

# Definitions of plant Diseases

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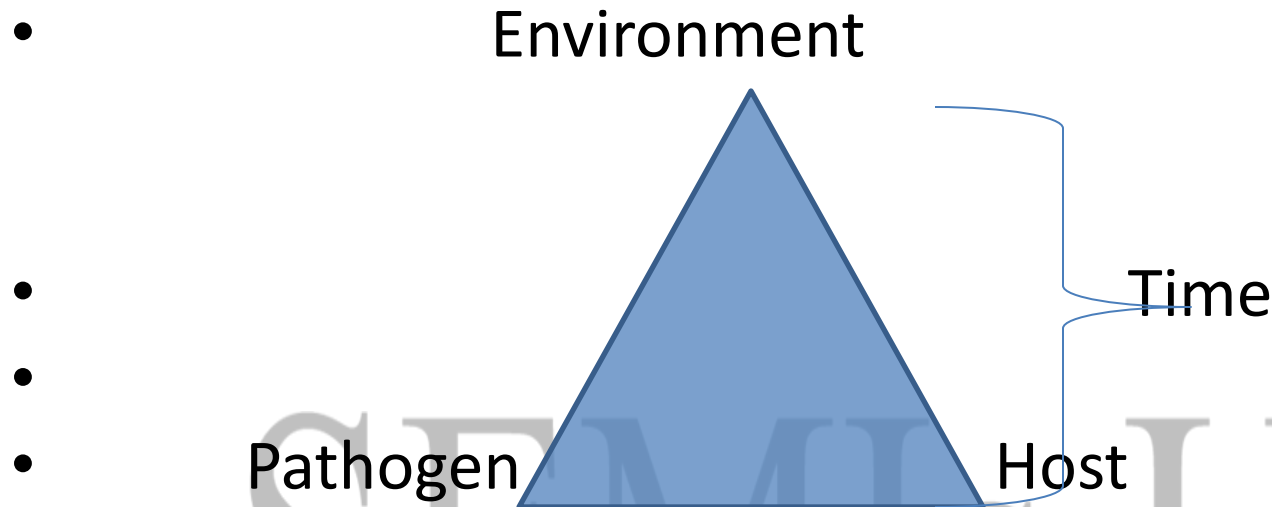
## Definitions of plant Diseases

- A *plant disease* is an abnormal growth and/or dysfunction of a *plant*.
- *Diseases* are the result of some disturbance in the normal life process of the *plant*.
- *Diseases* may be the result of living and/or non-living causes.
- Biotic *diseases* are caused by living organisms (e.g., fungi, bacteria, nematodes and viruses).

## Definitions of plant Diseases

- Abiotic diseases are caused by non-living environmental conditions
    - ✓ soil compaction,
    - ✓ wind, frost,
    - ✓ soil salt damage, and girdling roots
    - ✓ Nutrient deficiencies
    - ✓ Environmental pollution
- To be handled later

# Definitions of plant Diseases: Biotic/Infectious agents-Disease Triangle



- **Conditions for disease**
- Host should be susceptible
- Pathogen should be virulent
- Environment should be favorable for the disease
- **Over a given time**

# Definitions of plant Diseases: Biotic/Infectious agents

- Infectious agents
- Fungi
- Bacteria
- Viruses
- Nematodes
- Mycoplasmas
- Higher plants
- Algae

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## **Definitions of plant Diseases: Biotic/Infectious agents**

- **Pathogen: This is a parasitic organism that causes disease in a plant.**
- **Parasite: This a living organism that attacks and obtains nourishment from cells of another living organism, the host, while contributing nothing to the host's survival.**
- **Note: All pathogens are parasites but not all parasites are pathogenic to plants.**

## Definitions of plant Diseases: Biotic/Infectious agents

- **Host:** It is a living organism or plant that supports the activities of a pathogen or a plant from which a pathogen derives its nourishment or nutrition.
- A host plant could either be *susceptible or resistant to an invading pathogen.*

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## Environmental factors affecting disease development

### Temperature:

Each pathogen has an optimum temperature for growth. In addition, different growth stages of the fungus, such as the production of spores, their germination, and the growth of the mycelium, may have slightly different optimum temperatures.

### Relative humidity :

Relative humidity is very critical in fungal spore germination and the development of storage rots.

