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PESTS AND DISEASES OF PLANTAIN IN GUYANA

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MANAGEMENT STRATEGY

Both cultural and chemical strategies have been used for control of the banana thrips. In new plantations only peeled and washed rhizomes should be used since the pest can spread by infested setts, young suckers and soil infested with pupae. In addition to spraying of the pseudostem and suckers, young fruits are bagged. The bunch is bagged using a polyethylene sack, which is impregnated with an insecticide (chloropyrifos) to prevent infestation of thrips from the pseudostem to the fruit. Fruits should be washed and treated before shipping since live insects can be carried on them. Fruits should be inspected for live insects.



Figure 11: Fruit scarring

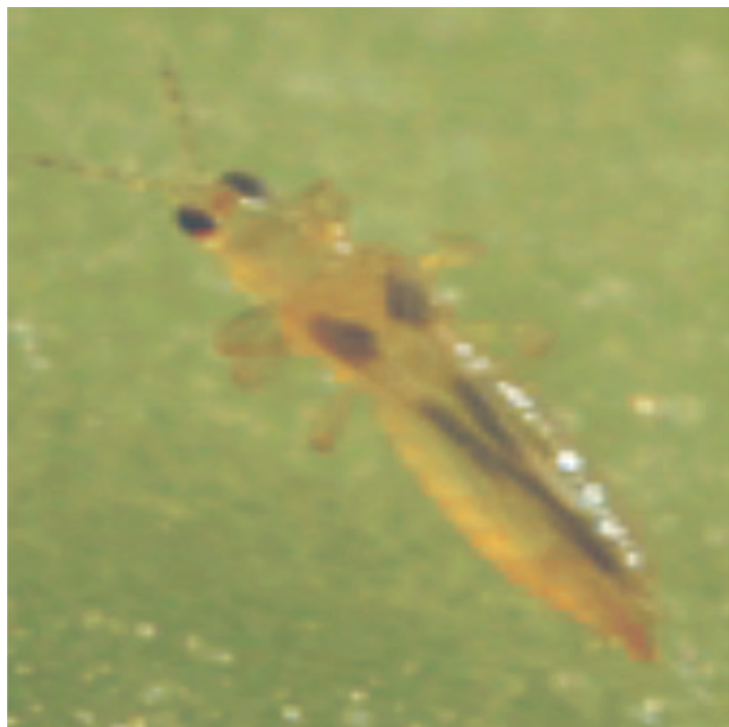


Figure 12: Red rust thrips

MAJOR PESTS AND DISEASES OF PLANTAIN IN GUYANA

RED RUST THRIPS -*Chaetanaphothrips signipennis* (Thynasoptera: Thripidae)

The red rust thrips, *Chaetanaphothrips signipennis*, is of economic importance in many banana-producing countries. When fruits are attacked, the market value is reduced although the quality of fruit is not affected. Circular rusty-red patches appear on affected fruits and later there is superficial cracking of the skin or sometimes splitting of the fruit. This pest has a limited distribution in the Caribbean and is of quarantine significance.

BIOLOGY

Thrips are small insects, about 1 to 2 mm long, that occur on the fruit as the bunch is emerging and the bracts lift. The eggs are laid under the epidermis of the plant on shoots, edges of the sheaths and young leaves. On the fruit, eggs are also laid in sheltered bases and between fruits for protection. The eggs hatch in 1-2 weeks and the larvae crawl and feed for about one week before going to the soil to pupate. The pupae live for 7-12 days and the adults for 27-112 days (average 50-55 days). The adults live on any sheltered part of the plant: in the bunch, under the sheaths or on young leaves and petioles. Adult thrips reproduce sexually and there are more females than males in field populations. Under cool day conditions, the life cycle is prolonged.

SYMPTOMS

Red rust thrips cause rust-colored blemishes to form on the fruit due to feeding of nymphs and adults. They feed on the soft skin of the immature fruit, usually on the hidden surfaces between the closely packed fingers, especially in areas where the fingers are touching. The top hands are usually the most seriously affected. The damage should not be confused with maturity bronzing, which occurs on the exposed outer curve of the fruit and is not confined to areas where the fingers are touching. In severe cases the fruit develops longitudinal cracks and damage may extend over most of the fruit surface. Although the damage does not reduce the eating quality of the fruit, it negatively affects the external appearance and market value.

Flower thrips (*Frankliniella* spp.) are common throughout Guyana and cause a small raised pimple, capped by a black spot, to develop on the fruit surface. This is due to the adult female laying its eggs in the skin of soft immature fruit.



