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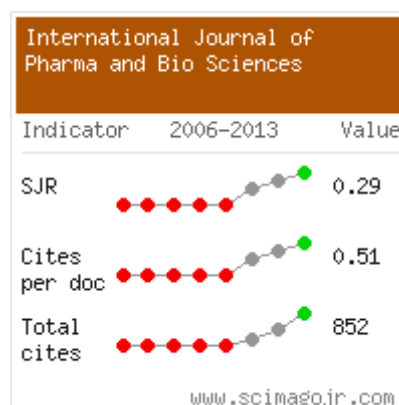
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## INCIDENCE OF GRAIN MOLD ON SORGHUM IN MARATHWADA REGION

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### ABSTRACT

Sorghum (*Sorghum bicolor* (L.) Moench) is one of cereal crop of the world. It is a good source of Carbohydrates. Sorghum is produced on a large scale in India and worldwide. This is an important cereal crop facing the problem of yield loss, because of biotic factors and abiotic factors. Grain mold disease is a serious biotic factor for yield loss in this crop. Due to grain mold disease maximum yield loss was occurring in sorghum. In India sorghum was cultivated in kharif and rabi season. In kharif season raining and humid condition favors the development of this disease. In the present study infected sorghum panicles was collected from various regions of Marathwada in rainy season. Seed mycoflora were isolated by using blotter plate method and Agar plate method. 17 different fungus was isolated from infected sorghum, those are via *Alternaria alternata*, *Alternaria sps*, *Aspergillus flavus*, *A. niger*, *A. paraciticus*, *A. terrus*, *Bipolaris sps*, *Cladosporium sps*, *Curvularia lunata*, *Fusarium maniliformae*, *Fusarium semitectum*, *penicillum sps*, *Phoma sorghina*, *Rhizopus stolonifer*, *Rhizopus sps*, and *trichothecium roseum*. Disease incidence was calculated in both the methods of isolation.

**KEYWORDS:** Grain mold, Sorghum, Pathogen, Incidence.



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## INTRODUCTION

Sorghum is one of most important cereal crop of Marathwada region, for food as well as fodder purpose. This is economically important cereal crop now threatened by various disease, bacterial, fungal diseases, nematodes etc. Among this fungal diseases are more damaging to grain sorghum. Grain mold disease is severe fungal disease of sorghum. It directly affects on the yield and quality of the grain. Actual yield loss cannot be predictable because it involves from flowering to harvesting and marketing stages, (Singh and Bandyopadhyay, 2000) depending upon the time of flowering, weathering conditions and cultivars yield loss due to grain mold varies from 30% to 100%. One of the first visible symptoms is pigmentation of the lemma, palea, glumes, and lodicules. Pinkish orange spot on the panicles indicates the infection of *Fusarium* species on the panicles while blackish grains from the panicles indicate the presence of *Alternaria*, *Curvularia* and *Helminthosporium* species. Some blackish patches on panicles indicate the presence of *Phoma* species. Depending on the fungus involved, the grain maturity stage and severity of infection, the symptoms could be highly variable. Severely infected grain is fully covered with mold; partially infected grain may look normal and discolored, while some apparently normal grain may not show external symptoms but produces mold fungi on blotter after surface sterilization. Fungal growth occurs on the surface of the grain, and subsequently extends on the pericarp surface. Severe infection in the field results in multicolored grains due to various colored fungal mycelium and sporulating structures depending on the fungal pathogen involved in colonizing sorghum grains. Discoloration of the grains due to fungal infection is more prominent on white-grain than in brown/red grain sorghums (Thakur et al, 2006). *Fusarium*, *Curvularia lunata*, *Alternaria alternata* and *Phoma sorghina* are the major fungi associated with sorghum at an early stage of infection (Indira et al., 1991; Bandyopadhyay et al., 2000; Thakur et al., 2003). During physiological maturity, species of *Fusarium*, *Alternaria*, *Curvularia*, and *Phoma* were more

prominent than other genus ( Thakur et al, 2006) The ability of some fungal members to produce mycotoxin in grain sorghum is also a one of major threat for the human (Bhat et al, 2000). Because in developing country sorghum considered as one of major staple food. More than 60% of people feed on it of this region. The toxin produce by that fungus shows adverse effect on the health of people. The frequency of appearance of toxin producing fungus *Fusarium verticillioides* (8.3%), *Aspergillus flavus* (3.5%), *Alternaria alternata*, *Curvularia lunata*, *Aspergillus niger* were high in a rainy season as compare to post rainy season (Navi, 2008).

