

- Ploughing the field deeply during April and May, with 15-day intervals, helps to bury the infected plant debris.
- Remove and burn the infected crop residues from the field
- Avoid water stress especially during the flowering and grain filling stages.
- Grow maize hybrids that are recommended for their resistance or tolerance to charcoal rot.
- Seed treatment with *Trichoderma harzianum* @ 6 g/kg or Thiram Flo 40 FS @ 5 ml/kg seeds before sowing.

5. Fusarium stalk rot (FSR)

Causal organism: *Fusarium verticillioides*

Economic importance: The yield losses due to this disease may go up to 42 percent or even more under severe conditions.

Favorable conditions: The disease is more prevalent in warm and relatively dry weather where water stress occurs after flowering stage.

Identification/symptoms

- The infected plants often exhibit wilting symptoms, where the leaves lose their normal healthy appearance and turn a dull greyish-green color.
- The lower portion of the stalk from the base, may change from dark green to a straw-colored appearance.
- The affected tissues may become soft and decayed with light pink to tan discoloration visible when stalk is split open. (Figure 5).
- Fusarium stalk rot usually becomes apparent after the flowering stage of the plant.
- In some cases, Fusarium stalk rot may occur in combination with charcoal rot disease, caused by the fungus *Macrophomina phaseolina*.



Figure 5. Symptoms of Fusarium stalk rot

Management

- Complete destruction of previous crop debris by deep ploughing during April and May at 15-day intervals.
- Crop rotation with non-host crops.
- Remove and burn the infected crop residues from the field.
- Apply a balanced dose of fertilizers, with a low dose of nitrogen and a high dose of potassium.
- If stalk rot is present in the field, harvesting the crop early can help minimize ear loss and reduce the spread of the disease.
- Avoid water stress during the flowering stage by providing adequate irrigation.
- Grow maize hybrids that are recommended for their resistance or tolerance to FSR.
- Seed Treatment of 6 g carbendazim/kg seed or 6 g tabuconazole +20 g *Trichoderma* chalk formulation + 100 g dung ash. Mix all with seed thoroughly in a plastic container or steel container by shaking it well.
- Foliar Spray with carbendazim 12% + mancozeb 62.7% (2 g/L) It should be done after 40 and 55 days after sowing or immediately after symptom appearance by using of thoroughly covering entire foliage.
- If the disease severity is more give second spray of Tebuconazole @ 2 g/L solution at 55 days after sowing.

6. Bacterial stalk rot (BSR)

Causal organism: *Dickeya zeae*

Economic importance: The disease is prevalent in Himachal Pradesh, Uttaranchal, Jammu & Kashmir and adjoining plain areas of states like Punjab, Haryana and Uttar Pradesh.

Favorable conditions: This disease is prevalent in heavy soil under high temperature and humidity conditions. Continuous rains in the month of August and September aggravate this problem in farmer's field.

Identification/Symptoms:

- The disease can appear at various stages of the crop, after sowing until the harvesting stage.
- The disease initially causes water soaking and rotting of the basal stem, particularly affecting the leaf sheaths.
- This rotting may progress rapidly and infected plants may exhibit rolling of the leaves. commonly observed around the time of tasseling.
- The affected stalks may show a change in the color of the rind. The natural green color of the stalk may be lost, giving it an appearance as if it has been boiled in water (Figure 6).
- Rotten stalks affected by bacterial stalk rot emit a characteristic fermenting odor.
- Infected stalks may break over from the second or third basal internode, leading to lodging and further damage to the plant.

Management

- As soon as disease symptoms are noticed, remove and destroy the infected plants.
- Maintaining adequate drainage is essential to prevent water logging and excessive soil moisture.
- Growing of resistant or tolerant maize hybrids to bacterial stalk rot.
- Practice crop rotation with non-host crops.
- Wounds and injuries can provide entry points for the bacteria, increasing the likelihood of infection. Therefore, Proper handling and management practices should be followed to minimize mechanical injury to maize plants.
- Drenching with bleaching powder (calcium hypochlorite) @ 1.5 grams per 15 liters of water around the stem.



Figure 6. Symptoms of Bacterial stalk rot

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Maize Diseases and their Management



FUNGAL DISEASES

1. Maydis leaf blight (MLB)

Causal organism: *Bipolaris maydis*

Economic importance: The disease is prevalent in almost all maize growing areas in India. The disease may cause losses up to 70 per cent or even more under congenial conditions.

Favourable conditions: Maize Leaf Blight (MLB) found in warm humid temperate to tropical regions where temperatures ranging from 20° to 30° C throughout the cropping season. The disease is prevalent in regions where the relative humidity exceeds 80 percent.

Identification/symptoms

MLB symptoms can be observed on various parts of the maize plant, including leaves, sheaths, stalks, husks, ears, and cobs.

In the early stages, the lesions appear on leaves as small and oval to diamond-shaped, (Figure 1).

Later, the lesions elongate, but their growth is constrained by the leaf veins giving rectangular-shaped, necrotic to brown coloured lesions.

As the disease advances, they merge to form larger, irregular patches (Figure 1).

In severe cases, the lesions can coalesce, blight the entire leaf and the affected field shows a scorched appearance.

Management

- Collect and remove any infected crop residue from the field.
- Grow maize hybrids that are recommended for their resistance or tolerance to MLB.
- Seed treatment with Thiram @ 3 g/kg seed + Foliar spray with Mancozeb 75 WP (2.5 g/l water) at 45 days after sowing + Foliar sprays with Azoxystrobin 18.2% w/w + Difenconazole 11.4% w/w SC @ 1 ml/l water at 55 days after sowing will be very effective against the disease.

