The Pharma Innovation Journal 2023; 12(8): 1330-1332

www.ThePharmaJournal.com

The Pharma Innovation

ISSN (E): 2277-7695
ISSN (P): 2349-8242
NAAS Rating: 5.23
TPI 2023; 12(8): 1330-1332

www.thepharmajournal.com
Received: 02-05-2023
Accepted: 13-06-2023

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Character association studies for grain mold resistance traits in *kharif* sorghum (*Sorghum bicolor* (L.) Moench)

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Abstract
The experimental research was work out to observe the correlation among the traits related to grain mold resistance in *kharif* sorghum (*Sorghum bicolor* (L.) Moench). Experiment was conducted using ten diverse patents and forty-five F_1 crosses, generated by crossing these ten diverse parents in half diallel mating design without reciprocals and evaluated for grain mold resistance traits. The study revealed that, threshed grade mold rating (TGMR) shows significant negative correlation with grain hardness, grain density, germination percentage and significantly positive correlation with water absorption capacity, electrical conductivity of grain leachates, FGMR, fungal load of *F. moniliforme*, fungal load of *C. lunata.* and also, for other mold fungi. Thus, the selection for grain hardness and grain density would simultaneously improve the germination percentage of seed and reduce the fungal load, FGMR, TGMR, electrical conductivity of grain leachates and water absorption capacity. Hence, these traits could be contemplated as useful traits, for ameliorating grain mold resistance.

Keywords: Sorghum, correlation, grain mold

1. Introduction
Sorghum (*Sorghum bicolor* (L.) Moench) is prime important cereal crop cultivated in the world because of its wide adaptability, with low cost of cultivation and disparate uses (Aruna *et al.*, 2011) [2]. Grain mold is an important biotic constraint of sorghum which causes reduction in the grain yield, quality of grains and grain size, also the blackening of grains makes them unfit for human consumption (Aruna *et al.*, 2021) [1]. Mold damage can occur in several ways *viz*., blackening of grains, endosperm degradation, reduction in grain filling and seed size, lower down germination and viability of seed, presence of fungal toxins reduces dry matter, decreased density and weight of seed, altered nutritional content of the grain, low storage capacity, low food value, disapprove and rejected by the consumer and fetches low market value (Rao *et al*., 2016) [9].
The knowledge of correlation between the desirable characters associated with grain mold resistance is useful in joint selection of the traits which are highly interrelated with grain mold resistance. This will provide pinpoint information for the selection of important characters, which may contribute more towards grain mold resistance. The present experimental research was work out to study the correlation among the traits interrelated with grain mold resistance in *kharif* sorghum.

2. Materials and Methods
The experimental research was workout at Sorghum Research Unit, Dr. PDKV., Akola during *kharif* 2021. Experimental material comprising of ten parents and 45 F_1 crosses were sown following Randomized Block Design with three replications. Ten parents namely, CSV 27, CSV 34, PDKV Kalyani, RMP-42, AKMS 30B, AKMS 14B, GMN 16-3, AKGMR 117, AKGMR 118, B 58586 were crossed in half diallel mating design without reciprocal for generating 45 F_1 crosses. Randomly five mold fungi culture inoculated plants were opted from each treatment in each replication for recording the observation data in F_1 crosses and parents. Observations were recorded on characters like Field grade mold rating (FGMR), Threshed grade mold rating (TGMR), grain hardness (kg/cm^2), grain density (g/ml), electrical conductivity of grain leachates (ms/ppt), germination percentage, glume coverage (%), water absorption capacity (g), fungal load of *Fusarium moniliforme* (%), fungal load of *Curvularia lunata* (%), fungal load of other mold species (%). The genotypic and phenotypic correlation coefficients were analyzed as per the formulae suggested by Hayes *et al.* (1955) [5].