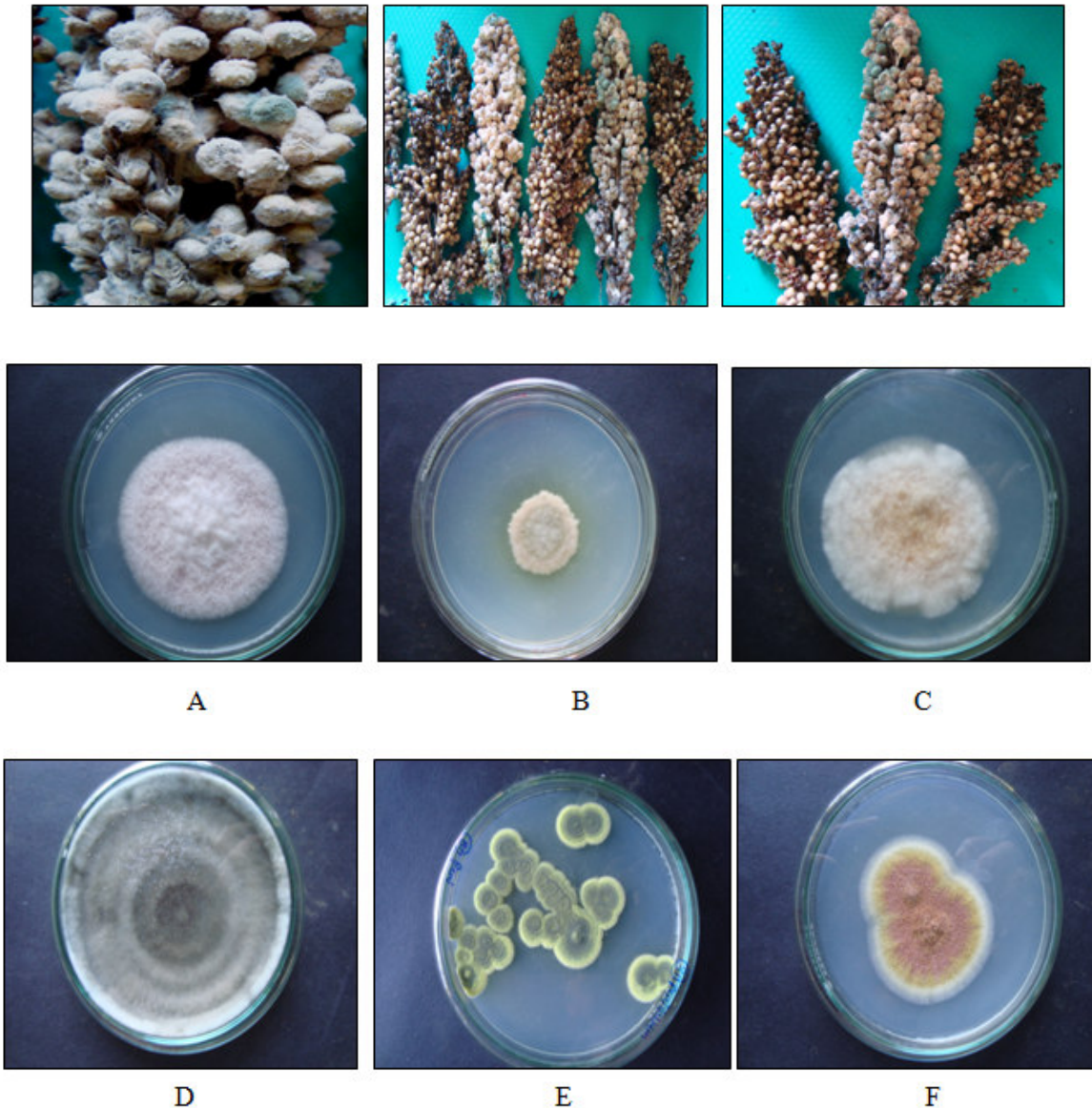
## MATERIALS AND METHODS

Infected sorghum panicles were collected from various regions of Marathwada. Isolation of fungi was done by Blotter plate method and Agar plate method. In Blotter plate method, Blotter were soaked in sterilized distilled water and placed in petriplates. After that 10 seeds in each Petri-plate were placed in equidistance in aseptic condition, then these plates were kept for incubation at  $20 \pm 2^{\circ}$  C for 7 days in the alternative light interval. On the next day of incubation period various colonies were observed. Each colony was a subculture on separate petriplates containing PDA medium for pure culture. In Agar plate method, infected Sorghum grains were collected, Washed with distilled water and surface sterilized with 0.1%  $HgCl_2$ . Then inoculated in a petriplates containing PDA as a medium. The plates were kept for incubation at  $26 \pm 2^{\circ}$  C, and examined on 5<sup>th</sup> of incubation. Individual colonies were again subculture on separate Petri plates containing PDA medium for pure culture. Identification of pathogens was made on the basis of microscopic observations i.e. Growth pattern, Pigmentations, Conidia, conidiophores and fruiting structure. Incidence and frequency of occurrence were made by a simple linear mean procedure.

