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Heterosis Studies in Single Cross Hybrids of Maize (*Zea mays* L.) for Yield and Yield Attributing Traits under Rice Fallow System

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ABSTRACT

In the present investigation, forty five F_1 single cross hybrids developed through crossing ten inbred lines in a half diallel fashion were evaluated under *rice fallow* situation. Maximum heterosis was obtained for yield which ranged from 37.89 (CM 210 × BML 6) to 202.12 (CM 120 × CM 131) per cent. The hybrids CM 120 × CM 131, CM 131 × BML 10 and CM 120 × BML 13 showed highest heterobeltiosis for grain yield per plant and also showed higher herterobeltiosis for plant height, ear girth, number of kernels per row and 100- kernel weight coupled with high *per se* performance. Hence, these crosses could be exploited to a maximum extent in future heteosis breeding programmes to improve the yield under *rice fallow* system.

Key words : Heterosis, Rice fallow maize.

Maize is the most important food crop in the world and it occupies a prominent position in global agriculture after wheat and rice. Maize is gaining popularity at a fast rate due to its increasing demand particularly as livestock feed besides being used as food for human and also as an industrial raw material. Therefore, there is a dire need to increase the maize production and productivity through the development of new hybrids exploring suitable non-conventional production systems. In Andhra Pradesh, of late *rice fallow* maize production has become popular and showing promising yield and returns to farmers especially in krishna godavari, narth coastal and central telangana zones. Hence, there is an immediate need to develop hybrids to suite the demands of the *rice fallow* maize production system. For any hybrid development programme heterosis studies is a valuable tool to determine superior hybrid combinations, for further use in hybrid breeding programmes. Therefore, heterotic studies can prove the basis for the exploitation of valuable hybrid combinations in the future breeding programme and their commercial exploitation. While selection of superior hybrids, a breeder must consider not only the *per se* performance of the hybrid but also the predictors of single cross hybrid value (or) heterosis between the parental inbred lines, which will increase the efficiency of hybrid breeding programme (Betran *et al.*, 2003). Hence, the present investigation was under taken to assess the nature and magnitude of heterosis for yield and yield contributing traits between the recycled inbred lines aimed for grain yield improvement under *rice fallow* system.

MATERIAL AND METHODS

The experimental material comprised ten inbred lines of maize *viz.*, CM 119, CM 120, CM 131, CM 133, CM 210, CM 211, BML 6, BML 7,BML 13 and BML 10, which were mated in a half diallel fashion to generate forty five cross combinations during *kharif,* 2010 at Sri Venkateswara Agricutural College farm, Tirupati. Ten parents and forty five F_1 single cross hybrids were sown in RBD with three replications separately in the contigenous experiments under *rice fallow* system during *rabi*, 2010-11. Each entry was planted in a single row plot of 4 m length and the row-to-row and plant to plant distance was maintained at 75 and 20 cm, respectively. Standard plant protection measures were adopted to minimize the effect of insect pests and diseases. The data were recorded on randomly selected five competitive plants for plant height, ear length, ear girth, number of kernel rows per ear, number of kernels per row, 100-kernel weight and grain yield per plant. However, the data for days to 50 per cent tasseling, days to 50 per cent silking, anthesis-silking interval and days to maturity were recorded on plot basis. The data were subjected to preliminary analysis of variance (Panse and Sukhatme, 1985) and heterotic effects were estimated by the method suggested by Hallauer and Miranda (1988).

