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INTERRELATIONSHIP AMONG THE PARAMETERS ASSOCIATED WITH GRAIN MOLD RESISTANCE IN KHARIF SORGHUM

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Abstract

Correlation studies in ten parents and the forty five hybrids developed by crossing these ten parents in half-diallel (excluding reciprocals) fashion revealed that seed hardness exhibited significant and positive association with germination percentage while negative significant association was found with electrical conductivity of grain leachates and fungal load of *Fusarium moniliforme* both at genotypic and phenotypic levels. This indicated that the proper selection procedure to increase seed hardness would thus result in increased germination percentage. Such selection would consequently reduce down the fungal load, electrical conductivity of grain leachates and water absorption capacity and thus help in grain mold resistance breeding programme effectively.

Key words : Correlation, sorghum, fungal load.

Introduction

The knowledge of interrelationship among the parameters associated with grain mold resistance is useful in identifying the traits which are highly correlated with grain mold resistance and helps the breeder to plan the grain mold resistance breeding programme accordingly. Study of grain mold is important in *kharif* sorghum because grain mold is one of the most important biotic stresses affecting the grain yield as well as the grain quality of *kharif* sorghum. The present investigation was undertaken to study the extent of association present among the parameters associated with grain mold resistance in *kharif* sorghum.

Materials and Methods

The experimental material consisted of ten parents (SVD 9601, GM 9219, IS 14332, AKMS 14 B, IMS 9 B, MS 296 B, ICS 70 B, MS 27 B, IS 14384 and GMPR 65) and the forty five hybrids developed by crossing these ten parents in half-diallel (excluding reciprocals) fashion. The experiment was conducted during *kharif* 2007-08 at the sorghum research unit, Dr. PDKV, Akola (MS). The experiment was laid out in randomized block design with spacing of 45 × 15 cm. in three replications. Five spore inoculated plants were randomly selected from each entry in each replication for recording the observations. Observations were recorded on characters like days to 50% flowering, grain yield (g), glume coverage (%), 100 seed weight (g), seed hardness (kg/cm^2), grain density (g/ml), water absorption capacity (g), electrical conductivity of grain leachates (ms/ppt), germination (%), fungal load of *Fusarium moniliforme* (%), fungal load of *Curvularia lunata* (%), fungal load of other species (%). The data was subjected to analysis of variance and covariance (Panse and Sukhatme, 1954). Genotypic and phenotypic correlation coefficients for all the characters were estimated by using method suggested by Hayes *et al.* (1955).

Results and Discussion

In general, the genotypic correlation coefficients were higher than the phenotypic correlation coefficients indicating the limited role of environment in modifying the total expression of the genotypes. Days to 50% flowering did not showed any correlation with any of the characters under study. Grain yield exhibited positive and significant association with glume coverage, 100 seed weight, grain density and water absorption capacity both at genotypic and phenotypic levels. Similar positive significant association between grain yield and 100 seed weight was reported by Kedar (2013). While negative and significant correlation was found between grain yield

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Table-1: Phenotypic (P) and genotypic (G) correlation coefficients among the parameters associated with grain mold resistance.

S. no.	Characters		Grain yield /plant (g)	Glume coverage (%)	100 seed weight (g)	Seed hardness (kg/cm²)	Grain density (g/ml)	Water absorption capacity (g)	Electrical conduc-tivity (ms/ppt)	Germin ation (%)	Fungal load of *Fusarium moniliforme* (%)	Fungal load of *Curvularia lunata* (%)	Fungal load of *Curvularia lunata* (%)
1	**Days to 50 % flowering**	G	0.004	-0.01	-0.12	0.18	0.10	-0.06	-0.01	0.14	-0.04	0.07	-0.05
		P	-0.01	0.003	-0.05	0.15	0.08	-0.05	-0.01	0.11	-0.03	0.06	-0.05
2	**Grain yield /plant (g)**	G		0.40**	0.33*	0.18	0.35**	0.29*	0.004	0.13	-0.27*	0.004	-0.21
	P		0.38**	0.28*	0.18	0.34*	0.28*	0.004	0.12	-0.26	0.01	-0.20	
3	**Glume coverage (%)**	G			0.02	-0.16	0.23	0.20	0.17	0.02	-0.04	-0.21	-0.20
	P			0.03	-0.16	0.22	0.20	0.17	0.02	-0.04	-0.20	-0.19	
4	**100 seed weight (g)**	G				0.45**	0.33*	0.36**	-0.52**	0.46**	-0.32*	-0.05	0.06
	P				0.37**	0.28*	0.31*	-0.44**	0.39**	-0.27*	-0.04	0.06	
5	**Seed hardness (kg/cm²)**	G					0.04	-0.01	-0.60**	0.68**	-0.42**	-0.10	0.10
	P					0.04	-0.01	-0.58**	0.63**	-0.41**	-0.10	0.09	
6	**Grain density (g/ml)**	G						0.17	0.10	0.05	-0.15	0.02	-0.14
	P						0.16	0.10	0.05	-0.15	0.02	-0.13	
7	**Water absorption capacity**	G							0.09	-0.02	0.20	0.15	0.40**
	(g)	P							0.09	-0.02	0.20	0.15	0.39**
8	**Electrical conductivity**	G								-0.72**	0.49**	0.15	0.08
	(ms/ppt)	P								-0.70**	0.49**	0.15	0.08
9	**Germination (%)**	G									-0.70**	-0.35**	-0.05
		P									-0.67**	-0.34*	-0.05
10	**Fungal load of *Fusarium***	G										0.42**	0.21
	***moniliforme* (%)**	P										0.42**	0.21
11	**Fungal load of *Curvularia***	G											0.08
	***lunata* (%)**	P											0.08