- Others to be covered under abiotic factors



## Definitions of plant Diseases and their importance

- Biotic stresses have the ability to reduce production substantially in various ways which can either be qualitative and/or quantitative.
- Quantitative losses are through reduced productivity leading to a lower yield per unit area,
- While qualitative losses are
  - ✓ reduced contents of valuable seed ingredients,
  - ✓ reduced market value due to loss of aesthetic features,
  - ✓ reduced germination,
  - ✓ production of toxic substances like mycotoxins
  - ✓ and finally disease transmission.

## Definitions of plant Diseases and their importance

- *Plant diseases* affect plants of all ages and in various seasons.
- **Plant diseases** are known from times preceding the earliest writings.
- The Bible and other early writings mention **diseases**, such as rusts, mildews, blights, and blast, that have caused famine and other drastic changes in the economy of nations since the dawn of recorded history.

## Definitions of plant Diseases and their importance

- **Concerns on plant diseases arise when they cause economic losses.**
- **Eg way back 1800 – 1900 there was the Devastating epidemic, the Late blight (1845) in Ireland that dramatized the effect of plant diseases on people where there was great suffering which led to intense studies to identify their cause and come up with control**
- **(1 million people died)**
- **Causal agent: *Phytophthora infestans***

Modern times-Late blight-Symptoms:

Potato tuber (left) with reddish brown discoloration and potato leaf lesions (right) due to infection with *P. infestans*



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Definitions of plant Diseases and their importance:  
Irish potatoes-Bacterial wilt

- **Bacterial wilt of potato caused by *Ralstonia solanacearum* is a major threat to potato growing.**
- *R. solanacearum* is the most serious pathogen of solanaceous plants in tropical regions.
- **Its management options are fairly limited due to its very wide host range.**

# Definitions of plant Diseases and their importance: Irish potatoes-Bacterial wilt

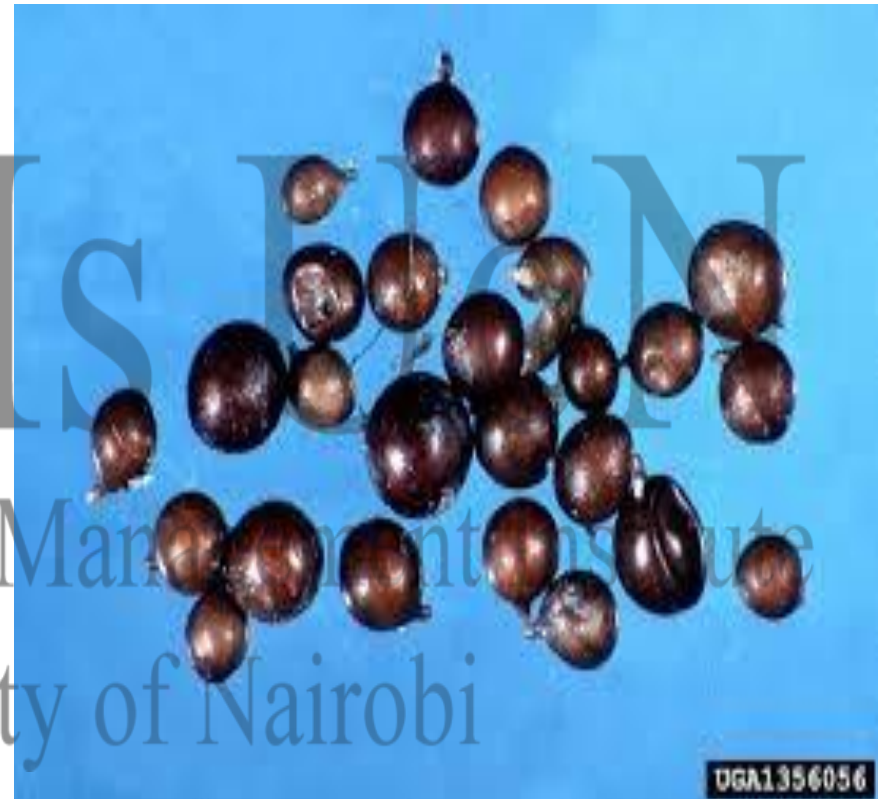
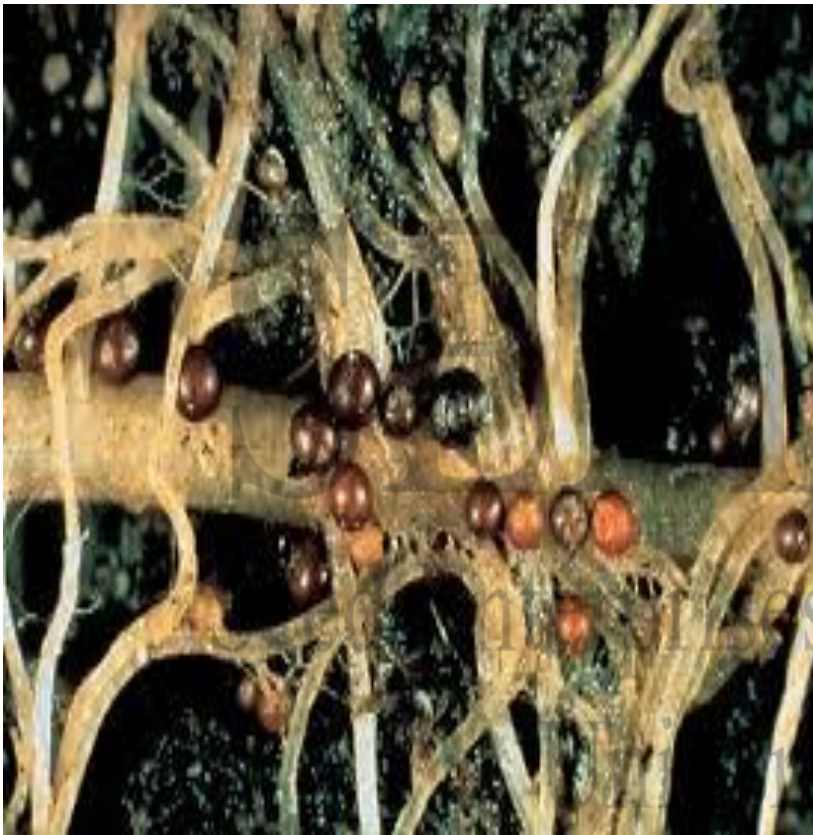


