Loose Smut of Wheat

Pathogen: *Ustilago segatum* var. *tritici*

Systematic Position: Subdivision: Basidiomycotina; Class: Teliomycetes; Order: Ustilaginales; Family: Ustilaginaceae

Distribution and Importance: The disease is worldwide in distribution but is more abundant and serious in humid and sub-humid regions. In India, the disease has been found in almost all the states where the crop is grown. Loose smut causes damage by destroying the ears of the infected plants. Losses from the disease may be up to 10-40%.

Symptoms: The symptoms of the disease are seen only after the emergence of the ears. The black powdery mass is seen in the ear instead of flowers. All the parts of spikelets are converted into black mass of smut spores and no grains are formed. In the beginning the smut sori remain covered with a thin silvery membrane which disintegrates soon and the smut spores are liberated in the atmosphere. These spores are blown-off by wind and the rachis remains naked.

Pathogen: The disease is caused by *Ustilago segatum* var. *tritici*. It has ***dikaryotic mycelium***. The mycelium is septate and hyaline during its growth through the plant but it changes to brown near maturity. The hyphae are present in the intercellular spaces of the host tissue. They absorb nutrition from the host cells by diffusion. ***The hyphae do not produce haustoria***.

Spore formation: The mycelium grows keeping pace with the growth of the host plant. It is chiefly confined to the stem. At the time of flowering and when the inflorescence is still enclosed by the boot leaf, the mycelia enter the ovary of the flowers. Within the ovary, each hypha grows vigorously and branches repeatedly to form a dense mass of hyphae. They later, destroy the host tissue in the ovaries and surrounding floral parts. The cells of these hyphae are binucleate. The hyphae undergo additional septation to form short, binucleate cells. These cells swell and round-off to form binucleate smut spores. The smut spores are also called ***Brand spores, teliospores and chlamydospores***. They are spherical to oval and measure 5.9µ in diameter. They have finely echinulate, thick spore wall which is olivaceous brown in colour. The smut spores are produced in great numbers.

Disease Cycle: The disease is internally seedborne. The pathogen is present as dormant mycelium in embryo/scutellum of infected seeds. Whenever such seeds are sown and germinate, the dormant mycelium within the grain resumes activity. It grows best in or near meristematic tissue keeping pace with the growth of the host plant. The hyphae, thus, grow just behind the growing point. When the plant forms the head, and even before it emerges, the mycelium invades all the young spikelets, where it grows intercellularly and destroys most of the tissues of the spike, except the rachis. The mycelium in the infected kernels is soon transformed into smut spores which are covered by a thin, silvery membrane of host tissue. The membrane burst open soon after maturation of the smut spores and the spores released and blown-off by air currents to nearly healthy plants. There are clouds of smut spores in the atmosphere over the wheat field. Smut spores landing on flowers germinate through formation of a basidium on which the haploid hyphae are produced. After fusion of the sexually

compatible haploid hyphae, the resulting dikaryotic mycelium penetrates the flowers through the stigma and becomes established in the tissues of the embryo before the kernel matures. The mycelium, the, becomes inactive and remains dormant, until the infected kernel germinates.

Disease Management:

1. ***Seed Selection:*** Since the disease is seedborne, the seeds should be obtained from healthy crops or a certified and reliable agency.
2. ***Rogueing:*** The wheat plant with infected ears which emerge out of the boot leaves earlier than the healthy ones, may be uprooted at once and burnt. Removal of such plants should be done carefully by covering the earhead with an envelope so that the spores do not fall in the field.
3. ***Solar Heat Treatment:*** Jai Chand Luthra and A. Sattar (1953) proposed this treatment for Punjab and Uttar Pradesh. The seeds are soaked in water for four hours (8 AM to 12 noon) and then they are dried up by spreading them in a single layer on pucca floors or ground painted with cowdung in open sun from 12 noon to 4 PM in the months of May and June. After drying the seeds are cooled in shade, packed and stored properly. When seeds are soaked in water, the dormant mycelium becomes active and starts the process of growth and it dies during the process of drying in the hot sun since temperatures in the stated areas during the months of May and June are so high that the growing mycelium cannot withstand and thus, seeds become free from infection.
4. ***Resistant Varieties:*** This is the simplest and most important method of management of the disease. Some of the varieties resistant to this disease are NP-710, NP-120, PB-90, UP-2003, HD-2285, HD-2329, PBW-154, PBW-226 and WG-377.
5. ***Use of Systemic Fungicides:*** Seed treatment with vitavax or plantvax @ 2.5g/kg seed gives quite encouraging results. Seed treatment with captan and captafol @ 3.0g/kg seeds also give satisfactory results. A new chemical tebuconazole (Raxil 2DS) is found promising for seed treatment @ 2.0g/kg seed.