

though being a complex trait, expressed 98.74 per cent of heritability. Higher estimates of heritability with genetic advance was observed for plant height, spike yield per plant and grain yield per plant indicating the presence of additive gene action and so selection can be easily done for these traits. Since other traits expressed low genetic advance values, non additive gene action would be predominant and so heterosis breeding would be recommended.

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Madras Agric. J., 95 (1-6): 192-195 January-June 2008

<https://doi.org/10.29321/MAJ.10.100560>

## Research Notes

# Character association and path analysis of yield components in pearl millet (*Pennisetum glaucum* L. R.Br.)

B. MEENA KUMARI AND P. NAGARAJAN

*Dept. of Millets, Centre for Plant Breeding and Genetics, Tamil Nadu Agrl. Univ., Coimbatore-3.*

Pearl millet (*Pennisetum glaucum* L.R.Br.) is the most important food and fodder crop of dryland agriculture in India and Africa. In order to realize the substantial production and improvement in this allogamous crop, information on the type, nature and magnitude of association between yield and its components is essential. Also, path analysis helps in identifying the yield components which directly and indirectly influence the yield. Selection for the improvement of particular trait will be effective, when a thorough knowledge about inter relationship existing among the yield traits is known.

Hence, the present research work was undertaken to study the correlation and path

coefficients and to formulate the selection criteria for evolving high yielding genotypes in pearl millet.

The parental materials consisted of eight lines from diverse cytoplasmic sources of A1, A4, unclassified source and twelve testers, which were obtained from ICRISAT, Patancheru and Millet Breeding Station, Tamil Nadu Agricultural University, Coimbatore. Each of the eight male sterile lines was crossed with twelve testers in Line x Tester mating design, by which, 96 hybrids were obtained. These hybrids were raised with their parents in randomized block design with two replications during *kharif* 2003 at Millet Breeding Station, Tamil Nadu Agricultural University, Coimbatore.

**Table 1. Genotypic correlation among different traits**

Traits	Grain yield	Plant height	Days to 50% flowering	No.of tillers	No.of prod.tillers	Spike length	Spike thickness	Spike yield	1000 grain weight
Grain yield	1.000	0.49**	-0.22**	-0.08	0.38**	0.63**	0.41**	0.25**	0.25**
Plant height		1.000	-0.01	-0.43**	-0.90**	0.23**	0.60**	0.52**	0.87**
Days to 50% flowering			1.000	0.60**	0.16*	-0.14	-0.32**	0.23**	0.11
No. of tillers				1.000	0.04	0.03	0.37**	0.12	0.50**
No. of prod, tillers					1.000	0.21*	0.20*	0.11	0.40**
Spike length						1.000	-0.39**	0.20*	0.23**
Spike thickness							1.000	0.82**	0.59**
Spike yield								1.000	0.30**
1000 grain weight									1.000

\* - Significance at 5% level; \*\* - Significance at 1% level.

**Table 2. Direct and Indirect effects of yield components on grain yield per plant**

Traits	Plant height	Days to 50% flowering	No.of tillers	No.of prod. tillers	Spike thickness	Spike yield	Spike weight	1000 grain	Genotypic correlation coefficient
Plant height	-0.65	0.07	0.09	0.01	0.10	0.06	0.960	-0.15	0.49**
Days to 50% flowering	-0.12	0.13	-0.31	-0.10	0.24	0.02	0.06	-0.14	-0.22**
No. of tillers	0.14	0.13	-0.38	-0.04	0.04	-0.01	0.11	-0.07	-0.08
No. of prod, tillers	0.05	0.19	-0.13	-0.07	0.01	0.01	0.58	-0.26	0.38**
Spike length	-0.25	0.16	-0.06	-0.02	0.27	0.02	0.75	-0.24	0.63**
Spike thickness	-0.28	0.03	0.05	-0.01	0.06	0.10	0.50	-0.04	0.41**
Spike yield	-0.26	0.24	-0.12	-0.03	0.25	0.24	0.29	-0.36	0.25**
1000 grain weight	-0.16	0.25	-0.04	-0.03	0.11	0.02	0.71	-0.61	0.25**

Residual effect - 0.1308 \*\* - Significance at 1% level

Each entry was sown in two rows of 4.0m length each, with a spacing of 45cm in between rows and 15cm between plants within the row. Observations were recorded for yield and its component traits in five randomly selected plants of each replication. Genotypic correlation co-efficients ( $r_g$ ) among different traits were computed as given by Webber and Moorthy (1952). To partition the correlation co-efficient of various yield components on grain yield into direct and indirect effects, path analysis (Dewey and Lu, 1959) was performed.

