blotch. These spots may be scattered freely over the surface of the fruit or several may run together forming irregular black patches. Black Spot often develops in the same areas occupied by Blotch.

Cause

The disease is apparently caused by a fungus which appears in one form as a **Cercospora**. This is the type of spore produced in the white fungus growth on the surface of the spots. From the interior of the spot a dark fungus mycelium has been repeatedly obtained which appears to be identical to that produced by germinating the **Cercospora** type of spores from the surfaces of the spots. The complete identity of this fungus has not yet been established, for when grown under laboratory conditions it has failed to form spores by which it might be classified. Our efforts to make it fruit in pure cultures have not been successful up to the present. The parasitic nature of the fungus has not been demonstrated yet since all inoculations into fruits have given negative results. However, the dark fungus mycelium has been repeatedly isolated from Blotch Spots in various stages of development and the constant association of this fungus with the type of spot would suggest it as a possible cause of the disease. Perhaps another spore form is produced on some other part of the tree which may be responsible for the beginning of the Blotch type of spot.

Control

The control of Blotch will follow along the same lines as that of Black Spot. Both diseases occur at the same time and under practically the same conditions and the method of control employed for one should serve for the other.

Powdery Mildew

This is a foliage trouble that has been observed on several occasions during the past few years on both young and old trees. It is probably not a serious pest especially on bearing trees; however, it might become troublesome in the nurseries or on young trees located in damp shaded situations. It is a fungus disease and should yield readily to proper treatment.

Appearance

Attacks on young trees may result in the killing back of the tips of the tender shoots. The affected terminal leaves may show a dark watery discoloration on the upper surfaces, along the mid-ribs, and they may be curled or dwarfed. From one-third to one half of the leaf tissue may be affected with the disease. On the under surface of an infected leaf the same dark, watery area is visible and this is generally covered with a white powdery fungus growth, the spore bearing parts of the fungus. On more mature leaves large, irregular spots or blotches occur on the under surfaces, varying from one-half to an inch or more in extent. These spots have a purplish cast, or they may also show the white powdery fungus growth. They are rather characteristic on account of the network or vein-like appearance of the affected areas. The spots are not prominent on the upper surfaces of the more mature leaves but may be faintly outlined by pale green areas.

Control

While no control experiments have been tried out for this particular disease, like most of the powdery mildews, it should yield readily to the sulphur treatment. Spraying with lime-sulphur solution, 1 to 30 should keep the disease in check, or probably dusting with powdered sulphur would be equally as effective. Where only a few small plants are involved the dust method may be employed to advantage. Where the disease occurs to any extent in the nursery two or three applications of lime-sulphur solution at intervals of two weeks apart should keep the disease under control.

Rusty Blight

This is a fungus disease that has proven quite troublesome on the avocado in Hawaii, and it may occur to some extent here in Florida. It is found chiefly on the foliage and young branches; however it may also attack the bloom and immature fruit. In habits it corresponds very closely to Wither tip on citrus. A species of **Gloeosporium** has been identified as the cause of the disease.

Appearance

Infected leaves turn rusty brown and the affected part is often marked by concentric circles of lighter color showing the progress of the fungus. The leaf may be attacked in any part of the blade, the disease spreading rapidly until a large part of the tissue is invaded. Leaves thus affected later fall, and in severe attacks the tree may be nearly defoliated. The fungus may pass from an infected leaf into the young twig, killing it back.

Affected branches become dark in color and may continue to die back carrying the disease into the large parts of the tree. The bloom may also be attacked and it is often through the infected flowers that the disease gains entrance to the young twigs. It is probable that in severe attacks the fungus causes an excessive dropping of the newly set fruit.

Control

Attacks on leaves, bloom and fruit may be kept down by spraying with Bordeaux mixture, 4-4-50 formula. As soon as the trouble appears an application of the spray should be made. Other applications should follow at weekly intervals until three or four sprayings are made. Any dead or sickly branches should be removed from affected trees to prevent further progress of the disease in the healthy branches.

Russet Fruits

Russetting of avocado fruits is not uncommon, and varying degrees of injury of this nature may be observed each season. Such injuries are probably the result of several causes and no doubt some of it is mechanical injury, due to the young fruits rubbing against the twigs and branches of the tree. Thrips are probably responsible for a certain amount and perhaps certain fungi are concerned with the development of the remainder.

