Table 4. Cluster means for five characters in 21 green gram genotypes

Clusters	Plant height	No. of primary branches	No. of secondary branches	No. of pods per plant	Single plant yield
I	33.56	1.70	4.63	12.76	2.91
II	37.00	1.50	4.00	9.00	3.40
III	41.15	1.50	3.85	11.10	3.60

plant height and single plant yield. Intercrossing the types from these clusters might result in array of variability for exercising effective selection in these traits.

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GENETIC ARCHITECTURE OF METRIC TRAITS IN PEARL MILLET

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ABSTRACT

The P1, P2, F1, F2, BC1 and BC2 generations of five pearl millet crosses were studied for six metric traits. The additive dominance model was adequate for plant height, leaf breadth, earhead length and earhead breadth in one cross each. An epistatic digenic model was assumed for other crosses. Heterosis breeding is suggested for improvement of all traits. Duplicate epistasis playes a relatively greater role than complementary epistasis. Among the interactions, dominance X dominance played a major role. Therefore, reciprocal recurrent selection is suggested for development of a superior variety.

KEY WORDS : Genetic Architecture, Pearl millet, Metric Traits

The efficiency of selection for the improvement of metric traits depends upon the nature and magnitude of gene effects involved in the inheritance of a particular trait. In *Pennisetum glaucum* (L.)R. Br the importance of dominance gene effect has been reported (Virk, 1988) for different yield component traits. An attempt has been made in the present study to estimate gene effects for yield and other traits using a set of six generations derived from five crosses.

MATERIALS AND METHODS

Five cross combinations *viz.*, Pt 3832 X ICMPES 11, Pt 3832 X ICMPES 15, Pt 3832 X 81 B, Pt 3832 X 732B and 81B X 732 B were used for the study. Six generations *ie.*, P1, P2, F1, F2, BC1 and BC2 of each cross were sown in randomised block design with four replications at the National Pulses Research Centre, Vamban. The spacing was 45 cm between rows and 15 cm within the rows. The total number of population raised in each

