

A photograph of a sorghum field with several panicles of grain in focus. The background shows a hilly landscape under a clear sky.

DISEASE OF FIELD AND HORTICULTURAL CROPS – I

**SESSION 8 & 9
SORGHUM DISEASES**

Important Diseases

❖ Major Diseases

1. Smut - *Sporisorium spp.*, *Tolyposporium sp.*
2. Anthracnose - *Colletotrichum graminicola*
3. Ergot - *Claviceps sorghi*
4. Grain mold - Different fungi
5. Striga - *Striga asiatica*

❖ Minor Diseases

1. Rust - *Puccinia purpurea*
2. Charcoal rot - *Macrophomina phaseolina*
3. DMD - *Perenosclerospora sorghi*
4. Leaf blight - *Drechslera turcicum*
5. Cercospora leaf spot - *Cercospora sorghi*

Smut Diseases

1. Grain/Kernel Smut - *Sporisorium sorghi*
2. Loose smut - *Sporisorium cruentum*
3. Head smut - *Sporisorium relianum*
4. Long smut - *Tolyposporium ehrenbergi*

GRAIN SMUT

❖ *Sporisorium sorghi*

❖ **Most common and most damaging**

❖ **Symptoms**

1. Individual grains are attacked; But majority infected
2. Grain transformed into sori – oval/ cylindrical
3. Stamens and ovary are aborted
4. Slender columella present



LOOSE SMUT

❖ *Sporisorium cruentum*

❖ Symptoms

1. All spikelets are infected
2. The membrane covering the sori burst early to release smut spores
3. Stamens and ovary are aborted
4. On ear emergence, spores are released leaving behind columella



HEAD SMUT

❖ *Sporisorium reilianum*

❖ Symptoms

1. Inflorescence is completely converted into smut sori
2. Smutted panicle emerge
3. Membrane breaks to release smut spores



LONG SMUT

❖ *Tolyposporium ehrenbergi*

❖ Symptoms

1. Individual grains are infected
2. Only few grains
3. Sori – Long cylindrical



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Comparisons of Smut Diseases

