

## ✓ Symptoms

### 6.6.1. Loose Smut

In loose smut disease basically the mass of black sooty spores are exposed and blown away by wind. The disease symptoms vary depending on the host plant.

The major symptom of loose smut is the smutted grain heads. They contain masses of black or brown spores where the grain would have been normally. The spores completely replace the grain head, so grains are not harvested from infected plants.

The infected plants get taller than the normal plants in the field and easily identified. These plants also mature little earlier.

In wheat plant every head of the attacked plants is converted to a black powdery mass of spores. The disease is recognized in the field only when the plant produces ears. In some variety of wheat, yellow chlorotic streaks may develop on flag leaves before emergence of ears. Usually in an infected plant all the ears, all spikelets and kernels of each ear are smutted. The infected spikelet is first covered by a delicate greyish membrane which soon bursts and sets the spores free. After the disposal of spores by wind current, the rachis is left naked.

In corn, the symptoms are slightly different. The disease is caused by *Ustilago maydis* (or *U. zeae*). The disease is easily recognizable by the presence of large sooty swellings galls called smut galls or tumors. These galls develop on the ears or stalks. They also develop on the leaves and male flowers. The galls at the early stage are light coloured and covered with a firm shining membrane which is greenish white in colour. When matured, the tumors turn sooty due to spore formation inside. The covering membrane gradually dries up and bursts open to expose the mass of spores. In this case the disease is localized but not systematic.

In sugarcane the disease is caused by *Ustilago scitamineae*. The infected plant is recognized by its long whip-like black shoot much curved on itself. The powdery mass of teliospores on this whip like structure is contained first by a fine membrane which later exposes the black sooty mass by rupturing itself. The lateral shoots developing from the eyes on the infected cane may develop similar structures after infection.

Fig. 6.11 gives the graphic representation of the life cycle of a smut fungus causing loose smut in wheat.

