The Pharma Innovation Journal 2023; 12(11): 1871-1873

www.ThePharmaJournal.com

The Pharma Innovation

ISSN (E): 2277-7695
ISSN (P): 2349-8242
NAAS Rating: 5.23
TPI 2023; 12(11): 1871-1873

www.thepharmajournal.com
Received: 21-08-2023
Accepted: 30-09-2023

Bhuyar SA
Ph.D. Scholar, Department of Agricultural Botany, Dr. PDKV, Akola, Maharashtra, India

Ghorade RB
Head, Department of Agricultural Botany, Dr. PDKV, Akola, Maharashtra, India

Gomashe SS
In-Charge, NBPGR, RS, Akola, Maharashtra, India

Tayade NR
Research Fellow, NBPGR, RS, Akola, Maharashtra, India

Kogade VT
Senior Research Assistant, Dr PDKV, Akola, Maharashtra, India

Corresponding Author:
Tayade NR
Research Fellow, NBPGR, RS, Akola, Maharashtra, India

Investigation for trait association analysis in barnyard millet germplasm (*Echinochloa frumentacea*) under multiple environments

Bhuyar SA, Ghorade RB, Gomashe SS, Tayade NR and Kogade VT

Abstract
Barnyard millet (*Echinochloa frumentacea*) is becoming the fastest growing minor millets among the millets. An investigation was taken to analysis the pooled character association analysis for the grain yield and its component traits along with Grain Iron (Fe) and Zinc (Zn) content in 50 barnyard millet germplasm including five check varieties cultivated in four different environment and the trail was raised in randomised block design with three replications. Significant difference between genotypes was observed from pooled ANOVA. Correlation studies exhibited significant positive relationship of grain yield with panicle length, panicle width, plant height, 1000 grain weight and fodder yield per plant. Also, the grain Fe and Zn content found associated with grain yield and inter-correlated among themselves.

Keywords: Barnyard millet, correlation, genotypic correlation, phenotypic correlation, iron and zinc

Introduction
Barnyard millet (*Echinochloa frumentacea*) is among the earliest cultivated crop in the semi-arid pockets of Asia and Africa (Sood *et al*., 2020) [7], with chromosome number 2n=4x=36, and is mainly a self-pollinated crop belonging to the Poaceae family. In India this crop is, cultivated in the central and southern parts. It is generally a short season dual-purpose crop, grown for grain and fodder under limiting inputs and extreme environmental conditions. This millet known for providing normally digestible proteins and extravagant source of insoluble and soluble dietary fiber. Barnyard millets contain Iron (Fe) and Zinc (Zn) in its whole grains which ranges from 25 ppm to 44 ppm and 36 ppm to 40 ppm respectively (Girish *et al*., 2014) [3]. Hene, considering these nutritional values which makes this crop, a nature's gift to humankind by providing well-being perks such as regulation of blood pressure, lowering blood sugar level, thyroid, cardiovascular and celiac diseases.
In dry land areas with limiting inputs, barnyard millet seems to be emerging as fast-growing crop which the has promising range of nutrient which can alleviate nutritional deficiency in the developing countries around the globe. Knowledge of association ship between the traits and their relative effect on grain yield will assist in indirect selection in crop refinement programmes. But experiments on trait association and their consequence on grain yield in barnyard millet are very limited. Hence, this investigation was conducted to assess the magnitude of genetic parameters and quantitative traits association in barnyard millet. Character association is a statistical measure which is used to work out the degree and direction of relationship between two or more variables.

Materials and Methods
Present study consisted of 50 barnyard millet germplasm including five check varieties (VL 29, VL 172, VL 207, TNAU 101 and K^{-1}) which were obtained from the gene bank of National Bureau of Plant Genetic Resources, Regional station, Akola. The main experimental trails were laid in randomized block design (RBD) with three replications with a paired row of three-meter length with spacing of 30 x 10 cm. Different environments used for sowing were, Sorghum Research Unit, Dr. PDKV, Akola (E1), NBPGR, RS, Akola (E2), Regional Research Station, Amravati (E3) and Agriculture Research Station, Buldana (E4). The recommended packages of crop management practices were adopted to raise the good crop condition.
The morpho-physiological observation was recorded on 12 biometrical traits *viz*., days to fifty percent flowering, days to maturity, total number of tillers per plant, total number of productive tillers per plant, plant height (cm), panicle length (cm), panicle width (cm), 1000

grain weight (g), grain yield per yield (g), straw yield per plant (g), grain Fe content (mg/100g) and Grain Zn content (mg/100g). For every trait, five random plants were selected from each replication and used to collect the biometrical data except days to fifty percent flowering and days to maturity which were recorded on a plot basis.

