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Short Communication

Generation means analysis for grain yield and its components in maize (*Zea mays* L.)

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Generation means analysis of three crosses, CML56 × CML49, CML85 × CML42 and CML39 × CML14 involving six inbred lines of maize was carried out in respect of grain yield and its component characters. Six generation viz; P_1, P_2, F_1, F_2, BC_1, and BC_2 of each of three crosses were separately grown in compact family block design with three replications during kharif 1997 in the farm of Birsa Agricultural University, Ranchi. The net plot size was of 5m. length of two rows each for P_1, P_2, F_1, BC_1, and BC_2 and of four rows for F_2 generation. The recommended inter row spacing of 70 cm. and intra row spacing of 25 cm. was maintained. Observation on grain yield (g/plant), days to tasseling, days to maturity, plant height, ear length, ear girth, kernel rows/ear, kernels/row, kernels/ear and 100-grain weight were recorded randomly on ten plants from both the parental generation (P_1 and P_2) and F_1's, 20 plants from back cross generations (BC_1 and BC_2) and on 50 plants from F_2 generation from each plot. The scaling tests A, B and C [1] and joint scaling test [2] were computed for all the ten characters in three crosses to test the adequacy of the additive dominance model. The gene effects and interactions for each characters were estimated after Hayman [3].

Out of three scaling test at least one or two scale and joint scaling test were found significant in all the three crosses for most of the characters. This indicated the presence of epistatic/digenic interactions [4, 5].

The estimate of mean (m) was highly significant for all the characters in all the crosses (Table 1). Both additive (d) and dominance (h) gene effects were significant in respect of grain yield, days to tasseling, days to maturity, plant height, ear length, ear girth and kernels/ear in the cross CML85 × CML42 and in respect of three characters viz; plant height, days to maturity and ear girth in the cross CML56 × CML49 and only two characters i.e. plant height and days to maturity in the cross CML39 × CML14. The additive and dominance gene effects were significant only for plant height and days to maturity in all the three crosses. The dominance component (h) was significant and greater in magnitude than the additive effect (d) for most of the traits in all the three crosses. This indicated predominant role of dominance gene action in controlling the above traits. Importance of the dominance gene effects in maize has been reported in the inheritance of plant height, ear length, ear girth and grain yield [4], ear diameter and kernel rows/ear [5], for 100-grain weight [6] and for maturity [7].

Among the digenic interaction effects, additive × additive (i) and dominance × dominance (l) interaction were significant for most of the characters. The interactions (l) was negative and greater in magnitude than (i) for most of the characters in all the three crosses. Importance of epistatic effect in the inheritance of ear length, kernel rows/ear, kernels/row and 100-grain weight has also been reported [6]. Epistatic gene action was relatively more important than additive gene effect but less important than the dominance gene effect for plant height, ear length, ear girth, kernel rows/ear and seed yield [4]. All the three epistatic interactions were observed to be significant for plant height and ear length in the cross CML56 × CML49, for grain yield and 100-grain weight in the cross CML85 × CML42 and for days to tasseling and ear girth in the cross CML39 × CML14. The magnitude of the additive × additive (i) and dominant × dominant (l) interactions was more than the magnitude of additive × dominance (j) for most of the characters. Duplicate gene action was observed for most of the characters which indicated hinderance in selection improvement. In this situation reciprocal recurrent selection is likely to be useful for the effective utilization of both type additive and non- additive gene actions simultaneously [8].

Table 1. Genetic components of generation means in three maize crosses for yield and its components

