Signs, symptoms and impact of crop diseases: 6th February 2018

Prof. A. W. Mwang'ombe, EBS

Signs, symptoms and impact of crop diseases

- Crop losses due to crop infections from pathogens such as bacteria, viruses, nematodes and fungi are persistent issues in agriculture for centuries across the globe.
- In order to minimize the disease induced damage in crops during growth, harvest and postharvest processing, as well as to maximize productivity and ensure agricultural sustainability, disease diagnostic methods including advanced disease detection and prevention in crops are imperative.

Signs, symptoms and impact of crop diseases

- Some of the questions one should ask persistently are :
  - ✓What is wrong with my plant;
  - ✓followed by, what can I do to get rid of the problem?
  - ✓However, it may be too late to help the specific plants when the question is asked, but proper diagnosis may be extremely important in preventing the problem on other plants or in preventing the problem in the future.

Signs, symptoms and impact of crop diseases

- Control measures depend on proper identification of diseases and of the causal agents.
- Therefore, diagnosis is one of the most important aspects of a plant pathologist's training.
- Without proper identification of the disease and the disease-causing agent, disease control measures can be a waste of time and money and can lead to further plant losses.
- Thus, proper disease diagnosis is therefore vital.

Signs, symptoms and impact of crop diseases

- **Diseased plants/plant parts:** When plant disease is suspected, look for symptoms and signs.
- **Defintion of symptoms : "Symptoms"** refers to the way a plant responds to stresses caused by the disease or perhaps by the environment.
- **Definition of signs: "Signs"** are actual parts of the pathogen visible to the eye.
- Signs might include:
  - ✓ abnormal plant growth called 'galls',
  - ✓ ooze caused by bacteria,
  - ✓ visible mold, or fruiting structures of fungal pathogens.

Plant Disease Symptoms and signs : eg late blights of potato caused by *Phytophthora infestans*

Signs of Stem rust of wheat: *Puccinia graminis f.sp. Tritici-* **reddish-brown**, **powdery**, oblong **pustules**

Ralstonia solanacearum in potato/tomato: Bacterial streaming from a cut infected tomato stem.

A quick field diagnostic identification of *R. solanacearum* -bacterial streaming from infected plant material can be used.

Signs and symptoms of crop diseases

- Symptoms are visible effects of disease on plants due to the interference in the development and/or function of the plant as it responds to the pathogen i.e. a result of invasion and infection by the pathogen.
- Symptoms may be classified as:
  - ✓ **local or systemic, primary or secondary, and microscopic or macroscopic**.
- Local symptoms are physiological or structural changes within a limited area of host tissue around the infection site, such as leaf spots, galls, and cankers.
- Systemic symptoms are those involving the reaction of a greater part or all of the plant, such as wilting, yellowing, and dwarfing.

Signs and symptoms of crop diseases

- The disease symptoms may be microscopic or macroscopic.
- In microscopic symptoms, the expressions of disease are in the cell structure or cell arrangements.
- These can be seen under a microscope.
- Whereas macroscopic symptoms are the expressions of disease on the surface of plant parts that can be seen with the unaided eye in the form of symptoms on the plant.

Signs and symptoms of crop diseases

- **Types of symptoms:**
  - ✓ **Morphological symptoms**
  - ✓ **Histological symptoms**