The generated data was subjected to analysis of variance (ANOVA) given by Panse and Sukhatme (1967) [9]. The genotypic and phenotypic correlation between yield and its component traits and among themselves was calculated as per the method suggested by Johnson *et al*. (1955) [6].

Results and Discussion

In the present investigation, pooled analysis of variance showed significant difference between 50 genotypes for all the traits and the correlation coefficient assist to assess the mutual association among different traits and disclosed the characters on which the selection can be absorbed for genetic improvement of grain yield. Grain yield articulation is affected by a number of its component traits. grasping the relationship between grain yield and related traits paves the way for refine selection efficiency.

In this investigation high positive genetic correlation was observed between grain yield and productive tillers per plant (0.85), plant height (0.52), panicle length (0.85), panicle width (0.75), 1000 grain weight (0.58), grain Fe contain (0.47) and grain Zn content (0.55) biomass. Similar relationships were reported by the Arunachalam and Vanniarajan (2012) [1] in barnyard millet. The traits *viz*., days to 50% flowering (0.29), productive tillers per plant (0.49), plant height (0.64), panicle length (0.69), panicle width (0.81), grain yield per plant (0.83), 1000 grain weight (0.54), grain Fe contain (0.50) and grain Zn contain (0.44) exerted positive genetic association with biomass i.e., straw yield per plant. Similar relationship of straw yield with theses traits were also reported by Channappagoudar *et al*. (2008) [2].

The nutritional traits, grain Fe contain (0.47) and grain Zn content (0.55) had positive and significant association with grain yield per plant, which is in agreement with Vishnuprabha and C. Vanniarajan. Besides grain yield per plant, grain Fe content also displayed positive association with traits like, panicle width (0.59), panicle length (0.57), plant height (0.48) and straw yield per plant (0.50), whereas grain Zn content recorded positive correlation with productive tillers per plant (0.34), panicle length (0.50), panicle width (0.40), straw yield per plant (0.44), 1000 grain weight (0.47) and grain Fe content (0.30).

For the phenotypic correlation analysis, grain yield per plant showed positive and significant relationship with the traits like panicle width (0.56), panicle length (0.57), plant height (0.18) and productive tillers per plant (0.45). Similarly, the straw yield per plant displayed significant and positive phenotypic correlation with grain yield per plant (0.67), panicle width (0.72), panicle length (0.51), plant height (0.34) productive tillers per plant (0.26), days to 50% flowering (0.28) and days to maturity (0.14).

Nutritional parameters such as grain Fe content recorded positive and significant phenotypic correlation with 1000 grain weight (0.24), straw yield (0.47), grain yield per plant (0.40), panicle width (0.53), panicle length (0.77) and plant height (0.25), whereas grain Zn content has positive and significant association ship with grain Fe content (0.29), 1000 grain weight (0.42), straw yield (0.41), yield per plant (0.22), panicle width (0.35), panicle length (0.40) and productive tilers per plant (0.22), similar pattern of association ship was also recorded by Govindaraj et. al., (2009) [4-5].

Table 1: Genotypic and phenotypic association of grain yield per plant with other characters in 50 genotypes of Barnyard millet.