Pathogen	
YELLOW SIGATOKA <i>Mycosphaerella musicola</i> <i>(Pseudocercospora musae)</i> <ul style="list-style-type: none"> conidiophores formed in dense clusters (sporodochia) on dark stromata on both leaf surfaces conidiophores straight, usually nonseptate and unbranched, no spore scars conidia uniform thickness for full length, 1-5 septate, no distinct basal scar 	BLACK SIGATOKA <i>Mycosphaerella fijiensis</i> <i>(Pseudocercospora fijiensis)</i> <ul style="list-style-type: none"> conidiophores formed singly or in small groups (2-5) on lower leaf surface. conidiophores straight or bent, 0-3 septate and occasionally branched, slightly thickened spore scars conidia taper from base to apex, 1-6 septate, distinct basal scar
Hosts	
YELLOW SIGATOKA Bananas (AAA) generally susceptible; most cooking bananas and plantains (AAB and ABB) moderately to highly resistant	BLACK SIGATOKA Most dessert bananas, cooking bananas, and plantains susceptible
Symptoms	
YELLOW SIGATOKA <ul style="list-style-type: none"> early streak pale yellow streaks appear on leaf numbers 4-5 (unsprayed Cavendish) 	BLACK SIGATOKA <ul style="list-style-type: none"> early streak dark brown streaks appear on leaf numbers 2-4 (unsprayed Cavendish)
Epidemiology	
YELLOW SIGATOKA <ul style="list-style-type: none"> more common in cooler environments inoculum consists of both conidia (water-dispersed) and ascospores (wind-dispersed) conidia first appear in the mature spot stage produce more than 30,000 conidia per spot conidia not dislodged by wind mature ascospores produced 4 weeks after the appearance of streaks 	BLACK SIGATOKA <ul style="list-style-type: none"> more common in warmer environments windborne ascospores are the major inoculum conidia first appear in early streak stage produce about 1,200 conidia per spot conidia both water- and wind-dispersed mature ascospores produced 2 weeks after the appearance of streaks

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sometimes with a purple tinge, and visible on the top surface. The lesions then enlarge, becoming fusiform or elliptical, and darken to give the characteristic black streaking of the leaves. Adjacent tissue often has a water-soaked appearance, especially under conditions of high humidity. When the disease severity is high, large areas of the leaf may become blackened and water-soaked. On the necrotic tissue, numerous, tiny, black, globose fruiting bodies containing sac-like structures filled with ascospores will emerge from the underside of the leaf. If left unchecked, black Sigatoka will progress through the plant's leaf surface area, greatly reducing photosynthetic capability and thus yield.

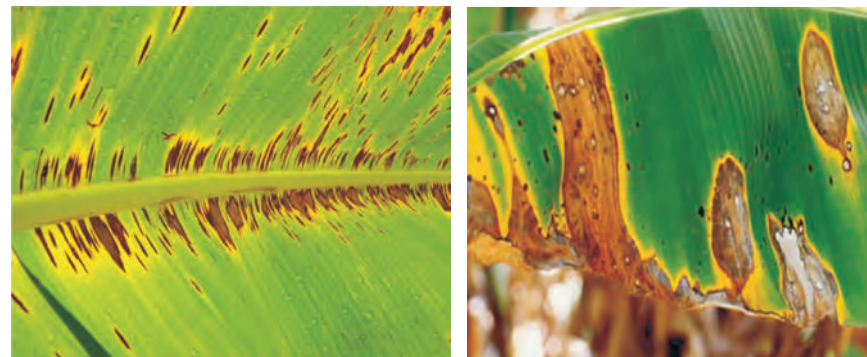


Figure 10: Necrotic lesions on leaves

MANAGEMENT STRATEGY

Black Sigatoka is controlled with frequent applications of fungicides and cultural practices, such as the removal of affected leaves, and adequate spacing of plants and efficient drainage within plantation. In total, these are very expensive practices.

Black and Yellow Sigatoka Compared (next page)

CONDITIONS FOR DEVELOPMENT

The spread and dispersal of this disease is by use of planting materials taken from diseased stands, from mother corm into the suckers and followers. Insects such as bees and wasps also facilitate transmission of this disease. The disease is moved into countries by people and goods; by air and sea and from plant to plant through the use of un-sterilised farm tools.