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Definitions of plant Diseases and their importance:  
Irish potatoes-Potato cyst nematode

- **Potato cyst nematode pest can reduce up to 80% potato production in Kenya.**
- The pest was first identified in Nyandarua County in 2014 in Kenya after potato and soil samples taken from the county were tested in Kenya and Germany confirmed the presence of the pest.
- The region produces more than 40 per cent of the potatoes produced in Kenya.
- *Causal agent **Globodera rostochiensis** or **G. rostochiensis**.*

# Definitions of plant Diseases and their importance: Irish potatoes-Potato cyst nematode





## Definitions of plant Diseases and their importance: Stem rust



# Definitions of plant Diseases and their importance: MLND



# Definitions of plant Diseases and their importance:

## MLND

- The **disease** is caused by a combination of two viruses, **Maize** chlorotic mottle virus (MCMV) and Sugarcane mosaic virus (SCMV), a pathogen prevalent in many parts of Kenya affecting cereal crops.
- Infection of **maize** by any of the viruses alone does not cause MLND.
- Maize lethal necrosis disease (MLND) is a serious threat to maize production.

# Definitions of plant Diseases and their importance:

## MLND

- In Kenya, in areas where MLND was very serious, farmers experienced extensive or complete crop loss.
- The infected plants are frequently barren; the ears formed are small, deformed and set little or no seeds, drastically reducing the yield.
- The areas affected constitute major maize production acreage and given the recorded loss of up to 100%, it has become an important food security issue in Kenya.

# Definitions of plant Diseases and their importance: **Rice blast**

- Rice blast disease, caused by *Magnaporthe oryzae* (Ascomycota), occurs in about 80 countries on all continents where rice is grown, in both paddy fields and upland cultivation.
- The extent of damage caused depends on environmental factors, but worldwide it is one of the most devastating cereal diseases, resulting in losses of 10–30% of the global yield of rice.

