Madras Agric. J., 86(7-9): 443 - 446 July - September 1999
https://doi.org/10.29321/MAJ.10.A00642

INHERITANCE OF METRIC TRIATS IN PEARL MILLET

N. RAMAMOORTHI and R. GOVINDARASU

Pandit Jawaharlal Nehru College of Agriculture & Research Institute.
Karaikal -609 603.

ABSTRACT

The P_1, P_2, F_1, F_2, BC_1 and BC_2 generations of five pearl millet crosses were studied for seven metric traits. The additive dominance model was adequate for three crosses for number of tillers and earhead length, and two crosses in each of leaf length and leaf breadth. An epistatic digenic model was assumed for other crosses. Heterosis breeding is suggested for improvement of all traits. Duplicate epistasis played 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 : Inheritance, Duplicate, Reciprocal recurrent selection

The efficiency of selection for the improvement of metric traits depends upon the nature and magnitude of gene efforts involved in the inheritance of a particular trait. In pearl millet, 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 its component traits using a set of six generations derived from five crosses.

MATERIALS AND METHODS

Five cross combinations *viz.*, ICMPES 11 x ICMPES 15, ICMPES 15 x 81 B, ICMPES 11 x 732B, ICMPES11 x 81 B and ICMPES 11 x 732 B were used for the study. Six generations viz., P_1, P_2, F_1, F_2, BC_1 and BC_2 of each cross were sown in randomised block design with four replications at National Pulses Research Centre, Vamban during 1995. The spacing was 45 cm between rows and 15 cm within the rows. The total number of population raised in each replication was 25 in parents, F_1 and backcross generations and 270 in F_2. Observations on plant height, number of tillers, earhead, length, earhead breadth, leaf length, leaf breadth and grain yield per plant were recorded on 20 plants each on P_1, P_2 and F_1, 250 plants in F_2 and 75 plants each in BC_1 and BC_2 generations. The means and variance of means of seven metric traits were computed for each generation of all the crosses. The genetic effects were estimated using the methods suggested by Mather and jinks (1971) and Jinks and Jones (1958).

RESULTS AND DISCUSSION

The scaling test 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 ICMPES 11 x 81 B, ICMPES 11 x 732 B and ICMPES 11 x 81 B for Number of tillers and earhead length, ICMPES 15 x 81 B and ICMPES 11 x 732 B for earhead breadth, ICMPES 11 x ICMPES 15 and ICMPES 11 x 81 B for leaf length and ICMPES 11 x ICMPES 15 for leaf 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, dominance effect (h) was predominant in all the seven characters. It was also reported by Prem sagar (1970) as well. As the dominance effect was found to be pronounced, heterosis breeding is suggested for improvement of grain yield and its component traits. Among the interaction components, the fixable additive x additive interaction effect [i] was predominant in plant height, earhead length and grain yield per plant. The additive X dominance effect [j] was important for plant height earhead

Table 1. Scaling test and genetic effects for six traits in Pearl Millet

Character	Scales			Genetic effects						Type epistasis
	A	B	C	(m)	(d)	(h)	(i)	(j)	(l)	
Plant height										
1. ICMPES 11 x	-	-	*	172.8±**	5.4±	-76.7±	-47.7±**	-9.3±	57.3±*	D
ICMPES 15				18.9	3.6	48.2	18.5	14.5	31.8	
2. ICMPES 15 x	-	*	*	116.7±**	14.6±**	53.4±	-11.6±**	-22.5±	-14.4±	D
81 B				16.9	3.0	41.4	16.6	11.7	27.1	
3. ICKMPES 11 x	-	-	*	163.9±**	21.7±**	-84.6±*	-65.9±**	-6.2±	58.3±*	C
732 B				20.1	2.9	47.4	19.9	12.3	28.9	
4. ICMPES 11 x	-	*	-	61.3±*	19.9±**	196.5±**	49.1±**	-39.1±**	-117.2±**	D
81B				17.0	3.2	39.8	16.7	10.5	25.1	
5. ICMPES 11 x	*	*	*	-96.7±**	27.1±**	439.2±**	200.1±**	24.7±*	-262.1±**	D
732B				18.7	3.1	43.8	18.4	11.5	26.1	
No.of tillers										
1. ICMPES 11 x	*	*		3.8±**	0.005±	-5.8±**	-2.1±	0.19±	4.75±**	C
ICMPES 15				1.3	0.129	2.7	1.3	0.47	1.56	
2. ICMPES 15 x	-	-	-	1.9±**	0.10±	-1.02±	-	-	-	-
81B				0.6	0.16	1.00				
3. ICMPES 11 x	-	-	-	1.9±**	0.02±	-1.32±	-	-	-	-
732 B				0.6	0.15	1.39				
4. ICMPES 11 x	-	-	-	0.6±	0.10±	2.82±				
81 B				0.8	0.13	1.88				
5. ICMPES 11 x	-	-	*	0.7±	0.01±	1.31±	0.90±	0.80±	0.18±	C
732 B				0.6	0.12	1.55	0.56	0.50	1.07	
Earhead length										
1. ICMPES 11 x	*	*	-	33.8±**	0.4±	-33.3±**	-13.1±**	0.6±	22.5±*	D
ICMPES 15				3.9	0.6	10.7	3.9	3.3	7.1	
2. ICMPES 15 x	-	-	-	21.4±**	2.4±**	-4.9±	-	-	-	-
81 B				3.6	0.6	8.6				
3. ICKMPES 11 x	-	-	-	25.9±**	2.6±**	-14.9±	-	-	-	-
732 B				4.4	0.6	10.1				
4. ICMPES 11 x	-	-	-	17.6±**	1.9±**	3.0±	-	-	-	-
81B				3.2	0.6	7.9				
5. ICMPES 11 x	-	-	*	2.7±	2.2±**	47.9±**	20.8±**	2.3±	-23.6±**	D
732B				3.4	0.7	8.4	3.3	2.4	5.5	

