Lecture No. 12
Diseases of Minor (Small) Millets
Ragi (finger millet), Barnyard millet & Foxtail millet

1. Blast disease : *Pyricularia grisea* in Ragi & Barnyard millet
   *Pyricularia setariae* in foxtail millet

2. Cercospora Leaf Spot : *Cercospora eleusinis*

3. Green Ear/Downy Mildew/Crazy Top: *Sclerophthora macrospora* in Ragi
   *Sclerospora graminicola* in foxtail millet

4. Brown Spot (Seedling Blight or Leaf Blight):
   - Ragi : *Drechslera nodulosum*
   - Barnyard millet : *Drechslera frumentacea*
   - Proso millet : *Bipolarispanici-miliacei*
   - Little millet : *Alternaria* sp
   - Kodo millet : *Alternaria tenuissima*

5. Smut : *Melanopsichium eleusinis* in Ragi
   *Ustilago crameria* in Foxtail millet
   *Ustilago trichophora* in Barnyard millet

6. Foot Rot : *Sclerotium rolfsii* (Sacc.)

7. Rust : *Uromyces eragrostidis*

8. Banded Blight : *Rhizoctonia solani*

9. Udbatta : *Ephelis oryzae*

10. Phanerogamic partial root parasite : *Striga asiatica*

1. **Blast disease:** *Pyricularia grisea* in Ragi & Barnyard millet
   *Pyricularia setariae* in foxtail millet

Reported for the first time from Tanjore delta of Tamil Nadu, India by Mc Rae (1920) is a major production constraint causing heavy yield losses.

**Symptoms**

Characterized by typical spindle shaped spots on leaf lamina. Under highly congenial conditions such spots enlarge, coalesce and leaf blades especially from the tip towards base give a blasted appearance. Two to four inches of the neck almost immediately below the ear turns initially brown and later to black. An olive grey growth of the fungus may be seen on this area. The pathogen also attacks fingers.

**Pathogen**

Minimum temperature of 15-25° C and relative humidity of more than 85 % with intermittent rainfall are congenial climatic conditions for disease development.
Management

- Seed treatment with *Trichoderma harzianum* and two sprays of *Pseudomonas fluorescens* at 0.3% at the time of flowering followed by second spray 10 days later.
- Use of blast resistant varieties like GPU-28, GPU-26, and GPU-48
- Seed treatment with carbendazim @ 2g/kg
- Two sprays of Saaf (0.2%) or carbendazim 0.05% with first spray at 50% flowering followed by the second 10 days after were also found effective

2. Cercospora Leaf Spot: *Cercospora eleusinis*

This is one of the important foliar diseases occurring in Himalayan foothills and mid hills of Nepal. The crop is susceptible to the disease during all stages of its growth, from seedling to grain formation stage.

**Symptoms**

Initial symptoms that mostly start on older leaves appear as reddish-brown specks with yellow halo. At this stage, the lesions are easily confused with those of *Helminthosporium* leaf spot. Later, several such specks coalesce to form large lesions with a yellow hallow. In some cases, the lesions enlarge to assume eye shaped spot measuring up to 15 x 3mm and such lesions are similar to those of blast. Such leaves give burnt appearance.

**Pathogen**

Fungus prefers to grow in hilly terrains where mean daily temperature does not exceed 20°C and rainfall is generally high. The disease occurs most severely in the month of June in the early sown crop.

**Management**

- Field sanitation
- Spraying of carbendazim @ 0.05% at 15 days intervals

3. Green Ear Disease or Downy Mildew or Crazy Top: *Sclerophthora macrospora* in Ragi
   *Sclerospora graminicola* in foxtail millet

This disease of ragi was reported for the first time in India by Venkatarayan (1946) from old Mysore state. Disease occurs in a sporadic manner and may lead to total crop failure owing to malformation of the affected ears. In foxtail millet, disease can cause loss upto 50%.

**Symptoms in Ragi**

Affected plants are generally stunted with shortened internodes and profuse tillering. The plant assumes a bunchy and bushy appearance. Often, pale yellow translucent spots are seen on leaves of affected plants. The green ear manifests itself at the time of grain formation and completely converts the ear heads into green narrow leafy structures causing complete sterility. The whole ear gives a bush-like appearance displaying typical ‘green ear’ symptom.
Symptoms in Foxtail millet

Floral parts are proliferated in to green leafy structures, hence the name “green ear”. Leaf shredding is very common.

Pathogen

Whitish bloom of sporangiophores and sporangia develop on the surface of the affected leaves under humid conditions. The disease is favored by heavy dew and low temperature during the period of crop development in kharif. A temperature range of 20-25°C that occur during night and early morning favors very good spore germination and disease development.

Management

- Seed treatment with Apron 35 SD @ 2.5 – 3.0 g/kg
- Providing good drainage in the low lands, proper crop rotation methods, roguing of infected plants
- Elimination of wild grasses and related wild hosts will reduce the disease incidence

4. Brown Spot (Seedling Blight or Leaf Blight):

- Ragi - *Drechslera nodulosum*
- Barnyard millet - *Drechslera frumentacea*
- Proso millet - *Bipolarispanici-miliacei*
- Little millet - *Alternaria sp*
- Kodo millet - *Alternaria tenuissima*

This disease was first noticed by Butler (1918) to cause foot rot, seedling blight or leaf blight of ragi in different parts of India. The disease assumes severe proportion when the crop suffers from prolonged drought or nutrient deficiency.

