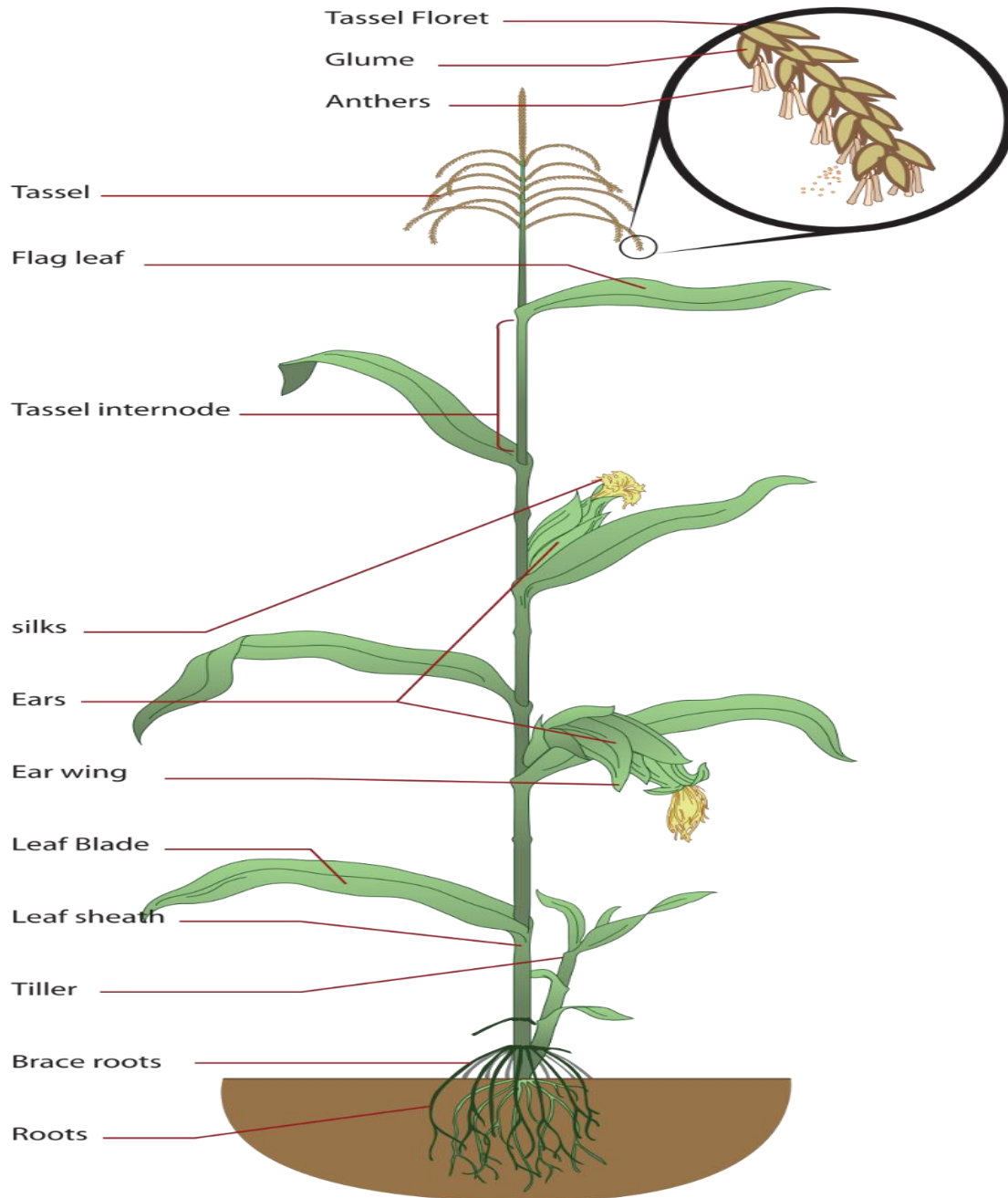




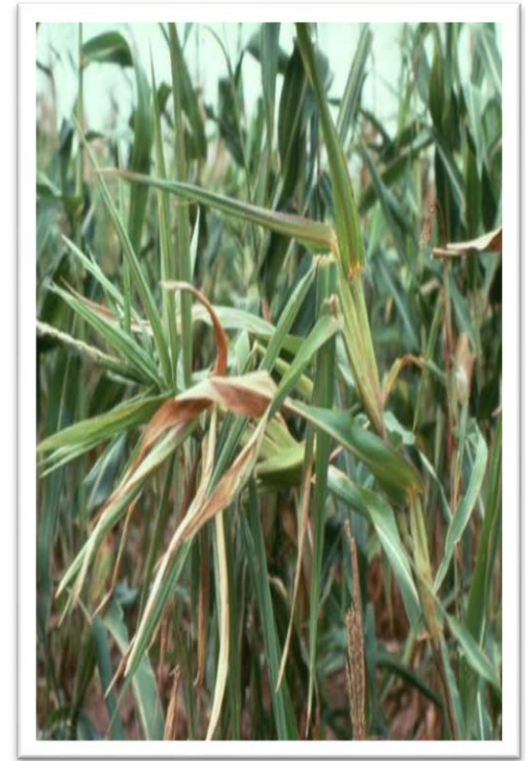
Maize

Zea mays L.



