



## Symptomatology study on Smuts of Sorghum occurring in Marathwada (MS) India

H. M. Lakde  
Dept. of Botany  
Degloor College,  
Degloor, Dist. Nanded

### ABSTRACT

*In marathwada Sorghum is one of the important Cereal crop cultivated on 1809870 hectares. In Marathwada farmers cultivate hybrid varieties Sorghum on large scale in kharif in addition to some local varieties. In Marathwada several diseases are found on Sorghum caused by different fungi. Covered smut of Sorghum caused by Sphacelotheca sorghi, Head smut of Sorghum caused by Sphacelotheca reilina and Long smut of Sorghum caused by Tolyposporium enrenbergii are smuts of Sorghum found in Marathwada. Due to smuts of Sorghum 10- 40 % loss in the yield crop may occurs. Smut of Sorghum is more common on local varieties in Marathwada.*

**KEYWORDS :** Sorghum, fungal pathogen Smut, head, symptoms.

### INTRODUCTION:

Sorghum (*Sorghum bicolor* L.) is one of the most important staple food crops of the people, particularly those living in the rural area of Maharashtra. The total sorghum cultivated area of the world is 44.5 million hectares, with an annual production of 55.6 million tons (F.A.O. 2010). In India sorghum is the third important cereal crop after rice and wheat, and is currently grown on 11.62 million hectares with an annual production of 7.34 million tons (F.A.O. 2010). In India it is mainly cultivated in Maharashtra, Karnataka, Andhra Pradesh and Madhya Pradesh, Gurat and Tamilnadu. In India nearly 52% of this area is planted in the rainy season

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**Dr. Anil Chidrawar**  
I/C Principal

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Degloor College, Degloor Dist. Nanded



(kharif) and the rest in the post rainy season (rabi).

Sorghum grain is used for both human food and animal feed. The stems and foliage are used as fodder for cattle's. Generally, sorghum grain yields on peasant farms are very low ranging from 500 to 800 kg/ ha. The yield per hectare in the developing countries was 1028 kg/ ha. in 1989, which was below the world average of 1309 kg/ ha and well below the 3177 kg/ ha. Of the developed countries (F.A.O. 1989). Sorghum is a relatively undeveloped crop with great potential. Yields can be increased well beyond present levels, while the adaptation of sorghum to a wide range of ecological conditions is its greatest asset (Dogget 1988).

Sorghum is an important food and fodder crop in Marathwada region. In Marathwada 1024740 ht. land under the cultivation of Sorghum. In Marathwada region sorghum can be cultivated in kharif session in the month of June and July and in winter session in the month of September to october. In Marathwada different varieties of Sorghum cultivated by formers, which are having duration from three to six months, depending upon the varieties.

In Marathwada formers may cultivated hybrid varieties on large scale in kharif session in addition to some local varieties. The local varieties mainly cultivated by former for the purpose of fodder for cattle's. In Marathwada CSH-9, CSH-14, Mhindra-256, Mhico-51, Nermal-2776 hybrid varieties are cultivated in kharif session.

In Marathwada, several diseases known to attack Sorghum crop. Some of the important diseases found in Marathwada are Leaf blight, Leaf spots, Smut, Rust, Downy mildew and Charcol rot.

#### **MATERIALS AND METHODS:**

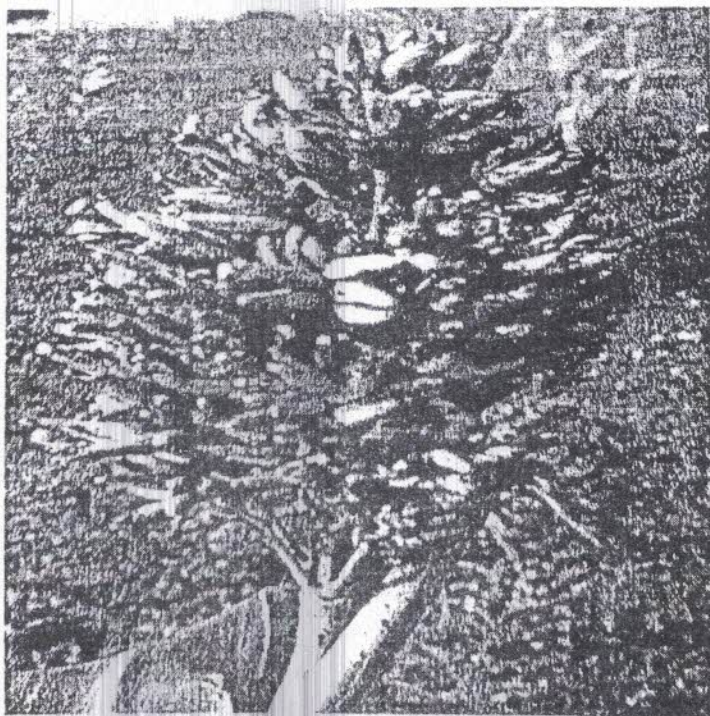
Plants of Sorghum were closely observed, when it passes in to heading stage till harvest and changes occurring in infected heads of plants were noted carefully. Further, types of symptoms on heads, noted during the survey throughout year of different fields in Marathwada regions. Infected parts of plants i.e. heads, collected time to time from surveyed plots, packed in polythene bags and brings in to laboratory. All the samples were closely examined for studying the symptoms, mycelium and conidia under microscopes in the laboratory.