* significant at 5 per cent. **significant at 1 per cent.

and fungal load of *Fusarium moniliforme* thereby indicating the role of grain mold fungi in reducing the grain yield in *kharif* sorghum. Glume coverage did not showed any correlation with any of the characters under study. The character 100 seed weight exhibited positive and significant association with seed hardness, grain density, water absorption capacity and germination percentage whereas, it showed negative and significant correlation with electrical conductivity and fungal load of *Fusarium moniliforme* both at genotypic and phenotypic levels. Ghorade and Shekar (1997) reported the positive and significant association of 100 seed weight with grain density and germination percentage. Thorat *et al.* (2004) observed that 100 seed weight was positively and significantly associated with germination percentage, grain hardness and water absorption capacity. Seed hardness exhibited significant and positive association with germination percentage while negative significant association was found with electrical conductivity of grain leachates and fungal load of *Fusarium moniliforme* both at genotypic and phenotypic levels. It is well known that hard seed coat in sorghum resist the fungal attack which in turn reduces the electrical conductivity of grain leachates due to less damage to the seed coat and it ultimately improves the germination percentage of the seed. Kedar (2013) reported similar positive and significant association between grain hardness and germination percentage and also reported the negative and significant correlation with electrical conductivity of grain leachates and threshed grain mold rating (TGMR). Kalpande *et al*. (2013) also reported positive and significant association between grain hardness and germination percentage of seed. Grain density did not showed any correlation with any of the characters under study. Water absorption capacity showed positive and significant correlation both at genotypic and phenotypic levels with fungal load of other species. From grain mold resistance breeding point of view a genotype with less water absorption capacity is desirable because it indicates less seed coat damage due to fungal attack. Utikar *et al.* (1985) reported that high water absorption capacity in moldy grains indicated significant positive correlation with percent grain mold index and thereby suggesting that the affected grains had absorbed more water and seemed to be an important character while selecting the mold tolerant genotypes in sorghum. Electrical conductivity of grain leachates exhibited significant positive association with fungal load of *Fusarium moniliforme* and significant negative association with germination percentage both at genotypic and phenotypic levels. It clearly indicated that due to higher grain mold infestation the seed coat is more damaged which ultimately leads to higher electrical conductivity of grain leachates. Kedar (2013) also reported similar positive significant correlation with threshed grain mold rating (TGMR) and negative significant association with germination percentage of seed. Germination percentage of seed had shown negative and significant association with fungal load of *Fusarium moniliforme* and fungal load of *Curvularia lunata* thereby indicating the predominant role grain mold fungi in reducing the germination percentage of seed. Ghorade and Shekar (1997) reported negative correlation between grain mold fungi and seed germination. Kedar (2013) also reported similar negative significant correlation between germination percentage of seed and threshed grain mold rating (TGMR). Fungal load of *Fusarium moniliforme* had shown positive and significant association with fungal load of *Curvularia lunata*, which indicated the dominant role of both these fungi in grain mold infestation of sorghum.

Thus, it was concluded from the present correlation study that selection for seed hardness would simultaneously improve the germination percentage of seed and reduce the fungal load, electrical conductivity of grain leachates and water absorption capacity. Study also confirmed the role of grain mold attack in reducing the gain yield in kharif sorghum.

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