# Definitions of plant Diseases and their importance: **Rice blast**



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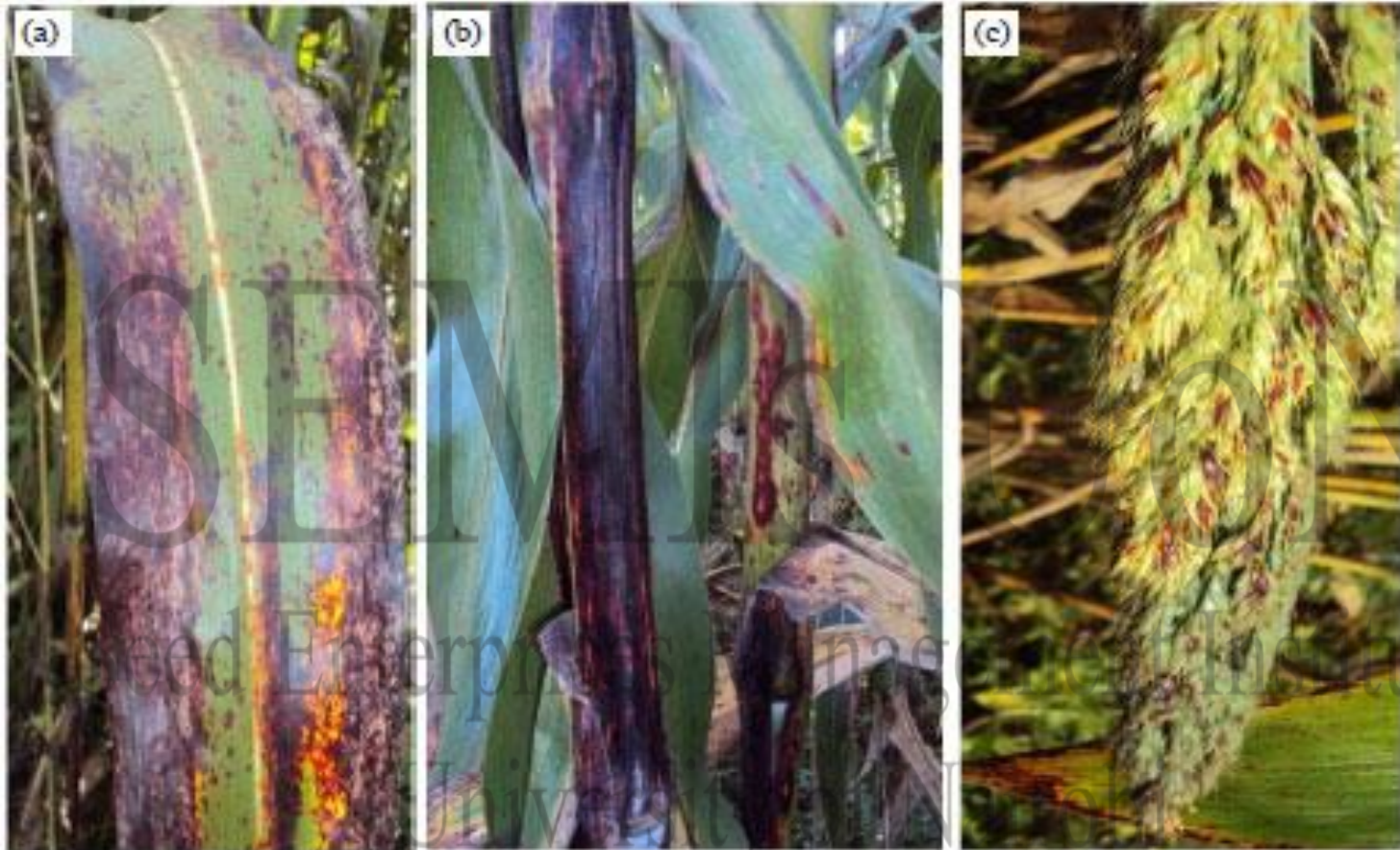
Definitions of plant Diseases and their importance:

## **Sorghum anthracnose**

- **Sorghum anthracnose caused by *Colletotrichum sublineolum*.**
- Sorghum anthracnose is one of the most important diseases of sorghum, limiting grain production in most of the regions where sorghum is grown.
- It is especially damaging in West Africa.

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# Definitions of plant Diseases and their importance: **Sorghum anthracnose**





Definitions of plant Diseases and their importance:

## **Anthracnose on Dry Beans**

- Anthracnose is caused by the fungus *Colletotrichum lindemuthianum*, poses a major constraint on the production of dry bean.
- Anthracnose on beans can reduce both yield and quality.

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Definitions of plant Diseases and their importance:  
**BCMV on Dry Beans**



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# Definitions of plant Diseases and their importance:

## **BCMV and BCMNV on Dry Beans**

- BCMV originated in the Americas and is one of the earliest reported virus diseases of plants in the world.
- BCMV is prevalent in Africa.
- BCMNV spread from eastern Africa in bean seed of susceptible bean varieties shipped to other countries.
- Strains of both BCMV and BCMNV now are known occur in Africa.
- Field infections by BCMV have been reported as high as 100 percent in susceptible bean varieties.
- Yield losses vary, depending on varieties, environment and time of infection, and whether the disease originates as a seed-borne infection or is carried in later by aphids.