DISEASES OF MAIZE

1. **Downy Mildew** : *Peronosclerospora sorghi*
2. **Stalk rot** : *Fusarium moniliformae*
3. **Leaf Blight/Turcicum** : *Helminthosporium turcicum*
Leaf Blight/Northern
Blight : *Exerohilum turcicum*
4. **Maydis Leaf Blight/**
Southern Blight : *Helminthosporium maydis*
Bipolaris maydis
5. **Banded leaf and Sheath**
blight : *Rhizoctonia solani fsp. sasakii*
6. **Late wilt** : *Cephalosporium maydis*



Downey Mildew

Peronosclerospora sorghi

(1) Downy Mildew

C. O. : *Peronosclerospora sorghi*

Class : Oomycetes

Order : Sclerosporales

Family : Peronosporaceae

The most common and dangerous in India are caused by *P. sorghi*, *P. philippinensis* and *P. sacchari*.

The complete loss of the plant during its early stage of growth or varying degrees of grain loss if cobs are formed.

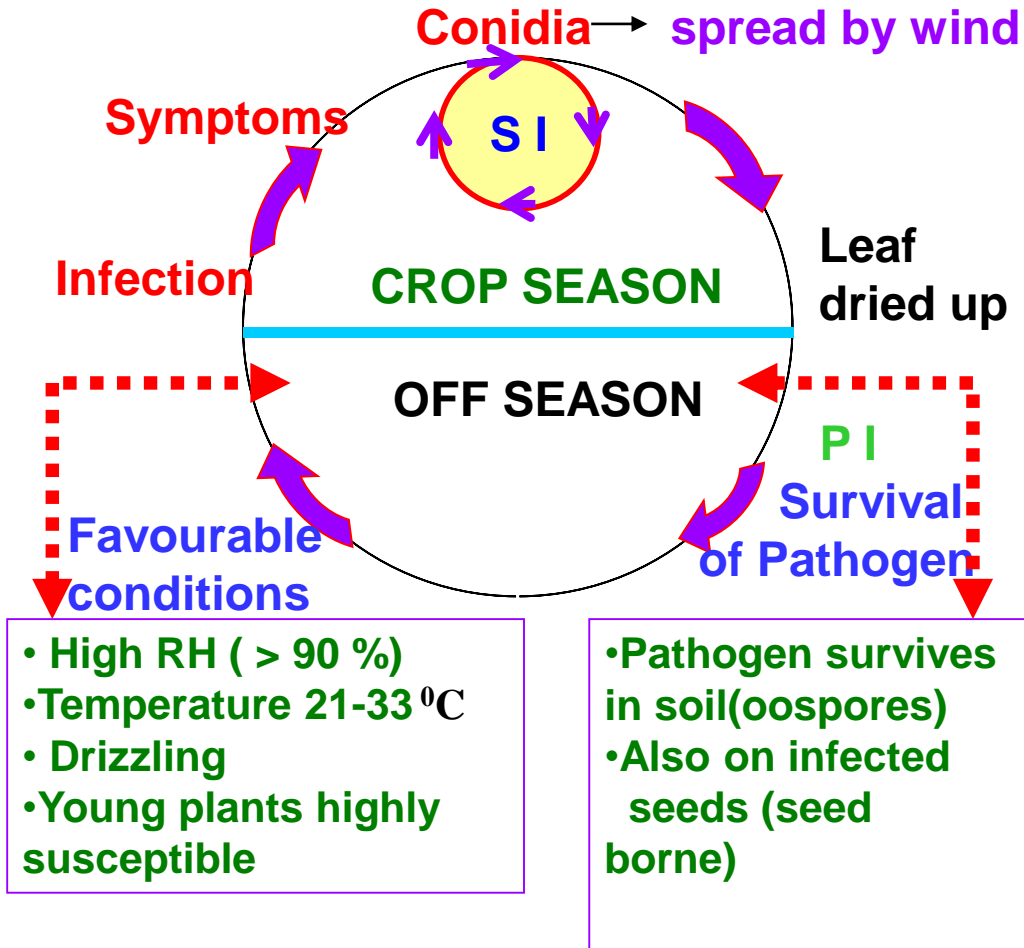
If normal looking kobs do develop they rarely reach maturity or bear mature grains.

Symptoms:

- Development of **chlorotic streaks** on the leaves.
- **Plants stunted and bushy appearance due to shortening of the internodes.**
- **White downy growth 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 axillary buds on the stalk of tassel and the cobs is common (Crazy top).**



DISEASE CYCLE: Downey Mildew



Disease cycle:

- ✓ **Primary source:** Infected seed, crop residue containing **oospores/mycelium** in soil.
- ✓ **Secondary spread:** Air borne spores(**conidia**).