RESULTS AND DISCUSSION

Analysis of variance (Table 1) revealed highly significant differences among the F_1's for all the characters studied except number of kernel rows per ear. The *per se* performance and better parent heterosis for grain yield per plant and its components were presented in Table 2. The *per se* performance for days to 50% tasselling ranged from 49.67 (CM 120 × CM 133) to 61.67 days (BML 7 × BML 13). Similarly the range varied from 53.00 (CM 120 × BML 10) to 66.33 days (BML 7 × BML 13) for days to 50% silking; 2.33 (CM 120 × BML 7, CM 120 × BML 10 and CM 131 × BML 10) to 5.00 days (CM 119 × BML 7, CM 133 × BML 10 and BML 7 × BML 10) for anthesis-silking interval; 155.56 (CM 131× CM 210) to 228.99 cm (CM 211 × BML 7) for pant height; 88.33 (BML 13 × BML 10) to 105.00 days (CM 211 × BML 7) for days to maturity; 15.69 (CM 210 × BML 6) to 21.01 cm (CM 211 × BML 13) for ear length; 13.27 (CM 131 × BML 13) to 16.33 cm (CM 131 × BML 6) for ear girth; 13.46 (CM 211 × BML 10) to 15.33 (CM 131 × BML 6) for number of kernel rows per ear; 34.33 (CM 210 × BML 10) to 46.70 (CM 211 × BML 7) for number of kernels per row; 24.36 (CM 210 × BML 6) to 34.67 (CM 120 × BML 10) for 100-kernel weight and 88.40 (CM 210 × BML 13) to 146.28 (CM 211 × BML 7) for grain yield per plant.

The better parent heterosis for days to 50% tasselling ranged from -24.37% (CM 120 × CM 133) to -7.65% (CM 120 × CM 133). Similarly the range varied from -22.44% (CM 120 × BML 10) to -3.86% (BML 7 × BML 13) for days to 50% silking; -36.36% (CM 131 × BML 10) to 87.50% (CM 133 × BML 10) for anthesis-silking interval; 8.23% (CM 210 × BML 6) to 64.32% (CM 119 × CM 133) for pant height; -19.34% (CM 119 × CM 131) to -5.15% (CM 211 × BML 6) for days to maturity; 6.54% (CM 210 × BML 6) to 64.45% (CM 120 × BML 13) for ear length; 7.97% (CM 131 × BML 7) to 55.19% (CM 133 × CM 210) for ear girth; -10.96% (CM 211 × BML 10) to 22.46% (CM 120 × CM 210) for number of kernel rows per ear; 32.21% (BML 6 × BML 10) to 124.97% (CM 120 × BML 13) for number of kernels per row; -14.30% (CM 210 × BML 6) to 82.15% (CM 133 × CM 210) for 100-kernel weight and 37.89% (CM 210 × BML 6) to 202.12 (CM 120 × CM 131) for grain yield per plant.

Three crosses *viz.,* CM 120 × CM 133, CM 120 × BML 10 and CM 119 × CM 133 had highest negative heterosis with low *per se* value for days to 50 per cent tasselling and days to 50 per cent silking. Hence, these three crosses could be a good source material in future hybridization programmes aimed for earliness and there by the possibility of developing short duration hybrids. Similarly, the hybrid CM 120 × BML 7 was also recorded the highest negative heterosis coupled with low *per se* performance for the trait anthesis-silking interval. Hence, this cross combination might be fruitful in future line of work to reduce anthesis-silking interval in maize, so as to isolate the genotypes tolerant to moisture stress conditions. Balanos and Edmeades (1993) were also explained the usefulness of reduced anthesis-silking interval in the breeding drought tolerance lines. Likewise, for the trait, days to maturity, the hybrids CM 119 × CM 120, CM 120 × BML 6 and CM 120 × CM 210 showed maximum heterobeltiosis in negative direction besides low *per se* performance and thus indicating that these crosses could be utilized successfully in the future breeding programmes to isolate genotypes which can mature early. In the present results it is pertinent to note that most of the crosses exhibited negative heterosis for days to 50 per cent tasselling, days to 50 per cent silking and days to maturity. Similar findings of negative heterosis were also recorded for days to 50 per cent tasseling by Muraya *et al*. (2006), days to 50 per cent silking and anthesis-silking interval by Yusuf *et al*. (2009) and for days to 50 per cent maturity by Perez- Velasquez *et al*. (1995).