2. Turcicum leaf blight (TLB)

Causal organism: *Exserohilum turcicum*

Economic importance: The disease is most common in hilly areas. In severe conditions, this disease can cause damage up to 90 percent or even more.

Favourable conditions: The disease is favoured in wet, humid, and cool weather with temperatures ranging from 18 to 27°C and humidity levels reaching up to 75%.



Figure 1. Symptoms of Maydis leaf blight



Figure 2. Symptoms of Turcicum leaf blight

Identification/symptoms

- Initially, symptoms appear as small, light tan-coloured elliptical spots on the lower leaves of infected plants.
- Typical symptoms appear as elongated lesions resembling cigars shape on the leaves which may range in length from 1-6 inches (Figure 2).
- In severely infected fields, the disease can cause extensive damage, resulting in complete scorching of the leaves.

Management

- Collect and remove any infected crop residue from the field.
- Grow maize hybrids that are recommended for their resistance or tolerance to TLB.
- Practice proper crop rotation with non-cereal crops.
- Foliar spray with Azoxystrobin 18.2% + Difenconazole 11.4% w/w SC @ 1ml/l of water or Indofil M-45 (Mancozeb) @ 2.5 g/l of water. The first spray should be applied immediately after symptom appearance, followed by a second spray at 10-15 days interval.

3. Banded leaf and sheath blight (BLSB)

Causal organism: *Rhizoctonia solani* f.sp. *sasakii*

Economic importance: The yield losses may vary from 11 to 40 per cent or even more depending on environmental conditions.

Favourable conditions:

High relative humidity (90%) and optimum temperature about 28°C, and rain fall in the first week of infection significantly favours the development and spread of disease.

Identification/symptoms

- The symptoms of BLSB usually appear on 40 to 50 days old maize plants.
- Initially, water-soaked lesions with a straw-colored appearance develop on the basal leaf sheaths. These lesions are often characterized by alternating dark brown bands (Figure 3 A, B).
- As the disease progresses, the lesions on the leaf sheaths enlarge, merge together and spread upward from the lower parts of the plant.
- In later stages of BLSB, dark brown sclerotia (compact masses of fungal mycelium) can be observed on the diseased leaf sheaths, husks, and cobs (Figure 3 C).
- In severe cases of BLSB, developing maize cobs can be completely damaged and dried by the disease.

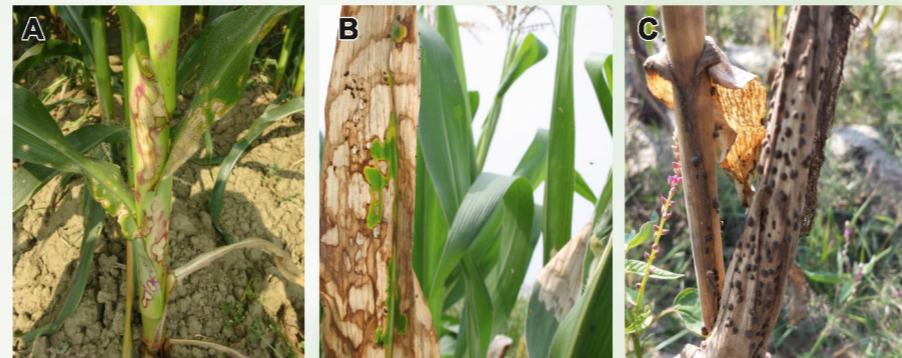


Figure 3. A, B Symptoms and C sign of Banded leaf and sheath blight

Management

- Remove the lower 2-3 leaves in contact with the soil along with their sheaths. This practice reduces the chances of the pathogen spreading from infected plant debris to healthy plants.
- Collect and remove any infected crop residue from the field.
- Grow maize hybrids that are recommended for their resistance or tolerance to BLSB.
- Foliar spray with Azoxystrobin 18.2% + Difenconazole 11.4% w/w SC @ 1ml/l of water immediately after symptoms appear, and if necessary, repeat the spray at 10-15 days interval. Or Apply IDM module as soil amendment with *Trichoderma harzianum* formulation @ 6 t/acre Farm yard manure + seed treatment with Salicylic acid (100 ppm) + Foliar spray with Azoxystrobin 18.2% w/w+ Difenconazole 11.4% w/w SC @ 0.1% (1ml/l) using 500 L water/ ha. The first spray should be applied immediately after symptom appearance, followed by a second spray at 10-15 days interval.
- Apply chemical module as seed treatment with Salicylic acid (100 ppm)+Foliar spray with Azoxystrobin 18.2% w/w+Difenconazole 11.4% w/w SC @ 0.1% using 500 l water/ ha immediately after symptoms appearance.

4. Charcoal rot

Causal organism: *Macrophomina phaseolina*

Economic importance: The disease may cause loss up to 42 per cent or even more under severe soil dry conditions. The disease is also prevalent in those areas where water stress is common during flowering time.

Favorable conditions: High soil temperature (30-42°C) and low soil moisture/water stress during flowering stage favours the disease development.

Identification/symptoms

- Initially, upper leaves of plants show abnormal drying which may exhibit wilting, discoloration, and a gradual loss of turgidity.
- On the advancement, lower part of the stem weakens and bends, causing the plant to fall over.
- The dried stems become soft and can be easily compressed when pressed with fingers.
- Premature death of the plants can also occur (Figure 4).
- At maturity, upon cutting open the stem, numerous minute black specks (microsclerotia) can be seen on the shredded vascular bundles show a distinct charcoal or greyish-black discoloration.



Figure 4. Symptoms of charcoal rot

Management

- Crop rotation with non-host crops