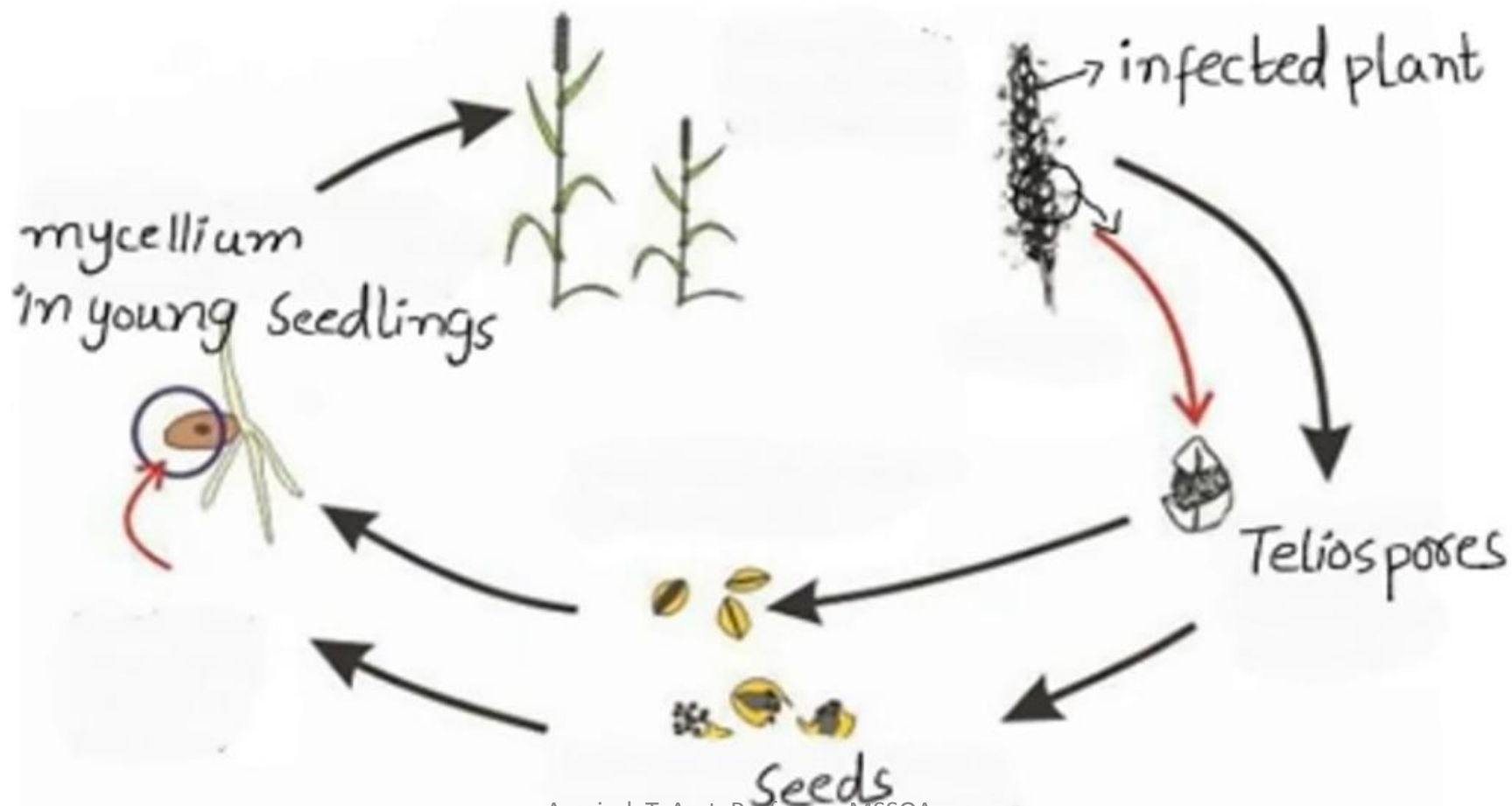
Characters	Grain Smut	Loose smut	Head Smut	Long smut
Pathogen	<i>Sporisorium sorghi</i>	<i>Sporisorium cruentum</i>	<i>Sporisorium relianum</i>	<i>Tolyposporium ehrenbergi</i>
Infect	Individual grains (majority)	All spikelets	Entire inflorescence	Individual grains (Few)
Sori	Small, Round/cylindrical	Small, round	Large	Small, Elongate/Cylindrical
Columella	Short	Long	Absent	Absent
Spores	Single; Round to oval	Single; Spherical	Single; Spherical	In spore balls;
Spread	Externally seed borne	Externally seed borne	Soil and seed borne	Soil
Viability spores	10 years	4 years	2 years	2 years



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❖ Disease cycle

- ✓ Primary inoculum - Ext. Seed/Soil borne
- ✓ Secondary spread - Air borne sporidia



❖ Favourable Conditions

✓ T~25 °C; RH>80%

❖ Management

1. Resistant variety - Nandyal, SPV 102, 104
2. Use disease free seeds
3. Field sanitation & Roughing
4. Crop rotation????
5. Deep summer ploughing
6. Solar energy treatment – Seeds soaked in water for 4 hrs and then dried in under shade.
7. Seed treatment – Thiram 75% WP – 3 g/ Kg seeds
- Carboxin 37.5% + Thiram 37.5% WP @ 3g/Kg

ANTHRACNOSE

❖ *Colletotrichum graminicola*

❖ ~Red leaf disease

❖ **Symptoms**

1. Leaf spot (anthracnose) and stalk rot (red rot)
2. Small red coloured spots on both surfaces of the leaf.
3. Centre - white in colour ; red, purple or brown margin.
4. Numerous small black dots (acervuli) at center
5. Many lesions coalesce and kill large leaf portions.
6. Lesions develop on stem as well