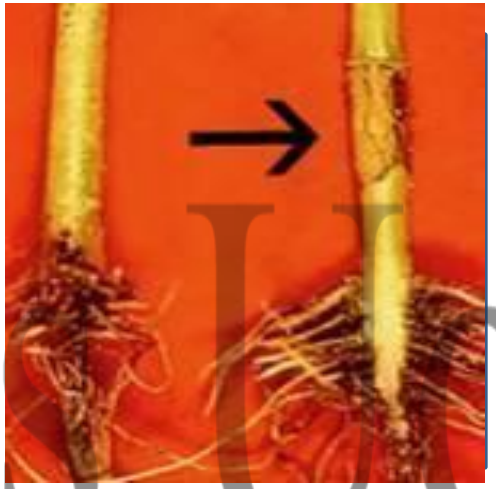
Signs and symptoms of crop diseases

- **Morphological symptoms:**
  - ✓ **Morphological: (Externally detectable symptoms caused by any pathogen e.g. blight, leaf spot).**
  - ✓ **These include:**
  - ✓ **Necrosis ,**
  - ✓ **Hypoplasia,**
  - ✓ **Hyperplasia and Hypertrophy.**
- **Necrosis : It's the** degeneration of protoplast followed by death of the tissue or organ or plant.

Disease Symptoms : Examples of **Necrotic symptoms on green plant parts-Damping off eg on legumes**

Is the collapse and death of seedlings due to extensive necrosis of stem tissues before or after they emerge from the soil (pre-emergence and post-emergence damping-off, respectively).

- **caused by *Pythium and Rhizoctonia* ,**



Signs and symptoms of crop diseases: Necrotic symptoms-Leaf spot: A well defined or self-limiting grey,tan or brown necrotic lesion on a leaf eg Angular leafspot of beans

Bean anthracnose on leaves

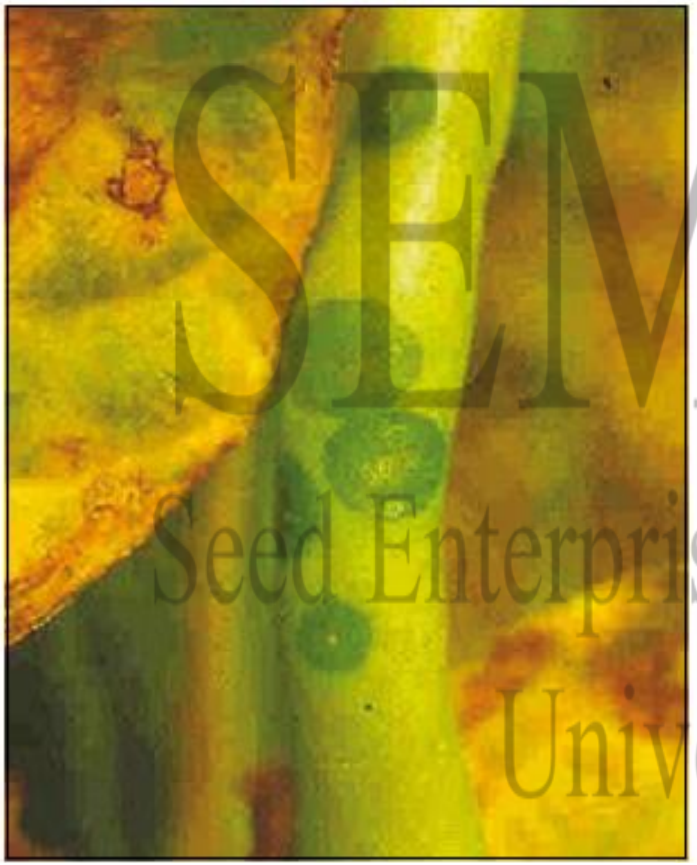
Bean anthracnose on pods

Halo blight of beans-on leaves-***Pseudomonas savastanoi pv. phaseolicola***

Halo blight of beans-on pods-***Pseudomonas savastanoi pv. phaseolicola***Halo blight of beans