		Days to 50% flowering	Days to Maturity	Tiller per plant	Productive tillers per plant	Plant Height	Panicle Length	Panicle Width	Yield per plant	Straw Yield	1000 Grain Weight	Fe content	Zn content
Days to 50% flowering	G	1	0.7139 **	0.2371	0.1859	0.4952**	0.0874	0.2391	0.0626	0.2952 *	-0.1032	0.0778	-0.0169
	P	1	0.6282**	0.0687	0.0975	0.2395 **	0.0864	0.1872 **	0.0344	0.2588 **	-0.0968	0.0805	-0.0051
Days to Maturity	G		1	-0.1067	0.0164	0.3551*	-0.0052	0.1804	-0.095	0.1722	-0.1949	0.0899	-0.2274
	P		1	-0.1274	0.0434	0.0755	-0.0181	0.1021	-0.0381	0.1427 *	-0.1532 *	0.09	-0.1775 *
Tiller per plant	G			1	0.4528 **	-0.0837	0.1285	0.0693	-0.0389	-0.1183	-0.01	-0.1787	-0.0438
	P			1	0.2058 **	0.0352	0.0829	0.0588	-0.1144	-0.0654	-0.012	-0.0879	-0.0245
Productive tillers per plant	G				1	0.4552**	0.6018 **	0.4963 **	0.8503 **	0.491 **	0.3676 **	0.3309*	0.3468 *
	P				1	0.1264	0.2496 **	0.2776 **	0.4596 **	0.2611 **	0.2062 **	0.1814 *	0.2265 **
Plant Height	G					1	0.4929 **	0.456 **	0.5228 **	0.6491 **	0.098	0.4823**	0.2731
	P					1	0.2744 **	0.2675 **	0.1824 **	0.34 **	0.0303	0.2526 **	0.1477 *
Panicle Length	G						1	0.8375 **	0.8569 **	0.6986 **	0.4613 **	0.574 **	0.5048 **
	P						1	0.6435 **	0.5729 **	0.5141 **	0.3555 **	0.4769 **	0.4081 **
Panicle Width	G							1	0.751 **	0.816 **	0.4912 **	0.5986**	0.4021 **
	P							1	0.5694	0.7251 **	0.4324 **	0.5387	0.3535

									**			**	**
Yield per plant	G								1	0.8331 **	0.5829 **	0.4774**	0.5572 **
	P								1	0.6726 **	0.4755 **	0.4048 **	0.4623 **
Straw Yield	G									1	0.5476 **	0.5089**	0.4462 **
	P									1	0.472 **	0.4761 **	0.4148 **
1000 Grain Weight	G										1	0.2782	0.4754 **
	P										1	0.2414 **	0.4253 **
Fe content	G											1	0.3089 *
	P											1	0.2974 **
Zn content	G												1
	P												1

Conclusion

The current experiment aimed at studying the extent of association ship prevailing among the50 barnyard genotypes evaluated at four different environments. Based on the character association in the present study the traits namely plant height, number of productive tillers per plant, panicle length and panicle width can be centralized with respect to increase the grain yield in barnyard millet improvement programmes.

Trait association studies also divulge that grain yield per plant exhibited significant positive relation with grain Fe and Zn content. Further these two nutritional traits also found inter-correlated among themselves. Consequently, improvement of grain yield in barnyard millet will also jointly lead improvement on grain Fe and Zn content.

References

1. Arunachalam P, Vanniarajan C. Genetic parameters and quantitative traits association in barnyard millet (*Echinochloa frumentacea*). Plant Archives. 2012;12(2):691-694.
2. Channappagoudar BB, Hiremath SM, Biradar NR, Koti RV, Bharamagoudar TD. Influence of morpho-physiological and biochemical traits on the productivity of barnyard millet. Karnataka J Agric. Sci. 2008;20(3):477- 480.
3. Girish C, Meena RK, Mahima D, Mamta K. Nutritional properties of minor millets: neglected cereals with potentials to combat malnutrition. Current Science. 2014;107(7):1109-111.
4. Govindaraj M, Selvi B, Rajarathinam S. Correlation studies for grain yield components and nutritional quality traits in pearl millet (*Pennisetum glaucum* (L.) R. Br.) Germplasm. World Journal of Agricultural Sciences. 2009;5(6):686-689.
5. Govindaraj M, Selvi B, Rajarathinam S. Correlation studies for grain yield components and nutritional quality traits in pearl millet (*Pennisetum glaucum* (L.) R. Br.) Germplasm. World Journal of Agricultural Sciences. 2009;5(6):686-689.
6. Johnson, Herbert W, Robinson HF, Comstock RE. Estimates of genetic and environmental variability in soybeans. Agronomy journal. 1955;47(7):314-318.
7. Sood S, Joshi DC, Pattanayak A. Breeding Advances in Barnyard millet. In: Accelerated Plant Breeding. Volume 1 cereal crops. S.S. Gosal, S.H. Wani (Eds), Springer, Germany; c2020. p. 391-409.
8. Tayade N, Ghorade RB, Kalpande VV, Akhare AA, Rathod TH. Character association studies in post rainy sorghum (*Sorghum bicolor* L. Moench) genotypes for traits related to drought tolerance. The pharma Innovation Journal. 2023;12(2):3333-3335.
9. Avadhani MS, Sukhatme BV. Controlled sampling with varying probabilities with and without replacement. Australian Journal of Statistics. 1967;9(1):8-15.