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Short Communication

Phenotypic Stability in Pearl Millet [*Pennisetum glaucum* (L.) R. Br.]

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The stability is the consistency in performance of genotypes over wide range of environments. An ideal variety should have a high mean yield combined with a low degree of yield fluctuation when grown over diverse environments. A knowledge regarding the nature and relative magnitude of the various types of G×E interactions is therefore, crucial in making decisions concerning breeding methods, selection programmes and testing procedures in crop plants. Pearl millet (*Pennisetum glaucum* (L.) R. Br.) is an important food and forage crop in the arid and semi-arid areas. Adoption rates of improved cultivars/varieties are lower in the drier regions and especially in desert areas where pearl millet is the principal grain crop for human consumption and an indispensable fodder crop for livestock production. Therefore, evaluation of potential genotypes/hybrids under different environments (location and years) before selecting desirable ones for release and commercial cultivation are very useful. Though few reports on stability in pearl millet are available (Yahaya *et al.*, 2006; Munawwar *et al.*, 2007; Dakheel *et al.*, 2009) but such study, particularly under arid and semi-arid regions of India, is meagre. Thus present investigation was undertaken to study the phenotypic stability of parents and inbred crosses of pearl millet.

The experimental material consisted of 10 genetically diverse inbred lines (restorers) developed at New Delhi (4), Hissar (3), Durgapura - Jaipur (2) and Jamnagar (1). These selected inbreds were crossed in diallel fashion (excluding reciprocal) to obtain 45 inbred crosses (F_1s) in summer 2000 at International Crop Research Institute for Semi Arid Tropics (ICRISAT), Patencheru, Hyderabad (A.P). The 45 F_1s along with ten parents were planted in a Randomized Block Design (RBD) with three replications during *kharif* 2000 at four locations viz. (i) A.R.S., RAU, Mandor-Jodhpur (Raj.) (E_1), (ii) A.R.S., RAU, Durgapura – Jaipur (Raj.) (E_2), (iii) College of Agriculture, JNKV, Gwalior (M.P.) (E_3) and (iv) Millet Research Station, JAU, Jamnagar (Guj.) (E_4). Each plot consisted of a single row of 5-meter length with 50 cm row to row and 15 cm plant to plant spacing. Non-experimental rows were planted all around the experimental field to eliminate the border effects, if any. Recommended agronomic practices and plant protection measures were adopted. The observations were recorded on ten random plants per treatment per replication on plant height (cm), number of effective tillers plant^{-1}, panicle length (cm), panicle girth (cm), 1000-seed weight (g), grain yield plant^{-1} (g), dry fodder yield plant^{-1} (g) and harvest index (%) whereas for days to flowering and days to maturity whole population was considered. Stability parameters were computed using the model proposed by Eberhart and Russell (1966).

The analysis of variance for phenotypic stability revealed that genotypes as well as environments were highly significant for all the characters. This showed significant variation among genotypes and among environments. The GxE interaction was highly significant for all the characters studied suggesting that genotypes reacted differently to different environments. Both linear and non-linear components were significant for all the characters indicating importance of both components in building up total GxE interactions as reported earlier by Dahiya *et al.* (1987) and Yahaya *et al.* (2006). The environment (linear) component was significant for all the characters when tested against pooled deviation. Prediction of performance of genotypes over environments was possible for panicle girth as GxE interaction

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Table 1. Crosses showing stability for different characters under specific environments

Characters	No. of stable crosses	Environments	
		Better	Poor
Days to 50% flowering	11	-	-
Days to maturity	16	-	RIB 3135-18 x H 90/4-5
Plant height	20	-	PPMI 823 x G 73-107
Number of effective tillers plant^{-1}	16	-	-
Panicle length	25	D 23 x RIB 335/74	-
		J 998 x PPMI 823	-
Panicle girth	16	D 23 x G 73-107	J 998 x PMI 823
		D 23 x RIB 335/74	-
		PPMI 814 x PPMI 845	-
1000-seed weight	13	PPMI 845 x H 90/4-5	-
Dry fodder yield plant^{-1}	9	-	-
Grain yield plant^{-1}	9	-	-
Harvest Index	19	-	J 998 x G 73-107