Cross	Genetic components						Type of interaction
	(m)	(d)	(h)	(i)	(j)	(l)	
Grain yield							
CML56 × CML49	96.9 ± 2.4**	3.5 ± 3.2	135.2 ± 12.5**	70.2 ± 11.9**	3.1 ± 3.6	−112.9 ± 18.1**	D
CML85 × CML42	61.1 ± 1.5**	11.7 ± 2.9**	98.3 ± 8.8**	32.2 ± 8.4**	13.3 ± 3.3**	63.2 ± 14.2**	C
CML39 × CML14	69.0 ± 1.7**	−0.9 ± 4.8	179.4 ± 12.2**	122.2 ± 11.9**	5.4 ± 5.1	−160.3 ± 21.2**	D
Plant height							
CML56 × CML49	121.2 ± 1.7**	−10.8 ± 2.8**	60.0 ± 8.9**	39.8 ± 8.7**	−9.0 ± 2.9**	−58.7 ± 13.3**	D
CML85 × CML42	118.3 ± 1.4**	−12.0 ± 2.8**	79.9 ± 8.2**	60.8 ± 7.9**	−1.9 ± 3.2	−61.4 ± 13.1**	D
CML39 × CML14	113.9 ± 1.7**	−13.4 ± 2.2**	64.3 ± 8.4**	42.2 ± 8.2**	3.4 ± 2.6**	−37.3 ± 11.8**	D
Days to tasseling							
CML56 × CML49	64.4 ± 0.5**	0.2 ± 0.7	−14.7 ± 2.5**	−10.5 ± 2.4**	−0.3 ± 0.8	12.9 ± 3.6**	D
CML85 × CML42	64.0 ± 0.5**	−3.2 ± 0.6**	−12.4 ± 2.4**	−8.1 ± 2.4**	−0.1 ± 0.6	1.2 ± 3.2	-
CML39 × CML14	63.5 ± 0.5**	−0.1 ± 0.5**	−18.0 ± 2.1**	−12.7 ± 2.1**	−1.5 ± 0.6**	12.9 ± 2.9**	D
Days to maturity							
CML 56 × CML 49	108.3 ± 0.5**	2.0 ± 0.6**	−11.7 ± 2.3**	−7.9 ± 2.2**	0.0 ± 0.0	8.3 ± 3.1**	D
CML85 × CML42	106.4 ± 0.6**	10.8 ± 2.8**	−1.7 ± 2.8	−3.4 ± 0.7**	−11.3 ± 3.7**		C
CML39 × CML14	106.7 ± 0.6**	1.6 ± 0.5**	−14.8 ± 2.5**	−7.9 ± 2.5**	−0.8 ± 0.6	6.3 ± 3.3	D
Ear length							
CML56 × CML49	13.5 ± 0.3**	−0.7 ± 0.4	6.5 ± 1.4**	4.5 ± 1.4**	−1.3 ± 0.5**	−7.6 ± 2.1**	D
CML85 × CML42	13.0 ± 0.3**	0.9 ± 0.4*	5.9 ± 1.3**	3.2 ± 1.3*	0.8 ± 0.4	−1.6 ± 1.9	-
CML39 × CML14	13.2 ± 0.2**	−0.2 ± 0.4	8.2 ± 1.3**	4.3 ± 1.2**	0.4 ± 0.5	−4.2 ± 2.1*	D
Ear girth							
CML56 × CML49	4.2 ± 0.1**	−0.2 ± 0.1*	1.8 ± 0.3**	1.2 ± 0.3**	−0.1 ± 0.1	−1.9 ± 0.4	D
CML85 × CML42	3.7 ± 0.1**	0.2 ± 0.1**	1.4 ± 0.3**	0.9 ± 0.3**	0.1 ± 0.1	−0.1 ± 0.4	-
CML39 × CML14	3.8 ± 0.1**	0.1 ± 0.1	2.7 ± 0.2**	1.9 ± 0.2**	0.3 ± 0.1**	−2.5 ± 0.4**	D
Kernel rows/ear							
CML56 × CML49	13.3 ± 0.2**	−0.6 ± 0.3	4.62 ± 1.1**	2.7 ± 1.0**	−0.7 ± 0.4*	−3.1 ± 1.7	D
CML85 × CML42	12.3 ± 0.2**	−0.5 ± 0.4	5.2 ± 1.0**	2.4 ± 1.0*	−0.2 ± 0.4	−0.1 ± 1.7	-
CML39 × CML14	12.3 ± 0.2**	0.3 ± 0.4	7.5 ± 1.1**	5.4 ± 1.1**	0.6 ± 0.4	−7.5 ± 1.8**	D
Kernels/row							
CML56 × CML49	26.8 ± 0.5**	1.3 ± 1.0	22.6 ± 2.9**	15.1 ± 2.8**	0.4 ± 1.1	−26.4 ± 4.8**	D
CML85 × CML42	23.7 ± 0.4**	−1.2 ± 1.1	25.9 ± 2.8**	19.1 ± 2.7**	−0.0 ± 1.1	−19.9 ± 4.8**	D
CML39 × CML14	24.8 ± 0.4**	−0.1 ± 1.0	20.0 ± 7.4**	12.5 ± 2.6**	0.4 ± 1.1	−16.4 ± 4.6**	D
Kernels/ear							
CML56 × CML49	362.2 ± 8.9**	2.1 ± 13.7	384.8 ± 46.3**	242.3 ± 45.0**	−11.9 ± 15.0	−406.6 ± 70.0**	D
CML85 × CML42	291.0 ± 5.4**	−36.6 ± 16.8*	471.7 ± 42.1**	298.7 ± 39.9**	−14.2 ± 17.9	−213.6 ± 75.4**	D
CML39 × CML14	305.1 ± 7.1**	4.1 ± 16.4	444.6 ± 45.3**	291.1 ± 43.3**	15.0 ± 18.1	−373.9 ± 76.4**	D
100-grain weight							
CML56 × CML49	27.2 ± 0.4**	0.5 ± 0.7	7.7 ± 2.2**	0.4 ± 2.1	1.5 ± 0.7*	−2.4 ± 3.3	-
CML85 ± CML42	21.9 ± 0.4**	4.6 ± 0.8**	−0.9 ± 2.3	−7.1 ± 2.2**	3.6 ± 0.8**	23.9 ± 3.7**	D
CML39 × CML14	23.0 ± 0.4**	−0.4 ± 0.8	20.6 ± 2.3**	14.9± 2.2**	0.9 ± 0.8	−20.2 ± 3.6**	D

C = Complementary, D = Duplicate

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