

5. Diseases of Maize

Downy mildew/Crazy top

Sorghum downy mildew - *Perenosclerospora sorghi*

Philippine downy mildew - *Perenosclerospora philippinensis*

Crazy top - *Sclerophthora macrospora*

Symptoms

The most characteristic symptom is the development of chlorotic streaks on the leaves. Plants exhibit a stunted and bushy appearance due to shortening of the internodes. White downy growth is seen on the lower surface of leaf. Downy growth also occurs on bracts of green unopened male flowers in the tassel. Small to large leaves are noticed in the tassel. Proliferation of auxillary buds on the stalk of tassel and the cobs is common (Crazy top).



Symptoms



Pathogen

The fungus grows as white downy growth on both surface of the leaves, consisting of sporangiophores and sporangia. Sporangiophores are quite short and stout, branch profusely into series of pointed sterigmata which bear hyaline, oblong or ovoid sporangia (conidia). Sporangia germinate directly and infect the plants. In advanced stages, oospores are formed which are spherical, thick walled and deep brown.

Favourable Conditions

- Low temperature (21-33°C)
- High relative humidity (90 per cent) and drizzling.
- Young plants are highly susceptible.

Disease cycle

The primary source of infection is through oospores in soil and also dormant mycelium present in the infected maize seeds. Secondary spread is through airborne conidia. Depending on the pathogen species, the initial source of disease inoculum can be oospores that over winter in the soil or conidia produced in infected, over wintering crop debris and infected neighboring plants. Some species that cause downy mildew can also be seed borne, although this is largely restricted to seed that is fresh and has high moisture content.

At the onset of the growing season, at soil temperatures above 20°C, oospores in the soil germinate in response to root exudates from susceptible maize seedlings. The germ tube infects the underground sections of maize plants leading to characteristic symptoms of systemic infection including extensive chlorosis and stunted growth. If the pathogen is seed borne, whole plants show symptoms. Oospores are reported to survive in nature for up to 10 years.

Once the fungus has colonised host tissue, sporangiophores (conidiophores) emerge from stomata and produce sporangia (conidia) which are wind and rain splash disseminated and initiate secondary infections. Sporangia are always produced in the night. They are fragile and can not be disseminated more than a few hundred meters and do not remain viable for more than a few hours.

Germination of sporangia is dependent on the availability of free water on the leaf surface. Initial symptoms of disease (chlorotic specks and streaks that elongate parallel to veins)

occur in 3 days. Conidia are produced profusely during the growing season. As the crop approaches senescence, oospores are produced in large numbers.

Management

- Deep ploughing.
- Crop rotation with pulses.
- Rogue out infected plants.
- Treat the seeds with metalaxyl at 6g/kg.
- Spray the crop with Metalaxyl + Mancozeb @ 1kg on 20th day after sowing.
- Grow resistant varieties and hybrids *viz.* CO1, COH1 and COH2.

Leaf blight - *Helminthosporium maydis* (Syn: *H. turcicum*)

Symptoms

The fungus affects the crop at young stage. Small yellowish round to oval spots are seen on the leaves. The spots gradually increase in area into bigger elliptical spots and are straw to grayish brown in the centre with dark brown margins. The spots coalesce giving blighted appearance. The surface is covered with olive green velvety masses of conidia and conidiophores.

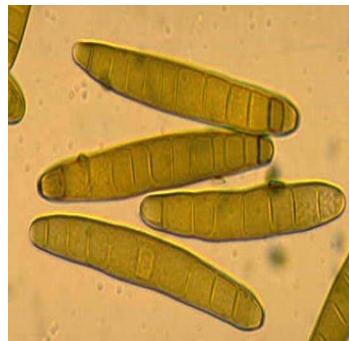


Symptoms

Pathogen

Conidiophores are in group, geniculate, mid dark brown, pale near the apex and smooth.

Conidia are distinctly curved, fusiform, pale to mid dark golden brown with 5-11 septa.



Conidia

Favourable Conditions

- Optimum temperature for the germination of conidia is 8 to 27°C provided with freewater on the leaf.
- Infection takes place early in the wet season.

Disease cycle

It is a seed-borne fungus. It also infects sorghum, wheat, barely, oats, sugarcane and spores of the fungus are also found to associate with seeds of green gram, black gram, cowpea, varagu, Sudan grass, Johnson grass and Teosinte.

Management

- Treat the seeds with Captan or Thiram at 4 g/kg.
- Spray Mancozeb 2 kg or captan 1 kg/ha.

