

Developmental of Sorghum Genotypes Resistant to Grain Moulds

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Abstract: Sorghum genotypes were evaluated to identify sources for grain mould resistance. Among the 76 genotypes evaluated, nineteen lines selected in F_2 population from the crosses 296 B x IS 3443 (cross⁻¹) and CK 60B x IS 3443 (cross⁻³) showed high level of resistance both under field and laboratory testing. Majority of the genotypes were associated with *Alternaria* sp and *Phoma* sp. followed by *Gloeocercospora sorghi* and *Curvularia* sp. The germination was not affected by molds.

Introduction

Grain deterioration due to grain moulds is one of the important diseases that limit the production of quality sorghum during kharif season in Karnataka. Dharwad and Belgaum district of north karnataka where rainy season is prolonged, well distributed and coincides with earhead emergence with high degree of relative humidity and optimum temperature favours grain mould severity.

Grain moulds have become increasingly important after the introduction of early maturing hybrids with narrow genetic base for grain mould resistance. Large number of unspecific fungi such as species of *Fusarium*, *Phoma*, *Alternaria*, *Curvularia*, *Cladosporium*, *Gloeocercospora* etc. have been reported to be associated with grains by various workers (Tripathi 1974, Hiremath *et al.*, 1993 and Palakshappa *et al.*, 2001). Since the control of grain moulds in a commercial crop was not accepted by the farmers and is impracticable, the incorporation of resistant character to develop agronomically superior cultivar is the cheap and best method to combat grain deterioration due to grain mould pathogens.

Material and Methods

The individual earheads selected in F_2 and F_3 generations from the crosses 296B x IS 3443 and CK 60 B x IS 3443 and progressed to advance generations. After attaining stabilization the genotypes were further subjected to screening in randomized block design with two replications during the year 2001 and 2002 rainy seasons at Main Agricultural Research Station, University of Agricultural Sciences, Dharwad. Dharwad is the hot spot for grain moulds and the disease appears severely without inoculation (Anahosur, 1983). To avoid any escape, the ears were spray inoculated at milky stage with a spore mixture (the inoculum was obtained by washing the early formed ears from a general crop). Inoculated ears were bagged for a week. At maturity five earheads from each entry from two replications were scored following 1-5 scale as suggested by Bandyopadhyay *et al.* (1988). The ears were threshed and grains were again graded using the same scale. Fungi associated were tested by Blotter technique and the genera associated with the grain are presented in table 1.

Table 1. Grain mould ratings and fungi associated with grains of selected sorghum genotypes