(linear) was significantly higher than the mean sum of squares due to pooled deviation. For days to 50% flowering, 1000-seed weight, grain yield plant^{-1}, dry fodder yield plant^{-1} and harvest index there was greater importance of non-linear portion in building up of total GxE interactions. For days to maturity, plant height, number of effective tillers plant^{-1}, panicle length and panicle girth linear component was higher than non-linear component indicating greater importance of non-linear portion in building up of total GxE interactions and prediction of performance of genotypes can be made considering the values of bi and S^2di values for these characters.

Amongst parents, D 23 was found stable for grain yield plant^{-1} with above mean and also exhibited average stability for high dry fodder yield plant^{-1} and tall plant height. Parent H 77/833-2 was stable across environments for shorter plant height, higher number of effective tillers plant^{-1} whereas for days to 50% flowering it showed stability for poor environments. G 73-107 was found stable for shorter plant height and early flowering while parents PPMI 814 was found stable for only shorter plant height. Parent PPMI 823 was found stable across environments for shorter plant height, higher number of effective tillers plant^{-1} and high dry fodder yield plant^{-1} whereas, it showed stability for days to maturity in better environments. Parent RIB 3135-18 was found stable for higher number of effective tillers plant^{-1} and shorter plant height. Parent RIB 335/74 was found stable genotype for higher panicle length and shorter plant height. Parent H 90/4-5 found stable across the environments for higher panicle girth. Parents PPMI 845 and J 998 were identified as stable genotypes for higher panicle length and high 1000-seed weight.

Among crosses, nine crosses were found stable with high *per se* performance for grain yield plant^{-1} (**Table 2**). Among these, most promising cross was RIB 3135-18 x H 90/4-5 followed by D23 x PPMI 845, G 73-107 x RIB 3135-18, PPMI 814 x D23, PPMI 814 x G 73-107, PPMI 823 x RIB 3135-18, J 998 x G 73-107, RIB 3135-18 x RIB 335/74 and J 998 x G 73-107. These crosses showed stability for some of the important yield components in desirable direction also. For example, RIB 3135-18 x H 90/4-5 was stable for plant height, number of effective tillers plant^{-1} and panicle girth; D23 x PPMI 845 for panicle length; G 73-107 x RIB 3135-18 for days to 50% flowering, plant height, number of effective tillers plant^{-1}, dry fodder yield per plant and harvest index; PPMI 814 x D23 for panicle length, panicle girth and dry fodder yield plant^{-1}, PPMI 814 x G 73-107 for number of effective tillers plant^{-1}, panicle length, panicle girth, 1000-seed weight, dry fodder yield plant^{-1} and harvest index; PPMI 823 x RIB 3135-18 for number of effective tillers plant^{-1} and harvest index; J 998 x G 73-107 for panicle length, panicle girth, dry fodder yield plant^{-1} and harvest index; RIB 3135-18 x RIB 335/74 for panicle length and J 998 x G 73-107 for days to 50% flowering, plant height, number of effective tillers plant^{-1}, panicle length and harvest index. Based on stability

parameters various crosses were identified for different environments.

Four restorer lines i.e. D 23, RIB 3135-18, G 73-107 and J 998 were identified with desirable general combining ability, high mean performance for grain yield and its important component characters. Nine crosses were found stable with high *per se* performance for grain yield per plant. Among these, most promising cross was RIB 3135-18 x H 90/4-5 followed by D 23 x PPMI 845, G 73-107 x RIB 3135-18, PPMI 814 x D 23, PPMI 814 x G 73-107, PPMI 823 x RIB 3135-18, J 998 x G 73-107, RIB 3135-18 x RIB 335/74 and J 998 x G 73-107.

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