MANAGEMENT STRATEGY

Rigid sanitary methods are the best means of control as no chemical treatment is available to prevent or control infection. Management includes the following:

- a) use of planting materials from disease free fields,
- b) removal and destruction by burning of all plants which show any signs of disease,
- c) proper field sanitation – plots should be weed free, since “moca-moca” bush and other weed species may keep Moko bacteria alive,
- d) disinfection in the fields can be achieved by flaming tools (heat exposure) or sterilised in a solution of 70% ethanol (alcohol), formaldehyde (formalin) 10% or chlorine solution 10% (marvex /bleach), for at least 10 minutes,
- e) provision of adequate drainage to avoid run-off water from contaminated fields so that the disease cannot be transmitted from field to field,
- f) if fields are already infested, then all plants should be removed and destroyed by burning. The fields must then be fallowed for at least 12 months,
- g) crop rotation – crops, such as yams, sweet potato and eddoes may be used, and
- h) before leaving the diseased site, soak hands, tools, boots etc. in alcohol, bleach or formalin solution.

BLACK SIGATOKA -

Mycosphaerella fijiensis

Black Sigatoka is the most important foliar disease in plantain and banana caused by the fungus, *Mycosphaerella fijiensis*, which thrives in the heat and humidity of the tropics. This disease can cause a reduction in yield as much as 30 -50%.

SYMPTOMS

The first symptoms of black Sigatoka disease are tiny, chlorotic spots that appear on the bottom surface of the 3rd or 4th open leaf. The spots grow into thin brown streaks that are limited by leaf veins. The color of the streaks becomes darker,

INTRODUCTION

Plantains are a major sub-group of the cultivated banana (*Musa* sp). Plantains are sturdy plants grown on the Coastal Plains and in riverain areas. Plantains are important food crops for the populace. Plantains have been identified for expansion under the Agricultural Diversification Project (ADP).

Plantain Varieties

The main varieties of plantains cultivated in Guyana are 'Horse', 'Creole' and 'Horn'. Farmers can choose from these three varieties depending on the market (both local and export) requirements.

PESTS

MOKO DISEASE -

Ralstonia solanacearum (Race 2)

Moko disease is a major disease of plantain/banana in Guyana. It is widespread throughout the plantain/banana growing areas. Moko disease of banana is caused by the soilborne bacterium, *Ralstonia solanacearum* (Race 2). The pathogens enter the banana tree through root wounds, and quickly grow and spread throughout the entire plant blocking the channels that carry water, thereby preventing the distribution of food and water.

SYMPTOMS

The signs indicating the presence of the disease are as follows:-

1. Yellowing and drooping of young leaves with brown patches resulting in the death of the plant.
2. Premature and uneven yellowing of fruits which, when cut, display black spots or blackening of the pulp.
3. Presence of a dark brown to bluish – black ring in the cross-section of the pseudostem (trunk) of the plant.
4. Navel, i.e. male flowers ends, wither and become black.
5. Breaking of the leaf petioles, wilting, drying and eventual death of plant.



Figure 8: Wilting of plants



Figure 9: Blackening of fruit pulp

DISEASES

PLANTAIN/BANANA ROOT WEEVIL -

Cosmopolites sordidus - (Coleoptera; Curculionidae)

The banana weevil *Cosmopolites sordidus* is a major insect pest in all the banana and plantain growing areas of Guyana. It is associated with yield losses of up to 50% even to 100% in severe infestations which may lead to total crop failure.



Figure 1: Plantain/Banana Root Weevil

Symptoms

Detection of Infestation:

Adult

- i) Existence of tunnels in the corm with all stages of the weevil.
- ii) Presence of red marks about 1.3cm (1/2in) to several centimeters long on the pseudostem surface near the corm.
- iii) Placing traps around cultivated area. Traps are made by cutting pseudostem about 45cm long (18ins) and placing the cut surface facing the ground. An average of three adults per trap would indicate that infestation needs control.

Larva

The larva causes damage through feeding and tunneling in the corm. Continuous feeding and tunneling causes the corm to become a blackened mass of decaying tissue. Above ground symptoms are the yellowing of leaves, withering and eventual death of the plants. Infected plants are easily blown over by winds since the roots are weakened. The mature larva, or grub is about 1-1.5cm long, creamy-white in colour, fleshy, and are legless, with the body distinctly curved and swollen in the middle.

Serious weevil attacks may lead to massive toppling of bananas. Other detrimental effects of weevil infestations include: premature plant death, stunted growth, delayed fruit maturation, production of small bunches, reduced number of suckers, reduced sucker vigour and development of water suckers.

