

Integrated Disease Management for Red Rot of Sugarcane

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Abstract

Sugarcane (*Saccharum* spp.) is most prominent commercial cash crop grown across tropical and subtropical regions of the world. It provides raw material for 336 sugar-mills which is the second most important agro-based industry in India. Among all the pathogens inciting disease in this cash crop, Red rot of sugarcane caused by *Colletotrichum falcatum* (Went, 1893) (Teleomorph: *Glomerella tucumanensis*) is the most destructive one as it is both soil and sett borne in nature which needs effective integrated disease management for its control and to reduce the resultant yield loss. Red patches with ash coloured centre on the mid rib along with reddened pith in case of severe infection is being characteristic symptom of the disease which can be effectively managed by combine approach of cultural method, physical method, biological method and chemical method.

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Sugarcane is a perennial, monocotyledon plant belonging to gramineae family grown in subtropical to tropical climate of south-east Asia. It is mainly grown for sugar which is made by evaporating cane juice. About 87% of world's sugar production comes from sugarcane. Apart from sugar production it is also used for making ethanol which is a biofuel. Bagasse obtained as by-product of sugar industry is used for electricity production. Press mud obtained from filtration of cane juice is used for reclamation of acidic soil as it contains 45% lime. Sugarcane is a C₄ and day neutral plant thus it has better potential for greater biomass production. Uttar Pradesh is the leading producer of sugarcane (225.22 MT) followed by Maharashtra (123.97 MT) and Karnataka (62.46 MT) while Tamil Nadu (104.78 T/ha) has highest productivity among all the state.

Sugarcane is one the most important cash crop preferred by farmers as it provides stable and ample income. Sugar industry is second most important agro-based industry after textile in India thus any factor that hampers the sugarcane production incurs greater financial losses on farmer's pocket. Sugarcane is affected by many biotic and abiotic factors which hinder its production and yield. It is affected by many fungus, bacteria, virus and phytoplasma which cause different diseases in sugarcane. Among all the pathogens causing disease in sugarcane red rot caused by *C. falcatum* is most destructive so its management is very crucial.

Traditionally chemical fungicides were used to control the disease but due to their persistent nature in soil and accumulation in the biomass it is preferred to adopt a holistic approach for controlling the fungal pathogen *C. falcatum*. Thus integrated disease management should be adopted to mitigate the harmful effects of chemical fungicides.

Red Rot of Sugarcane

- It was first reported by Went in 1893 from java (Indonesia)
- In India it was reported by Barber in 1901.
- Butler gave the name red rot.
- It is destructive disease in tropics and sub tropics.
- Red Rot epidemic came in 1939-40 in eastern UP and Bihar.
- It can reduce cane weight by up to 29% and loss in sugar recovery by 31%.

Symptoms

- First symptom appears after rainy season, when plant growth stops and sucrose formation begins.
- Earliest symptom is loss of colour and drooping of third or fourth leaves from top.
- Lately entire top withers.
- Canes becomes shriveled, the rind shrink and become longitudinally wrinkled.
- Infected canes are lighter in weight and easily broken.
- Pith becomes red in colour.
- Characteristic bands of clear white areas are seen running transversally across the full breadth of reddened pith.
- In advanced stage red colour is replace by dirty brown and white bands.
- Cavities filled with greyish or white mycelium in the pith.
- Red patches with ash coloured centre on the mid rib.



Causal organism

- Red rot is caused by *Colletotrichum falcatum*.
- Its teleomorph is *Glomerella tucumanensis*.