Common bacterial wilt of beans-*Xanthomonas axonopodis pv. phaseoli*

Common bacterial wilt of beans-*Xanthomonas axonopodis pv. phaseoli*

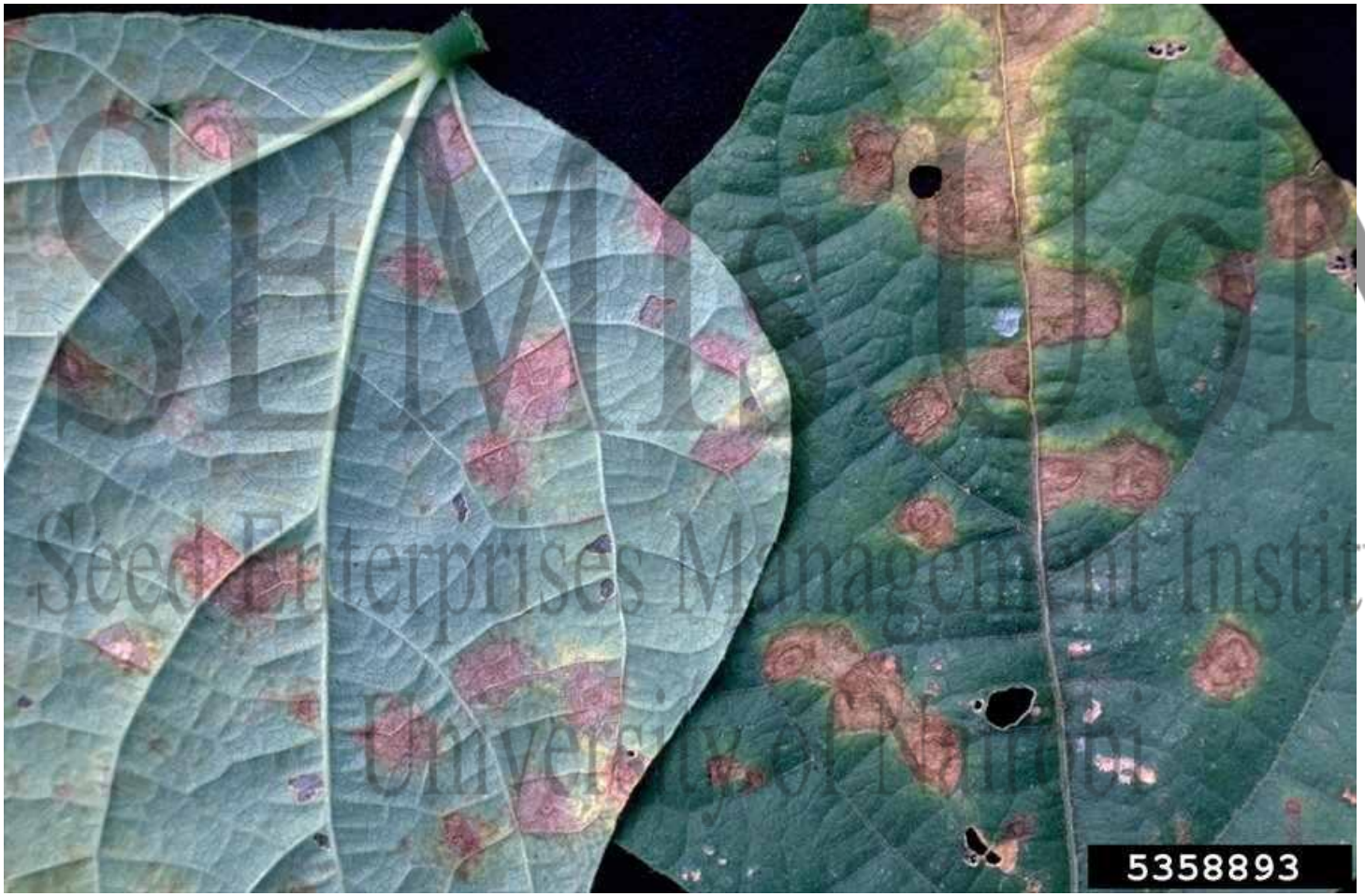


Cowpea anthracnose -*Colletotrichum destructivum*

,

Cowpea-**Septoria Leaf Spot of Cowpea-***Septaria vignoe and S. vignico!a*

Cowpea Cercospora leaf spot of cowpea-Pseudocercospora cruenta



Pigeonpea-Fusarium wilt-*Fusarium udum* (***Gibberella indica)***

Wheat stem rust

Wheat yellow rust -*Puccinia striiformis f. sp. tritici*

Wheat leaf rust -*Puccinia triticina (= P. recondita Roberge ex Desmaz. f. sp. tritici*

