

TOPIC:WHIP SMUT OF SUGARCANE
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WHIP SMUT OF SUARCANE

Sugarcane is the most important commercial crop of India. It is grown all over in India, but U.P. has the largest area of about 1.2 million hectares and the other states including Bihar, Orissa, Bengal, Andhra Pradesh, Maharashtra and Karnataka contribute nearly 40% of the area.

Whip Smut is well known disease of sugarcane and is reported from India, Java, Pakistan, Burma, Philippines, Australia and Ceylon. In India it is found in almost every sugarcane tract, through the intensity of infection may vary from place to place, depending upon the cane variety grows and the cultural practices adopted. The disease also inhabits grasses such as 'kans', which may serve as collateral hosts.

Symptoms of Whip Smut Disease:

- a) Symptoms appear mostly on floral shoots, which transform into dusty black, whip-like, much curved structure varying several feet in length.
- b) Primarily, it remains covered by a silvery membrane imparting white appearance but the membrane soon ruptures and flakes-off exposing dense black powdery mass of spores. The spores are blown-off by even a slight breeze.
- c) Sometimes, if the whip-like structure falls-off or the growing point of the cane is damaged by any means, several eyes on the plant sprout and invariably give rise to smutted whip-like structures.
- d) However, affected canes have slender and thin stems and can be differentiated easily before the appearance of whips.
- e) These culms are taller and stand distinctly higher than the rest of the crop.
- f) Losses due to smut range from 30 - 40% in plant crops and even up to 70% in ratoons. Sucrose content of infected cane is reduced to 3 - 7%.

Causal Organism of Whip Smut Disease: *Ustilago scitaminea* Sydow

Systematic Position:

Kindom: Fungi

Divison: Basidiomycetes

Class : Ustilaginomyces

Order: Ustiliganeles

Family: Ustilaginaceae

Genus: *Ustilago*

Species: *scitaminea*



Figure: Black long whip like structure



Figure: Smut produced from top of the cane

The fungal mycelium is present in abundance in the infected canes. The mycelium is septate, dikaryotic, intercellular, and generally grows systemically inside the plant. The mycelium is transformed into spherical, smooth-walled or sometimes echinulated, light brown teleutospores, which measure 5-10 μm in diameter.

On germination, the teleutospores form 4-celled short promycelium or basidium. From each of these cells of a basidium arises a sporidium on short stalks. Two sporidia of compatible nature (+ and -) fuse together producing infection hypha. However, sometimes, instead of producing sporidia the basidial cells give rise to branched hyphae which function as infection hyphae.

Disease Cycle:

(i) Perennation:

Since the sugarcane crop stands generally throughout the year in the field either as such or via ratoons, the pathogen survives in them by means of its mycelium. In addition, the teleutospores also perpetuate in the soil.

(ii) Primary Infection:

Primary infection on cane plants growing fresh can be rendered by any of the following means:

(a) Teleutospores perennating in soil may germinate producing sporidia. The two sporidia of compatible nature (+ and -) fuse and produce infection hypha which infect the sown setts via their buds. Sometimes, basidial cells directly give rise to infection hyphae that infect setts in soil.

(b) When such setts are sown, which already contain the viable mycelia of the pathogen, they give rise to smutted canes.

(c) Fresh shoots arising from ratoons developed from diseased canes invariably become diseased because such ratoons harbour the viable mycelium in them.

(d) However, the mycelia after entering inside the plant grow systemically and the symptoms manifest, at appropriate places at appropriate time.

(iii) Secondary Infection:

Unlike most of the smut diseases, where secondary infections mostly lack, they may occur during the same growing season in case of this disease. Some of the teleutospores blown-off from smutted whips may fall on the junction of the leaf and the leaf-sheath of healthy cane plants, travel down the sheath and reach the tender nodal region and the young eyes.

Since there is plenty of moisture available, the teleutospores germinate and, finally, cause infection. Teleutospores, which fall on the injuries made on the scales of eyes or any other part of the host, may facilitate secondary infection.

Predisposing Factors:

100% relative humidity and temperature ranging between 25-30°C at the time when teleutospores germinate is considered most favourable for disease incidence because the teleutospores germinate very quickly and infection is established successfully at these environmental conditions. However, the teleutospores may germinate at a temperature minimum 5-9°C and maximum between 36-40°C, and at relative humidity less than 100% but in no case below 90%.

