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Research Notes

Character association and path analysis in pearlmillet

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Pearl millet is the fifth most important cereal crop, and the most important millet with more than 55 percent of global millet production, grown in 40 countries, predominantly in Africa and Asia, as a staple food grain and source of feed, fodder, fuel and construction material in the hottest, driest, semi-arid and arid regions where rainfed agriculture is practiced. India is the largest producer of this crop, both in terms of area (9.1 m ha) and production (7.3 m t), with an average productivity of 780 kg/ha. Nearly 50 per cent of the millet area is under hybrid cultivars. Understanding of the interaction of the traits among themselves and with the environment is of great use in plant breeding. Correlation studies provide information on the nature and extent of association between any two metric traits and it would be possible to bring out genetic upgradation in one trait will be efficient in selection of the other trait of a pair also. However, some earlier reports on high phenotypic and genotypic coefficients of variation for grain yield/plant is available (Abraham *et al.,* 1989; Harer and Karad, 1998; Kulkarni *et al.,* 2000). Correlation between line *per se* and hybrid performance of CMS lines showed positive and high correlation coefficient values for days to 50 per cent flowering, spike length, spike girth, grain density and 1000 grain weight were reported by Madhusudhana and Govila (2001). Grain yield was positively and significantly correlated with tillers per plant and biological yield per plant which was reported by Manoj Kumar *et al.* (2002). Grain yield per plant showed significant positive correlation with all its component traits *viz.,* days to 50 per cent flowering, days to physiological maturity, number of tillers per plant, number of productive tillers per plant, plant height, ear length, ear girth, 1000 grain weight and dry fodder weight per plant at both genotypic and phenotypic levels which was reported by Salunke *et al.* (2006). The present study was planned to understand the association of various characters and their cause with yield and its components in pearl millet involving different sources of male sterile lines and their hybrids.

Five male sterile lines as female parents, ICMA 94111A and 81A having A_1 cytoplasm, ICMA 88004A and PT 5054A having A_4 cytoplasm and 732A belonging Bellary cytoplasm, a different source which had been derived from PT 819, an inbred line originated from Andhra Pradesh, India were used. Thirty inbreds were used as testers. This research work was carried out at Millet Breeding Station, Centre for Plant Breeding and Genetics, Tamil Nadu Agricultural University, Coimbatore-641 003 during 2005-2007. The 150 hybrids (5 lines x 30 testers) along with their parents and the check, MBH 163 were raised in Randomized Block Design with three replications during *kharif,* 2006. Each hybrid was accommodated in one row with a row spacing of 45 cm and plant to plant spacing of 15 cm. Uniform and recommended cultural practices were followed to raise agronomically good managed crop. Observations were recorded on five randomly selected competitive plants for eight economically

Table 1. Genotypic correlation coefficients among grain yield components and grain yield of pearl millet involving male sterile lines.

Characters	Days to 50 per cent flowering	Plant height	Total number of tillers	Total productive tillers	Ear length	Ear girth	100 grain weight	Grain yield per plant
Days to 50 per cent flowering	1.000	-0.679**	-0.198	-0.124	-0.711**	-0.358**	-0.478**	-0.347**
Plant height		1.000	0.0672	0.032	0.653**	0.252	0.427**	0.334**
Total number of tillers			1.000	0.959**	0.439**	0.351**	0.319**	0.818**
Total productive tillers				1.000	0.336**	0.469**	0.326**	0.766**
Ear length					1.000	0.183	0.455**	0.563**
Ear girth						1.000	-0.109	0.374**
100 grain weight							1.000	0.364**

Table 2. Direct (diagonal) and indirect effects of different characters on grain yield of pearl millet involving male sterile lines.

Characters	Days to 50 per cent flowering	Plant height	Total number of tillers	Total productive tillers	Earhead length	Earhead girth	100 grain weight	Grain yield per plant
Days to 50 per cent flowering	0.228	-0.140	-0.264	0.088	-0.085	-0.095	-0.079	-0.347**
Plant height	-0.154	0.206	0.090	-0.023	0.078	0.067	0.071	0.334**
Total number of tillers	-0.045	0.014	1.331	-0.680	0.053	0.093	0.053	0.818**
Total productive tillers	-0.028	0.008	0.728	-0.208	0.040	0.125	0.054	0.767**
Earhead length	-0.162	0.134	0.584	-0.238	0.120	0.048	0.075	0.563**
Earhead girth	-0.081	0.052	0.467	-0.332	0.022	0.266	-0.018	0.374**
100 grain weight	-0.109	0.088	0.424	-0.231	0.054	-0.029	0.166	0.364**

** Significant at P = 0.01.

importance characters *viz.*, days to 50 per cent flowering, plant height, total number of tillers, total productive tillers, ear length, ear girth, 100 grain weight and grain yield per plant. Genotypic correlations were carried out (Dewey and Lu, 1959) and their significance were tested as per Fisher and Yates (1975). To establish cause and effects relationship, the genotypic correlation coefficients were partitioned into direct and indirect effects by path analysis as suggested by Dewey and Lu (1959).

Genotypic correlation coefficients between all possible traits of characters are presented in table 1. It was observed that the total number of tillers, total productive tillers, earhead length, earhead girth, 100 grain weight and plant height were exhibited highly significant positive correlation with grain yield. The present findings were in conformity with the results of Azhaguvel (1997) for plant height, total productive tilled per plant and earhead girth; Karthigeyan (1998) for plant height, earhead length and days to 50 per flowering; Latha and Shanmugasundaram (1998) for total productive tillers, plant height and 100 grain weight. Navale *et al.* (1995) noticed positive and significant association of productive tillers with yield. Tomer *et al.* (1995) observed strong association of grain yield with effective tillers per plant, earhead length, earhead girth and 1000 grain weight. It would be inferred that, selection for high yield would be effective through selection for these characters. The days to 50 per cent flowering recorded negatively significant correlation with grain yield, which was in accordance with the finding of Meena Kumari (1998).

Inter correlation between plant height, total productive tillers, earhead length, earhead girth and 100 grain weight were positive and significant. This indicated the possibility of simultaneous improvement of these traits by a single selection programme. The results were in agreement with findings of Azhaguvel (1997) and Latha and Shanmugasundaram (1998).

The correlation measured the relationship existing between pairs of traits. But dependent traits is an interaction product of many mutually associated components. The path analysis takes into account the cause and effect relationship between the variables by partitioning the association into direct and indirect effects through other independent variables. The direct and indirect effects for the characters are given in table 2. The path analysis revealed that, total productive tillers had moderate positive direct effect followed by earhead girth (moderate) and plant height (moderate) on grain yield. These revealed the true relationship of these characters with grain yield. Hence, direct selection for these traits could be rewarding for the improvement of grain yield. Earlier workers Poongodi and Palanisamy (1995), Santhose (2002) and Salunke *et al.* (2006) reported the similar finding.

Hence, it would be inferred that selection should be in positive side for the traits total productive tillers, total number of tillers, earhead length, earhead girth, 100 grain weight and plant height and automatically increase the grain yield. Selection based on early flowering plants would also improve the grain yield, because days to 50 per cent flowering exhibited negative association with grain yield.

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