There is one type which is rather striking and which may be the effect of fungus injury, however, as yet the cause is unknown. This resembles very closely in outward appearance the Melanose injury of citrus fruits and it may be caused in a somewhat similar manner. The surfaces of badly affected fruits are thickly studded with small, hard, brown, angular spots that are raised above the surrounding tissue. This gives the fruit a roughened surface similar to that of coarse sand paper. The streaks, bands and circles characteristic in Melanose of citrus fruits are absent, but large caked masses are found with hard glazed surfaces that finally crack, forming the small angular spots. Slight attacks may show a scattering of spots more or less circular in shape distributed over the surface of the skin, or the spots may occur in broken or irregular lines. The injury is confined to the surface of the fruit and does not penetrate deep into the skin. Apparently the meat is unaffected and no decay has been observed following this type of injury. Fruits thus affected are often misshapen or undersized, and of course the outward appearance is completely marred.

Other types of injury occur as dark brown, hard, glazed spots or streaks extending across the fruit. The surfaces of such injuries are smooth and unbroken and raised

above the healthy, skin. They may vary from a fourth to a half inch or more in width and streaks may be observed two inches or more in length. They appear to be the result of mechanical injury. The writer has produced similar areas on the avocado by slightly scratching the surfaces of immature fruits with a piece of sandpaper. Thus any bruising or scratching of the surface of the fruit during its early period of growth would result in an injury of this character. This condition is frequently observed where two or more fruits come together in a cluster. Irregular blotches and areas have been noted from time to time on the surfaces of fruits that are suggestive of thrips injury found on the surfaces of citrus fruits.

Mango Diseases

The growing of mangoes from a commercial standpoint is becoming more important in Florida and the development of this industry even for local consumption has excellent possibilities. Aside from the culture, proper varieties to grow and possible markets for the fruit, the grower of mangoes must also reckon with the disease and insect phase of the subject. This may prove to be the larger task.

Anthrachnose at the present time is the bane of the mango grower, and this disease is generally the limiting factor in the production of the crop in this State. Unfortunately no satisfactory practical remedy has yet been found for the complete control of this disease, however, spraying with fungicides affords some measure; of relief. This is a problem that needs further investigation and one that must be solved if the mango industry is to develop to the state it should here in Florida.

Mango Anthracnose or Blight

This disease is caused by the fungus **Colletotrichum gloeosporioides** which is a well known offender and it has a wide distribution throughout the State. This same fungus attacks citrus causing Withertip, Bloom Blight, Anthracnose, and other injuries in the groves, and it is commonly found on a large list of plants native to Florida. Thus, in any locality where the mango is grown the fungus is almost certain to be present in abundance.

The mango has proven to be a desirable host for the fungus and under favorable weather conditions its destruction is rapid and complete. The bloom seems to be more susceptible to the disease and in severe attacks trees may fail to get a single fruit, owing to the complete destruction of the bloom. This appears to be the worst phase of the disease to combat, the injury to the bloom. The fungus attacks the leaves, flowers, twigs and fruits. Young leaves are quite susceptible and infections first appear as small blister-like spots. This stage is followed by the blackening and destruction of the leaf tissue resulting in the death of the foliage. Flower clusters that are severely attacked soon turn black and drop the flowers or wilt so that the whole top of the tree may present a blackened appearance, suggesting the name Blight. On the more hardened tissue of the flower and fruit stems and tender twigs, the disease appears as small blackened spots. On fruits blackened spots or areas are formed which greatly mar their appearance and as such fruits mature these spots result in a decay of the flesh

beneath.

Control

The production of a good mango crop in Florida will depend largely upon the condition of the weather during the time of blooming. If the weather is cloudy during this period accompanied by rain or heavy dews, very little can be done to prevent Bloom Blight which is the most serious form of the disease. Bloom Blight apparently does not yield to spraying since it is not possible to protect all exposed parts of the flowers as they open, even by the most careful spraying. The fungus spreads rapidly under moist conditions and the open bloom affords an easy entrance for the disease. If the weather is clear and dry during the blooming period a sufficient amount of fruit will usually set. This may be protected from spotting during the early stages of the development by several applications of Bordeaux mixture.

Where Anthracnose is troublesome each season it is probably advisable to use Bordeaux mixture to protect the bloom buds until they begin to open. This will reduce the amount of disease on flower and fruit stems, and give the fruit a better chance to escape early infection. Probably three sprayings of the flower clusters before the bloom opens will be ample to keep the fungus in check. The first application of Bordeaux mixture should be made when the buds are just swelling, and subsequent applications at intervals of four or five days apart until the flowers begin to open. The 4-4-50 Bordeaux formula may be used. After the fruit has set it should be kept covered with Bordeaux mixture during the first eight or ten weeks of its development. Fruits seem to be more susceptible to the disease just as they are setting, and the first spraying should be made in the last part of the bloom period. A second spraying should follow a week after the first, and a third a week later, and a fourth two weeks after the third. If the weather is damp and cloudy during this period a fifth spraying may be necessary three weeks after the fourth application.