**Experimental Results**

The isolation of pathogens was done on the basis of external seed mycoflora and internal seed borne pathogens. In blotter plate method and Agar plate method 18 different fungal member was observed via *Alternaria alternata*, *Alternaria sps*, *Aspergillus flavus*, *A. niger*, *A.*

*paraciticus*, *A. terrus*, *Bipolaris sps*, *Cladosporium sps*, *Curvularia lunata*, *Fusarium maniliformae*, *Fusarium semitectum*, *Fusarium verticilliodes*, *penicillium sps*, *Phoma sorghina*, *Rhizopus stolonifer*, *Rhizopus sps*, And *trichothecium roseum* .



**Figure A**  
***Fusarium oxysporum* B- *Alternaria alternata* C- *F. equiseti* D- *Curvularia lunata* E- *Penicillium sps*. F- *Aspergillus terrus*.**

**Table 1**  
**Percentage (%) Incidence of grain mold association at different locality of Marathwada on sorghum**

Sr. No.	Name of fungus	Percentage (%) of incidence at localities				
		Aurangabad	Jalna	Beed	Parbhani	Osmanabad
1	<i>Alternaria alternata</i>	15	10	15	-	10
2	<i>Alternaria sps</i>	-	10	10	-	-
3	<i>Aspergillus flavus</i>	35	30	55	60	50
4	<i>Aspergillus niger</i>	50	25	40	40	35
5	<i>Aspergillus paraciticus</i>	10	10	-	-	10
6	<i>Aspergillus terrus</i>	20	15	10	30	25
7	<i>Bipolaris sps</i>	10	-	-	15	-
8	<i>Cladosporium</i>	15	20	30	10	20
9	<i>Curvularia lunata</i>	20	35	50	25	30
10	<i>Fusarium moniliforme</i>	10	15	10	10	15
11	<i>Fusarium oxysporum</i>	30	25	15	20	10
12	<i>Fusarium semitectum</i>	10	30	10	-	10
13	<i>Fusarium verticilliodes</i>	20	10	30	30	-
14	<i>Penicillium citrinum</i>	10	45	20	20	10
15	<i>Phoma sorghina</i>	20	25	30	30	20
16	<i>Rhizopus stolonifer</i>	10	25	10	30	30
17	<i>Rhizopus sps</i>	10	-	-	15	10
18	<i>Trichothecium roseum</i>	10	-	-	-	-

*Aspergillus flavus*, *A. niger*, *Curvularia lunata*, *Phoma sorghina*, *Rhizopus stolonifer*, and *Fusarium sps* was dominant in all the localities. *Aspergillus flavus* shows highest percentage of incidence in Parbhani region (60 %) followed by *Aspergillus niger* (50 %) in Aurangabad region and *Curvularia lunata* (50%) in beed region. Out of all the localities Aurangabad region is most susceptible for the incidence of grain mold in Marathwada region (Table 01). *Trichothecium roseum* shows very least incidence (10 %) from all the localities. *Aspergillus flavus*, *Aspergillus*

