

## Phylum Basidiomycota

Order: Ustilaginales

The Smut Fungi

The order Ustilaginales includes the plant pathogenic organisms commonly known as the smut fungi. This name refers to the black dusty masses of teliospores resembling soot or smut that form in diseased plants. All these are biotrophic (obligate) pathogens with shorter or longer saprobic phases. This order has 1200 species and 50 genera. Example of smut fungi are; Ustilago maydis, the cause of loose smut of corn smut; U. avenae, the cause of loose smut of oats; Urocystis cepulae, the cause of onion smut; Ustilago tritici, loose smut of wheat; and certain species of Tilletia that cause so-called bunt diseases of various cereal grains. The prime example is kernel bunt caused by Tilletia indica, first reported in the Karnal district of India by Mitra in 1931. In kernel bunt of wheat, kernels are partially destroyed, hence this is also named as partial bunt of wheat. However, there are some bunts in which whole kernels are destroyed by bunt diseases, e.g., T. tritici. Bunted kernels are consumed by the mass of teliospores and give off the offensive odor of trimethylamine that causes the grain to smell like rotten fish. Due to foul smell, infected seeds become unfit for human consumption. The chances of burning of smutted seeds are more than the healthy seeds.

General characteristics:-

In nature, the dikaryotic phase of the life cycle of a smut fungus appears to be obligately parasitic on flowering plants.

These pathogens can affect various portions of the plants i.e., leaves, stems, and in few cases, even roots, however, mostly flowers are infected by these pathogens. Hyphae of smut fungi are slender, septate, and often highly convoluted structures that grow primarily between host cells. A few species are said to produce haustoria. Hyphae of some species appear to grow indiscriminately between, into, and completely through the cells of their hosts without killing them.

The typically hyphal ~~se~~ septum of a smut fungus appears to possess a tiny central pore that may be closed rapidly during septum ontogeny. Polypore septum is present, however, clamp connections are not present in all species. Homobaryons of smut fungi are non-pathogenic and grow readily in culture on simple nutrient media. In vitro, homobaryons of many species grow as yeasts, producing populations of single uninucleate cells by budding. These cells usually are referred to as "sporidia". Dibaryons of many species can be produced in culture by combining compatible sporidia. They produce white fluffy or filamentous mycelium on the nutrient media. These dibaryons can only survive for shorter period of time on the medium.

### Teliospores and Reproduction:-

The teliospores/teleutospores are called smut spores, and are characteristic resting spores of the smut fungi. These spores are formed in masses known as sori that may develop in various places on the host, including flower parts such as ovaries and stamens or in seeds, leaves, stems, rhizomes, and even roots. Various patterns of spore development exist in smut fungi. The first indication of the onset of teliospore formation is the development of a profuse mycelium at the site of sporulation. Maturing sora appear as long, thin, dark stripes that often extend visibly the entire length of the blade.

In most species, teliospores are produced singly at the tips of special sporogenous hyphae and may at maturity bear tail-like appendages termed pedicels. Regardless of how the teliospores of smut fungi develop, they all appear to arise from dikaryotic hyphal compartments. Teliospores may be ~~tuberculate~~ reticulate, spiny, tuberculate and so on. Some teliospores may be smooth. Most teliospores are globose in shape, when veined individually or in small groups, appear yellowish, brownish, or blackish in colour. When teliospores are semented together they form specialised "spore balls". Teliospores of some smut fungi are capable of surviving in the soil for many years. Teliospores of smut fungi are similar to rust fungi. Teliospores germinate and form promycelium, in promycelium meiosis takes place leading to the development of basidiospores.

### ⇒ Penetration of Host Plants by Smut Fungi

Basidiospores, promycelium and secondary sporidia are the primary infection causing agents. These structures germinate and form germ tube that enters through stomatal pores, on the glume, lemma, and/or pslea. Smut pathogen enters the host as dikaryotic not homobary-

order Ustilaginales have two families

① Ustilaginaceae

② Tilletiaceae

#### I. Ustilaginaceae

This family has very important ~~one~~ genera i.e. Ustilago. This genus causes several economical important diseases. These are

I- Ustilago avenae: cause loose smut of oats.

II- U. nuda: cause loose smut of barley

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III - U. tritici; the cause of loose smut of wheat

IV U. maydis " " Corn smut/margin smut

U. maydis is also being used for experimental organism for different genetic studies.

② Tilletiaceae :-

It has two genera i.e. Tilletia and Urocystis. These two genera cause very serious diseases.

The End