In maize tall types are preferred over dwarf types and hence, positive heterosis is considered to be desirable for plant height (Premalatha and Kalamani, 2010). The crosses CM 119 × CM 133, CM 119 × BML 10 and CM 119 × CM 120 exhibited maximun percentage of heterobeltiosis besides high *per se* performance (Table 2). Further, all the

Table 1. Analysis of variance for yield and yield components in maize.

S.No.	Characters	Source of Variation		
		Replications (df=2)	Genotypes (df=44)	Error (df=88)
1	Days to 50 % tasseling	0.83	31.41**	0.90
2	Days to 50% silking	0.20	36.20**	0.91
3	Anthesis-silking interval	0.54	1.45**	0.54
4	Plant height (cm)	338.34	1084.81**	39.91
5	Days to maturity	2.80	49.25**	1.81
6	Ear length (cm)	2.71	6.14**	1.06
7	Ear girth (cm)	1.60	1.43**	0.60
8	Number of kernel rows per ear	0.90	0.40	0.49
9	Number of kernels per row	13.95	24.76**	4.69
10	100-Kernel weight (g)	4.75	19.86**	3.38
11	Grain yield per plant (g)	71.43	859.77**	105.76

*,** Significant at5% and 1% level, respectively.

hybrids exhibited significant positive heterobeltiosis for plant height, indicating that most of the hybrids showed tall stature. Positive heterosis for the cob features in addition to high *per se* performance is expected to yield better hybrids. For the trait, number of kernel rows per ear, the hybrids CM 120 × CM 210 and CM 210 × BML 13 manifested the highest percentage of positive heterobeltiosis in addition to high mean performance. Similarly, the hybrid *viz.,* CM 120 x BML 13 also exhibited maximum positive heterobeltiosis coupled with high *per se* performance for the trait number of kernels per row. Similar results of high heterosis for this trait were also reported by Sallilari and Hoxa (1998). The estimates of heterosis for ear length revealed that the hybrids CM 120 × BML 13 and CM 210 × BML 13 exhibited highest percentage of heterobeltiosis besides high *per se* performance. Forty four hybrids exhibited significant positive heterobeltiosis for ear length. Likewise, for both the traits *viz.,* ear girth and 100-kernel weight, the hybrids CM 133 × CM 210 and CM 120 × BML 13 and CM 133 × CM 210 and CM 131 × BML 13 exhibited highest heterobeltiosis and also high *per se* performance. Significant positive heterobeltiosis was exhibited by forty two and thirty eight crosses for ear girth and 100-kernel weight, respectively. Similar trend of significant positive heterosis was also observed for ear length by Abdel Moneam *et al.* (2009) and for ear girth and 100-kernel weight by Abhishek (2006).

Rice fallow maize, though restricted to krishna godawari, narth coastal and central telangana zone only, of late, it is gaining most popularity among the farming community in Andhra Pradesh. Hence, there is an immediate need to understand the heterosis pattern of maize under *rice fallow* system and the reports on such studies are very limited. In the present research done in *rice fallow*, the heterosis for grain yield varied from 37.89 per cent (CM 210 × BML 6) to 158.54 per cent (CM 131 × BML 10) and the promising top five crosses identified were *viz*., CM 120 × CM 131, CM 131 × BML 10, CM 120 × BML 13, CM 133 × CM 210 and CM 120 × BML 10 which showed highest heterosis for yield. Out of these, the cross CM 120 × BML 13 also showed low heterosis for days to 50% tasseling, days to 50% silking and days to maturity. Hence, this cross could be utilized for generating heterotic pools for exploiting high yield and ealy lines under *rice fallow* situations. Similarly, out of these five superior

Table 2. *Per se* performance and heterosis over better parent (BP) in F_1's of maize for yield and yield components in *rice fallow* situation.