Favorable conditions:

- **High humidity.**
- **Low Temperature (21-33 °C)**
- **Drizzling**
- **Young plants highly susceptible**

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.**



Stalk rot

Fusarium verticilloides

(2) Stalk rot

C. O. : *Fusarium moniliformae*, *F. verticillioides*

In India, *Fusarium* stalk rot was first reported from Mount Abu, Rajasthan (Arya and Jain, 1964).

It has been infecting maize in north and central Karnataka causing economic losses up to 85 per cent.

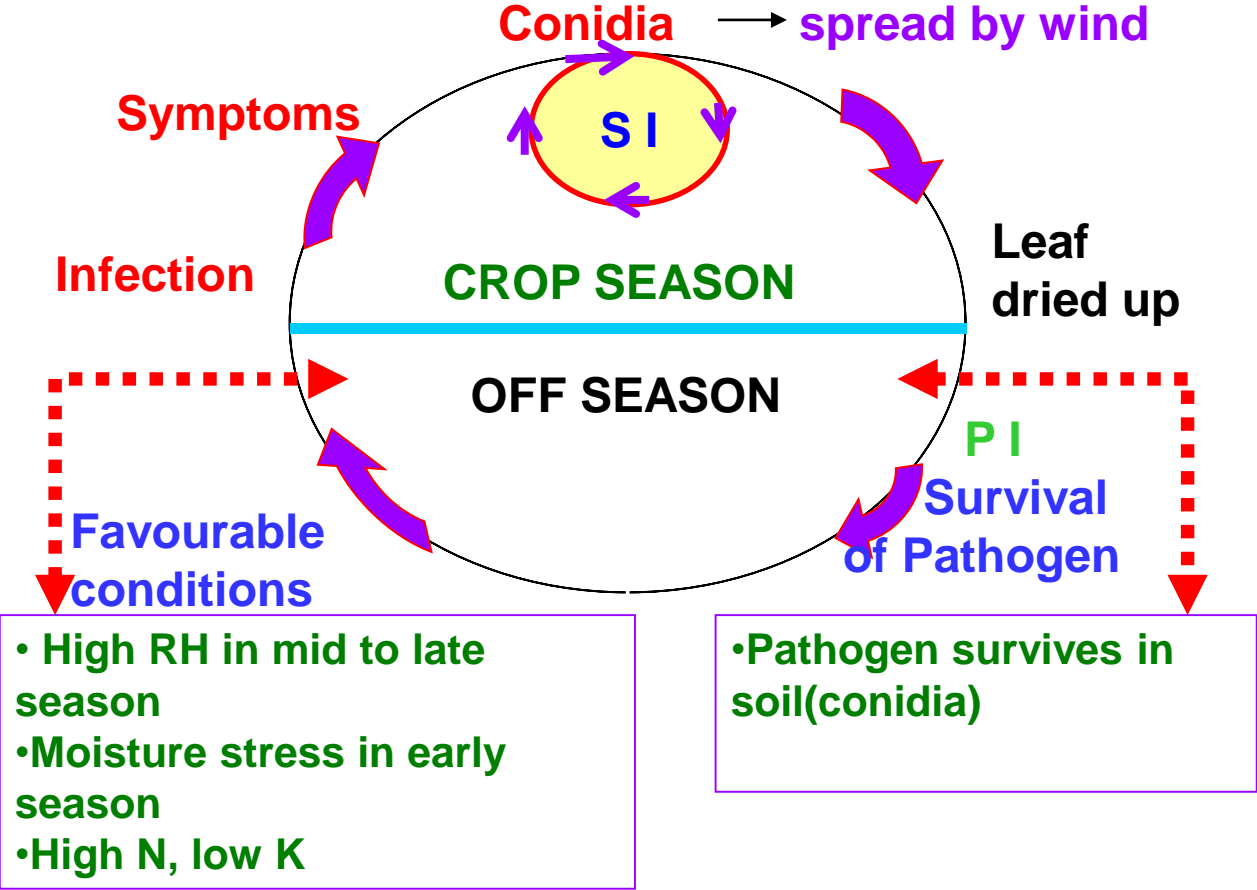
Symptoms:

- **Rotting at roots, crown and lower internodes**
- **Plants wilt, take on a grayish-green hue, and then turn tan**
- **When split, inner stalk shows a light pink to tan discoloration, but no black specks (fungal fruiting bodies) in or on the stalk**
- **Pith disintegrates, vascular bundles remain intact**
- **Stalks feel spongy when squeezed and may be easily crushed or crimped at lower internodes**
- **Plants may lodge when pushed sideways or impacted by wind**



DISEASE CYCLE:

Stalk rot



Disease cycle:

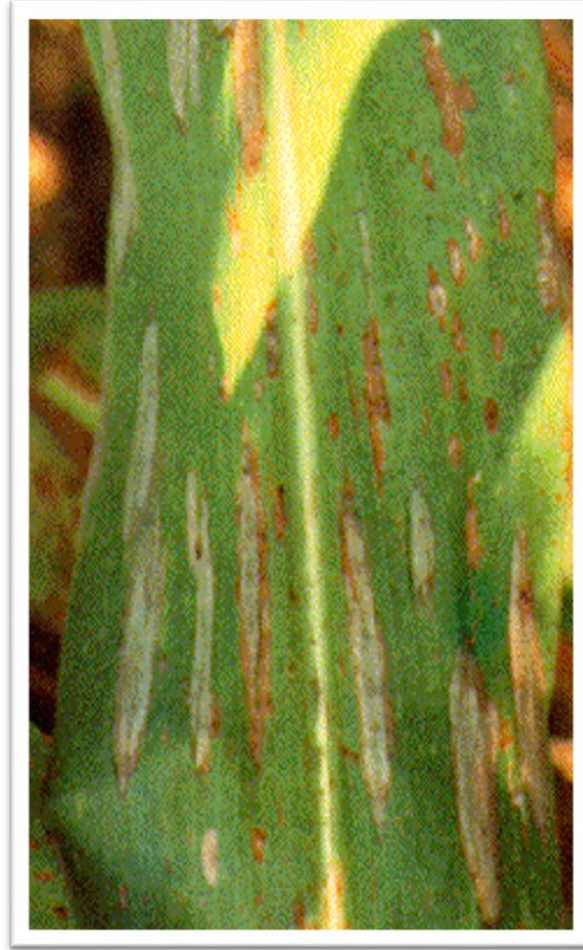
- ✓ **Primary source: Crop residue containing conidia/mycelium in soil.**
- ✓ **Secondary spread: Air borne spores(conidia).**

Favorable conditions:

- **High humidity.**
- **High RH in mid to late season**
- **Moisture stress in early season**
- **High N, low K**

Management:

- **Crop Rotation**
- **Use a tillage system that chops and incorporates residue to break it down**
- **Proper plant population**
- **Maintain proper nitrogen to potassium balance**
- **Reduce stresses when possible**
- **Control corn root worm and corn borer.**
- **Resistant varieties – Ranjit and Ganga 5.**
- **Application of farmyard manure and neem cake along with *Trichoderma harzianum* 15-20 days before sowing with two additional irrigation at tasselling and silking stage reduced the disease.**
- **Integration of *Trichoderma viride* (drenching), with carbendazim (ST), followed by tebuconazole (ST) + *Trichoderma viride* (drenching).**



Turcicum Blight

Helminthosporium turcicum

(3) Leaf Blight/Turcicum Leaf Blight/Northern Blight

C. O.: Helminthosporium turcicum

Exerohilum turcicum

Perf. Stage : *Trichometasphaerica turcica*

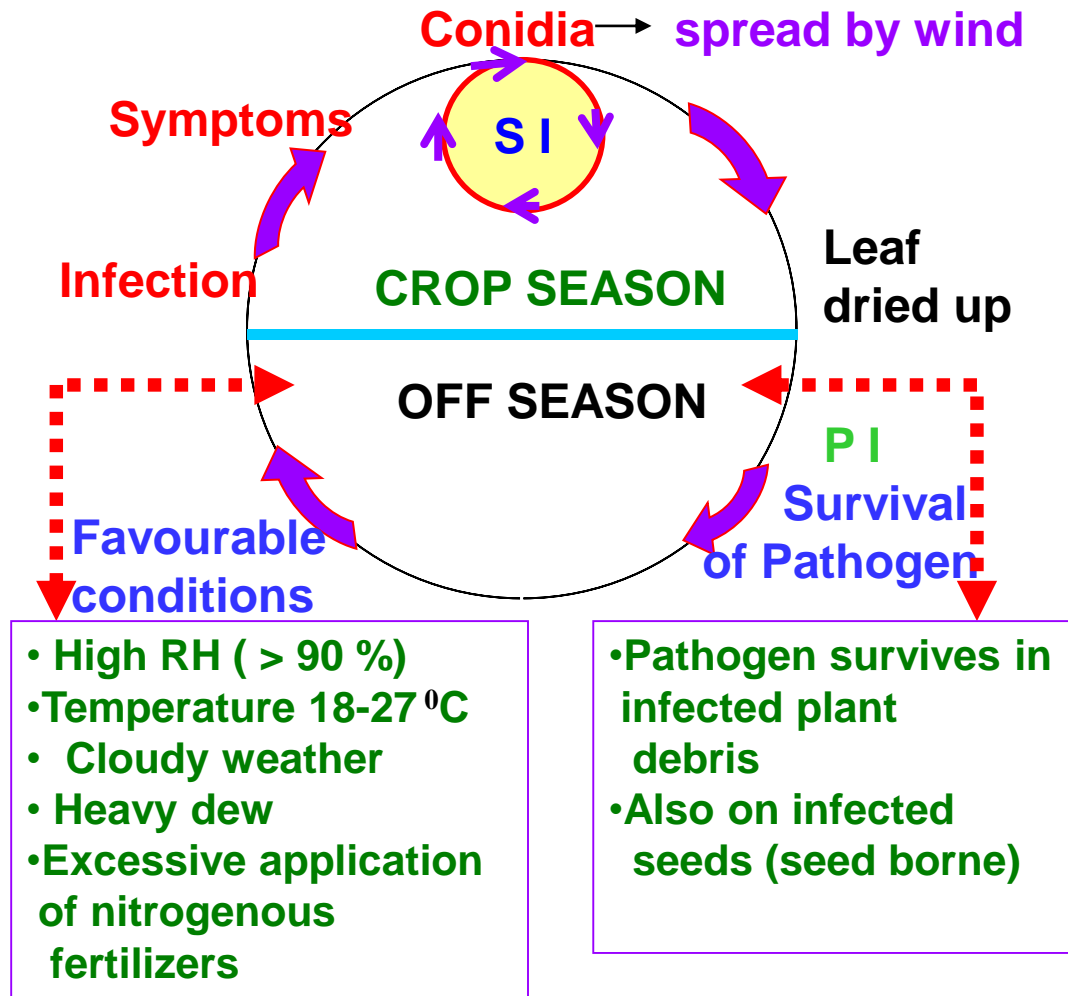
Symptoms:

- **Long elliptical or boat shaped** greenish-brown lesions are developed on leaves
- leaf spots vary from 4-15 cm and severe on the lower leaves.
- These spots coalesce and cover large area and become necrotic.
- Form a stripes and finally lead to death of leaves.
- **If disease appear in early stage, no cob formation takes place.**



DISEASE CYCLE:

Turcicum / Maydis Leaf Blight of Maize



Disease cycle:

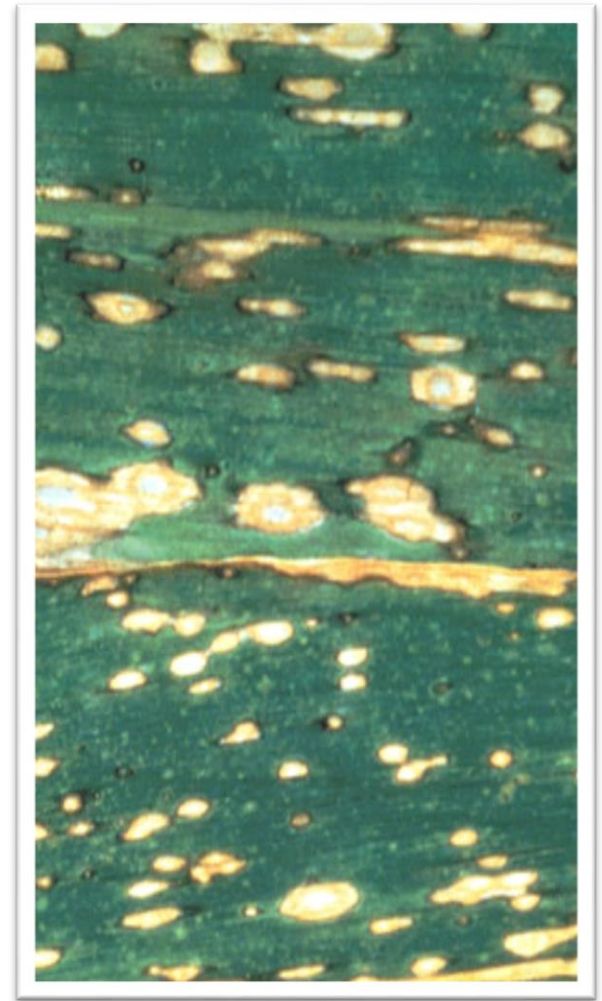
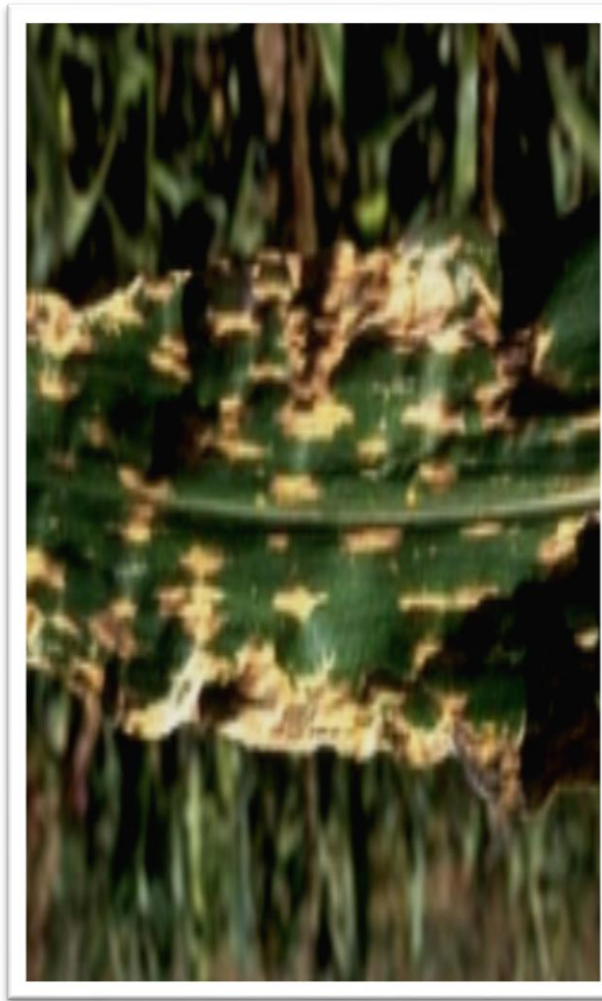
- ✓ **Primary source: Infected seed, crop residue containing **conidia/mycelium** in soil.**
- ✓ **Secondary spread: Air borne spores(**Conidia**).**

