

# *Summary & Conclusion*



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## CHAPTER-V

### SUMMARY AND CONCLUSION



Sorghum is the emerging fourth most important crop after rice, wheat and maize and cultivated widely throughout the tropical, subtropical and temperate regions. It is an important cereal crop grown 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.

Therefore, the investigations on the grain molds of sorghum seeds collected from farmers field were undertaken on various aspects, viz., detection of external and internal fungi, their effect on seed germination, seedling mortality and management of sorghum grain molds.

The pathological investigations of the discolored diseased seed were undertaken by recording the natural symptoms and signs. The microscopic examination and repeated isolation from discolored seed sample revealed the presence of *Fusarium* sp., *Colletotrichum* sp., *Curvularia* sp., *Alternaria* sp., *Macrophomina* sp., *Phoma* sp. and *Aspergillus* sp. Among, the fungi isolated from sorghum grains, *Fusarium* sp., *Alternaria* sp., *Colletotrichum* sp. and *Macrophomina* sp. were found associated both externally and internally while, the rest were found to be associated externally only. After purification of each isolate, the cultural and morphological characters of vegetative and reproductive structures of each isolate were studied. The following fungi were identified as *Fusarium moniliforme*, *Fusarium oxysporum*, *Colletotrichum graminicola*, *Macrophomina phaseolina*, *Curvularia lunata*, *Alternaria alternata*, *Phoma sorghina*, *Aspergillus niger* and *Aspergillus flavus* and also the same were confirmed from Agriculture College, Pune (Mahatma Phule Krishi Vidyapeth).

The pathogenicity test conducted for five fungi viz., *F. moniliforme*, *C. lunata*, *A. alternata*, *C. graminicola* and *M. phaseolina* proved to be positive. These pathogens adversely affect seed germination and cause seedling mortality in *in vitro* and *in vivo*. In case of *F. moniliforme* seed germination and seedling mortality *in vitro* and *in vivo* was

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58.0, 75.00 and 62.0, 78.00 per cent, respectively, in case of *C. graminicola* it was 67.0, 56.00 and 72.0, 52.18 per cent, respectively, in case of *F. oxysporum* it was 61.0, 32.00 and 66.0, 38.00 per cent, respectively, in case of *M. phaseolina* it was 76.0, 26.78 and 81.0, 32.00 per cent, respectively, and in case of *A. alternata* it was 77.0, 38.00 and 79.0, 32.00 per cent, respectively. The reisolation from diseased seeds and blighted seedlings yielded the same respective pathogen, used for inoculation.

Seven synthetic and semi synthetic, solid as well as broth media were tested for growth and sporulation of five grain molds. In solid media, maximum mycelial growth and sporulation of *F. moniliforme* was on PDA followed by Czapek's Dox agar, in case of *M. phaseolina* and *A. alternata*, PDA was best followed by Richard's agar and Czapek's Dox agar, for *F. oxysporum* and *C. graminicola*, Richard's agar and PDA were best for maximum mycelial growth and spore formation. Among, the different broth media tested, Richard's broth and Potato dextrose broth gave maximum dry mycelial weight and sporulation of *F. moniliforme* and *A. alternata*. The Richard's broth followed by Czapek's Dox broth gave maximum dry mycelial weight and sporulation of *F. oxysporum*, *C. graminicola* and sclerotia production in case of *M. phaseolina*.

Considering, the overall performance of different solid media and broth state, potato dextrose medium was found to be best for growth and sporulation of *F. moniliforme* and *A. alteranta*. The growth and sporulation of *C. graminicola*, *F. oxysporum* and *M. phaseolina* was maximum on Richard's medium.

The germination was drastically reduced by seed inoculation with different nine fungi and mixture of nine fungi. Seeds treated with cultural filtrates of mixture of nine fungi revealed significantly the lowest seed germination (28.75%) followed by *F. moniliforme* (66.00%), *F. oxysporum* (68.30%), *C. graminicola* (71.53%), *A. alternata* (73.20%) and *M. phaseolina* (77.23%) inoculated seed. Minimum adverse effect on seed germination was observed in sorghum seed inoculated with *C. lunata* (88.85%), *P. sorghina* (91.05%), *A. niger* (92.98%) and *A. flavus* (93.45%) over control (95.03%).

Aqueous extracts of commonly available seven plant species evaluated *in vitro* for their inhibitory effect on the growth of five major grain molds showed bulb extract of

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Garlic and Neem seed kernal extract most effective in growth inhibition of *A. alternata*, *F. oxysporum*, *C. graminicola*, *F. moniliforme* and *M. phaseolina*.

Eight known antagonists were tested by three different methods against major grain molds of sorghum in *in vitro*. Among the different antagonists tested *T. viride*, *A. niger*, *A. flavus* and *B. subtilis* consistently showed strong antagonistic activity against *M. phaseolina* and *F. oxysporum*. Whereas in case of *C.graminicola* and *F. moniliforme*, *T. viride* proved to be highly antagonistic followed by *T. harzianum* and *A. niger* and in case of *A. alternata* strong antagonism was found with *T. viride*, *T. harzianum* and *T. longibrachyatum* as compared to the other antagonists tested.

Nine fungicides were screened *in vitro* by food poisoned technique against *C. graminicola*, *A. alternata*, *F. moniliforme*, *M. phaseolina* and *F. oxysporum*. Among different fungicides tested against *A. alternata*, Propiconazole and Hexaconazole (0.1 %) were the most effective fungicides providing maximum inhibition of fungal growth and sporulation. In case of *F. oxysporum* the most effective fungicides were Carbendazim, Propiconazole and Chlorothalonil providing maximum growth inhibition, whereas Carbendazim and Copper oxychloride proved most effective in *C. graminicola* growth inhibition. The fungicides Carbendazim, Propiconazole, Metalaxyl 8% + Mancozeb 64% and Chlorothalonil each at 0.1 % concentration proved to be most effective against mycelial growth and sporulation of *M. phaseolina* and Carbendazim and Triadimefon both at 0.1 % concentration were effective against *F. moniliforme*.