S. No.	Crosses	DT		DS		ASI		PH (cm)		DM		EL (cm)	
		BP	Mean	BP	Mean	BP	Mean	BP	Mean	BP	Mean	BP	Mean
1	CM 119 × CM 120	-16.24**	55.00	-14.63**	58.33	0.00	3.33	61.59**	202.79	-19.34**	89.33	21.43**	17.09
2	CM 119 × CM 131	-11.60**	53.33	-11.46**	56.67	-9.09	3.33	45.11**	182.10	-11.19**	94.33	12.91*	15.89
3	CM 119 × CM 133	-22.45**	50.67	-21.57**	53.33	-20.00	2.67	64.32**	206.21	-12.01**	95.33	14.48*	16.15
4	CM 119 × CM 210	-14.05**	53.00	-13.92**	55.67	-20.00	2.67	55.44**	195.07	-12.24**	92.00	15.89**	16.31
5	CM 119 × CM 211	-7.65**	60.33	-7.25**	64.00	0.00	3.67	51.57**	226.91	-8.49**	100.67	24.86**	17.58
6	CM 119 × BML 6	-12.50**	58.33	-10.95**	62.33	20.00	4.00	35.65**	210.94	-10.71**	96.33	33.56**	19.67
7	CM 119 × BML 7	-8.67**	59.67	-6.28**	64.67	36.36*	5.00	32.83**	213.19	-15.29**	95.00	27.78**	19.37
8	CM 119 × BML 13	-12.29**	52.33	-11.64**	55.67	0.00	3.33	48.65**	186.55	-10.65**	93.67	22.24**	17.21
9	CM 119 × BML 10	-17.20**	51.33	-15.46**	54.67	0.00	3.33	63.49**	208.73	-10.92**	94.67	31.04**	18.45
10	CM 120 × CM 131	-13.20**	57.00	-11.71**	60.33	-9.09	3.33	53.11**	180.64	-18.44**	90.33	38.86**	18.08
11	CM 120 × CM 133	-24.37**	49.67	-21.95**	53.33	37.50	3.67	57.39**	185.68	-17.54**	91.33	20.43**	16.99
12	CM 120 × CM 210	-22.84**	50.67	-20.49**	54.33	22.22	3.67	36.38**	160.90	-18.74**	90.00	59.38**	18.86
13	CM 120 × CM 211	-11.68**	58.00	-11.11**	61.33	-9.09	3.33	42.42**	213.22	-14.83**	94.33	37.56**	19.03
14	CM 120 × BML 6	-15.50**	56.33	-14.29**	60.00	10.00	3.67	35.25**	210.31	-19.04**	89.67	31.68**	19.40
15	CM 120 × BML7	-19.29**	53.00	-19.81**	55.33	-36.36*	2.33	29.65**	208.08	-15.29**	95.00	21.00**	18.34
16	CM 120 × BML 13	-19.80**	52.67	-19.02**	55.33	-20.00	2.67	43.54**	169.35	-18.14**	90.67	64.45**	19.46
17	CM 120 × BML 10	-22.84**	50.67	-22.44**	53.00	-12.50	2.33	32.88**	169.65	-14.83**	94.33	41.26**	18.23
18	CM 131 × CM 133	-22.45**	50.67	-20.10**	54.33	0.00	3.67	51.49**	171.22	-12.01**	95.33	37.92**	19.46
19	CM 131 × CM 210	-16.76**	51.33	-15.46**	54.67	-9.09	3.33	32.88**	155.36	-14.96**	90.33	57.91**	20.56
20	CM 131 × CM 211	-9.18**	59.33	-9.18**	62.67	-9.09	3.33	35.71**	203.17	-8.49**	100.67	49.07**	20.63
21	CM 131 × BML 6	-18.00**	54.67	-16.67**	58.33	0.00	3.67	21.94**	189.61	-11.33**	95.67	42.57**	21.00
22	CM 131 × BML 7	-13.27**	56.67	-12.56**	60.33	0.00	3.67	27.19**	204.13	-13.21**	97.33	23.86**	18.77
