

Course- B.Sc. (Honours), Part -1
Subject- Botany, Paper-II (Group-B)
Topic- Red rot of Sugarcane.

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Red rot of Sugarcane

This is one of the most severe of the known diseases of sugarcane. It was first described from Java by Went in 1893. It is widely distributed throughout the sugarcane-growing countries of the world, and in fact it is extremely doubtful if there are any sugarcane-growing areas where it does not exist, although it may be much more destructive in some places than others.

The disease was very widespread and virulent in North Behar and Eastern part of the United Provinces during 1939 and 1942. It was so destructive that it almost whipped out the sugarcane plantations in those areas.

Symptoms of Red Rot of Sugarcane:

The first external evidences of disease are the drooping, withering, and finally yellowing of the upper leaves. This is followed by a similar wilting of the entire crown, and finally the entire plant shows indications of disease and dies. When not severe, the eyes frequently die and blacken and the dead areas extend out from the nodes.

Infection in the stem being internal, the presence of the disease is not visible externally. Upon splitting a diseased cane during the early stages of the disease, it will be found that the fibro-vascular bundles near the base are reddish in colour. The host tissue reacts vigorously to the presence of the fungus and some kind of reaction or change sets in the host cells in advance of the hyphal invasion.

The protoplasm changes colour and a gummy dark-red material oozes out of the cells filling the intercellular spaces. The soluble pigment present in this ooze, is absorbed by the cell wall producing the characteristic red rot appearance.

However, the presence of a red colour in the fibro-vascular bundles is not necessarily an indication of this disease, since the colour may be due to any one of many other causes. As the disease advances the red colour spreads to the surrounding tissues extending through many internodes and irregular discoloured blotches are formed, which may be reddish or yellowish or white with red margins (Fig. 374A).

These white areas with red margins are a positive proof of the disease. When the stem is completely rotted inside, the natural bright colour of the rind disappears and turns dull as it shrivels. Black specks appear on shrivelled rind. The stem shrinks at the nodes (Fig. 374C). Split cane gives sour smell and shows red tissue with white cross-bands.

About this time the upper leaves of the stem turn pale and gradually droop down. These leaves then wither at the tips and along the margins. Ultimately the entire plant withers and droops down. In areas where the disease appears in a severe epidemic form, the entire crop withers and droops resulting in a complete loss of crop.

Though the fungus attacks all parts of the host above ground, stems and midribs of leaves are more susceptible to fungal attack. Infection in the leaves is visible along the midribs as dark-reddish zones having tendency to elongate rapidly turning blood-red enclosed

by dark margins (Fig. 374B). When the infection becomes old, the central blood-red colour changes to straw colour.

The hyphae after ramifying in the infected host tissue collect beneath the epidermis and form a stroma of densely packed cells and ultimately an acervulus is developed resulting in the rupture of host epidermis. The acervulus bears long septate setae along with short conidiophores on which falcate (sickle-shaped) conidia are borne (Fig. 374D to F).

After growing for a period within the host tissue, the hyphae produce a large number of chlamydospores in the pith parenchyma. The chlamydospores persist in the soil for a long time.

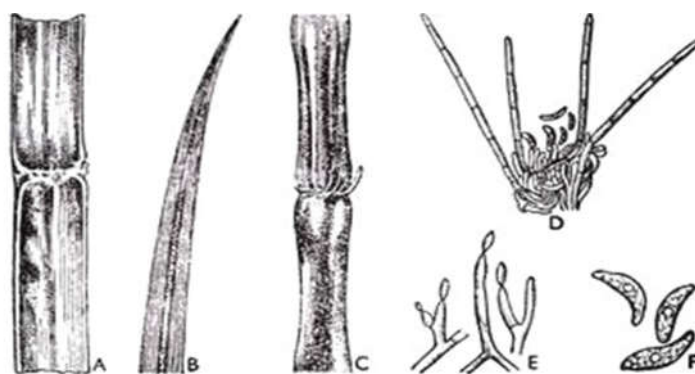


Fig. 374. Red Rot of sugarcane. A—C. Disease symptoms. A and C. On stem. B. On leaf. D. An acervulus. E. Conidiophores producing conidia. F. Conidia.

An examination of the diseased tissues with a microscope will reveal more or less mycelial threads of the fungus, or if the diseased canes are split and put in a moist chamber the fungus will develop readily and be easily recognized.

Causal Organism of Red Rot of Sugarcane:

Red rot of sugarcane disease is caused by *Colletotrichum falcatum* Went, the perfect stage of which is *Glomerella tucumanensis* (Speg.) Arx and Muller. There has been considerable difference in opinion as to the nature of the fungus that causes this disease. Some insisted that this fungus is more strictly saprophytic than parasitic, and that it cannot attack healthy canes.

Others said that it cannot attack mature canes except through wounds, but that it can attack young plants. However, the young canes are usually protected by the leaf sheaths. In some places the fungus has been reported to grow on the dead canes only and the disease is not known.

