

Introduction



CHAPTER I

INTRODUCTION



Sorghum [*Sorghum bicolor* (L.) Moench] is a vital life-sustaining food crop for humanbeing as well as for livestock in many parts of world. It is one of the major staple foods for the world's poorest and insecured people. It is emerging as the fourth most important crop after rice, wheat and maize. Sorghum is cultivated widely throughout the tropical, subtropical and temperate regions. It forms the staple diet of the poor people of the world located especially in Africa, Asia, America and Australia. In other countries it is used as fodder, cattle feed and as an Industrial raw material.

Globally, sorghum is cultivated in area of 45 million hectares with the production of 63.90 million tones of grains with average productivity of 1.42 tones per hectare (FAO, 2007). In India, Maharashtra, Karnataka, Andhra Pradesh, Madhya Pradesh, Gujarat and Tamil Nadu are major sorghum growing states. India has total area of 9 million hectares under sorghum with annual production of 7.63 million tones of grains with an average productivity of 896 kg/ha (Anon., 2007). In Maharashtra sorghum crop is cultivated for grain and fodder purpose. Nutritionally sorghum grain contains about 10-12 per cent protein, 3 per cent fat, 70 per cent carbohydrate and 2 per cent crude fiber (Laing and Pearson, 1998).

Sorghum is an important cereal crop mainly grown during kharif and rabi season when conditions are congenial for the seed infection by large number of fungi, some of them are seed transmitted, resulting into poor seed germination and plant stand in the field affecting the quality and yield. Among the several sorghum diseases occurring in various parts of Maharashtra, majority of them are reported to be seed borne. The most destructive Sorghum diseases reported are fungal diseases viz., Anthracnose (foliar, head, root and stalk rot) *Colletotrichum graminicola* (Ces.) G.W. Wils., Charcoal rot *Macrophomina phaseolina* (Tassi) Goidanich, Crazy top downy mildew *Sclerophthora macrospora* (Sacc.), Damping-off and seed rot *Aspergillus* spp., *Fusarium* spp., *Penicillium* spp., *Pythium* spp., *Rhizoctonia* spp., Ergot *Claviceps sorghi*, *Fusarium* head blight, root and stalk rot *Fusarium moniliforme* J. Sheld, Grain storage mold *Aspergillus*

spp., *Penicillium* spp., Gray leaf spot *Cercospora sorghi* Ellis & Everh., leaf spot *Cercospora fusimaculans* Atk., Leaf blight *Curvularia lunata*, *Pythium* root rot *Pythium* spp., Seedling blight and seed rot *C. graminicola* (Ces.) G.W. Wils., *Fusarium moniforme* J. Sheld., *Pythium* spp., Smut, covered kernel *Sphacelotheca sorghi* (Link), Smut, head *Sphacelotheca reiliana* (Kühn), Smut, loose kernel *Sphacelotheca cruenta* (Kühn), downy mildew *Sclerospora sorghi*; bacterial diseases as Bacterial leaf spot *Pseudomonas syringae* van Hall, Bacterial leaf streak *Xanthomonas campestris* pv. *holcicola* (Elliott) Dye, Bacterial leaf stripe *Pseudomonas andropogonis* (Smith) Stapp.; nematodes, parasitic : *Xiphinema*, *Longidorus*, *Paratylenchus* spp., *Rotylenchus* spp., *Meloidogyne* spp., *Helicotylenchus* spp., *Tylenchorhynchus* spp.; virus diseases: (Also Mycoplasma Like Organism [MLO]), maize chlorotic, dwarf maize, dwarf mosaic, sugarcane mosaic, yellow sorghum stunt (Horne and Frederiksen, 1993).

Sorghum grains are known to be infected with several seed borne fungi such as *Fusarium moniliforme* J. Sheld, *Curvularia lunata* (Wakker.) Boedijn, *Phoma sorghina* (Sacc.) Boerma, *Alternaria alternata* (Fr.) Keissler, *Exserohilum turcicum* (Pass.) K. J. Leonard & E. G. Suggs, *Macrophomina phaseolina* (Tassi) Goidanich, *Drechslera rostrata* (Drechs.) Richardson and Fraser, *Rhizopus stolonifer* (Ehx-ex-fr) Lind, *Aspregillus* spp. etc (Patil *et al.*, 2008). These seed borne fungi are responsible for grain discoloration, reduced seed weight, germination, viability and causes seedling mortality (Navi *et al.*, 2005 and Leslie *et al.*, 2005). They also affect the shoot, root length and moisture content of the grains (Kotgire, 2009). The seed borne nature of pathogen provide primary inoculum during crop growth stage. It is main source of introduction and spread of pathogen in disease free area. Scientific information on various aspects related to the sorghum grain mold in Maharashtra state is quite lacking.

Therefore, considering the importance of the problem, the present investigations were carried out on various aspects to generate more information on sorghum grain molds.

1. Pathological Investigations

1.1. Collection of healthy and diseased earheads of sorghum

1.2. Symptoms and signs observed on grains in nature

due to infection of various pathogens

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- 1.3. Isolation of pathogens
 2. Identification of pathogens
 3. Pathogenicity test
 4. Physiological Investigations
 - 4.1. To find out the superior media for growth and sporulation of various pathogens
 - 4.2. Effect of grain molds on germination of sorghum seed
 5. Management of Grain molds
 - 5.1. *In vitro* screening of plant extracts against pathogenic fungi
 - 5.2. *In vitro* screening of antagonists against pathogenic fungi
 - 5.3. *In vitro* screening of fungicides by Poisoned Food Technique (PFT) against pathogenic fungi