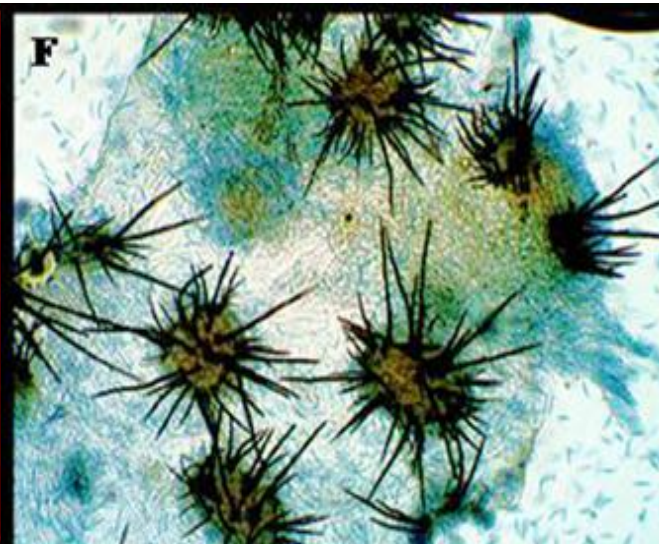
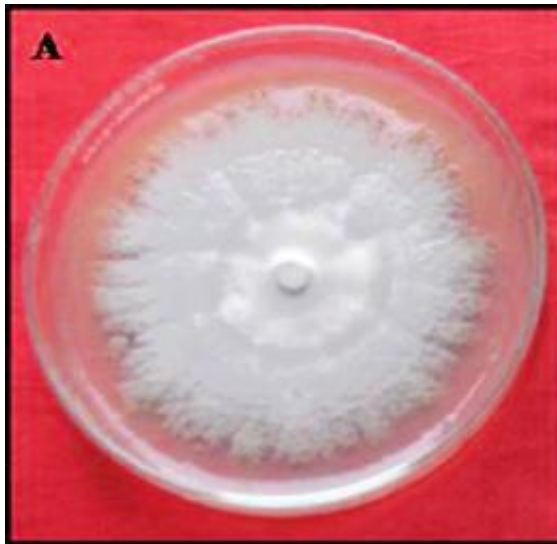
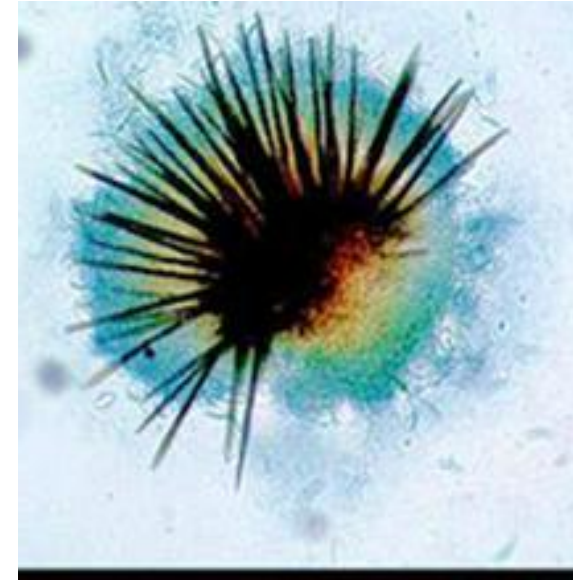


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Etiology

- ❖ Conidia – Hyaline, single celled, vacuolated, falcate
- ❖ Acervuli



Disease cycle

- ❖ **Primary infection** – Collateral host, Plant debris and seed
- ❖ **Secondary infection** – Conidia

Favourable condition

- ❖ T ~ 28 °C; High RH, Frequent rains

Management

1. Resistant varieties – SPC 162, CSV- 17
2. Crop rotation
3. Field sanitation - Destruction of weed hosts
4. Disease free seeds
5. Seed treatment Thiram 75% WP @ 3g/kg of seed
6. Foliar Spray
 - Azoxystrobin 23% SC @ 1ml/L
 - Tebuconazole 25.9% EC @ 1ml/L
 - Carbendazim + Mancozeb @ 0.2%.