3. Results and Discussion

Phenotypic and genotypic correlation coefficients among the different grain mold resistance traits are shown in Table 1a and 1b. The genotypic correlation coefficient was of higher magnitude than phenotypic correlation coefficient indicating the inherent interrelationships between various traits studied. Grain hardness has significant positive correlation with grain density and germination percentage. However, grain hardness had significant negative correlation with electric conductivity of grain leachates, water absorption capacity, FGMR, TGMR and with percent infection of mold fungi i.e., *F. moniliforme*, *C. lunata*, and other mold fungi. Significant negative association between seed hardness and threshed grade mold rating score as well as with electric conductivity of seed was reported by Awate (2019) [3] and Patil *et al*. (2022) [8]. Thus, selection for grain hardness will be effective in concurrent improvement of germination percentage of seed and ultimately reduces the grain mold infestation.

Grain density has significant positive correlation with germination percentage. However, grain density had negative significant correlation with electric conductivity of grain leachates, water absorption capacity, FGMR, TGMR and also with the percent infection of all the mold fungi studied. The similar association between grain density, threshed grade mold rating and fungal load of mold spp, were also reported by Ingole (2017) [6].

Electric conductivity of grain leachates has significant positive association with water absorption capacity, FGMR, TGMR and to infection percentage of all the mold fungi studied. However, electric conductivity of grain leachates had negative significant association with germination percentage and glume coverage. Similarly, significant positive interrelationship between threshed grade mold score and electric conductivity was reported by Kathalkar (2017) [7], Awate (2019) [3] and Patil *et al.* (2022) [8]. Infestation of grain mold causes the damage of seed coat and it increases the electric conductivity ultimately lower down the germination of seed and seed quality, resulting in reduction of the grain yield.

Germination percentage has significant positive correlation with glume coverage. However, germination percentage had significant negative correlation with water absorption capacity, FGMR, TGMR and to infection percentage of grain mold fungi studied. Bhakare (2010) [4] and Patil *et al.* (2022) [8] reported negative association between grain mold fungi and seed germination.

Glume coverage had negative significant association with water absorption capacity, field and threshed grade mold rating and to infection percentage of all mold fungi studied. The character water absorption capacity has significant positive correlation with infection load of *F. moniliforme*., *C. lunata*, and other mold fungi. The water absorption in mold affected grains showed significant positive interrelation with disease index. Hence water absorption capacity is also an important character taking in to consideration while selecting mold resistant genotypes. (Utikar *et al*. 1985) [10].

The percent infection of grain mold fungi namely *F. moniliforme*, *C. lunata* and other mold fungi has significant positive association with field and threshed grade mold rating.

Table 1a: Estimates of phenotypic correlation coefficient for grain mold resistance related traits

Characters	GH	GD	EC	GC	WAC	FLF	FLC	FLO	FGMR	TGMR	GP
GH	1.00	0.362 **	-0.789**	0.294	-0.696**	-0.766**	-0.678**	-0.384**	-0.746**	-0.763**	0.721**
GD		1.00	-0.504**	0.034	-0.414**	-0.469**	-0.530**	-0.294**	-0.474**	-0.496**	0.567**
EC			1.00	-0.319**	0.834**	0.927**	0.737**	0.419**	0.839**	0.864**	-0.850**
GC				1.00	-0.336**	-0.339**	-0.176*	-0.161*	-0.321**	-0.329**	0.155*
WAC					1.00	0.784**	0.707**	0.501**	0.765**	0.760**	-0.759**
FLF						1.00	0.737**	0.382**	0.793**	0.823**	-0.842**
FLC							1.00	0.492**	0.716**	0.730**	-0.782**
FLO								1.00	0.349**	0.379**	-0.443**
FGMR									1.00	0.944**	-0.822**
TGMR										1.00	-0.848**
GP											1.00

Table 1b: Estimates of genotypic correlation coefficient for grain mold resistance related traits