Wheat loose smut-*Ustilago tritici*

PPP 4&5-**Plant Disease Symptoms :Necrosis of the green plant parts: Streaks-Maize streak**

Some Important diseases in Kenya

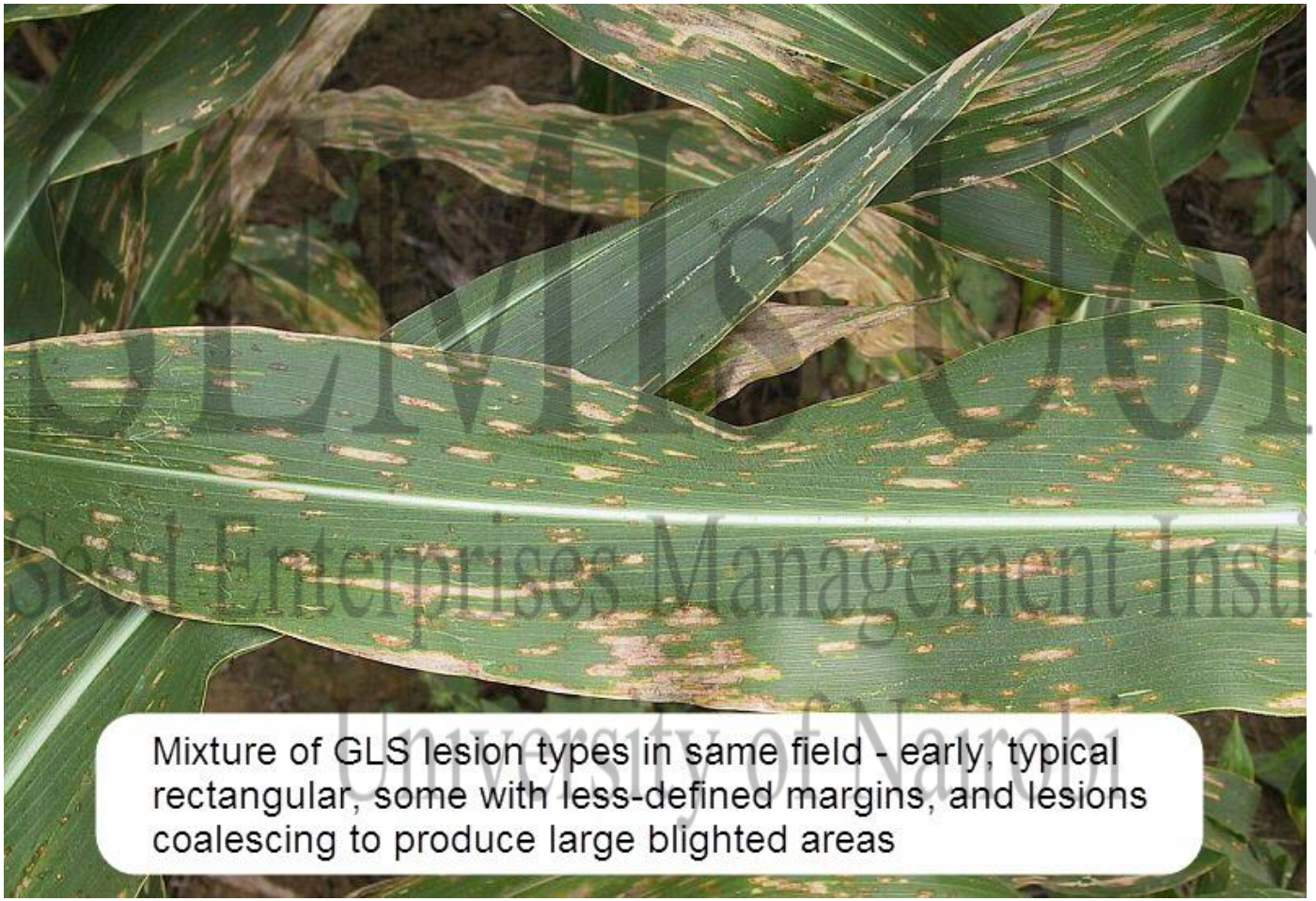
