RAMA UNIVERSITY

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FACULTY OF AGRICULTURAL SCIENCES AND ALLIED INDUSTRIES

DISEASES OF FIELD&HORTICULTURAL CROPS&

Management 1 PPA - 312

LECTURE 02

1. NAME OF DISEASE – PANAMA WILT OF BANANA

Casual organism- Fusarium oxysporum f.sp. cubense

- First reported from Australia in 1876
- The popular variety Gros Michel, mostly grown for export quality fruits, was most susceptible and had to be replaced with Cavendish bananas which were resistant in the Latin American countries
- Cultivars Rasthali (Amrutapani), Gros Michel, Karpooravalli cultivars are susceptible
- Four races of the pathogen are known to exist but race 1 is mostly prevalent in India attacking Silk group of cultivars (Rasthali or Amritapani)

Symptoms

- Fungus attacks roots and finds its way in to the pseudostem
- Conspicuous symptoms usually appear on 3 to 5 months old plants, although 2-3 months old plants are also killed under highly favourable conditions
- Symptoms initially seen in older plants in a mat
- The earliest symptoms are faint yellow streaks on the petiole of oldest, lower most leaves
- Affected leaves show progressive yellowing, break at the petiole and hang down along the pseudostem
- Longitudinal splitting of pseudostem is very common
- Light yellow to dark brown discolouration of vascular strands in pseudostem. Usually the discolouration appears first in the outer or oldest leaf sheath and extends in to the inner sheaths
- The fungus grows and blocks the vascular system resulting in wilting of the plant
- Vascular discolouration in cross sections of rhizome appears reddish brown towards periphery progressing in to centre of rhizome
- Rhizomes of affected plants give characteristic odour of rotten fish if infection is due to odoratum isolate of the pathogen
- Young suckers also develop the disease but rarely develop external symptoms
- Affected plants do not produce bunches. Even if produced, fruits are malformed and ripen prematurely or irregularly. However the pathogen does not infect the fruits.

yellowing of the lower leaves

Drying of leaves

Survival and spread

Primary: Chlamydospores in soil and propagules in infected suckers used for planting

Secondary: Micro and macro conidia through irrigation water

Favourable conditions

- Saturated poorly drained heavy soils
- Cultivation of susceptible cultivars like Amritapani ¾ Infection by burrowing nematode, Radopholus similis, predisposes the plants to disease

Management

- Use of disease free suckers for planting
- Avoid ill drained soils
- Flood fallowing for 6 to 24 months or crop rotation with puddle rice
- Application of lime (1-2 kg/pit) to the infected pits after chopping of the plants parts
- Dipping of suckers in carbendazim (0.1%) solution before planting
- Neem cake + Trichoderma viride should be applied in planting pits
- Soil drench with 0.2% carbendazim or rhizome injection with 0.2% carbendazim
- Growing resistant Cavendish varieties, viz., Basrai (Vamanakeli or Dwarf cavendish), Poovan (Karpura chakkarakeli) etc.

2. NAME OF DISEASE – BACTERIAL WILT OF BANANA

Casual organism: Ralstonia solanacearum (race 2)

(Pseudomonas or Burkholderia)

- Gram negative bacterium with rod shaped cells that are motile by 1-4 flagella
- Also infects collateral hosts like Heliconia
- First recorded in Guyana in 1840 in Moko plantain
- Not reported from India

Symptoms

- Symptoms start on rapidly growing young plants
- The youngest three to four leaves turn pale green or yellow and collapse near the junction of lamina and petiole
- Characteristic discoloration of vascular strands, wilting and blackening of suckers
- Vascular discolouration (pale yellow to dark brown or bluish black) is concentrated near the centre of the pseudostem, becoming less apparent on the periphery
- Greyish brown bacterial ooze is seen when the pseudostem of affected plant is cut transversely
- A firm brown dry rot is found within fruits of infected plants (characteristic symptom)
- Death of whole plant occurs under severe infection.

Survival and spread

Primary: Bacterial cells in soil and through diseased plant suckers used for planting

Secondary: Bacterial cells through irrigation water

Management

- Grow relatively resistant varieties like poovan and monthan
- Adopt strict plant quarantine and phytosanitary measures and plant healthy suckers
- Exposure of soil to sunlight during dry hot weather
- Eradicate infected plants and suckers by rouging or killing in situ by application of herbicides
- Disinfestation of tools with formaldehyde diluted with water in 1:3 ratio
- Crop rotation (3 years rotation with sugarcane or rice) & providing good drainage
- Allow fallow period or flooding during off-season

- Fumigation of infected site with Methyl Bromide or chloropicrin
- Drenching soil in infected pockets with bleaching powder solution (1.5%) and Bordeaux mixture 1% + streptocycline (0.02%)
- Bio-control with Pseudomonas fluorescens .