Definitions of plant Diseases and their importance:  
**Fusarium wilt of pigeonpea**

- This disease is caused by a fungus, ***Fusarium udum.***, which survives in off season on plant trashes in the soil.
- The leaves of the affected plants become yellowish in color, then drop and finally the whole plant dry out.

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# Definitions of plant Diseases and their importance:

## **Fusarium wilt of pigeonpea**



Definitions of plant Diseases and their importance:  
Some cowpea diseases

- **Anthraco**se caused by *Colletotrichum lindemuthianum* .
- Septoria leaf spot: caused by *Septoria vignae* and *S. vignicola*
- **Cercospora leaf spot** :caused by *Cercospora canescens* and *C. cruenta*
- **Common bacterial blight: Cowpea bacterial blight** (CoBB), caused by *Xanthomonas axonopodis* pv. *vignicola* (Xav)

Definitions of plant Diseases and their importance:  
**Banana xanthomonas wilt**

- Causal agent is *Xanthomonas campestris pv. musacearum*.
- Banana xanthomonas wilt (BXW) is named after the bacterium that infects the plant and eventually kills it.
- The disease has surged through Uganda since it was first found in 2001 and is now widespread in the region.
- So far all banana types are susceptible.

Definitions of plant Diseases and their importance:  
**Banana xanthomonas wilt**

- **So far BXW does not occur (as of 2001) in West Africa**
- **and the other major bacterial wilt on banana worldwide, caused by *Ralstonia solanacearum* (Moko disease), is absent from all of Africa.**

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# Definitions of plant Diseases and their importance: **Banana xanthomonas wilt**

- *BXW produces a distinctive premature ripening of fruit, which eventually rots*



# Definitions of plant Diseases and their importance: **Banana xanthomonas wilt**

- *BXW can be confused with Fusarium wilt, caused by a fungus. The bacterial wilt affects younger leaves, though, and leaves collapse inwards*



Definitions of plant Diseases and their importance:

**Banana xanthomonas wilt:**

*BXW produces a distinctive premature ripening of fruit, which eventually rots-Symptoms*



Definitions of plant Diseases and their importance:

## **Fusarium wilt of Banana**

- *Fusarium wilt of banana*, popularly known as Panama disease, is a lethal fungal disease caused by the soil-borne fungus ***Fusarium oxysporum f. sp. cubense*** (Foc).
- The fungus enters the plant through the roots and colonizes the xylem vessels thereby blocking the flow of water and nutrients.

Definitions of plant Diseases and their importance:  
**Fusarium wilt of Banana (1996)**

- **Fusarium wilt of banana in Uganda, with special emphasis on wilt-like symptoms observed on East African highland cooking cultivars (*Musa* spp., AAA).**
- Caused by *Fusarium oxysporum* f. sp. *cubense*.
- Wilt incidence on exotic cultivars was as high as 67% on some farms.
- **Wilt symptoms also found in the other types:**  
on AAA, ABB, and AB exotic banana cultivars.

# Definitions of plant Diseases and their importance: **Fusarium wilt of Banana (1996)**



Definitions of plant Diseases and their importance:  
**Cassava xanthomonas wilt**

- ***Xanthomonas axonopodis* pv. *manihotis* cassava bacterial wilt.**
- Among diseases which afflict cassava worldwide, bacterial blight causes the largest losses in terms of yield.

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# Definitions of plant Diseases and their importance:

## **Cassava xanthomonas wilt**





Definitions of plant Diseases and their importance:

### **Cassava Mosaic Disease:**

- **Cassava Mosaic Disease: caused by Cassava mosaic virus.**
- **Being referred to as a Curse to Food Security in Sub-Saharan Africa.**
- Cassava is currently the third most important source of calories in the tropics, after rice and corn, and more than 800 million people use cassava as a source of food and income generation in Africa, Asia, and Latin America.
- Among the cassava-growing regions of the world, Africa accounts for more than 50% of the global cassava production.

Definitions of plant Diseases and their importance:

**Cassava Mosaic Disease:**

- Cassava is vulnerable to a broad range of diseases caused by viruses.
- Among them, cassava mosaic disease (CMD) is the most severe and widespread, limiting production of the crop in sub-Saharan Africa.

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# Definitions of plant Diseases and their importance:

## **Cassava Mosaic Disease:**