Ergot

❖ *Claviceps sorghi*

❖ ~Sugary disease

❖ Symptoms

1. The disease is confined to individual spikelets.
2. Secretion of honey dew (creamy sticky liquid) from infected florets.
3. Grain is replaced by long (1-2cm), straight or curved, cream to light brown, hard sclerotia.



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Etiology

- ❖ Conidia - single celled, hyaline, elliptic or oblong in shape
- ❖ Sclerotia – 10-12 mm long



❖ Disease Cycle

- ✓ **Primary inoculum-** germination of sclerotia which produce ascospores, which infect the ovaries
- ✓ **Secondary spread** – Insects, Air, Rain splashes

Favourable condition

- ❖ High temperature and high soil moisture (Water logging) favor the disease

Management

1. Adjust the date of sowing so that the crop does not flower during the periods of high rainfall and high humidity.
2. Resistant varieties - SPV 191, CSH 5, SPH 1 and CS3541.
3. Deep summer ploughing
4. Soaking seeds with 2% saline solution
5. Seed treatment - Captan or Thiram@4g/kg
6. Spray **Ziram** or Mancozeb @ 0.2% at emergence of earhead (5-10 per cent flowering stage) followed by a spray at 50 per cent flowering
7. Systemic - Fungicides Propiconazole or Tebuconazole @ 1ml/L

Grain mold

❖ *Fusarium*, *Curvularia*, *Alternaria*, *Aspergillus*, *Chaetomium*, *Rhizopus*, *Helminthosporium* and *Phoma*

❖ Symptoms

1. Infected grains are covered with pink or black mold and such grains disintegrate during threshing process.
2. *Fusarium spp.* - fluffy white or pinkish coloration.
C. lunata colours the grain black.



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❖ Disease Cycle

- ✓ **Primary inoculum**- crop debris, seeds
- ✓ **Secondary spread** – Air borne conidia

Favourable condition

- ❖ Hot humid weather with frequent rains

Management

1. Field Sanitation
2. Adjust the sowing time.
3. Grow resistant varieties like GMRP 4, GMRP 9, GMRP 13
4. Seed Treatment Thiram 75% WP @ 3g/Kg seeds
5. Spray Mancozeb (0.25%) or Captan 2g + Aureofungin 200ppm per liter

Striga

❖ *Striga asiatica* and *Striga densiflora*

❖ ~ *Witch weed*

❖ Symptoms

1. Yellowing and wilting of the host leaves.
2. The infected plants are stunted in growth and may die prior to seed setting, if the infection occurs early



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❖ Etiology

- ✓ Partial root parasite
- ✓ Small plant with bright green leaves, grows upto a height of 15-30 cm.
- ✓ Occurs in clusters of 10-20/host plant.
- ✓ *S. asiatica* produces red to pink flowers while. *S. densiflora* produces white flowers.
- ✓ Each fruit contains minute seeds in abundance which survives in the soil for several years.



❖ Disease Cycle

✓ Primary inoculum- Soil borne seeds

❖ Management

1. Resistant varieties
2. The use of Striga-free seed
3. Hand weeding of the parasites before flowering
4. Crop rotation with cowpea, groundnut and sunflower
5. Mixing of **ethrel** with soil triggers germination of Striga in the absence of host.
6. Spray **Fernoxone** (sodium salt of 2, 4-D) or Agroxone (MCPA) at 450g/500 liters of water.
7. 1% Tetrachloro dimethyl phenoxy acetate.

❖ Favourable Conditions

✓ **Weather** -~ 25 °C, High RH

❖ Management

1. Resistant varieties- DHM-1, Deccan, Kalinga Raj.
2. Crop rotation
3. Field sanitation – Remove weeds, Crop residues
4. Split application of nitrogen fertilizer
5. Seed treatment with Thiram @ 3 g/ Kg
6. Foliar spray - Mancozeb 75% WP (0.25%)
 - Kresoxim-methyl 44.3% SC (0.1%)
 - Azoxystrobin 18.2% + Difenconazole 11.4% w/w SC (0.1%)