3. NAME OF DISEASE – SIGATOKA DISEASE OF BANANA

Yellow Sigatoka – Mycosphaerella musicola (I.S: Pseudocercospora musae)
Black sigatoka – Mycosphaerella fijiensis (I.S: Paracercospora fijiensis) ¾

- First observed in Java in 1902
- Epidemic in 1913 in Sigatoka valley in Fiji
- Wide spread in nature and occurs is many countries except in Egypt and Israel
- In India a serious threat in states of Assam, Tamil Nadu, Karnataka & A.P
- The most important commercial cultivars belonging to Cavendish group are highly susceptible
- Black Sigatoka is not prevalent in India

Symptoms

- Early symptoms appear on the lower leaves
- Initially small reddish brown specks develop on leaves near the tip or margin of lamina
- Specks may also be produced near the midrib
- Specks increase in size and turn in to spindle shaped spots with reddish brown margin and gray centre surrounded by a yellow halo
- Spots formed near the midrib enlarge and extend towards the margin of lamina
- Spots coalesce and the entire spotted area appears dried
- Disease gradually progresses on to upper leaves
- Infection becomes severe after bunch emergence with the entire foliage infected under favourable conditions
- Fruits in bunches of infected plants are under developed and may ripen prematurely

Survival and spread

Primary: Pathogen survives on dry infected leaves on the field soil and primary infection takes place through ascospores produced in the infected plant debris

Secondary: Conidia by wind and rain splash

Favourable conditions

- High humidity, heavy dew and rainy weather with temp above 21o C
- Prolonged leaf wetness periods
- Poor drainage and low soil fertility particularly of potassium
- Closer planting ¾ Susceptible cultivars like Grand Naine, Dwarf Cavendish and Giant Cavendish
- More suckers in a mat because of non removal

Management

- Planting banana in well drained soils
- Growing moderately resistant cultivars like Karpura Chakkerakeli
- Planting at recommended density (1000 plants/acre)
- Prunning suckers periodically to avoid overcrowding in the field
- Removal and destruction of affected leaves followed by spraying with BM 1% + linseed oil 2% ¾
- Applying recommended dose of potassium fertilizer
- Spraying mancozeb or cholorothalonil 0.2% suspended in mineral (paraffin) oil
- Spraying chlorothalonil 0.2% with non ionic adhesive in pre-monsoon period and propiconazole 0.1% interspersed with tridemorph 0.1% at 20 days interval in rainy period .

4. NAME OF DISEASE – BUNCHY TOP DISEASE OF BANANA

Bunchy top / Curly top / cabbage top /strangles disease
- Banana bunchy top virus (BBTV)

- First reported from Fiji in 1889 in Cavendish varieties
- Around 1940, introduced into India from Srilanka through cyclone
- The virus is a domestic quarantine pest in India. Hence movement of planting suckers from North East, Tamil Nadu, Karnataka and Kerala to other parts of the country is banned The virus is a ssDNA virus with isometric particles belonging to Babu virus group

Symptoms

- Infection may start at any stage of crop growth
- Paling of lamina with interveinal chlorosis that is evident against light
- Prominent dark green streaks on the petioles and along midrib and leaf veins that range from a series of dark green dots to a continuous dark green line (Morse code)
- Infected plants show marked stunting
- Leaves are reduced in size with narrowed lamina and shortened petiole, produced at shortened internodal length, become erect and brittle and crowded at the top (bunchy top)
- Leaf margins also show chlorosis and slight curling and necrosis
- Infection of young plants leads to failure of bunch emergence
- Tips of inflorescence bracts of infected plants remain green and do not turn to normal pink or purple

S**urvival and spread**
Primary: Virus particles through diseased suckers used for planting

Secondary: Virus particles transmitted by banana black aphid, Pentalonia nigronervosa Colocasia esculenta serves as a latent reservoir host

Favourable conditions

- Progressively increasing temperature from February onwards favours virus spread and symptom expression
- Prevalence of infected reservoir host
- Prevalence of vector

Management

- Adoption of strict quarantine measures
- Use of only certified banana suckers or tissue culture plants for planting
- Periodical monitoring and rouging of infected plants with all suckers in the mat by rouging or killing by injecting herbicide, 2, 4-D
- Raising barrier crops like sunhemp in three to four rows on the field boundaries to check aphids from entering the fields from neighbouring infected fields
- Vector control with systemic insecticides, viz., Phosphomidon @ 1ml/l or Methyl demeton or Dimethoate @ 2 ml/l
- Discouraging intercropping with Colocasiai in disease endemic areas.