Diseases in seed crop production

Maize Lethal Necrosis Disease

Common smut of maize-***Ustilago maydis***

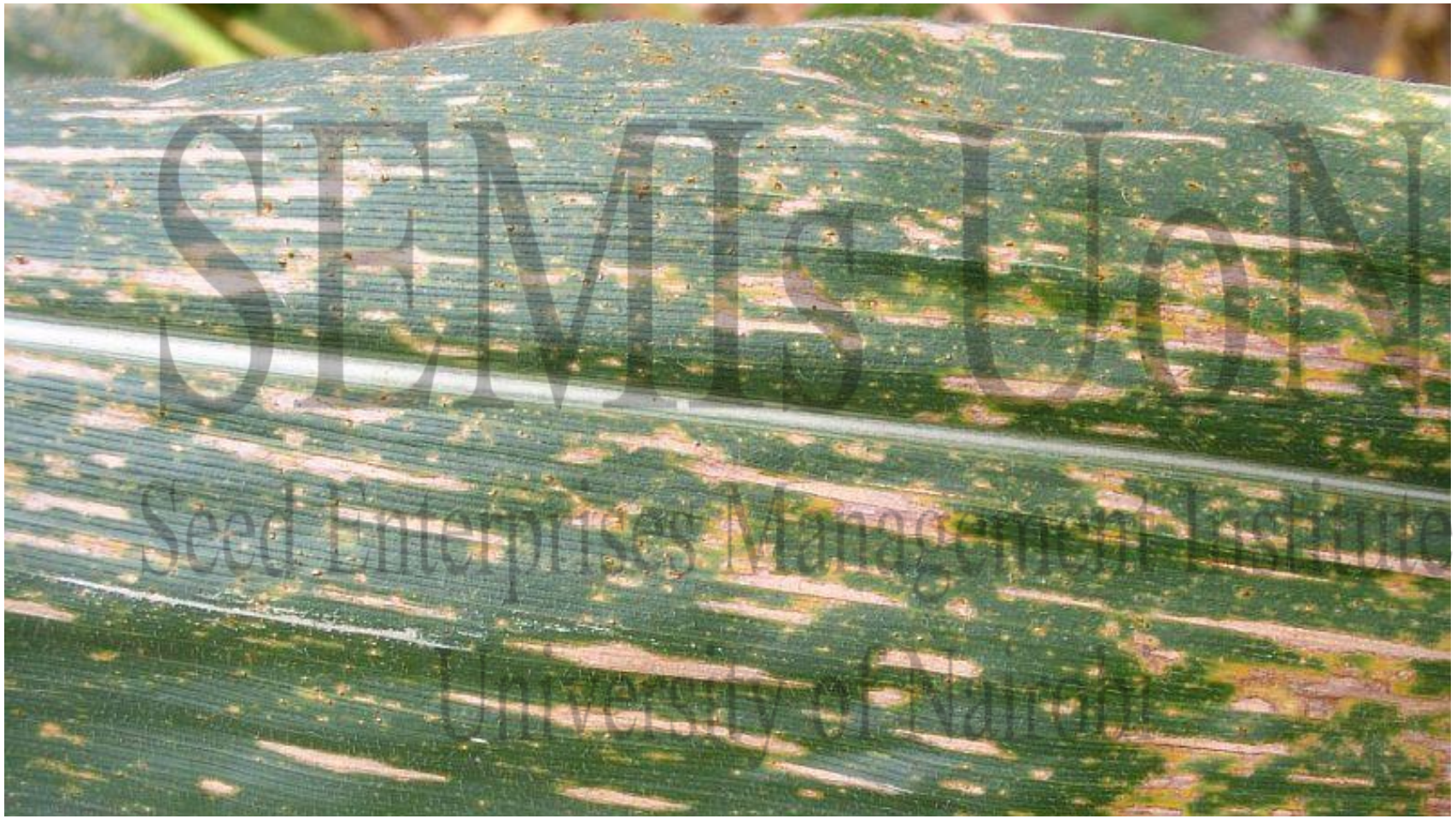
Maize head smut-***Sphacelotheca reiliana***