Favorable conditions:

- **High humidity.**
- **Cloudy atmosphere.**
- **Heavy doses of N₂ fertilizer.**

Management:

- **Destroy plant debris.**
- **Seed treatment with thiram / captan @ 3-4 g / kg seeds or carbendazim @ 2.5 g / kg seeds.**
- **Spraying of mancozeb or chlorothalonil @ 0.2 %.**
- **Use resistant varieties – GM-2, GM-3, GM—4, GM-6, Narmada Moti, Ganga Safed-2, Ganga-11**



Maydis Blight

Helminthosporium maydis

(4) Maydis Leaf Blight / Southern Corn Blight

C.O : *Helminthosporium maydis*

Bipolaris maydis

Perfect Stage : *Cochliobolus heterosporus*

Symptoms:

- **The disease occurs on leaf blade, leaf sheath and outer husk of ear.**
- **The spots are water soaked, light green at first reddish brown and finally become brown.**
- **Spots are more concentrated on basal leaves of plant.**
- **Affected leaves may die prematurely.**



Disease cycle:

- Primary source: Infected seed, crop residue containing **conidia/mycelium** in soil.
- Secondary spread: Air borne spores(**Conidia**)

Favourable conditions:

- High temp. 28 °C- 29 °C
- Abundant moisture
- Water logging

Management:

- Field sanitation.
- Timely sowing of the crop.
- Use of healthy and disease free seed for sowing.
- Crop rotation.
- Avoid water logging condition in field.
- Spray mancozeb or chlorothalonil @ 1.25 kg/ha.
- Use resistant varieties: GM-2, GM-3, GM-4, GM-6, Narmada Moti, Deccan- 10 etc.



Banded leaf and Sheath blight
Rhizoctonia solani fsp. *sasakii*

(5) Banded leaf and Sheath blight

C.O: Rhizoctonia solani fsp. sasakii

Symptoms:

- **The disease develops on leaves, sheaths and stalks and can spread to ears.**
- **On leaves and sheaths develop a characteristic symptoms of **concentric bands and rings** that are discolored, brown, tan or grey in color.**
- **Ear rot is characterized by light brown.**



Favourable conditions:

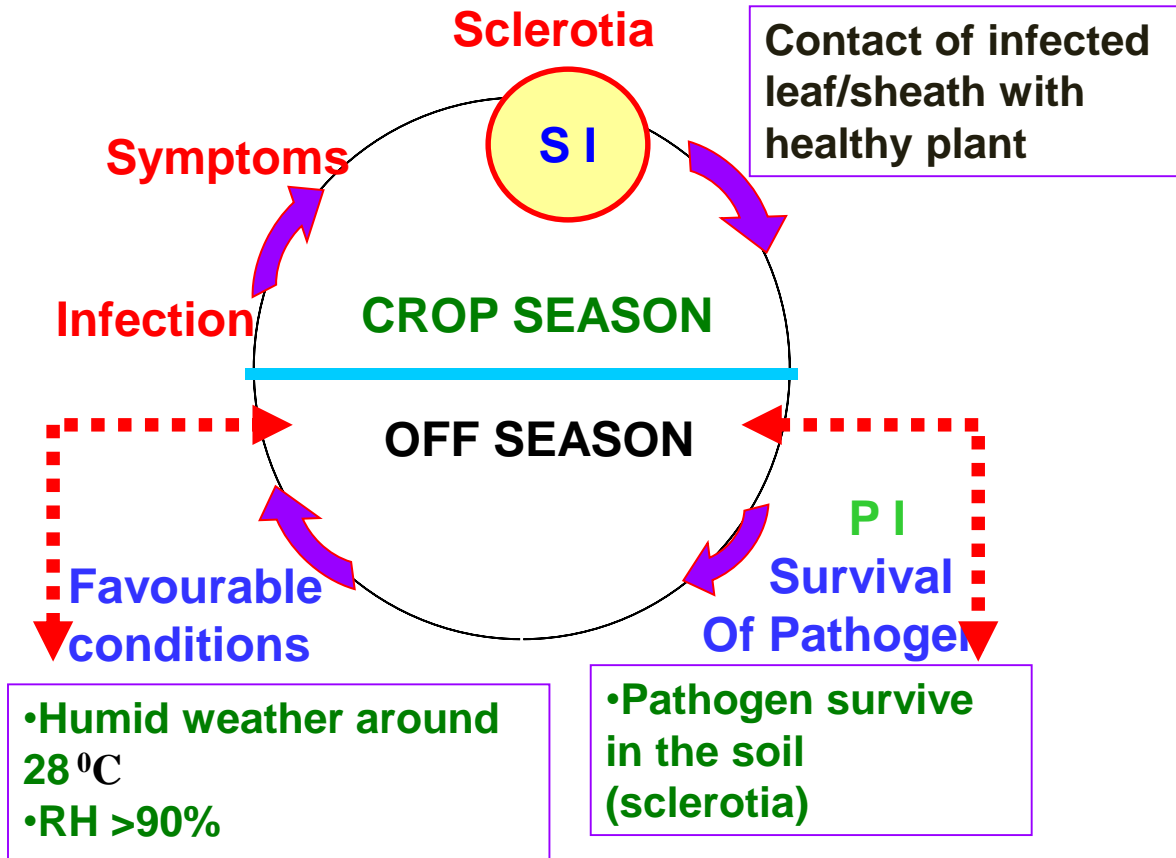
- Ill drained soil
- Humid weather around 28°C
- RH >90%