Characters	GH	GD	EC	GC	WAC	FLF	FLC	FLO	FGMR	TGMR	GP
GH	1.00	0.403**	-0.853**	0.308*	-0.794**	-0.830**	-0.741**	-0.427**	-0.829**	-0.853**	0.792**
GD		1.00	-0.539**	0.039	-0.500**	-0.528**	-0.600**	-0.317*	-0.549**	-0.553**	0.645**
EC			1.00	-0.328*	0.931**	0.968**	0.792**	0.455**	0.920**	0.953**	-0.906**
GC				1.00	-0.368**	-0.351**	-0.182	-0.170	-0.340*	-0.353**	0.162*
WAC					1.00	0.894**	0.810**	0.575**	0.868**	0.913**	-0.881**
FLF						1.00	0.794**	0.399**	0.888**	0.924**	-0.907**
FLC							1.00	0.538	0.800**	0.823**	-0.856**
FLO								1.00	0.386**	0.410**	-0.486**
FGMR									1.00	0.996**	-0.918**
TGMR										1.00	-0.947**
GP											1.00

GH: Grain Hardness (kg/cm^2)	FLC: Fungal load of *Curvularia lunata* (%)
GD: Grain density (g/ml)	FLO: Fungal load of other mold spp.
EC: Electric conductivity of grain leachates (ms/ppt)	FGMR: Field grade mold rating
GC: Glume coverage (%)	TGMR: Threshed grade mold rating
WAC: Water absorption Capacity (g)	GP: Germination percentage
FLF: Fungal load of *Fusarium moniliforme* (%)	

4. Conclusion

The results of the present research revealed that, the genotype and phenotypic association of threshed grade mold rating (TGMR) were significant negative association with grain hardness, grain density, germination percentage and were significantly positive association with water absorption capacity, electrical conductivity of grain leachates, field grade mold rating, fungal load of *Fusarium moniliforme*, fungal load of *Curvularia lunata and* fungal load of other mold spp. Thus, the selection for grain hardness and grain density would simultaneously improve the germination percentage of seed and reduce the fungal load, FGMR, TGMR, electrical conductivity of grain leachates and water absorption capacity and helps in mold resistance breeding programme effectively.

5. Conflict of Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

6. References

1. Aruna C, Das IK, Reddy S, Ghorade RB, Gulhane AR, Kalpande VV, *et al*. Development of sorghum genotypes for improved yield and resistance to grain mold using population breeding approach. Frontiers in Plant science. 2021;12:1-9.
2. Aruna C, Padmaja PG, Subbarayudu B, Seetharama N. Genetics of traits associated with shoot fly resistance in post-rainy season sorghum (*Sorghum bicolor* L.) Indian J Genet. 2011;71(1):9-16.
3. Awate Madhuri D. Evaluation of seed quality, growth parameters and yield in kharif sorghum (*Sorghum bicolor* (L.) Moench) M.Sc. Thesis (UNPUB.) Dr. PDKV, Akola; c2019.
4. Bhakare RL. Grain mold resistance studies in sorghum (*Sorghum bicolor* (L.) Moench). Ph.D. Thesis (Unpub.) Dr. PDKV, Akola; c2010.
5. Hayes HK, Immer FR, Smith DC. Methods of Plant Breeding. McGraw Hill Book Company, New York; c1955.
6. Ingole DG. Studies on grain mould resistance in sorghum (*Sorghum bicolor* (L.) Moench). Ph.D Thesis (unpub). VNMKV, Parbhani; c2017.
7. Kathalkar PB. Assessment of seed quality, growth parameters and yield in kharif sorghum (*Sorghum bicolor* (L.) Moench) M.Sc. (unpub.) Dr. PDKV, Akola; c2017.
8. Patil RC, Kalpande VV, Thawari SB. Correlation studies in land races of kharif sorghum (*Sorghum bicolor* (L.) Moench). The Pharma Innovation Journal. 2022;11(1):562-564.
9. Rao VT, Reddy P, Reddy PSBVS. Combining ability for grain mold resistance in sorghum (*Sorghum bicolor* (L.) Moench). SABRAO J of Breed. Genet. 2016;48:240-246.
10. Utikar PG, Shinde PA, Bapat DR. Physico-chemical characteristics of sorghum grain in relation to grain mold intensity. J Maharashtra Agric. Univ. 1985;10(2):155-157.