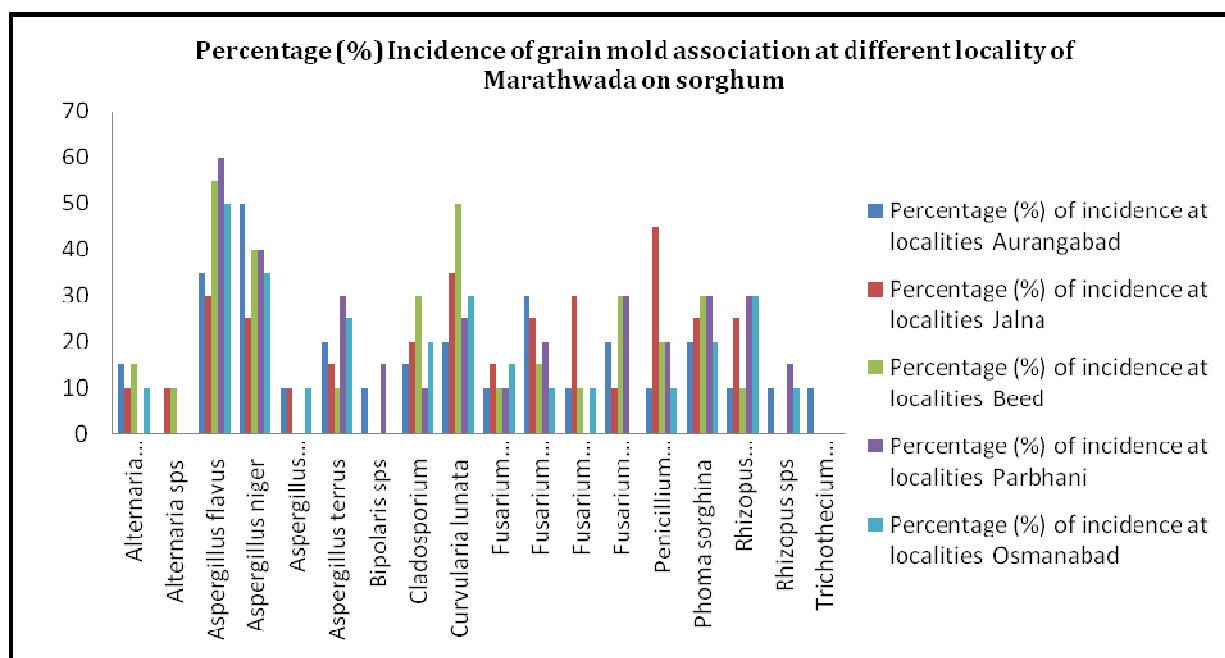
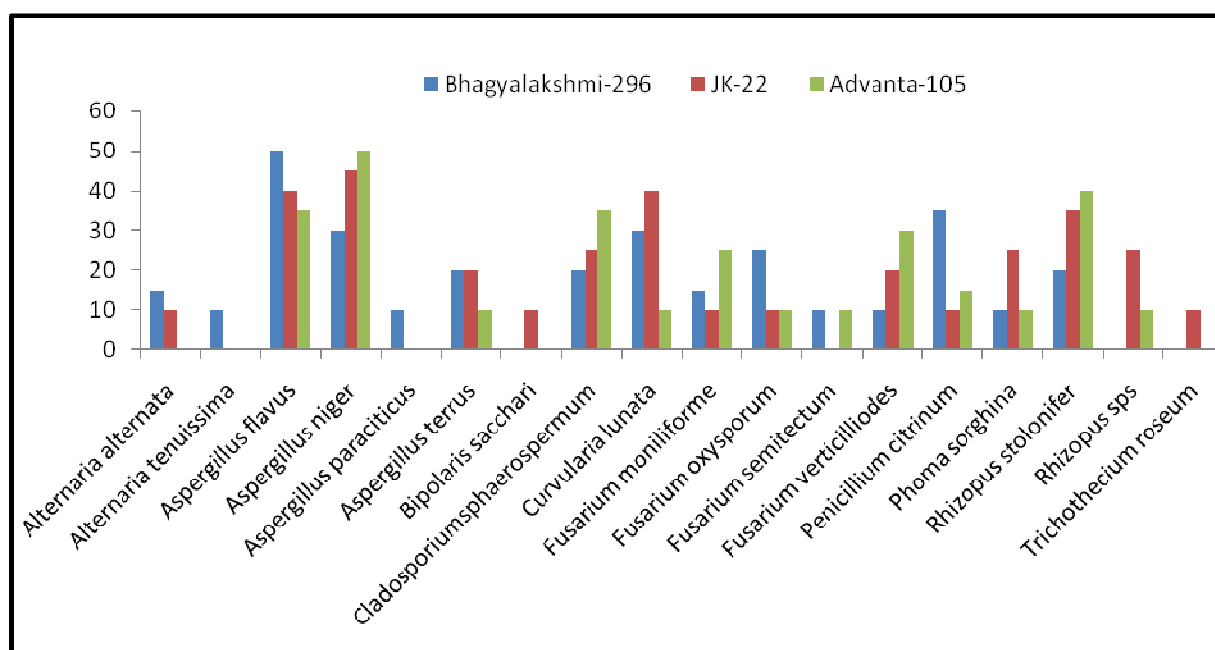