23	CM 131 × BML 13	-16.57**	50.33	-14.58**	54.67	18.18	4.33	63.92**	185.27	-10.56**	95.00	26.01**	16.41
24	CM 131 × BML 10	-10.75**	55.33	-10.82**	59.00	-36.36*	2.33	38.72**	177.11	-11.55**	94.00	38.86**	18.08
25	CM 133 × CM 210	-18.37**	53.33	-15.20**	57.67	44.44*	4.33	48.04**	173.07	-17.55**	89.33	33.14**	18.79
26	CM 133 × CM 211	-17.86**	53.67	-16.43**	57.67	9.09	4.00	33.90**	200.47	-6.37**	103.00	35.13**	19.07
27	CM 133 × BML 6	-19.00**	54.00	-18.57**	57.00	-10.00	3.00	20.53**	187.42	-9.86**	97.67	24.06**	18.27
28	CM 133 × BML 7	-14.80**	55.67	-14.98**	58.67	-18.18	3.00	20.29**	193.07	-14.11**	96.33	30.55**	19.79
29	CM 133 × BML 13	-19.90**	52.33	-17.16**	56.33	20.00	4.00	49.67**	168.71	-11.09**	96.33	20.06**	16.94
30	CM 133 × BML 10	-21.94**	51.00	-17.65**	56.00	87.50**	5.00	34.09**	171.19	-14.78**	92.33	15.14*	16.25
31	CM 210 × CM 211	-9.69**	59.00	-9.66**	62.33	-9.09	3.33	41.18**	211.37	-14.85**	93.67	49.94**	20.75
32	CM 210 × BML 6	-19.00**	54.00	-18.57**	57.00	-10.00	3.00	8.23*	168.30	-16.27**	90.33	6.54	15.69
33	CM 210 × BML7	-21.94**	51.00	-21.26**	54.33	-9.09	3.33	11.07**	178.26	-15.89**	94.33	21.62**	18.43
34	CM 210 × BML 13	-14.05**	53.00	-10.82**	57.67	40.00*	4.67	42.53**	166.64	-8.83**	91.00	64.07**	17.93
35	CM 210 × BML 10	-18.28**	50.67	-14.95**	55.00	44.44*	4.33	25.82**	160.63	-15.00**	90.33	30.92**	16.89
36	CM 211 × BML 6	-14.00**	57.33	-12.38**	61.33	9.09	4.00	41.21**	219.58	-5.15**	104.33	34.56**	19.82
37	CM 211 × BML 7	-14.29**	56.00	-13.53**	59.67	0.00	3.67	42.68**	228.99	-6.38**	105.00	35.01**	20.46
38	CM 211 × BML 13	-17.35**	54.00	-15.94**	58.00	9.09	4.00	37.56**	205.95	-13.94**	94.67	51.87**	21.01
39	CM 211 × BML 10	-15.31**	55.33	-15.94**	58.00	-27.27	2.67	33.23**	199.47	-13.03**	95.67	33.56**	18.48
40	BML 6 × BML 7	-14.00**	57.33	-13.33**	60.67	-9.09	3.33	22.37**	196.40	-9.65**	101.33	26.24**	19.13
41	BML 6 × BML 13	-15.50**	56.33	-14.29**	60.00	10.00	3.67	17.95**	183.42	-11.02**	96.00	30.69**	19.25
42	BML 6 × BML 10	-10.00**	60.00	-8.10**	64.33	30.00	4.33	8.31*	168.42	-9.48**	97.67	35.66**	19.98
43	BML 7 × BML 13	-5.61**	61.67	-3.86**	66.33	27.27	4.67	23.97**	198.97	-14.11**	96.33	23.47**	18.71
44	BML 7 × BML 10	-8.67**	59.67	-6.28**	64.67	36.36*	5.00	28.70**	206.57	-11.43**	99.33	22.26**	18.53
45	BML13 × BML 10	-10.22**	55.67	-8.25**	59.33	10.00	3.67	38.03**	176.22	-16.88**	88.33	37.59**	17.75