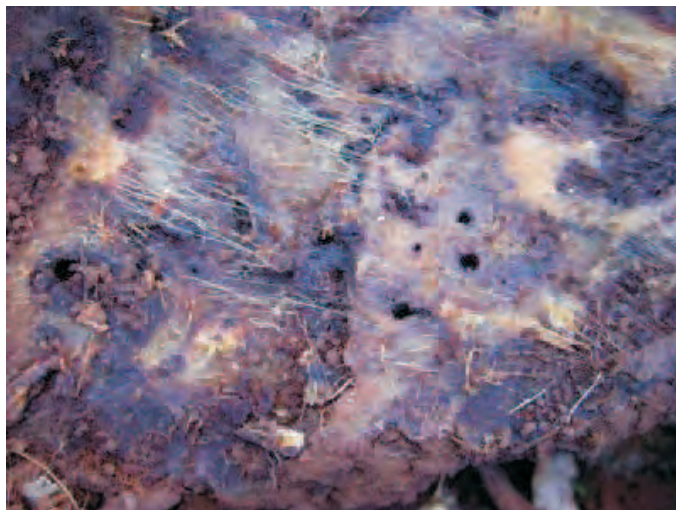


Figure 2: Feeding holes and tunneling in the corm of banana

MANAGEMENT STRATEGY

1. **Sanitation:** Use clean planting material. Ensure that suckers to be used for planting new fields are free from pests. Remove all trash from suckers and pare the corm to remove all roots and discoloured portions. Pared suckers are further dipped in a 4% Triazophos, Basudin or Vydate L solution. Allow suckers to dry for at least twenty-four hours before planting. Suckers so treated will be protected against weevil attack for 3-5 months.
2. **Cultural Control:** Weeding and fertilizing contribute to the plant vigour which enables the plant to better withstand weevil attack. De-sucker and clean matts regularly and remove all dead and decaying matter. Remove all plant residues from the previous crop.
 - a. **Field Treatment of Infested Plant:** Plants that are infected in the field can be given an insecticidal treatment. The insecticides Triazophos, Basudin or Vydate L are recommended at the rate of 15mls to 4500mls ($\frac{1}{2}$ fl.oz. to 1gal) water and applied thoroughly to the plant stand. The insecticide solution should be sprayed on to the pseudostem immediately above the corm, and the soil immediately around the base of the plant. This treatment should give control for approximately 3-5 months.
 - b. **Trapping:** The adult weevil is attracted to cut or damaged pseudostem. During harvesting, the pseudostem from these plants which would have already borne fruit can be split longitudinally and cut into 45cm (18ins) long pieces. The cut surface of each piece can be treated with 0.05% concentration of Triazophos or Basudin solution. Each cut piece should then be placed with its cut surface downwards on the soil surface between



Figure 6: Damage caused by nematodes



Figure 7: Result of severe nematode infestation

(infections), then soak them in hot water (125°F) for 20 minutes. Although those practices can reduce nematode populations, plants from tissue culture raised in a disease-free nursery are the best option.

1. Cultural Control:-

- a) Nematode free plantain/banana crops can be produced by using clean (uninfected) planting materials (properly pared corms or micro-propagated plantlets). These are planted in new areas or in fields which are free of plant nematodes.
- b) Proper field sanitation: - Fields should be kept free of weeds that could harbour the nematode.
- c) Good drainage / Irrigation.
- d) Crop rotation with turmeric has shown suppression of the all nematode populations;
- (e) Fallowing and flooding for three months after banana or plantain also suppresses population of *R. similis*
- (f) Black polythene mulch also helps to reduce the nematode population.
- (g) Application of neem coated urea also reduces populations in corms and soil.

2. Chemical Control:-

Presently, the standard recommendation for nematode control in plantain/banana crops is the use of clean planting materials (thoroughly pared corms or micro-propagated plantlets), treated with a nematicide, with follow ups at regular intervals. However, due to the environmental impact and consumer health considerations, attempts at breeding nematode resistant plantain/banana cultivars are ongoing. Vydate L is also recommended for controlling nematodes.



Figure 5: Symptom of nematode infestation

the standing crop. Traps will attract and kill adult weevils during a 7-10 day period. Untreated traps can be placed in the field as described above, however, these must be serviced and replaced every 48 hours. This system will also rigorously reduce the pest population in the field.