Dead and sickly wood should be kept pruned out of the trees and where the disease is severe, the fallen leaves and rubbish under the trees should be cleaned up and burned. A few sanitary precautions may go a long way toward helping to keep the disease in check.

A few other diseases of the mango, such as leaf spots and fruit injuries, have come to our attention from time to time but these have not been given sufficient study to determine their causes.

Guava Diseases

The production of guavas has its place in the fruit industry of Florida and we may look for continued development along this line to meet the growing demands for the jelly and other products for which the fruit is noted. At the present time guavas grow wild in certain parts of the State, but in the future as the demand increases they may be cultured and cared for as any other fruit crop. With this in view it is well to consider the diseases that are likely to affect the guava here in Florida. There are only a few diseases reported on this fruit and none of these have become a serious menace to our

guava crop as yet. Ripe Rot or Mummy Disease is probably more widely known and it has been reported as occurring to some extent in the State. It has become a serious trouble on the guava in Porto Rico and our Florida climate would appear to favor the development of the disease here. Other types of injury on leaves and fruits have been observed occasionally but these appear to be local troubles or diseases of minor importance. Fortunately, the guava seems to have escaped many of the serious ills that afflict our more famous fruits. Whether this is accidental or due to the fact that no one has taken enough interest to inquire into the diseases of the guava I am unprepared to say. It appears, however, that with a little spraying and an occasional pruning of the trees, the guava crop can be matured without any serious amount of loss.

Ripe Rot or Mummy Disease

This is a fungus trouble belonging to the group of Anthracnose which are well represented among our various fruit and vegetable crops. It is caused by the fungus **Gloeosporium psidii**. While the disease has been reported from Florida no statement has been seen as to the probable amount of damage it does to the guava crop in the State. The writer has observed occasional specimens of the disease but has not seen it abundant enough in any one locality to cause any serious concern. The disease attacks the ripening fruit causing it to rot, shrivel and dry up on the tree. The first indication of the trouble is the appearance of brown spots on the surfaces of the ripening fruits. These spots continue to increase in size until the entire fruit is decayed. The surfaces of the brown spots may show a pinkish coloration due to the spore masses of the fungus. The decayed fruits finally shrivel, become dry, and cling to the tree as mummies. It is probably by this means that the disease is carried over from season to season.

Control

Where the disease is troublesome certain measures can be taken to prevent it. All shriveled or mummified fruits should be removed from the trees and destroyed some time in advance of the new crop. Probably two or three applications of ammoniacal solution of copper carbonate applied before the fruit begins to ripen will readily control the disease. The first spraying may be made when the fruit is half mature or more and the spraying should be continued at ten-day intervals until the fruit ripens. The ammoniacal solution of copper carbonate will be preferable to Bordeaux mixture for this purpose since it will leave no objectional stain on the mature fruit.

Alga Leaf Spot

A leaf spot of the guava is sometimes found on bushes growing in moist shady situations. It is caused by a species of Alga but does not appear to be anything of a serious nature as far as the guava is concerned. The development of this spotting is chiefly influenced by shade and moisture and as yet it has not been observed in sufficient abundance to cause serious injury, to the foliage. However, under certain conditions it may become a troublesome pest. The disease appears as distinct, round, flattened spots, one fourth to one-half an inch in diameter, scattered over the surface of

the leaf. The spots are raised and first appear orange red in color, but later change to a greenish cast. If a considerable part of the leaf tissue is covered with such spots the leaf may fall and severe attacks of the disease may cause considerable defoliation.

Where control measures become necessary two or three applications of Bordeaux mixture at ten-day intervals should keep the disease in check.

Papaya Diseases

Two diseases are reported on the papaya that might be of interest to the growers of fruit in Florida. These are Leaf Blight or Leaf Spot and Foot Rot, both of which are fungous troubles. Foot Rot is a newly described disease from India which may not occur with us as yet. Leaf Blight however, has been found in Florida in a few localities this season and it may have a wider distribution than we suspect at the present time.