*,** Significant at 5 % and 1 % levels, respectively.

DT=Days to 50% tasseling, DS=Days to 50% silking, ASI=Anthesis-silking interval, PH=Plant height, DM= days to maturity, EL=Ear length.

Table 2. Contd…

S. No	Crosses	EG (cm)		NKRPE		NKPR		100KW (g)		GYP (g)	
		BP	Mean	BP	Mean	BP	Mean	BP	Mean	BP	Mean
1	CM 119 × CM 120	32.90**	15.28	10.77*	14.84	52.39**	38.64	35.92**	30.41	68.69**	111.93
2	CM 119 × CM 131	22.87**	14.13	7.33	14.39	41.59**	35.90	12.40	25.15	88.33**	124.96
3	CM 119 × CM 133	30.99**	15.06	-3.73	14.73	43.58**	36.41	11.37	24.92	45.81**	96.75
4	CM 119 × CM 210	24.61**	14.33	10.43*	14.79	48.64**	37.69	39.29**	31.16	72.45**	114.42
5	CM 119 × CM 211	15.08**	15.21	-3.13	14.64	55.82**	39.51	32.91**	29.74	73.86**	115.35
6	CM 119 × BML 6	17.02**	15.01	2.84	15.09	54.11**	44.02	8.07	30.71	96.05**	145.70
7	CM 119 × BML 7	16.70**	15.91	-0.02	14.73	52.61**	43.65	21.49**	31.26	89.25**	142.50
8	CM 119 × BML 13	36.23**	15.67	5.13	14.08	53.90**	39.02	28.56**	28.76	41.73**	94.04
9	CM 119 × BML 10	35.11**	15.64	8.36	14.52	62.90**	41.31	42.74**	31.94	104.01**	135.36
10	CM 120 × CM 131	34.51**	15.07	6.34	14.26	95.75**	41.87	41.45**	31.36	202.12**	125.32
11	CM 120 × CM 133	33.10**	14.40	-3.27	14.80	63.30**	39.25	22.40**	27.14	105.77**	98.67
12	CM 120 × CM 210	34.14**	14.51	22.46**	14.79	111.64**	38.55	30.76**	28.99	144.77**	106.87
13	CM 120 × CM 211	13.04**	14.94	-4.79	14.39	77.95**	42.50	51.89**	33.84	103.27**	127.39
14	CM 120 × BML 6	23.60**	15.85	-6.13	13.77	44.73**	41.34	13.12*	32.15	90.52**	141.59
15	CM 120 × BML7	12.00**	15.27	1.31	14.93	53.68**	43.95	26.93**	32.66	64.67**	123.99
16	CM 120 × BML 13	44.62**	15.64	14.11**	14.53	124.97**	41.50	52.30**	33.77	156.44**	124.63
17	CM 120 × BML 10	30.10**	15.06	5.19	13.73	78.51**	39.24	56.36**	34.67	151.46**	128.93
18	CM 131 × CM 133	34.16**	15.03	-3.29	14.79	46.75**	35.27	51.14**	29.52	93.36**	92.72
19	CM 131 × CM 210	39.87**	15.67	9.12*	14.63	94.27**	41.55	34.33**	26.24	147.08**	107.95
20	CM 131 × CM 211	18.99**	15.73	-5.91	14.22	81.62**	43.38	34.50**	29.97	90.71**	119.09
21	CM 131 × BML 6	27.31**	16.33	4.45	15.33	57.29**	44.93	16.55**	33.12	94.72**	144.71
22	CM 131 × BML 7	7.97	14.72	-2.42	14.38	56.28**	44.70	16.70**	30.03	80.58**	135.97
23	CM 131 × BML 13	18.48**	13.27	11.31**	14.93	89.90**	40.62	63.74**	31.98	135.63**	114.51
24	CM 131 × BML 10	31.28**	15.19	8.33	14.53	78.89**	39.33	26.21**	27.05	158.54**	143.03
25	CM 133 × CM 210	55.19**	15.99	-4.16	14.66	69.76**	40.80	82.15**	30.83	155.87**	111.79
26	CM 133 × CM 211	12.26**	14.84	-4.16	14.66	83.51**	44.10	24.52**	27.74	57.53**	98.73
27	CM 133 × BML 6	17.91**	15.12	-3.68	14.73	49.92**	42.83	-3.67	27.38	79.53**	113.43
28	CM 133 × BML 7	13.13**	15.42	-2.42	14.93	54.38**	44.15	21.96**	31.38	94.13**	146.18