Character	Scales			Genetic effects						Type
	A	B	C	(m)	(d)	(h)	(i)	(j)	(l)	epistasis
Earhead breadth										
1. ICMPES 11 x	*	*	*	4.3±**	0.09±	-8.7±**	-2.8±**	1.9±**	6.6±**	D
ICMPES 15				0.3	0.007	0.7	0.3	0.2	0.5	
2. ICMPES 15 x	-	-	-	1.9±**	0.05±	-1.06±	-	-	-	-
81B				0.3	0.09	0.78				
3. ICMPES 11 x	-	-	-	1.5±**	0.09±	0.16±	-	-	-	-
732 B				0.4	0.09	0.76				
4. ICMPES 11 x	*	*	*	1.4±**	0.4±	-0.5±	0.12±	0.20±	0.68±	D
81 B				0.3	0.08	0.7	0.26	0.22	0.43	
5. ICMPES 11 x	-	*	*	0.8±**	0.01±	0.8±	0.8±**	0.3±	0.07±	C
732 B				0.3	0.07	0.6	0.2	0.2	0.53	
leaf length										
1. ICMPES 11 x	-	-	-	50.9±**	1.45±	-3.5±	-	-	-	-
ICMPES 15				8.1	1.3	20.9				
2. ICMPES 15 x	*	-	-	46.9±**	5.9±**	-7.2±	-3.2±	-9.5±**	11.8±	
81 B				7.2	1.3	17.2	7.0	4.7	11.4	
3. ICKMPES 11 x	-	*	-	30.9±**	9.7±**	36.9±*	9.1±	-12.2±**	-16.6±	D
732 B				7.5	1.5	17.6	7.3	4.8	11.7	
4. ICMPES 11 x	-	-	-	46.9±**	4.5±**	-7.7±	-	-	-	-
81B				5.8	1.1	14.1				
5. ICMPES 11 x	-	-	*	20.2±**	8.2±**	73.3±**	28.3±**	0.3±	-38.4±**	D
732B				6.1	1.5	15.4	5.9	4.8	10.3	
leaf breadth										
1. ICMPES 11 x	-	-	-	2.9±**	0.05±	-1.9±	-	-	-	-
ICMPES 15				0.5	0.09	1.2				
2. ICMPES 15 x	*	-	-	2.2±*	0.3±**	-1.1±	-0.2±	-0.08±*	0.9±	D
81B				0.9	0.1	1.9	0.9	0.3	1.1	
3. ICMPES 11 x	*	-	*	1.4±**	0.3±**	1.1±	0.6±	-0.6±	0.06±	C
732 B				0.6	0.1	1.4	0.6	0.4	0.9	
4. ICMPES 11 x	*	-	-	2.4±**	0.3±**	-1.6±	-0.3±	-0.7±	1.2±	D
81 B				0.5	0.1	1.1	0.4	0.3	0.7	
5. ICMPES 11 x	*	-	*	0.5±	0.3±**	2.4±*	1.6±**	-0.5±	-0.8±	D
732 B				0.4	0.1	1.1	0.4	0.3	0.7	

Character	Scales			Genetic effects						Type epistasis
	A	B	C	(m)	(d)	(h)	(i)	(j)	(l)	
Grain yield per plant										
1. ICMPES 11 x	*	-	*	9.6±**	2.3±**	50.3±**	18.5±**	6.3±**	-27.8±**	D
ICMPES 15				3.2	0.3	7.1	3.2	1.4	4.2	
2. ICMPES 15 x	*	-	*	33.4±**	1.8±**	12.9±*	-9.6±**	-28.4±**	2.9±	C
81 B				3.3	0.2	6.9	3.3	0.9	3.9	
3. ICKMPES 11 x	*	-	-	17.2±**	3.2±**	19.9±**	5.3±**	1.4±	-10.1±**	D
732 B				2.1	0.3	5.1	2.1	1.4	3.4	
4. ICMPES 11 x	*	*	-	14.7±**	4.2±**	35.8±*	11.6±**	-5.6±**	-21.1±**	D
81B				4.6	0.3	9.4	4.4	1.4	5.1	
5. ICMPES 11 x	-	-	*	21.7±**	5.6±**	18.9±**	3.2±	-1.4±	-1.7±	D
732B				2.2	0.3	5.2	2.2	1.3	3.1	

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

length, earhead breadth and grain yield in one cross each. The dominant x dominant effect [l] was predominant in most of the crosses for plant height, earhead length 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 pearlmillet.

In majority of the crosses the [h] and [l] effects had opposite signs for all the traits. These two effects had similar signs in only one cross in different traits except for number of tillers. Therefore duplicate type 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 the characters studied. However, predominant 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

REFERENCES

JINKS. and JONES. R.M. (1958). Estamation of the components of heterosis. **Genetics 43:** 223-224

MATHER, K. and JINKS, J.L. (1971). **Biometrical** Genetics. Chapman and Hall ltd., London.

PREM SAGAR (1970). Inheritance of Plant height in Pearlmiller. **Indian J. Genet., 50:** 233-239.

VIRK., S.S. (1988). Biometrical analysis in Pearlmillet-a reivew. **Crop Improv., 15:** 1-29.

(Received : November 1997 Revised : August 1998)