Rust

❖ *Puccinia purpurea*

❖ Symptoms

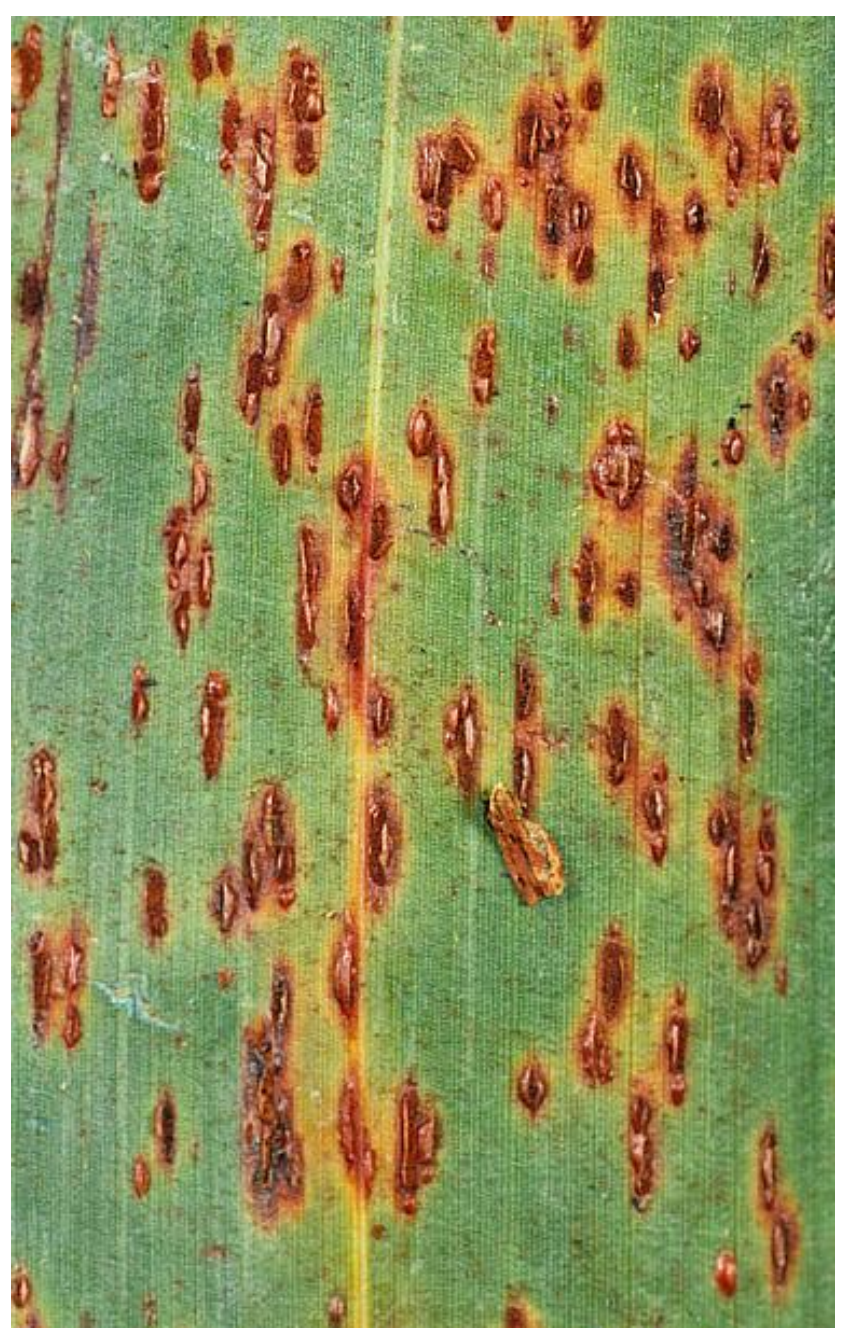
1. Reddish brown flecks on both surface of the leaves
2. Yellow halo may be present
3. Elliptical Pustules rupture to release reddish brown uredospores
4. Telia are more elongate and dark brown

❖ Disease cycle:

- ✓ Macrocytic and Heteroecious;
- ✓ Alternate host – *Oxalis corniculata*



Scot Nelson



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