From this analysis, it was found that grain yield per plant had recorded highly significant and positive association with spike length (0.63), plant height (0.49), spike thickness (0.41), number of productive tillers (0.38), spike yield (0.25) and 1000 grain weight (0.25) (Table 1). Positive correlation of grain yield with plant height, spike length and spike thickness was already reported by Letitia Poongodi (1991) and Azhaguvel (1997). This shows that grain yield is mostly determined by the above characters. The association of plant height with spike length (0.23), spike thickness (0.60), spike yield (0.52) and 1000 grain weight (0.87) was highly significant and positive indicating that tall plants could contribute to grain yield.

Days to fifty percent flowering had strong positive association with number of tillers (0.60), number of productive tillers (0.16), spike yield per plant (0.23). This shows that late maturing genotypes would produce more number of tillers and spike yield per plant. Character association revealed that number of tillers showed highly significant and positive association with spike thickness (0.37) and 1000 grain weight (0.50). Number of productive tillers were strongly correlated with 1000 grain

weight (0.40) but weakly with spike length (0.21) and spike thickness (0.20).

The correlation of spike length with spike yield (0.20) and 1000 grain weight (0.23) was positive and significant but negative with spike thickness (0.39). It implies that increase in spike length reduced spike thickness. Spike thickness showed strong positive correlation with spike yield per plant (0.82) and 1000 grain weight (0.59). Also, spike yield had positive association with 1000 grain weight (0.30). This shows that the increase in spike yield would produce bolder grains with more 1000 grain weight.

Path analysis facilitates the partitioning of correlation co-efficient into direct and indirect effects of various yield components on grain yield. The low residual effect of 0.1308 in the present study indicated that the characters chosen were adequate and appropriate (Table 2). The direct effect of spike yield per plant on grain yield per plant was positive and high and its indirect effect through other observed characters were also positive. It was confirmed by Hepziba *et al.* (1993) and Poongodi and Palanisamy (1995) for the influence of traits like plant height, number of tillers, spike length and 1000 grain weight. The high, positive, direct effect by spike length and spike thickness and high, negative, direct effect by 1000 grain weight were also observed. The indirect effect by all the other observed characters for spike length and spike thickness were positive and for 1000 grain weight was negative. Number of tillers had high negative direct effect on grain yield per plant, as observed in association analysis. These characters are to be given much importance during selection. It is interesting to note that plant height had expressed high negative direct effect,

but it showed positive correlation with grain yield per plant. Similarly, days to 50 per cent flowering had positive direct effect, but had negative association with grain yield per plant. The results of the present study indicated that an ideal bajra plant should have high spike yield per plant, spike length, spike thickness and 1000 grain weight since they expressed significant correlation with maximum direct effect on grain yield per plant.

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Madras Agric. J., 95 (1-6): 195-199 January-June 2008

### Research Notes

## Association and cause-and-effect analysis in F<sub>2</sub> generation of mungbean (*Vigna radiata* (L.) Wilczek).

ANUJ SRIVASTAVA, G.R.LAVANYA, R.K. PANDEY AND M.C.RASTOGI

*Department of Genetics and Plant Breeding, Allahabad Agricultural Institute-Deemed University, Allahabad-211007, U.P. India.*

Pulses are the second most important source of protein and is considered as a rich source of protein especially for vegetarian population of India. Seed yield being a complex character, controlled by polygenes and to make effective selection for higher yield, the estimates of

genotypic and phenotypic correlations between yield component characters and *inter se* association among themselves along with their direct and indirect effects on yield are essential to ensure effective simultaneous selection involving two or more characters. The consistency