



DISEASES OF SORGHUM ***(SORGHUM BICOLOR)***



DFHCM
CREDIT HOUR:2+1

MAJOR DISEASES OF SORGHUM

FUNGAL DISEASES

SMUTS

GRAIN SMUT/KERNEL SMUT / COVERED SMUT / SHORT SMUT

Sphacelotheca sorghi

LOOSE SMUT/LOOSE KERNEL SMUT

Sphacelotheca cruenta

LONG SMUT

Tolyposporium ehrenbergii

HEAD SMUT

Sphacelotheca reiliana

LEAF SPOT DISEASE

LEAF BLIGHT

Exerohilum turcicum
(Syn : *Helminthosporium turcicum*)

RECTANGULAR LEAF SPOT

Cercospora sorghi

ANTHRACNOSE AND RED ROT

Colletotrichum graminicolum

OTHER FUNGAL DISEASE

RUST

Puccinia purpurea

DOWNY MILDEW

Peronosclerospora sorghi

ERGOT OR SUGARY DISEASE

Sphacelia sorghi

PHANEROGAMIC PARASITE(WITCH WEED)

Striga asiatica And *Striga densiflora*

GRAIN SMUT/KERNEL SMUT / COVERED SMUT / SHORT SMUT OF SORGHUM

Economic importance

- It is considered as the most destructive disease among all the smuts of sorghum.
- The extent of damage is even upto 25% of the grain yield. It is widely prevalent in Maharashtra, UP, AP, Tamil Nadu, Gujarat and Karnataka when the seed is not disinfected with fungicides.
- However, recently the losses due to this disease are reduced since the seeds are being treated by fungicides before sowing.
- Most varieties of the cultivated species of *Sorghum vulgare* are susceptible, along with *S. halapense* and *S. sudanens*.

SYMPTOMS

- The disease becomes apparent only at the time of grain formation in the ear.
- **The individual grains are replaced by smut sori which can be localized at a particular part of the head or occur over the entire inflorescence.**
- The sori are dirty white to gray in colour, oval or cylindrical and are covered with a tough white cream to light brown skin (**peridium**) **which often persists unbroken upto threshing.**
- **The glumes are unaltered and** may be found adhering to the sides of the sorus.
- Sometimes the stamens may develop normally protruding out of the sorus.
- The size, colour and degree of breakage of the sori vary considerably with race of the fungus and the sorghum cultivar.
- Ratoon crops exhibit higher incidence of disease.

GRAIN SMUT/KERNEL SMUT / COVERED SMUT / SHORT SMUT OF SORGHUM



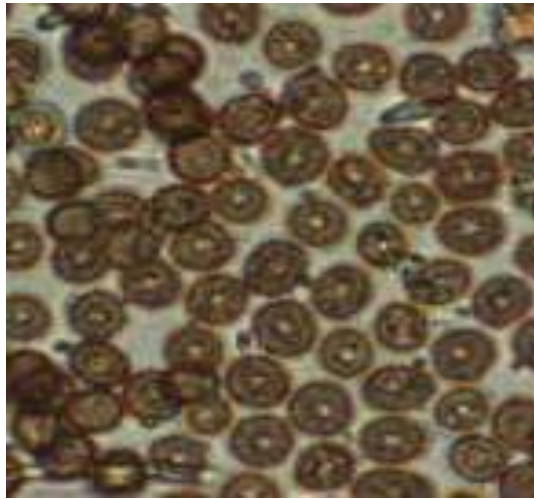
Healthy sorghum head



Affected head



PATHOGEN



Smut spores

ETIOLOGY

- PATHOGEN: *Sphacelotheca sorghi*
[subdivision-Basidiomycotina,order-Ustilaginales,Family-Ustilaginaceae]
- The fungus is systemic.
- The mycelium occupies the growing point of the seedling and continues to grow along the plant without producing any external symptoms until the earhead is put forth.
- The mycelium aggregates in the immature ovary and the chlamydospores are formed by the rounding off of the mycelium.
- The sorus wall is formed mean while mainly by the outer layer of the mycelium, and partly by the host tissue.
- The fungus is present in the form of sorus, which has a tough wall and a long, hard, central tissue called **columellum**.
- **The columella is bulbous at the base and narrowed** towards the tip.
- A dense mass of black to dark brown, smooth, thick walled spores, which are mostly single and measure 5-9 μ in diameter, fill the space between the columellum and sorus wall.
- They germinate immediately if moisture is available, usually by producing a four celled promycelium which buds off sporidia.