Maize Grey leafspot disease-***Cercospora zeae-maydis***

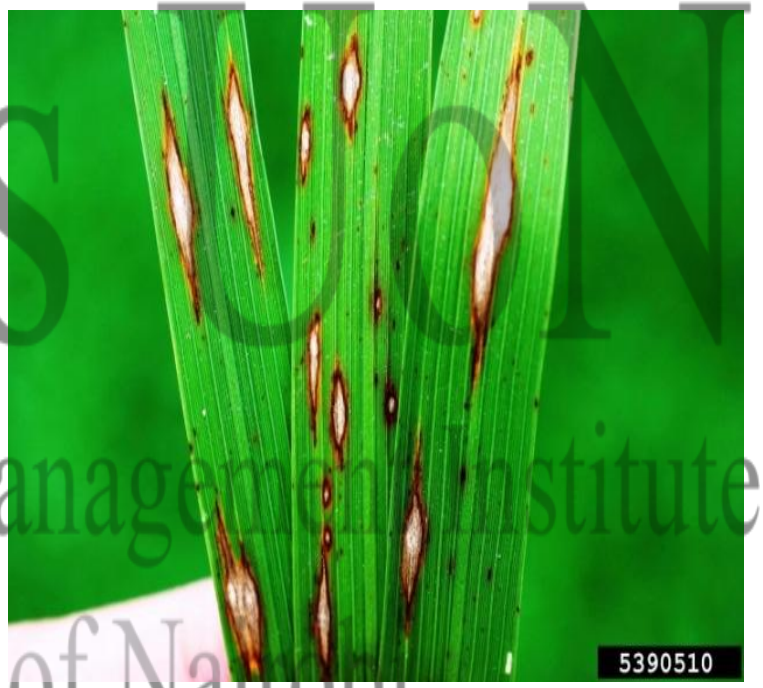


Northern leaf blight of maize-*Exserohilum turcicum*

Southern leaf blight of maize-*Bipolaris maydis* (*Cochliobolus heterostrophus* in its teleomorph)