The mycelium of the fungus grows both inter- and intracellularly in the parenchymatous cells of the host tissue. The hyphae are colourless, slender, freely branched and septate. Acervuli appear just above or below the nodes along the depressions or ridges. They are black velvety bodies, develop in clusters. Acervuli are cuspidate with irregularly arranged setae (Fig. 374D). Aseptate conidiophores 20μ long and 8μ wide, on which one-celled falcate conidia are borne. Conidia are 16 to 48μ long and 4 to 8μ broad. They bear large oil globule in the centre. Chlamydospores are terminal or intercalary.

The perfect stage was reported from India under cultural condition in 1952 and under natural conditions on sugarcane leaves in 1953. It comprises of perithecia which are globose superficial with bottom embedded in the host tissue. Asci are numerous, clavate and paraphysate bearing 8 ascospores which are aseptate, hyaline and elliptical.

Disease Cycle of Red Rot of Sugarcane:

The sources of primary inoculum are the old fragmented stalks and leaves and other rubbish on which the fungus grows saprophytically; and unknowingly planted diseased stock during cultivation. Ratoon crops also serve as a source of primary inoculum. Opinions differ whether the fungus is strictly saprophytic or parasitic.

The conidia that are produced in the acervuli developed along the midribs of the diseased leaves during primary infection, form the secondary inoculum. They are disseminated by wind, rain splashes, irrigation water and also by insects. The conidia germinate readily by germ tube which on coming in contact with any hard surface, e.g., soil particles or plant parts, forms appressorium from-which infection hypha is produced.

The pathogen may gain entrance through the nodes at the leaf scars, through any kind of wound, through root primordia and seed-cuttings. The diseased canes are frequently found to be injured by insects, especially borers, and no doubt these wounds facilitate the entrance of the fungus, which in turn does much more damage than the insects.

Red rot is not a root disease, though roots are often infected by the fungus. High humidity due to water-logging, weak growth of host plant for want of proper cultural operations, continuous cultivation of the same variety of sugarcane in a particular locality, and cultivation of susceptible cane variety in the neighbouring areas are some of the aspects that help disease incidence and often to epiphytotic.

Disease cycle of Red Rot of sugarcane is presented in Figure 375.

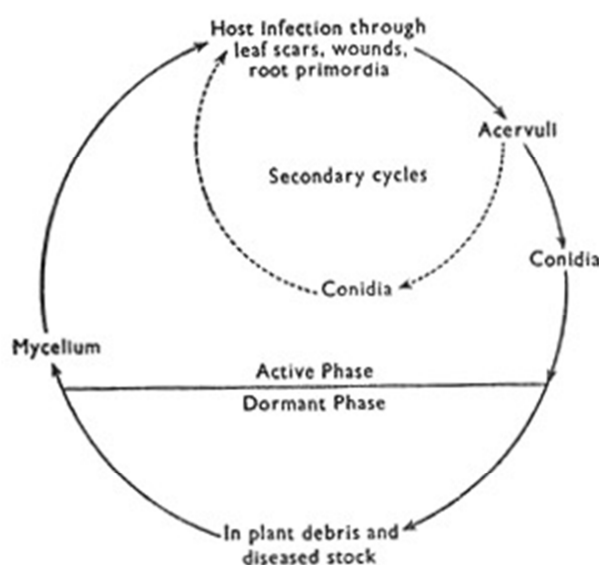


Fig. 375. Disease cycle of Red Rot of sugarcane.

Control of Red Rot of Sugarcane:

Red rot of sugarcane is hard to control because the stalk from which seeds are prepared has been largely affected from the time of planting, and fungicides cannot reach the infected tissues inside a diseased seed sett. Therefore careful selection of red rot-free seed setts is recommended for planting. Seed should always be taken from disease-free nurseries examined regularly by the cane protection staff.

Before planting, each seed sett should be carefully examined and those setts which show reddening should be discarded.

The spread of the red rot can be prevented during the growing season by timely roguing and burning of the affected clumps with utilization of the green leaves for cattle fodder. In no case ratoons of sugarcane should be kept in the red rot affected fields. Attention should always be given to sanitation by digging out stubbles of diseased canes and burning them with other trash in the field.

Where facilities are available for hot water treatment of seeds, they can be utilized for controlling red rot of seed (treat in water at 50°C., for two hours). Treating seed with fungicides like Arasan (0.25 per cent.) is often effective.

The use of sugarcane varieties resistant to red rot is also recommended. Some of the resistant varieties are: Co. 975, 1148, 1158, 1336 and 6611; Co. S 561, 574; B.O. 3, 10, 47. The possibilities of an epidemic is very much minimized with the practice of long crop rotations (2 to 3 years) where planting is done in plots.

One of the best ways to reduce the incidence of the disease is to raise healthy stock for planting in plots especially fertilized, cultivated, and kept disease-free by constant care.