Symptoms

Appearance of brown to dark brown spots on the leaf lamina. Symptoms can also be seen on leaf sheath, especially in older plants, where in the woolly growth of the fungus can be seen in the centre of the lesion, especially under high humidity conditions. When infection occurs on neck and fingers often under high humid conditions, neck may break and hang on to the plant. The severe infection causes chaffiness and discoloration of the seed.

Pathogen

Optimum temperature for infection is 30-32°C. High humidity and intermittent rains during emergence of ear and before grain formation cause heavy ear infection and yield reduction.

Management

- Pre sowing seed treatment with systemic fungicides
- Need based spraying of Mancozeb (0.2%) reduce the disease
5. **Smut**: *Melanopsichium eleusinis* in Ragi  
*Ustilago crameria* in Foxtail millet  
*Ustilago trichophora* in Barnyard millet

Reported for the first time by Kulkarni (1922) from Malkapur in 1918 from the then princely state of Kolhapur.

**Symptoms**

The affected ovaries are transformed into velvety greenish gall like bodies which are several times bigger in size than the normal healthy grains. These infected grains gradually turn pinkish green and finally to dirty black on drying.

**Management**

- Seed treatment with Carbendazim / Thiram @ 2g/kg\textsuperscript{-1} of seed.
- Use of resistant varieties
- Two sprays, the first with Difolatan at panicle initiation followed by second spray with mancozeb at flowering can reduce disease incidence.

6. **Foot Rot**: *Sclerotium rolfsii* (Sacc.)

First reported by Coleman (1920) from the then princely state of Mysore.

**Symptoms**

The basal portion of affected plant immediately above the ground initially appears water soaked. Later on it turns brown and subsequently dark brown with a concomitant shrinking of the stem in the affected region. Profuse white cottony mycelial growth occurs in the infected area. Soon small roundish white velvety grain like structures starts appearing in the fungal matrix. They grow, become mustard seed like, turn brown and these are the sclerotial bodies.

**Management**

- Growing of resistant varieties
- Soil application of *Trichoderma viride* at intercultivation or transplanting are good management practices.

7. **Rust**: *Uromyces eragrostidis*

This disease on finger millet as of now is negligible albeit. Severe incidence of rust was reported from Agricultural Research Station, Vizianagaram, Andhra Pradesh on various varieties.
Symptoms

The rust symptoms in ragi appear as minute to small, dark brown, broken pustules linearly arranged on the upper surface of the top leaves. The rust is more severe towards the top 1/3 portion of the upper leaf. In foxtail millet symptoms appear as numerous minute brown uredosori appear on both sides of the leaf. Rust pustules are oblong, brown, often formed in linear rows. They are also produced on the leaf sheaths, culms and stems. If the infection is severe premature drying of leaves and poor grain set are observed.

Management

- Growing of resistant varieties viz., SEC 915, 314, 712 and ICMV-221

8. Banded Blight: *Rhizoctonia solani*

Banded blight of finger millet was first recorded in a severe form at Vellayani, Kerala from India (Lulu Das and Girija, 1989). It is an emerging problem on all the small millets.

Symptoms

The disease is characterized by oval to irregular light grey to dark brown lesions on the lower leaf and leaf sheath. Occurrence of a series of copper or brown colour bands across the leaves gives a very characteristic banded appearance. The mycelial growth along with white to brown sclerotia can be observed on and around the lesions. Later on, the leaves dry up and plants appear blighted. The symptoms produced on every part of the plant, give a very characteristic banded appearance, due to which the disease has been named as banded blight.

Management

- Clean cultivation
- Draining out of excess water
- Removal of grass weeds on bunds can prevent the disease
- Spraying of propiconazole @ 1 mL-1 water is highly effective

9. Udbatta: *Ephelis oryzae*

This disease is very common in foxtail millet and kodo millet. Sometimes it is seen in little as well as prosomillets. Affected panicles are transformed into a compact agarbatti like shape, hence the name “Udbatta”.

10. Phanerogamic partial root parasite: *Striga asiatica*

Losses in grain yield due to infestation of *Striga* species depend primarily on the number of *Striga* plants attacking the crop and level of host resistance. Jain and Tripathi (2005) reported 42.4 to 65.8 per cent loss in grain yield per plant due to infestation of *Striga densiflora* in kodo millet.
**Symptoms**

The infestation of *Striga* species appears in the field after emergence of *Striga* plants from the soil. The underground portion of *Striga* plants remain attached to the roots of host plant by haustoria, from which the parasite absorb water and nutrients. The attacked plants are stunted with poor aerial growth and bear lanky panicles. If the infestation occurs in early stage, the plants may dry up before the flowering.

**Management**

- Weeding or hand pulling of *Striga* plants before flowering is the cheapest and effective method for its eradication.
- Improved kodo millet varieties *viz.* JK 41, GPUK 1, GPUK 3 and GPUK 5 were found least affected with *Striga* species.
- Application of nitrogenous fertilizers also reduces the infestation of *Striga* species.