



B.Sc. Third Year, Semester - V

Botany Paper No. XVI (C)

Plant Pathology Unit-2

1) Cereals

b) Grain smut of Jowar



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b) Grain smut of Jowar

Causal Organism: *Sphacelotheca sorghi*

Host: *Sorghum vulgare* (Jowar)

- **Classification**

- **Division-** Mycota
- **Sub Division-** Eumycotina
- **Class-** Basidiomycetes
- **Order-** Ustilaginales
- **Family-** Ustilaginaceae
- **Genus-** *Sphacelotheca*
- **Species-** *sorghi*

Distribution

Basically it is a covered smut. This is most common and destructive disease of jowar in India. Besides India, the disease has also been reported from Manchuria, Myanmar, Tanganyika, South Africa, Italy, U.S.A., Venezuela and other countries.

Symptoms

The smut attacks ovaries exclusively. Majority or all of the grains in the ear are attacked. Each infected ovary is transformed into a dirty grey spore sac (sorus). The shape and size of affected grain varies. They are generally oval or cylindrical, sometimes conical at the tip and 4-12 mm long. The sac surrounded by unaltered glumes at the base. The stamens are commonly absent. Thus in infected ears there is no grain formation as ovaries of spikelets are transformed in to sori. In some varieties of jowar, shape and size of smutted grain is not much different from those of normal ones.

The wall of sorus varies according to nature of attack. In long protruding sacs, the wall is entirely made up of fungal pseudoparenchyma. The host tissue contributes to only basal part of the wall. In the hidden forms, the wall in most part is the ovary wall which is rough and rigid and ruptures only after harvest. Each sorus has a slender, sometimes curved, column of hard tissue the columella in the centre. All around the columella, there is a black powdery mass of teliospores.



Photo showing Grain smut of Jowar

Causal organism and disease cycle:

Grain smut of jowar is caused by *Sphacelotheca sorghi*.

Teliospores are round to oval, dark brown in mass but brownish olive individually; smooth walled and 5-9 μm in diameter. They have a long viability as long as 13 years. Each teliospore germinate to produce a septate promycelium, budding off sporidia laterally as well as apically. The sporidia are spindle shaped, and measure 10-12.5 $\times$ 2-3 μm . the dikaryotic phase is established by fusion either between sporidia or their germ tubes.

Causal organism and disease cycle:

The disease is systemic and externally seed borne. The pathogen survives as teliospores on surface of contaminated seeds. When such seeds are sown in next season, teliospores germinate in presence of moisture to give rise promycelia and sporidia. The dikaryotic infection hyphae infect the young emerging seedlings. The pathogen grows in systemic manner throughout the developing plant and finally reaches the ovaries which become transformed in to smut sori. The sori are broken during the threshing of the crop and the spores released from them contaminate the seeds. The teliospores remain dormant until the next season when they germinate along with the seed germination. The infection takes place only during the period between seed germination and emergence of seedlings above soil level. The germ tubes enter mainly through the mesocotyl.

GRAIN SMUT OF SORGHUM

Division	- Eumycota
Class	- Teliomycetes
Order	- Ustilaginales
Family	- Ustilaginaceae
Genus	- Sphacelotheca
Species	- <i>S. sorghi</i>



INFECTED EAR



SORI WITH COLUMELLA



- Columella



SPORE



GERMINATING SPORE

Grain smut of sorghum is caused by the fungus *Sphacelotheca sorghi*.

Symptoms:-

- During the emergence of inflorescence, the smut symptoms appear only at the time of emergence of inflorescence.
- The grains are converted into black or grey colored spore sacs called sori.
- The infected grains are larger than healthy grains.
- The diseased plants may have shorter and fewer internodes.

Disease cycle:-

- The disease is externally seed borne.

- During thrusting, the sori are broken and the spores get lodged on the surface of the healthy seeds. They remain dormant until the next season.

Control measures:-

- Seed treatment with 2 to 4 gms. of sulphur or organic mercurials.
- Crop rotation, hot water treatment, planting resistant varieties are some other important disease control measures.

Control measures

1. Use of clean, disease free seeds for cultivation.
2. Treatment with formalin (0.5%) is useful for immersing the seeds for two hours. The seeds are then dried quickly.
3. The seeds may be soaked in copper sulphate (0.5-3.0%) solution for 10-15 minutes, then dried and sown.
4. Dry seed dressing with Agrosan GN (1:500).
5. Mercural and non mercural fungicides such as Arasan, N.I.Cerasan, Tillex, Flit 406, Cerasan M are also effective.
6. Use of disease resistant varieties- T29/1, PJ 7K, PJ 23K, Nandyal, Bilichigan, CSH-9, SPV-104, SPV-102, SPV-115, SPV-297, SPV-138, SPV-245, RSV-1-R, SDM-9, CSH-7-R and CSH-5.
7. Solar energy treatment.
8. Soaking seeds in water during summer for 4 hours and then spread out in the sun or in shade to dry.

Thank you