Sl No.	Genotypes	Panicle grade			Threshed grade			Per cent germination	Fungal severity
		2001	2002	Mean	2001	2002	Mean		
1.	DGMN-1-3	2.0	2.0	2.0	2.0	1.5	1.75	87.99(70.05)	Exse+, Ph++Gloe++Alt+++
2.	DGMN-1-2-1	2.0	2.0	2.0	2.0	2.0	2.00	95.05 (77.25)	Ph+,Gloe+Alt+++
3.	DGMN-1-7-2-1	2.0	2.0	2.0	2.0	2.0	2.00	87.87(69.74)	Cu+,Exse+,Ph++ Alt+++
4.	DGMN-1-9-5	2.0	2.0	2.0	2.0	2.0	1.75	95.03 (77.15)	Exse+,Cu+,Fu+,Ph++, Alt+++
5.	DGMN-1-18-4-1	2.0	2.0	2.0	2.0	2.0	2.00	92.50 (74.12)	Cu+,Alt++,Ph+++
6.	DGMN-1-18-4-2	2.0	2.0	2.0	2.0	2.0	2.00	97.54(82.70)	Exse+,Gloe+, Alt++,Ph+++
7.	DGMN-1-19-2-1	2.0	2.0	2.0	2.0	2.0	2.00	89.58 (71.14)	Exse+,Gloe+, Cu++, Alt+++
8.	DGMN-1-20-1	2.0	2.0	2.0	2.0	2.0	2.00	96.16 (78.77)	Ph+,Cu++, Alt++
9.	DGMN-1-20-2	2.0	2.0	2.0	2.0	2.0	2.00	86.87 (68.78)	Gloe+, Fu+, Exse+,Cu++,Alt++
10.	DGMN-1-21-1	2.0	2.0	2.0	2.0	2.0	2.00	94.25 (86.32)	Ph+, Cu+, Exse+ Alt++
11.	DGMN-1-22-5-2	2.0	2.0	2.0	2.0	2.0	2.00	90.16 (71.72)	Cu+,Ph+,Alt++
12.	DGMN-1-22-5-4	2.0	2.0	2.0	2.0	2.0	2.00	91.74 (73.35)	Cu+,Exse+, Alt++, Gloe++,Ph+++
13.	DGMN-1-24-2	2.0	2.0	2.0	2.0	2.0	2.00	87.27 (69.17)	Gloe+,Fu+, Cu+, Ph+++, Alt+++
14.	DGMN-1-1-30-3	2.0	2.0	2.0	2.0	2.0	2.00	93.96 (75.82)	Exse+Fu+, Cu+Alt++,Ph++
15.	DGMN-1-32-1	2.0	2.0	2.0	2.0	1.5	1.75	90.56 (72.15)	Fu+, Cu+, Alt+++,Ph+++
16.	DGMN-3-7-1	2.0	2.0	2.0	2.0	2.0	2.00	92.71 (74.42)	Cu+,Exse+,Fu++, Gloe++, Alt+++,Ph+++
17.	DGMN-3-49-1	2.0	2.0	2.0	2.0	2.0	2.00	74.77 (60.80)	Exse+,Gloe+,Alt++Ph+++
18.	DGMN-3-50-1	2.0	2.0	2.0	2.0	1.5	1.75	89.52 (71.39)	Gloe+,Ph++, Alt+++
19.	DGMN-3-51-1	2.0	2.0	2.0	2.0	2.0	2.00	86.78 (68.75)	Exse+,Gloe++, Alt+++, Ph+++
20.	296B	5.0	5.0	5.0	4.0	4.50	4.25	65.68 (55.31)	Cu++, Fu++, Alt+++,Ph+++
S.E.m _±		3.64							
C.D at 1 %		13.69							
Alt- <i>Alternaria</i> , Fu- <i>Fusarium</i> , Cu- <i>Curvularia</i> , Gloe- <i>Gloeocercospora</i> , Ph, - <i>Phoma</i>									
+Low (less than 25% seeds)									
++ Medium (25-50% seeds)									
+++High (More than 50% seeds)									

*Figures in the parenthesis are angular transformed values.

Results and Discussion

Screening large number of materials under high inoculum pressure and practicing intensive selection on an individual plant basis appear to be the key factor for success in dealing with the complex problem of sorghum grain moulds. Field screening of selected materials involving crosses with adopted parents was carried out during 2002 and 2001 rainy season. In collaborative effort with the sorghum breeding staff, selections were made for resistance and desirable agronomic traits.

Severity of grain moulds was >4 on susceptible check (296B) indicating high disease pressure. The severity range was from 2.0 to 5.0 and 1.75 to 4.25 in panicle and threshed grading respectively. Among the genotypes evaluated 19 genotypes were found resistant and recorded average grade 2 for panicle scoring and 1.85 threshed grade. The genotypes DGMN1-3, DGMN1-9-5, DGMN 1-32-1 and DGMN 3-50-1 recorded panicle scoring 2.0 and threshed grade 1.75 indicating consistent resistant reaction in both the years of evaluation. The remaining 15 genotypes showed grade 2 for both field and threshed grades and the other entires recorded

moderate to susceptible reacton to grain molds. Germination was more then 90 per cent in most of the genotypes. Eleven genotypes recorded >95.00 germination indicating that grain molds not necessarily affect the germination adversely. However, the susceptible check 296 B showed 65.68 per cent germination thus indicating slight reduction in the seed viability in susceptible check moulded severely.

Blotter test indicated that seeds of all the genotypes showed the association of molds. Among them *Alternaria alternata* was dominating followed by *Phoma sorghicola*, *Curvularia lunata* and *Gloeocercospora sorghi* which clearly indicates the association of pathogens causing grain molds in resistant genotypes too.

Hiremath *et al.* (1993) also showed association of *Fusarium*, *Curvularia*, *Phoma* and *Alternaria* with resistant sorghum genotypes.

From the experiment it is clear that, careful selection of individual heads from the populations under high inoculum pressure and subsequent genetic manipulation to get high yielding which combine with desirable agronomic qualities.

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