#### **RESULTS AND DISCUSSION:-**

Smut is one of the most important diseases of sorghum in many parts of the India, especially where untreated seeds are used by farmers for cultivation. Damage is confined almost entirely to the head or panicle, reducing both the grain yield and forage value. Three sorghum smuts are common in the India. Covered smut, Loose smut, and Head smut. Each one is caused by a different species of the fungus

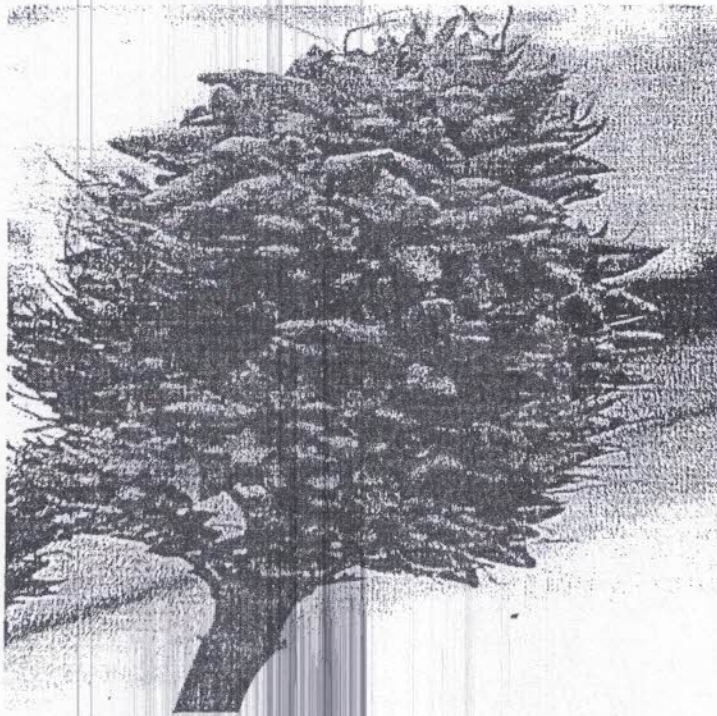
### Covered Smut

Covered smut, caused by the fungus *Sphacelotheca sorghi* attacks all groups of sorghums. Covered smut is the most common disease of sorghum in rabi session in Marathwada, where farmers cultivate untreated seed. Usually, all of the kernels in a smutted head are destroyed and replaced by dark brown, powdery masses of smut spores (teliospores or chlamydospores) covered with a tough, grayish white or brown membrane. The membrane usually ruptures at harvest time. The infected smut sori break, and the microscopic spores adhere to the surface of healthy seeds where they overwinter. Only seedborne spores cause infection. Smut sori are generally smooth; oval, conical or cylindrical; and vary in size from those small enough to be concealed by the glumes to those over one cm long. They may be white, gray, or brown coloured. The sori of covered smut were, first covered with a white silky membrane which turned pale brown with age becoming dark brown from the tip. With age membrane developed ruptures at the tip exposing spore mass. The Teliospore or sporidia germinate and infect the developing sorghum seedling. Once inside the seedling, the fungus grows systemically, apparently without damaging the plant until heading. At that time, the teliospores replace kernels and are surrounded by a membrane. At maturity, the membrane ruptures releasing the teliospores to contaminate seed or soil. Soilborne teliospores are not considered important in infecting seedlings. The incidence of smut decreases when seed is planted in progressively warmer, wet soils that are 15.5° to 32°C. Several distinct physiologic races of the covered smut fungus are known.