Rust - *Puccinia sorghi*

Symptoms

Circular to oval, elongated cinnamon-brown powdery pustules are scattered over both surface of the leaves. As the plant matures, the pustules become brown to black owing to the replacement of red uredospores by black teliospores.



Symptoms

Pathogen

Uredospores are globose or elliptical finely echinulate, yellowish brown with 4 germ pores. Teliospores are brownish black, or dark brown, oblong to ellipsoidal, rounded to flattened at the apex. They are two celled and slightly constricted at the septum and the spore wall is thickened at the apex.



Uredospores and teliospores

Favourable Conditions

- Cool temperature and high relative humidity.

Disease cycle

Primary source of inoculums is uredospores surviving on alternate hosts *viz.*, *Oxalis corniculata* and *Euchlaena mexicana*.

Management

- Remove the alternate hosts.
- Spray Mancozeb at 2 kg/ha.

Head smut - *Sphacelotheca reiliana*

Symptoms

Symptoms are usually noticed on the cob and tassel. Large smut sori replace the tassel and the ear. Sometimes the tassel is partially or wholly converted into smut sorus. The smutted plants are stunted produce little yield and remain greener than that of the rest of the plants.



Symptoms

Pathogen

Smut spores are produced in large numbers which are reddish brown to black, thick walled, finely spined, spherical.

Favourable Conditions

- Low temperature favours more infection and this fungus also infects the sorghum

Disease cycle

The smut spores retain its viability for two years. The fungus is externally seedborne and soil-borne. The major source of infection is through soil-borne chlamydospores.

Management

- Field sanitation.
- Crop rotation with pulses.
- Treat the seeds with Captan or Thiram at 4 g/kg.

Charcoal rot - *Macrophomina phaseolina (Rhizoctonia bataticola)*

Symptoms

The affected plants exhibit wilting symptoms. The stalk of the infected plants can be recognized by grayish streak. The pith becomes shredded and grayish black minute sclerotia develop on the vascular bundles. Shredding of the interior of the stalk often causes stalks to

break in the region of the crown. The crown region of the infected plant becomes dark in colour. Shredding of root bark and disintegration of root system are the common features.



Symptoms

Pathogen

The fungus produces large number of sclerotia which are round and black in colour. Sometimes, it produces pycnidia on the stems or stalks.

Favourable Conditions

- High temperature and low soil moisture (drought)

Disease cycle

The fungus has a wide host range, attacking sorghum, pearl millet, finger millet and pulses. It survives for more than 16 years in the infected plant debris. The primary source of infection is through soil-borne sclerotia. The pathogen also attacks many other hosts, which helps in its perpetuation. Since the fungus is a facultative parasite it is capable of living saprophytically on dead organic tissues, particularly many of its natural hosts producing sclerotial bodies. The fungus over winters as a sclerotia in the soil and infects the host at susceptible crop stage through roots and proceeds towards stem.

Management

- Long crop rotation with crops that are not natural host of the fungus.
- Irrigate the crops at the time of earhead emergence to maturity.
- Treat the seeds with Carbendazim or Captan at 2 g/kg.
- Grow disease tolerant varieties viz., SN-65, SWS-8029, Diva and Zenit.

Minor diseases

Bacterial Stalk rot - *Erwinia dissolvens*

Symptoms

The basal internodes develop soft rot and give a water soaked appearance. A mild sweet fermenting odour accompanies such rotting. Leaves some time show signs of wilting and affected plants topple down in few days. Ears and shank may also show rot. They fail to develop further and the ears hang down simply from the plant



Symptoms

Disease cycle

Borer insects play a significant role in initiation of the disease. The organism is soil borne and makes its entry through wounds and injuries on the host surface. The organism survives saprophytically on debris of infected materials and serves primary inoculum in the next season.

Mosaic - *Maize mosaic potyvirus*

Symptoms

Symptoms appear as chlorotic spots, which gradually turn into stripes covering entire leaf blade. Chlorotic stripes and spots can also develop on leaf sheaths, stalks and husks. Moderate to severe rosetting of new growth is observed. Size of stalk, leaf blades and tassel tend to be normal in late infection.



Pathogen

It is caused by *Maize mosaic potyvirus*. Virions are flexuous, 750-900nm long, ssRNA genome.

Disease cycle

Symptoms

It is transmitted in nature by leaf hopper vector, *Perigrinus maidis*.

Brown spot - *Physoderma maydis*

Water soaked lesions, which are oval, later turn into light green and finally brown.



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