Table 2

**Percentage (%) of incidence of grain mold association at different varieties of grain sorghum**

Sr. No.	Name of Fungi	Percentage (%) of incidence at varieties		
		Bhagyalakshmi-296	JK-22	Advanta-105
1	<i>Alternaria alternata</i>	15	10	-
2	<i>Alternaria tenuissima</i>	10	-	-
3	<i>Aspergillus flavus</i>	50	40	35
4	<i>Aspergillus niger</i>	30	45	50
5	<i>Aspergillus paraciticus</i>	10	-	-
6	<i>Aspergillus terrus</i>	20	20	10
7	<i>Bipolaris sacchari</i>	-	10	-
8	<i>Cladosporium sphaerospermum</i>	20	25	35
9	<i>Curvularia lunata</i>	30	40	10
10	<i>Fusarium moniliforme</i>	15	10	25
11	<i>Fusarium oxysporum</i>	25	10	10
12	<i>Fusarium semitectum</i>	10	-	10
13	<i>Fusarium verticilliodes</i>	10	20	30
14	<i>Penicillium citrinum</i>	35	10	15
15	<i>Phoma sorghina</i>	10	25	10
16	<i>Rhizopus stolonifer</i>	20	35	40
17	<i>Rhizopus sps</i>	-	25	10
18	<i>Trichothecium roseum</i>	-	10	-

niger, *Rhizopus stolonifer*, *Cladosporium sps* and *Curvularia lunata* were dominant in all the varieties (table 02). *Aspergillus flavus* shows maximum incidence in Bhagyalakshmi-296 variety (50 %) followed by *Rhizopus stolonifer* in Advanta-105 variety (40 %) and *Aspergillus niger* (50%) in JK-22 variety (table 02). As per results Bhagyalakshmi-296 variety is most susceptible for incidence of grain mold on sorghum. Majority of fungi observed on the Bhagyalakshmi-296 variety.



## DISCUSSION

From the observations (table 01), 18 different fungal members were observed in all the

localities from Marathwada region. Where *Aspergillus flavus*, *A. niger*, *Curvularia lunata* and *Phoma sorghina* were observed most dominating species of this region, whereas

Species of *Alternaria*, *Fusarium*, *Bipolaris*, *Trichothecium*, *Cladosporium*, *penicillum* were occurred in least concentration. Similar results were shown by (Patil et al, 2008). *Fusarium oxysporium* is also reported as a root endophytic (Mishra et al, 2015). They reported *Alternaria alternata*, *Fusarium culmorum*, *Aspergillus niger*, *A. fumigatus*, *Rhizopus stolonifer*, *Curvularia penniseti*, *Drechslera rostrata* were associated with grain sorghum in western Maharashtra region. Thakur et al (2006) also reported *Fusarium proliferatum*, *F. verticillodes*, *Curvularia lunata*, *Alternaria alternata*, *Phoma sorghina* were associated with the grain sorghum. Girish et al (2004) reported *Fusarium verticillodes* and *Curvularia lunata* were associated with grain sorghum. Singh and Bandyopadhyay (2000) isolated *Fusarium thapsinum*, *Fusarium semitectum*, *Curvularia lunata*, *Alternaria alternata*, *Phoma sorghina*, *Colletotrichum graminicola* from the infected grain sorghum. Panchal and Dhale (2011) also reported *Aspergillus terreus*, *A. flavus*, *Alternaria alternata*, *Colletotrichum graminicola*, *Rhizopus nigricans*, *Curvularia lunata*, *Phytophthora sps*, *Fusarium moniliforme*, *Penicillium crysogenum* from Marathwada region. This study was very much reveals with this results. Maximum incidences were shown by *Aspergillus flavus* (60 %), *Aspergillus niger*

(50 %) and *Curvularia lunata* (50 %) in Marathwada region. *Rhizopus stolonifer* (40%) and *Aspergillus niger* (50 %) shows the highest incidence on hybrid varieties Advanta-105 and Bhagyalakshmi -296 respectively. Panchal and Dhale (2011) reported the Highest incidence of *Curvularia lunata* (40%) and *Rhizopus nigricans* (40%) on agar plate method in grain sorghum. While Patil et al (2008) reported the highest incidence of *Curvularia penniseti* (30%) on the external mycoflora of infected panicle grain sorghum.

## CONCLUSION

From results and observation of present work, it is concluded that *Aspergillus flavus*, *Aspergillus niger* *Curvularia lunata* and *Fusarium Spp.* are dominantly associated with grain sorghum in Marathwada region.

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