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Factorial Analysis for Threshing Ratio, Grain Yield and its Attributes in Pearl Millet

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Pearl millet [*Pennisetum glaucum* (L.) R.Br.], is generally grown in the drought prone areas with unpredictable rainfall. Consequently, drought is the most important factor in limiting its production. Early flowering and high threshing ratio (seed yield panicle^{-1}) serve as useful criteria to identify drought tolerant genotypes (Bidinger *et al*. 1987 a, b).

In hybrid breeding, selection of suitable parents mainly determines the probability of success. Combining ability serves as a very useful tool in identifying the parents to be used in hybrid breeding. In the present investigation combining ability of pollinators was studied for time to flowering, threshing ratio, grain yield and its attributes.

Eight pearl millet pollinators (Table 1) were randomly selected from CAZRI inbred collection and were crossed on to two male sterile lines (843 A and 841 A). The 16 hybrids produced, thereof, were grown in randomized block design with three replications at Jodhpur during *kharif* 1991. Each hybrid was grown in four rows of 4 m length spaced 60 cm apart. Plant-to-plant spacing within rows was 15 cm. The total rainfall during the crop season was only 181 mm and the crop experienced moisture stress during panicle initiation and grain filling stages.

The data were recorded for time to flowering (days), plant height (cm), ear length (cm), grain yield (g) and dry fodder yield (g). The threshing ratio was calculated as the ratio of grain weight to panicle weight expressed in percentage. The data recorded were subjected to line x tester analysis following Kempthorne (1957).

Significant mean squares due to females, males, and females x males for all the traits (Table 1) indicated that parents differed for their general combining ability (GCA) and crosses for specific combining ability (SCA) effects. Additive genetic variance played a predominant role in the inheritance of time to flowering, ear length and grain yield whereas dominance variance was more important in the genetic control of threshing ratio, plant height and dry fodder yield (Table 1). Importance of both additive and dominance genetic variances has earlier been reported for grain yield and various yield contributing traits (Mangat & Satija 1987, Prakash et al. 1987).

Perusal of GCA effects (Table 2) revealed that none of the pollinators was desirable for all the

Table 1 *Analysis of variance for line x tester analysis for six traits in Pearl millet*

Source	d.f.	Days to flowering	plant height	Ear length	Grain yield $x10^{-3}$	Threshing percentage	Dry fodder yield $x10^{-4}$
Females	1	105.0**	300.0**	25.5**	535.5**	1324.1**	221.0**
Males	7	9.9**	521.1**	27.2**	77.9**	332.8**	82.8**
Females x males	7	10.3**	254.2**	2.0*	248.9**	342.1**	28.3*
Error	30	0.6	17.1	0.8	3.2	19.6	9.3
σ^2A (Additive variance)		6.3	20.8	3.2	8.2	54.8	2.7
σ^2D (Dominance variance)		3.2	79.0	0.4	8.0	107.5	43.8

*,** significant at P = 0.05 and 0.01, respectively.

Table 2 *General combining ability (GCA) effects of pollinators in Pearl millet*

Polinator	Days of flowering	Plant height	Ear length	Grain yield	Threshing percentage	Dry fodder yield
CZI 767	0.48	12.04**	−0.44	−74.79**	−8.44**	402.08**
CZI 798	0.65*	−4.12*	−0.10	−138.12**	−2.19	−247.92*
CZI 843	0.15	3.88*	0.90*	−68.12**	−3.30	−264.58*
CZI 848	2.31**	−15.29**	−1.44**	103.54**	17.10**	−264.58*
CZI 850	−2.19**	3.88**	4.23**	86.88**	1.13	−114.58
CZI 852	−0.69*	−1.12	−0.77*	55.21*	−0.84	518.75**
CZI 853	−0.52	9.88**	0.73	158.54**	−2.47	385.42**
$76K_2Pl_6$	−0.19	−9.12**	−3.10**	−123.12**	−1.00	−414.58**
S.E.	0.31	1.69	0.37	23.04	1.81	124.62

*,** significant at P = 0.05 and 0.01, respectively

characters simultaneously. Pollinator CZI 848 exhibited desirable significant and positive GCA effects for both threshing ratio and grain yield and thus would be the obvious choice to produce drought tolerant and high yielding hybrids. However, it is expected to contribute lateness and dwarfness in the resulting hybrids as shown by positive GCA effects for time to flowering and negative GCA effects for plant height. For earliness, CZI 850 was the best combiner alongwith its good worth in producing high yielding taller hybrids with long ears. CZI 852 was found to be good combiner for dry fodder and grain yield and earliness.

The crosses 843 A x CZI 853, 843 A x CZI 767, 841 A x CZI 850 and 841 A x $76K_2Pl_6$ were found to be desirable on the basis of their high SCA effects for grain yield, earliness and their ability to translocate pre-anthesis assimilates to grain. The most desirable combinations were 841 A x CZI 852 for dry fodder yield, 843 A x CZI 848 for plant height and 843 A x CZI 767 for earliness. Two crosses viz., 843 A x CZI 853 and 843 A x CZI 848, apart from exhibiting highly desirable SCA effects, also yielded very high. This suggests that these cross combinations need to be tested in large areas over time and space.

References

Bidinger FR, Mahalakshmi V & Rao GDP 1987a Assessment of drought resistance in pearl millet [Pennisetum americanum (L.) Leeke] I. Factors affecting yield under stress. *Australian Journal of Agricultural Research* **38** 37-48

Bidinger FR, Mahalakshmi V & Rao GDP 1987b Assessment of drought resistance in pearl millet (Pennisetum americanum (L.) Leeke] II. Estimation of genotype response to stress. *Australian Journal of Agricultural Research* **38** 49-59

Kempthorne O 1957 An *Introduction to Genetic Statistics.* John Wiley and Sons, Inc. New York

Mangat BK & Satija DR 1987 Genetic analysis of some morphological and physiological traits in pearl millet. *Crop Improvement* **14** 145-148

Prakash Om, Singh S & Khairwal IS 1987 Combining ability of some new male-sterile and maintainer lines of pearl millet. *Crop Improvement* **14** 169-172

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