Leaf Blight

This is a fungus disease of the leaves caused by **Pucciniopsis caricae**. It was found some years ago on Sanibel Island, Florida, but considered of minor importance at the time. This spring, however, the disease was observed at several points on the main land and in some cases the trouble appeared suddenly and seemed to spread rapidly. Specimens showing Leaf Blight were received first from St. Cloud, Florida, and later the disease was noted around Miami and farther south in Dade county. It has been reported from Porto Rico, Cuba and British Guiana, In Porto Rico, Leaf Blight frequently causes serious injury to the younger plants, resulting in almost complete defoliation in cases of severe attacks.

Appearance

The disease is striking and easily recognized by the black pustular spots on the under surfaces of infected leaves, suggestive of Sooty Mold. On the upper surface of the leaf the infected areas appear as brown circular spots distinctly outlined. The spots are usually small varying from one-eighth of an inch to mere dots. From a few to several hundred spots may be present on a single infected leaf.

Infections on the under surface of the leaf are represented by black round masses, called sporodochia, which are raised slightly above the leaf tissue and bear the spores of the fungus. The small, brown septate spores of the fungus are found abundantly in these black masses and it is by means of these spores that the disease is spread. They may be blown by the wind or carried by insects for considerable distances.

Severe attacks of the disease may cause defoliation of the plants, resulting in death or a very much weakened plant.

Control

Very little attention seems to have been given this disease in the past especially in

regard to control measures and such recommendations as can be suggested at the present time are only tentative.

If the disease is discovered in time it can probably be easily controlled by the use of Bordeaux mixture. Three or four sprayings at intervals of ten days to two weeks apart with 3-3-50 Bordeaux mixture should put down a mild attack. In this case the object should be to keep the slightly infected leaves covered with Bordeaux to kill any spores produced on the surfaces and the new leaves well protected during their tender period of growth to prevent new infections. Both under and upper surfaces of the leaf should be thoroughly covered with the spray. In cases of severe attacks all of the older infected leaves should be removed and destroyed. The remaining foliage should be thoroughly sprayed with Bordeaux mixture at weekly intervals until the new leaves that put out are entirely free from disease. If the badly infected plant is a small one it will be more economical to destroy it and start with a healthy plant. Seedling plants should be closely watched especially if they are grown in the vicinity of old plants carrying the disease. Frequent applications of Bordeaux mixture may be necessary to protect the seedlings from infection. When Leaf Blight appears efforts should be made at once to eliminate it as soon as possible.

Foot Rot

Foot Rot is a newly described disease in India where it is reported as troublesome during the rainy season, killing bearing plants or so weakening them as to cause reduced production and undersized fruits. The disease is more common on bearing plants two or three years old and it is rarely found on young seedlings. It is caused by a fungus which has been identified as **Pythium butleri**. Whether this fungus occurs in Florida or not is unknown at the present time. It belongs to a group of soil fungi noted for causing Damping Off and decay of plants at the crown or in the root system. Damping Off is a common trouble in Florida with many of our vegetable plants and a species of *Pythium* is one of the principal causes of this malady.

Appearance

Foot Rot appears usually at the surface of the soil and the first indications of the disease are marked by a patch of soft watery bark at the base of the plant. A copious flow of milky juice exudes from the affected tissue, which turns brown and coagulates on exposure to the air. The disease may continue to spread from a small area until the trunk of the plant is girdled or nearly so and the bark tissue is rotted down to the hard woody tissue. This finally becomes discolored and a foul odor is usually associated with the decay. The disease may extend up the trunk a foot or two and it is more active and spreads rapidly as long as the weather is damp and rainy. Foot Rot is chiefly a "rainy season" disease and it is rapidly checked when dry weather follows. The severity of an attack will depend upon the period the disease has to develop during favorable weather. A plant may be killed in one season or it may take a much longer time depending upon the rapidity with which the disease invades the bark tissue. A plant that is girdled soon dies, however large areas of the bark may be invaded and the plant still live, but very

much weakened. Again attacks may do little or no harm if infection takes place near the end of the rainy season.

We do not know how this disease might behave under climatic conditions in Florida and it is worth while to guard against its introduction or distribution among the plantings we have in the State.

Control

The following method of control has been suggested. The diseased bark should be cut away as soon as the trouble is observed and the wound should be painted over with some antiseptic covering. Crude carbolic acid, carbolineum, or pine tar may be used for this purpose but such should only be applied to the cut surfaces. The diseased bark cut away should be collected and burned and not allowed to remain at the base of the plant. This material contains the fungous parasite which may get back into the soil and form a source for reinfesting the plant. If taken in time the disease can be checked without much injury to the plant. If, however, the plant is nearly girdled before the disease is discovered, very little can be done to repair the damage.