Systematic position

Kingdom: Fungi

Division: Eumycota

Sub-division: Deuteromycotina

Class: Coelomycetes

Order: Melanconiales

Family: Melanconaceae

Genus: *Colletotrichum*

Species: *falcatum*

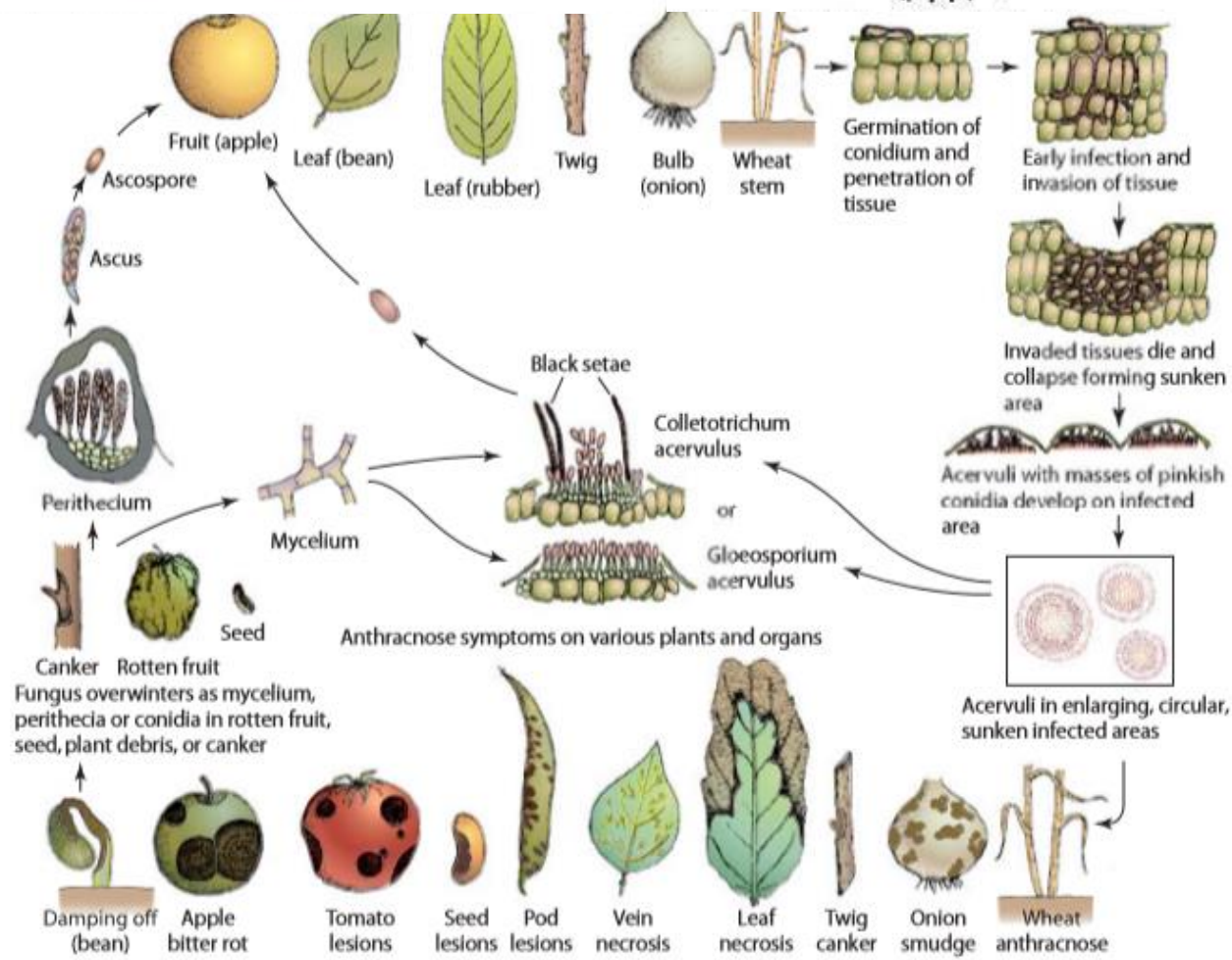
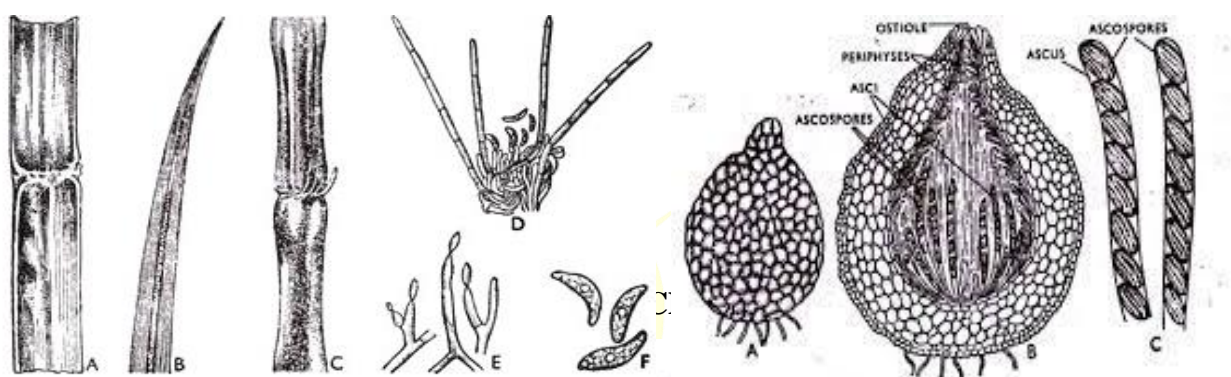
Etiology