Table 1. Scaling test and genetic effects for six traits in pearl millet

Character	Scales			Genetic effects						Type of epistasis
	A	B	C	(M)	(d)	(h)	(i)	(j)	(l)	
Plant height:										
1.Pt 3832 X ICMPES 11	-	-	-	118.9±15.2*	15.7±3.4*	47.8±38.6	-	-	-	-
2.Pt 3832 X ICMPES 15	-	*	*	193.2±17.2*	0.4±3.5	-96.2±41.2*	-62.4±16.9*	36.3±11.7*	76.6±25.7*	D
3.Pt 3832 X 81 B	*	*	-	101.4±16.9*	20.4±2.9*	54.7±41.9	9.5±16.7	54.8± 12.0*	-10.3±26.3	D
4.Pt 3832 X 732 B	-	*	*	93.6±19.2*	27.5±2.9*	134.8±45.6*	10.8±18.9	-49.5±11.8*	-97.5±28.4*	D
5.81 B X 732 B	*	*	*	96.1±2.5*	7.1±2.5*	- 104.7±35.9*	-12.8±14.7	-6.9±9.6	150.6±23.9*	D
Leaf length:										
1.Pt 3832 X ICMPES 11	*	-	*	46.7±7.3*	1.8±1.3	-3.1±17.7	1.1±7.1	-4.8±4.9	11.9±11.2	D
2.Pt 3832 X ICMPES 15	-	*	-	48.8±6.7*	0.4±1.2	5.8±16.8	-2.4±6.5	12.8±5.0*	2.6±11.0	C
3.Pt 3832 X 81 B	*	*	*	40.5±7.1*	6.1±1.3*	29.3±6.3*	3.3±7.0	-4.3±4.2	-24.4±9.7*	D
4.Pt 3832 X 732 B	-	*	*	30.6±7.1*	7.9±1.5*	49.1±18.2*	7.5±7.4	-11.2±5.1*	-30.2±11.4*	D
5.81 B X 732 B	*	*	*	42.5±5.8*	3.7±1.5*	-40.2±14.3*	-8.5±5.6	-1.5±4.4	44.9±9.7*	D
Leaf breadth:										
1.Pt 3832 X ICMPES 11	*	*	*	2.1±1.5*	0.0±0.1	0.5±1.0	0.3±0.5	-0.2±0.5	1.1±0.8	C
2.Pt 3832 X ICMPES 15	*	*	-	1.2±0.5*	0.1±0.1	1.4±1.1	1.5±0.4*	0.1±0.4	0.1±0.7	C
3.Pt 3832 X 81B	-	*	-	1.0±0.4*	0.3±0.1*	3.0±1.1*	1.1±0.4*	-0.4±0.4	-1.8±0.7	D
4.Pt 3832 X 732 B	-	-	-	2.8±0.5*	0.3±0.1	-1.8±1.3	-	-	-	-
5.81 B X 732 B	*	*	*	2.3±0.4*	0.0±0.0	-2.4±1.1*	-0.6±0.4	0.9±0.3*	2.3±0.7*	D
Earhead length:										
1.Pt 3832 X ICMPES 11	*	*	*	17.1±3.0*	1.0±0.6	1.6±7.7	3.0±2.9	-1.0±2.4	7.0±5.3	D
2.Pt 3832 X ICMPES 15	-	*	*	16.1±2.8*	0.6±0.7	7.6±6.9	3.5±2.7	3.9±2.2*	-1.4±4.5	D
3.Pt 3832 X 81 B	-	*	-	14.7±3.4*	1.4±0.6*	12.6±8.2	3.0±3.3	2.3±2.3	-7.7±5.2	D
4.Pt 3832 X 732 B	-	-	-	22.5±3.7*	1.6±0.6*	-9.4±8.8	-	-	-	-
5.81 B X 732 B	*	*	*	17.9±2.6*	0.2±0.6	-11.9±6.6*	-1.8±2.5	-0.5±2.0	16.2±4.6*	D
Earhead breadth:										
1.Pt 3832 X ICMPES 11	*	*	*	1.5±0.3*	0.2±0.1*	-0.9±0.7	0.1±0.3	-0.3±0.2	1.3±0.5*	D
2.Pt 3832 X ICMPES 15	*	-	*	1.3±0.3*	0.1±0.1	0.2±0.7	0.4±0.3	-0.1±0.2	0.3±0.4	C
3.Pt 3832 X 81 B	-	-	-	2.0±0.3*	0.1±0.1	-0.9±0.8	-	-	-	-
4.Pt 3832 X 732 B	*	*	-	2.4±0.4*	0.1±0.1	-3.4±0.9	-1.1±0.2*	-0.2±0.2	2.4±0.6*	D
5.81 B X 732 B	*	-	-	2.1±0.5*	0.1±0.1	-1.7±1.1	-0.6±0.5	-0.2±0.2	1.3±0.6*	D
Grain yield/plant:										
1.Pt 3832 X ICMPES 11	-	*	*	3.1±2.5	4.8±0.3*	68.0±6.0*	27.4±2.5*	-3.3±1.4*	-33.5±3.9*	D
2.Pt 3832 X ICMPES 15	-	-	*	47.8±2.8*	2.4±0.3	32.0±6.0	-15.0±2.7*	1.6±1.1	-15.7±3.4*	D
3.Pt 3832 X 81 B	-	*	-	15.4±2.5*	6.6±0.2*	33.2±5.9*	13.2±2.4*	-4.2±1.5*	-13± 3.7*	D
4.Pt 3832 X 732 B	*	*	-	27.7±2.5*	7.9±0.3*	7.9±5.6	-0.4±2.4	-9.0±7.2*	-0.3±3.7	D
5.81 B X 732 B	*	*	-	12.0±2.1*	1.3±0.3*	34.1±4.9*	8.7±2.1*	4.2±1.2*	-19.4±3.0*	D