DISEASE CYCLE

- The disease is **externally seed borne and systemic**.
- **The spores germinate with the seed** and infect the seed by penetrating through the radicle or mesocotyl to establish systemic infection that develops along the meristematic tissues.
- At the time of flowering, the fungal hyphae get converted into spores, replacing the ovary with the sori.
- If the diseased ears are harvested with the healthy ones and threshed together, the healthy grains become contaminated with the smut spores released from the bursting of the sori.
- The spores remain dormant on the seed until next season.

MANAGEMENT

- Use disease free seeds.
- Grow resistant varieties like T 29/1, PJ 7K, PJ 23K, Nandyal and Bilichigan.
- Treat the seed with fine sulphur powder @0.5% or Captan or Thiram @0.3%.
- Follow crop rotation.
- Collect the smutted ear heads in cloth bags and dip in boiling water.

LOOSE SMUT/LOOSE KERNEL SMUT

SYMPTOMS

- The affected plants can be detected before the ears come out.
- They are shorter about a foot than the healthy plants with thinner stalks and marked tillering.
- The ears come out much earlier than the healthy.
- The glumes are hypertrophied and the earhead gives a loose appearance than healthy.
- The sorus is covered by a thin membrane which ruptures very early, exposing the spores even as the head emerges from the sheath.
- The size of the sorus varies with the variety of the host.

PATHOGEN: *Sphacelotheca cruenta*

[subdivision-Basidiomycotina,order-Ustilaginales,Family -Ustilaginaceae]

LOOSE SMUT/LOOSE KERNEL SMUT



LONG SMUT

SYMPTOMS

- The presence of long smut can be discovered only by a close examination of the ears in the field.
- This disease is normally restricted to a relatively a small proportion of the florets which are scattered on a head.
- The sori are long, more or less cylindrical, elongated, slightly curved with a relatively thick creamy-brown covering membrane (peridium).
- The peridium splits at the apex to release black mass of spores among which are found several darkbrown filaments which represent the vascular bundles of the infected ovary.

PATHOGEN: *Tolyposporium ehrenbergii*

[subdivision-Basidiomycotina,order-Ustilaginales,Family -Ustilaginaceae]

LONG SMUT



HEAD SMUT

SYMPTOMS

- The head is completely replaced by a large gall (sorus).
- The galls are at first covered by a whitish grey membrane of fungal tissue, which ruptures, often before the head emerges from the boot leaf, to expose a mass of brown-black powder (smutspores) along which are embedded long, thin, darkcoloured filaments which are the vascular bundles of the infected head.
- Sometimes smaller sori develop on the leaves and lower part of the peduncle.

PATHOGEN: *Sphacelotheca reiliana*

[subdivision-Basidiomycotina,order-Ustilaginales,Family -Ustilaginaceae]

HEAD SMUT



MANAGEMENT FOR ALL SMUTS

- Treat the seed with Captan or Thiram at 4 g/kg.
Use disease free seeds.
- Follow crop rotation.
- Collect the smutted ear heads in cloth bags and dip in boiling water.

HEAD MOULD/GRAIN MOULD/HEAD BLIGHT

Symptoms

- If rains occur during the flowering and grain filling stages, severe grain moulding can occur. Infected grains are covered with pink or black mold and such grains disintegrate during threshing process.
- The disease caused by a no.of fungus like *Fusarium*, *Curvularia*, *Alternaria*, *Aspergillus*, *Cheatomium*, *Rhizopus*, *Helminthosporium* and *Phoma*
- *Moldy grains contain toxic mycotoxins* and are unfit for human consumption and cattle feed.

Disease cycle

- The fungi mainly spread through air-borne conidia. The fungi survive as parasites as well as saprophytes in the infected plant debris.

Favourable Conditions

- Wet weather following the flowering favours grain mould development and the longer the wet period the greater the mould development. Compact ear heads are highly susceptible.

Management

- Adjust the sowing time.
- Grow resistant varieties like GMRP 4, GMRP 9, GMRP 13 and tolerant varieties like CSV 15.
- Seed disinfestation with Thiram@0.3% will prevent seedling infection.
- Spray Mancozeb (0.25%) or captan (0.2%) or captan 2g + Aureofungin 200ppm per liter, in case of intermittent rainfall during earhead emergence, a week later and during milky stage.