Asexual Stage

- It produces large number of chlamydospores in the pith.
- Pathogen produce conidia from conidiophore arranged in acervuli.
- Conidia are falcate (sickle shaped) hyaline and septate. They look salmon pink in mass.
- The appressoria are brown, oval, round or irregular

Sexual Stage

- Chona and srivastava first reported the perithecial stage of the fungus in the culture at IARI New Delhi.
- Perithecia are globose, which are produce in the various parts of the host.
- Asci are numerous and hyaline.
- Ascospore are eight in number, aseptate, and hyaline.



Survival

- It is a soil and sett borne disease.
- Infected propagules in the soil may be conidia, setae or thick-walled hyphae
- It can survive 63 days during winter and for 34 days during summer in affected soil.
- Optimum temperature is 25-30°C in august and september.

Spread

- Primary transmission through soil and diseased setts.
- Secondary transmission through rain splash, air and soil.

Disease management

Cultural methods

- Field sanitation- fallen leaves and entire stool should be dug out and burnt.
- Repeated deep ploughing after crop harvest.
- 2–3-year crop rotation is also recommended.
- Crop rotation with wet rice culture reduces inoculum.
- Maintenance of soil moisture by irrigation delays onset of disease.
- Ratooning should be avoided in case of heavy infestation.
- Removal of collateral hosts- *Sorghum vulgare*, *Sorghum halepense*, and *Saccharum spontaneum*.
- Use of resistant varieties. like CO 244, CoH-99, CO 561, CoK-30, CoK-32, moderate resistant- CO 1111, CO 1118, CO 115, Stable resistance- CO 7314, CoLk-7702, For UP- CoS-687, CO 1148

Physical control

- Hot water treatment- sets were treated with hot water at 52°C for 18 minutes.
- Hot air treatment – sets are treated by hot air at 54°C for 2 hrs.
- Aerated steam therapy- sets are treated by hot air at 52°C for 4-5 hrs.

Biological Control

- Treatment of seed setts with *Chaetomium spp.* and *Trichoderma harzianum*.
- Soil application of *Trichoderma* and *Aspergillus + Pseudomonas aeruginosa*
- Strains of *Pseudomonas putida* and *P. fluorescens* were found to suppress red rot.
- Sett treatment with leaf extract of *Abrus precatorious* (Rosary pea) (gunja in hindi).

Chemical control

- Sett treatment with organo mercurales such as aretan, agallol, or emisan (0.25% suspension for 5 -10 minutes).
- 1 hour treatment of setts in 0.5% bavistin suspension.
- Sett treatment with carbendazim 0.5% and thiram 0.1%
- Use fungotoxic chemicals like azoxystrobin 18.2% + difenoconazole 11.4% w/w SC.

Conclusion

Sugarcane is mainly grown for producing sugar. Sugar, which is one of the most addictive substances as it's hard to suppress the urge to consume. Thus, it is important to ensure quality and quantity of produce which is hampered by many fungal diseases. Among them red rot is most destructive and thus it's necessary to adopt combined management tactics to manage the disease rather using chemical fungicides blindly.

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