Disease cycle:

- Survives in the soil and on infected crop debris in the form of **sclerotia**, which acts as primary source of inoculum and survives for several years in the soil.
- The fungi spread by irrigation, movement of contaminated soil and infected plant debris.
- **Secondary spread occurs by contact of diseased leaves or sheaths with healthy plants.**

DISEASE CYCLE :

Banded leaf and Sheath blight



Management:

- **Selection of well drained field.**
- **Planting on raised beds.**
- **Composting of hardwood.**
- **Rouging of diseased plants.**
- **Use *Trichoderma* soil application with FYM or neem cake.**
- **Long crop rotation with non-host crops.**
- **Stripping of the second and third leaf sheaths from the ground level at the age of 35-40 days old crop is effective in checking further BLSB development.**
- **Inter-cropping of maize with legumes especially with soybean effectively reduced the activity of the pathogen in soil.**
- **Inbred maize lines CM 117 and CM 211 as resistant to BLSB**
- **Seed treatment with carbendazim @ 2g / kg seed**
- **Spraying of trifloxystrobin 25% + tebuconazole 50% or validamycin 0.1% followed by carbendazim 0.1% or thiophanate methyl.**



Late wilt
Cephalosporium maydis

(6) Late wilt

C.O: *Cephalosporium maydis*

(*syns. Magnaporthiopsis maydis; Harpophora maydis*)

Late wilt or black bundle disease is a vascular wilt disease of corn caused by the soil-borne and seed-borne fungus,

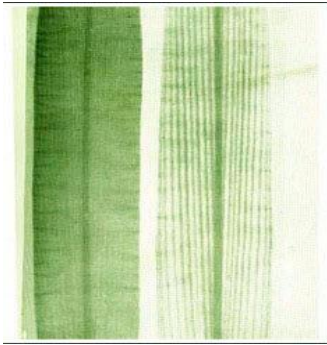
This disease was first reported as a vascular wilt disease of corn in Egypt

Symptoms:

- Characterized by relatively rapid wilting of maize plants, typically at the **age of 70 to 80 days**, before tasseling and until shortly before maturity.
- The first symptoms include the development of **light green stripes on the leaves; the stripes become translucent, and the entire leaf rolls inward from the edges**. Later, drying-out ascends upwards in the plant and includes leaf yellowing and dehydration, color alteration of the vascular bundles to a yellow-brown hue and then the appearance of red-brown stripes on the lower internodes, the symptoms advancing to the fifth internodes or further.