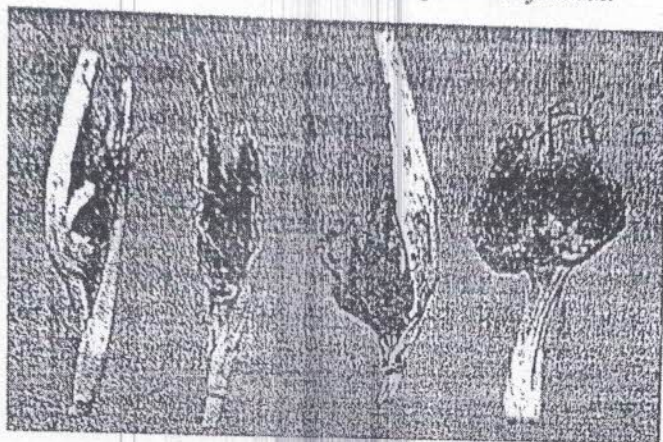
**Loose Smut**

Loose smut, caused by the fungus *Sphacelotheca cruenta* is less widespread than covered smut. Loose smut attacks all types of sorghums. Normally, all kernels in an infected panicle are smutted. Partial destruction is rare. Some kernels may be transformed into leafy structures or escape infection completely. Individual kernels are replaced by small smut sori that are 2.5 cm or longer, pointed and surrounded by a thin gray membrane. This membrane usually ruptures when or soon after the panicle emerges from the boot. Smutted panicles appear earlier than the Other healthy plant. The powdery, dark brown to black spores (teliospores) are soon blown away, leaving a long, black, pointed, conical, often curved structure (columella) in the center of what was the gall. Some smut spores adhere to the surface of healthy kernels on neighboring plants in the same field or ones nearby before and during harvest. When such infested seeds are planted, the teliospores germinate along with the seed by forming a 4-celled promycelium bearing lateral sporidia. The sporidia germinate and infect the developing sorghum seedling. Most infections, however, result from the teliospores producing hyphae which penetrate young seedlings before emergence. Seedling



Infection occurs over a wide range of soil moisture and temperature of 20° to 25°C. The fungus continues to grow systemically within the plant unobserved until heading, when the long, black, pointed smut galls develop in place of normal seeds. Plants affected with loose

smut are stunted, have thin stalks, and heads emerge earlier than healthy plants. Abundant side branches (tillers) also may develop. Occasionally, the tillers are smutted, while the primary head is not. Secondary infection may occur in loose smut when spores from a smutted head infect late-developing heads of healthy sorghum plants, causing them to become smutted. Localized infection of floral parts from airborne spores may occur.



**Head Smut**

Head smut caused by *Sphacelotheca reiliana* is not so widespread and damaging in the Marathwada as the covered smuts. Smutted plants also have weakened root systems and commonly exhibit more severe stalk and root rots than smut-free plants. Infection first appears when the young head, enclosed in the boot, is usually completely replaced by a large smut gall covered by a thick whitish membrane. The membrane soon ruptures, often before the head emerges, exposing a mass of dark brown to black, powdery teliospores intermingled with a network of long, thin, dark, broomlike filaments of vascular tissue. The head may be totally smutted with characteristic "witches' brooms," i.e., many small, rolled leaves protruding from the heads of suckers at the nodes or joints of some sorghums. Some affected plants are dwarfed; others are stunted due to a lack of elongation of the peduncle. Wind and rain quickly scatter the smut spores to the soil and plant debris, where they live through the winter. Parts of an infected panicle not included in the smut gall or sorus usually show a blasting or proliferation of individual florets. When sorghum seed is planted the following spring, the smut spores already in the soil germinate along with the seed to form a 4-celled or branched promycelium that bears sporidia terminally and near the septa. The sporidia may sprout to form yeastlike secondary sporidia or may germinate to form a germ tube that penetrates meristematic tissue in the sorghum seedling. Germination is highest in moist soil where the temperature is 27° to 31°C. Like the covered smuts, head smut is not evident until heading time. The fungus develops only in actively growing meristematic tissue. The smut spores also



may cling to the surface of sorghum seed, introducing the smut fungus into the soil of fields not previously infested. Apparently, seedborne spores are not important in causing infection.

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**Dr. Anil Chidrawar**  
I/C Principal

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