* indicates significance of scale; D:Duplicate; C:Complementary

replication was 26 in parents, F1 and backcross generations and 260 in F2. Observations on plant height, leaf length, leaf breadth, earhead length, earhead breadth and grain yield per plant were recorded on 20 plants each on P1, P2 and F1, 150 plants in F2 and 75 plants each in BC1 and BC2 generations. The means and variance of means of six metric traits were computed for each generations of all the crosses. The genetic effects were estimated using the models suggested by Mather and Jinks (1971) and Jinks and Jones (1958).

RESULTS AND DISCUSSION

The scaling test and the estimates of genetic parameters *viz*., [m], [d], [h], [i], [j] and [l] for different traits presented in Table 1.

A simple additive dominance model was adequate as seen from the non-significance of all the scales in Pt 3832 X ICMPES 11 for plant height, Pt 3832 X 732 B for the leaf breadth and earhead length; Pt 3832 X 81 B for earhead breadth. For the remaining crosses an epistatic digenic interaction model was assumed as any one or two or three of the scales was significant. In general, the dominance effect [h] was predominant in plant height, leaf length, leaf breadth and grain yield. The predominance of dominant effect for these characters was already reported by many workers including Prem Sagar (1970). However, earhead length and earhead breadth, both additive and dominance effects were important. Since for most of the traits including grain yield, the dominance effect was found to be important, heterosis breeding is suggested for improvement of grain yield with its component traits. Among the interaction components, the fixable additive X additive interaction effect [i] was preodminant only for leaf breadth in two crosses. The additive X dominance effect [j] was important for plant height, leaf length, earhead length and grain yield in one cross each. The dominant X dominant effect [l] was predominant in most of the crosses for plant height, leaf length, earhead breadth and grain yield. Hence, among the interaction components the unfixable dominant X dominant effect played a major role in control of most of the traits. Therefore, reciprocal recurrent selection seems to be ideal for developing suitable variety in peatl millet.

In majority of the crosses the [h] and [l] effects had opposite signs for all the traits. These two effects had similar sings in only one cross in different traits. Therefore duplicate kind of epistasis played a major role in governing all the traits than complementary type of interaction.

As a whole, additive, dominance and all the three types of non- allelic interaction effects appeared to govern all the characters studied. However, predominance of dominance and dominance X dominance interaction effects was observed for all the characters. In most of the cases the interaction is of duplicate type. Since the dominance effect is predominant, heterosis breeding is suggested for improvement of grain yield and its component traits. However for establishment of superior varieties, reciprocal recurrent selection is suggested.

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GENETIC DIVERGENCE IN SUNFLOWER

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ABSTRACT

Fifty four genotypes of sunflower were studied for their genetic divergence by D^2 analysis for a set of divergent characters nambely seed yield and five other metric traits. The genotypes were grouped into seven clusters. Based on the intercluster distance and cluster mean for various character, potential parent were identified from clusters VII, VI and V for hybridisation programme. Head diameter, seed yield and days to 50% flowering contributed more towards genetic divergence.

KEY WORDS : Sunflower, Genetic Divergence

Sunflower is one of the potent oil seed corps. Hybrid development programme is much of value for increasing the edible oil production in the country. Asthana and Pandey (1980) reported that the geographic diversity may not necessarily be related with genetic diversity. Therefore, the selection of varieties for hybridisation should be based on genetic diversity rather than geographic diversity. Many sunflower varieties developed for cultivation resulted in poor yield in vertisols under rainfed condition. To get higher yield level, the hybrids are used now-a-days. Since, the hybrid vigour depends upon the parent's divergence, it is necessary to identify diverse parents for hybridisation, multivariate analysis by means of mahalonobis D^2 statistic has been used in several crops. It is a powerful tool in quantifying the degree of genetic divergence among parents.