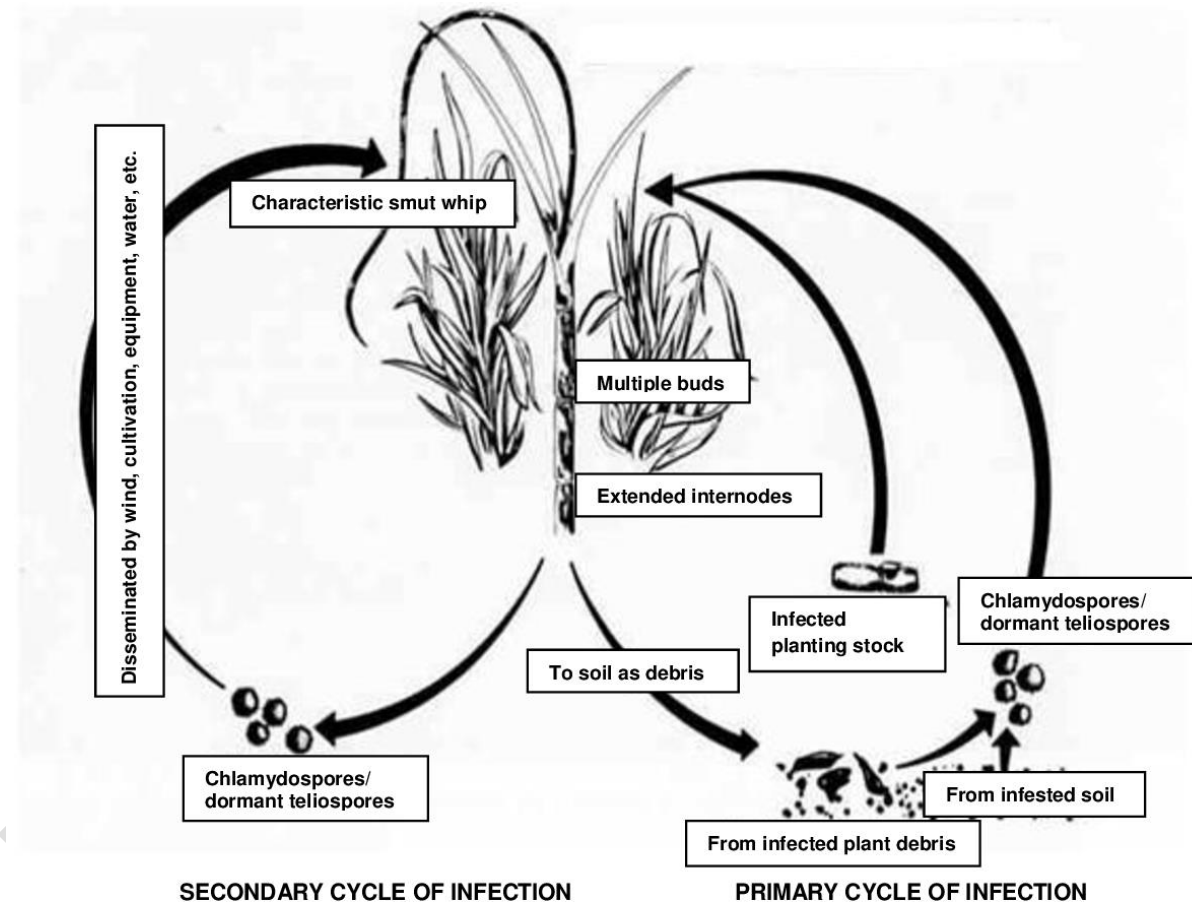


Figure: Disease cycle

Control measures:

(i) The best way to control the disease is to remove all sources of infection. Smutted whips should be carefully removed and then the entire clump should be dug out and burnt; practice of ratooning, particularly in cases where there is

frequent infection, should be entirely given up; and, sett-selection from infected field should be avoided.

(ii) Setts should be dipped in recommended chemicals prior to sowing, 5 minute dip in Bordeaux mixture (4:4:50), 5 minute dip in Agallol or Aretan having 6% mercury at 0.25% suspension in water, and 5 minute dip in mercuric chloride (0.1%) and formalin (1.0%) followed by a 2-hour covering under moist cloth are recommended.

(iii) Cultivation of susceptible varieties should be replaced by resistant ones. Some resistant varieties are – CO 356, 395, 421, 453, 285, 449, 527, 1118, COS 76, 109, 562, 574, POJ 28, 8, and BO 11, 22, 24. However, it has been found that if a single resistant variety is repeatedly grown in one area it becomes susceptible to disease. Therefore, variety in practice should be replaced by another one generally after a few years.

References:

- https://lh3.googleusercontent.com/proxy/qLds25sbYwVHu4LCbtxqp8C7b3zg2aTy28Xqr2BQYjJNyNpPLBYfHBM4X_T4eZCTquvt9Ea-c2QnKC34WWzW_bLgg0PCRUWxZP9OmtorFPc
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