29	CM 133 × BML 13	39.31**	14.35	-1.35	15.09	60.90**	38.67	61.30**	30.58	119.21**	106.53
30	CM 133 × BML 10	19.44**	13.82	-3.57	14.75	50.15**	36.09	29.07**	27.66	67.05**	92.42
31	CM 210 × CM 211	14.50**	15.13	-2.14	14.79	68.82**	40.32	35.10**	30.10	98.02**	124.10
32	CM 210 × BML 6	8.78	13.95	0.66	14.77	38.62**	39.60	-14.30**	24.36	37.89**	102.48
33	CM 210 × BML7	15.33**	15.72	-0.50	14.66	39.25**	39.83	22.71**	31.57	68.41**	126.81
34	CM 210 × BML 13	48.08**	14.69	17.78**	14.99	104.82**	37.78	46.27**	27.73	81.91**	88.40
35	CM 210 × BML 10	22.41**	14.17	12.59**	14.69	56.15**	34.33	56.40**	33.52	144.48**	135.26
36	CM 211 × BML 6	21.39**	16.04	-3.46	14.59	35.47**	38.70	4.11	29.59	62.48**	120.75
37	CM 211 × BML 7	18.41**	16.14	-4.15	14.49	63.29**	46.70	28.01**	32.94	94.28**	146.28
38	CM 211 × BML 13	15.33**	15.24	-2.60	14.72	71.46**	40.95	43.24**	31.91	98.64**	124.49
39	CM 211 × BML 10	8.45	14.33	-10.96**	13.46	73.89**	41.53	17.94**	26.28	84.80**	115.82
40	BML 6 × BML 7	10.93*	15.12	-2.60	14.35	48.51**	42.47	7.59	30.58	65.17**	124.37
41	BML 6 × BML 13	26.64**	16.24	1.39	14.88	45.17**	41.47	12.33*	31.92	49.03**	110.76
42	BML 6 × BML 10	20.92**	15.51	-1.91	14.39	32.21**	37.77	7.54	30.56	94.77**	144.75
43	BML 7 × BML 13	11.12*	15.15	-4.57	14.06	44.11**	41.22	26.29**	32.49	41.56**	106.59
44	BML 7 × BML 10	12.10**	15.28	-2.31	14.39	55.12**	44.36	27.46**	32.80	87.52**	141.20
45	BML13 × BML 10	23.65**	14.31	13.13**	14.76	67.31**	36.78	28.09**	27.45	81.99**	100.68

*,** Significant at 5 % and 1 % levels, respectively.
EG=Ear girth, NKRPE=Number of kernel rows per ear, NKPR=Number of kernels per row, 100-KW=100-Kernel weight, GYP=Grain yield per plant.

heterotic hybrids the hybrids, CM 120 × BML 13, CM 133 × CM 210 and CM 120 × BML 10 showed high heterosis for important yield and yield contributing characters. Hence, these crosses could be exploited to improve yield under *rice fallow* situation. Similarly, Dornescu (1977) and Beck *et al*. (1990) also reported greater heterosis for grain yield followed by varying degrees of heterosis for various yield components.

In conclusion, the magnitude of heterosis exhibited in the present investigation indicated that there is ample scope for the exploitation of heterosis that exists in the present material. Further, it could be recommended that F_1 hybrid approach is likely to be more appropriate, more precise and quickest way for the construction of crop ideotype suitable for *rice fallow* situation in order to get a quantum jump in the maize productivity levels. The hybrids CM 120 × BML 13, CM 133 × CM 210 and CM 120 × BML 10 could be exploited under *rice fallow* situation since these hybrids showed high heterosis coupled with high *per se* performance for yield and important yield attributes.

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