PSEUDOSTEM BORER:

Lapaeumides licus (Lepidoptera; Castinidae)

Odoiporus longicollis (Coleoptera: Curculionidae)

b. Pseudostem Borer

The larva (3.75cm long) bores into the pseudostem at any point up to one metre from ground level. At the point of boring, and evidence of infestation, a slimy, colourless material continuously exudes. The larvae bore mostly the periphery of the stem, but sometimes attack the core and reach the growing point, thus killing the plant. Once plants are checked regularly, slimy secretions will indicate the location of the larva.

Control

- Practice good field sanitation.
- Injection Method: - Make 2 – 3 holes 9cm (3ins) about 60cm (2ft) from the ground. These holes should go down at on 45degree angle and sideways into the trunk. With the use of a dispensing bottle, pour Triazophos 40% E.C. into the holes.
- DO NOT APPLY THIS TREATMENT TO PLANTS WHICH HAVE IMMATURE OR MATURE FRUITS.

Pseudostem Borer (*Odoiporus longicollis*):

Adults are either reddish brown or black. Initially, the grubs bore into the stem and feed within the stem. An initial symptom is in the form of exudation of plant sap and blackened mass that comes out from the hole made by the grub. Finally the whole plant dies.



Figure 3: Tunneling damage to the pseudostem



Figure 4: Death of the banana plant

Control:

- In case of severe infection the affected plants should be uprooted and burnt.
- Celphos (3 tablets/plant) is recommended for the control of egg, larva, pupa and adult populations of the insect. After placing the tablet inside the pseudostem, the slit should be plastered with mud.
- Clean cultivation is an important measure for its control. Application of Carbofuran (3 g of granules/stool) is also very effective to control the pest. Alternately, application of Endosulphan (0.04%) or Carbaryl WP (0.1%) also controls the pest population.

FRUIT SCARRING BEETLE -

Colaspis hypochlora

(Coleoptera; Chrysomelidae)

The fruit scarring beetle, *Colaspis hypochlora*, is a common insect pest in most of the plantain and banana producing areas of Guyana. Occurrence is usually high during the rainy season.

SYMPTOMS

Adult beetles feed on the fruit peel causing a localized scarring of the tissue in the damaged area. A clear fluid, which eventually turns black, is exuded from wounds. The wounds are only superficial and do not extend to the edible portion of fruits. Symptoms of fruit damage include raised lesions and scars along the peel surface, especially along the midrib area of the fruit. This pest invades the bunches when the fruits are very young.

CONDITIONS FOR DEVELOPMENT

Conditions suitable for development of this pest are poor field sanitation, water logged conditions, and/or heavy shade.

MANAGEMENT STRATEGY

The adherence to proper cultural practices will greatly reduce the incidence of this pest. Such practices include keeping the fields relatively free of weeds, providing adequate drainage, and allowing sufficient sunlight to penetrate the canopy. In addition, insect pressure can be reduced by spraying the bunches with a 0.1% sevin (carbaryl) solution or 0.05% malathion solution. Control is also achieved by covering the developing plantain and banana bunches with chlorpyrifos impregnated bunch cover.

Removal of grass weeds from plantations where the population of this pest is high can often reduce the population levels enough to avoid the use of insecticides.

NEMATODE: -

Radopholus similis (Tylenchida: Pratylenchidae)

The burrowing nematode or the banana-root nematode, *Radopholus similis*, causes toppling or blackhead disease of plantain and banana. Nematodes are now recognised as important soil-borne pathogens causing decline in yield in bananas by as much as 30 – 60 %.

SYMPTOMS

On Plantain/Banana this nematode invades and feeds on the cortex of the roots causing lesions and cavities. The nematode seldom feeds on vascular tissues. Nematode damage to roots results in reddish, elongated flex, parallel to the root axis. The discoloured areas enlarge as the nematode and progeny feed. The older parts of the lesions turn black and shrink while the advancing margins remain red. The root systems are reduced, severely damaged and unable to uptake water and nutrients thus, the plants lack vigour; are stunted, and because of poor anchorage, are prone to topping under bunch weight or to being blown over even by not so strong wind.

Nematode infested plantain/banana does not respond well to fertilizer application, irrigation or other cultural practices. Where there is severe nematode infestation, ratoon crops are hardly produced as there is continued plant loss and significant reduction of suckering

MANAGEMENT STRATEGY

Management of *R. similis* entails reducing nematode populations in the soil before planting, for example using soil fumigation, removing host and doing rotation with non-host crops and also planting cover crops such as *Crotalaria* or *Tagetes*. Furthermore, before planting pare the rhizomes in order to remove dark spots