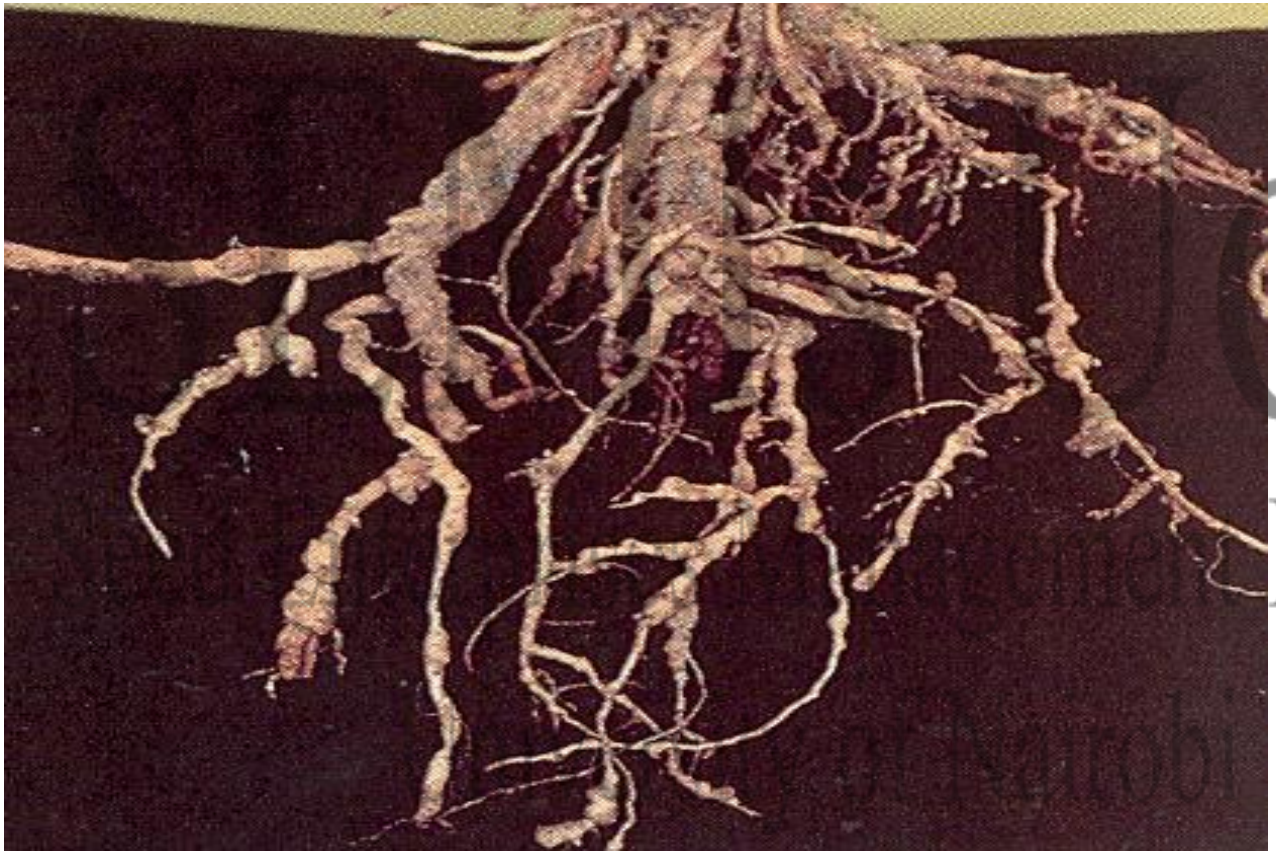
Rice blast-*Magnaporthe grisea*



Sorghum Rust- ***Puccinia purpurea***

Sorghum anthracnose- *Colletotrichum sublineolum*

Root knot diseases-*Meloidogyne* spp eg *incognita*



Impact of crop diseases

- As agriculture struggles to support the rapidly growing global population, plant disease reduces the production and quality of food, fibre and biofuel crops.
- Losses may be catastrophic or chronic, but on average account for 42% of the production of the six most important food crops.
- Losses due to postharvest disease can be disastrous, especially when farms are a long way from markets and infrastructure and supply chain practices are poor.

Impact of crop diseases

- Many postharvest pathogens also produce toxins that create serious health problems for consumers.
- Farmers spend billions of dollars are on disease management, often without adequate technical support, resulting in poor disease control, pollution and harmful results.
- In addition, plant disease can devastate natural ecosystems, compounding environmental problems caused by habitat loss and poor land management.

Impact of crop diseases

- Crop losses tend to be greatest in tropical countries where environmental conditions are particularly favourable, incomes are low and knowledge and investments in crop health management are minimal.
- Disease losses can mean that communities become dependent on imported foods, often replacing a balanced diet with processed foods that create further health problems.

Impact of crop diseases

- Plant breeders have very successfully increased potential crop yields, however the impacts of crop breeding for resource-poor farmers have been disappointing.
- Much greater emphasis is required to address reasons for the gap between potential and actual yields achieved by farmers, and research that is focussed on narrowing this gap.