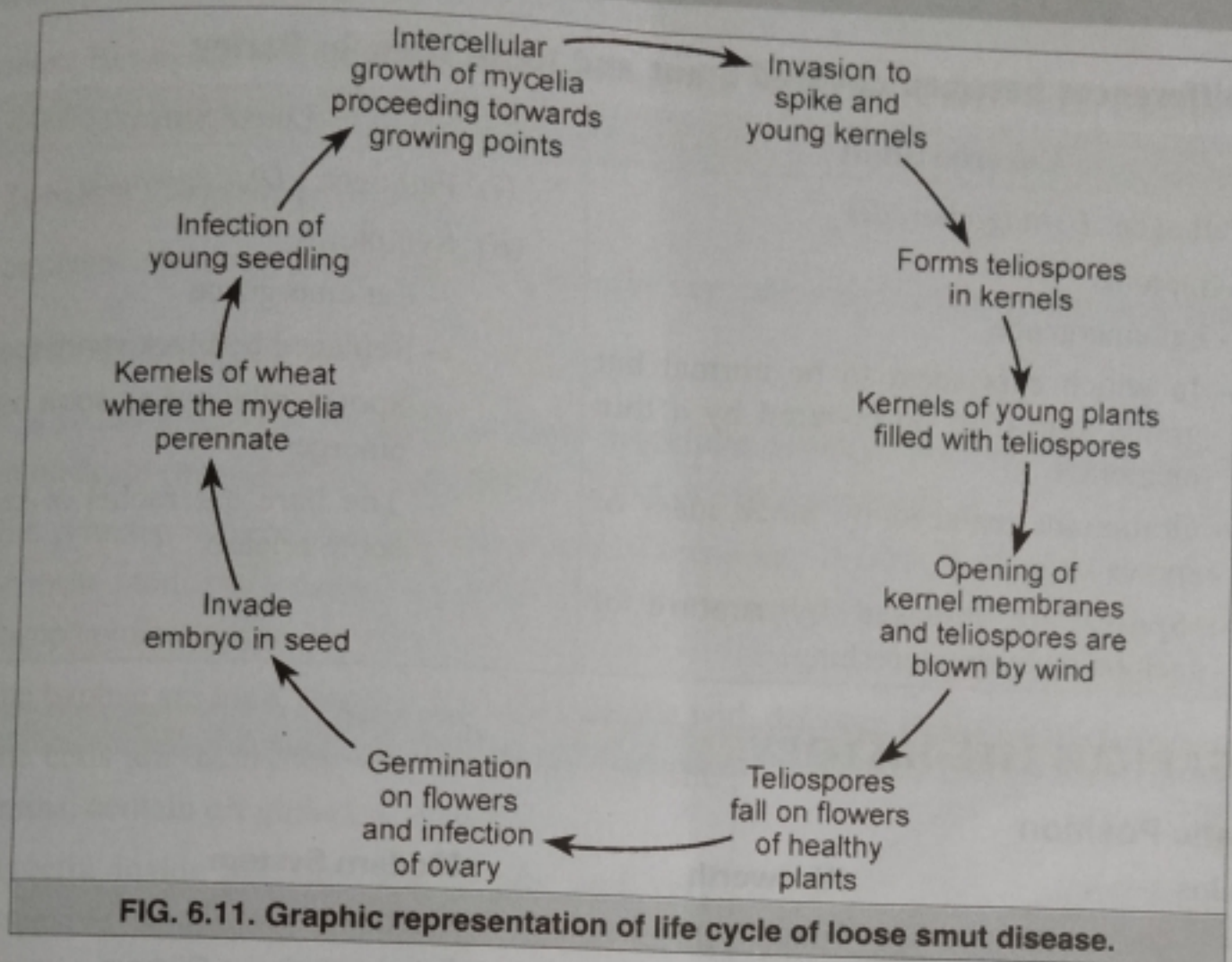
### 6.6.2. Covered Smuts

Generally in the covered smut diseases the spore mass remain covered by the wall of the grain. They are not exposed. They are only liberated during threshing when the wall of the grain ruptures by the threshing methods.

In covered smuts the infected plants do not show symptoms until heading. Kernels are replaced by masses of dark brown smut spores. The smutted heads are hard. Infected plants may be stunted.

Covered smut of barley is caused by *Ustilago hordei*. The visible appearance of the disease occurs at the flowering stage. From the stage onwards the ears of barley plants in the fields appear





blackend. Every ovary of the smutted ear contains a compact spore mass. The grains are replaced by the smutt balls or sori. The smut spores are firmly enclosed by a white shining silvery membrane. They do not form the source of infection in the growing seasons. They are liberated by the rupture of surrounding membrane during threshing process. The spores remain attached to the healthy grains.

Covered smut of oats is caused by *Ustilago kolleri*. It can occur anywhere oats are grown. It is not detectable until head emergence. Infested heads will typically emerge earlier than healthy heads. The fungus is present on the surface of the seed and is activated when the infested seed germinates. The head produced by an infested plant contains olive-brown to brown black powdery spore masses where healthy grains would have been present. Spore masses emerge within a greyish-white membrane that can persist until the chaff dries or the grain is harvested. Spores can be wind blown onto the flowering heads of healthy plants. The fungus can then enter the ovaries and developing grain and infect seed that may be used in subsequent years.

The disease cycle of *U. kolleri* is similar to a typical covered smut. The pathogen survives as teliospores on the seed surface. The disease is systematic and externally seed borne. The fungus infects the seedlings that develop from contaminated seeds. The teliospores of the contaminated seeds sown in the field germinate under suitable conditions to produce a septate promycelium. This forms monokaryotic sporidia. Dikaryotic hyphae are formed by the fusion of monokaryotic germ tubes. This dikaryotic hyphae infect the seedlings. The fungus then grows inside the host body and finally reaches the floral parts where it produces the characteristic teliospores covered by a membrane. They are released during threshing and contaminate the healthy seeds.