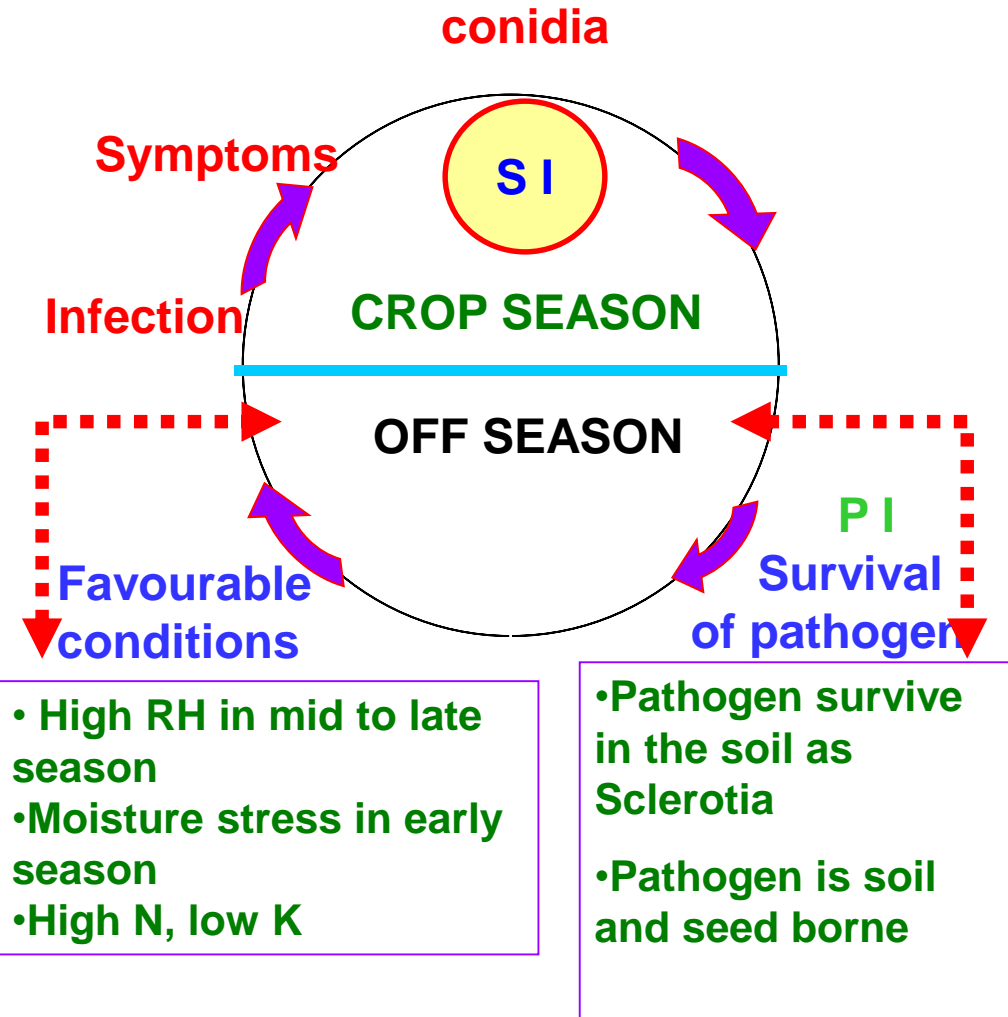
Symptoms:

- With disease progression, the lower stem dries out (particularly at the internodes) and has a shrunken and hollow appearance, with dark yellow to the brownish macerated pith and brownish-black vascular bundles.
- Late wilt is often associated with infection by secondary invaders such as *H. acremonium*, *Sclerotium bataticola*, *Fusarium verticillioides* and various bacterial rots to present a “stalk rot complex”. These saprobic organisms cause stem symptoms to become more severe. Fewer ears are produced, and kernels that form are poorly developed and may be infected with the pathogen.
- Seed quantity is correlated negatively to disease severity. The fungus caused seed rot and a low percentage of emergences and plants that did emerge were delayed. These researchers also reported that seeds taken from infected plants showed similar symptoms. In severe cases, no cobs were formed.



DISEASE CYCLE :

Late wilt



Disease cycle:

- **Soil/seed borne pathogen**
- **Primary source of inoculum: Sclerotia**
- **Secondary spread :Conidia**
- **Spread is primarily through movement of infested soil, crop residue, or seed borne inoculum.**
- **Spread within a field is often associated with mechanical operations such as cultivation that moves soil. *C. maydis* can persist on corn stubble for 12-15 months.**

Favourable conditions:

- **Late wilt develops rapidly at 20-32° C, with optimum disease development at 21-27° C.**
- **Growth of *H. maydis* in soil is sharply inhibited above 35° C.**
- **pH from 4.5-10, with an optimum at pH 6.5.**
- **Low soil moisture (25% saturation) favors sclerotial survival.**

Management:

- Crop sanitation
- Crop rotation
- Avoid water stress at flowering
- Seed treatment with thiram or captan @ 3 g/kg seed
- Grow resistant varieties like DHM-103, DHM 105, Hi-Starch and Ganga Safed-2.
- Cultural measures such as soil solarization, balanced soil fertility and flood fallowing can reduce disease severity and losses.
- Moisture management and flood fallowing may be useful cultural controls for late wilt where they are economically practical.
- Balanced fertility can reduce disease severity, although it does not provide complete control.
- Low levels of nitrogen fertilization (60 kg/ha) increased wilt even though yields were increased overall; however, higher nitrogen levels (120 kg N/ha) needed for optimal yield reduced late wilt.
- Phosphorus, organic amendments (straw, cotton cakes) and micronutrients (Cu, Fe, Mn, and Zn) also reduce disease severity.