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STUDY ON ESTIMATION OF HETEROSIS FOR HYBRIDS DERIVED DOUBLE HAPLOID (DH) LINES IN MAIZE (*ZEA MAYS* L.)

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ABSTRACT

This study evaluated 100 maize hybrids developed through Line × Tester (L×T) mating design during *kharif* and *rabi* 2024-25 at the College of Agriculture, Bheemarayanagudi. The hybrids, generated by crossing newly developed double haploid lines with genetically diverse testers, were assessed along with four standard checks (RCRMH-2, RCRMH-4, DKC9133 and NK6240) in an alpha lattice design to estimate heterosis for grain yield and component traits. Analysis of variance for 11 quantitative traits revealed highly significant variation among genotypes and significant L×T interaction effects, indicating substantial genetic variability and predominance of non-additive gene action. Lines contributed more to total hybrid variance than testers across all traits studied. The hybrid DH250 × CML451 recorded significantly highest grain yield (87.98 q/ha) as compared to best standard check RCRMH-4 (63.05 q/ha) followed by DH256 × CML451 (87.08 q/ha) and DH250 × ZL153493(86.46 q/ha). The hybrid DH250 × CML451 exhibited highest significant standard heterosis (39.54 %) over best check RCRMH-4 followed by DH256 × CML451(38.12 %) and DH250 × ZL153493(37.14). Several hybrids demonstrated superior performance for yield-contributing traits. The consistent superiority of top performing hybrids across environments confirms their strong hybrid vigour and commercial potential for high yielding maize hybrid development programs.

***Keywords*:** maize hybrids, heterosis, double haploid lines, grain yield.

Introduction

Maize (*Zea mays* L.) is a globally significant cereal crop, ranking third after rice and wheat in its contribution to food and nutritional security. Among major cereals, maize exhibits the highest productivity with an average grain yield of 6.5 metric tonnes per hectare, compared to wheat (3.9 metric tonnes per hectare) and rice (4.7 metric tonnes per hectare) (Anon., 2024a). This high yield potential, coupled with its adaptability and resource efficiency, makes maize crucial for addressing food demands in both developed and developing nations.

Botanically, maize is a diploid species (2n=2x=20) known as the "Queen of Cereals" due to its superior physiological and photosynthetic efficiency. As a C_4 plant, it exhibits remarkable adaptability across diverse agro-climatic zones, earning it the title "Miracle Crop" (Malhotra, 2017). Globally, maize is cultivated on approximately 199 million hectares, producing 1129.2 million tonnes with an average productivity of 5962 kg per hectare (Anon., 2024b). In India, it occupies 11.24 million hectares with a production of 37.66 million tonnes and productivity of 3351 kg per hectare. Karnataka contributes significantly with 1.76 million hectares, producing 5.36 million tonnes at 3043 kg per hectare (Anon., 2024c).

Heterosis breeding has been central to achieving higher maize yields. The term "heterosis," proposed by Shull (1914), refers to the superiority of F_1 hybrids over their parents, resulting from dominance and epistatic gene interactions (Aminu, 2013). An important advancement in maize breeding is Double Haploid (DH) technology, which enables rapid production of genetically uniform lines from segregating populations. The *in vivo* DH method is widely adopted in large scale commercial breeding due to its reliability and efficiency (Chang and Coe, 2009). Initially successful in Europe, North America and China (Molenaar and Melchinger, 2019), collaborative efforts by CIMMYT and the University of Hohenheim have facilitated DH technology adoption in tropical regions, leading to the release of numerous high yielding tropical maize hybrids in Africa (Beyene *et al.,* 2018), demonstrating its transformative impact on modern maize breeding programs.

Material and Methods

The present study on "Estimation of heterosis for hybrids derived double haploid (DH) lines in maize (*Zea mays* L.)" was carried out during *kharif* and *rabi* 2024-25 at the College of Agriculture, Bheemarayanagudi (16°44′01″N, 76°47′57″E, 468 m MSL). The experimental material comprised of 50 DH lines crossed with two testers in a Line × Tester design (Kempthorne, 1957), resulting in 100 single-cross hybrids during *kharif* 2024. These hybrids were evaluated along with four standard checks (RCRMH-2, RCRMH-4, DKC9133 and NK6240) during *rabi* 2024-25 in an alpha lattice design with two replications to estimate heterosis for yield and yield related traits.

Hybridization involved manual crossing, where female parents were detasseled before anthesis and bagged prior to silk emergence. Tassels of male parents were bagged a day before pollination and pollen collected in the morning was carefully applied to receptive silks to prevent contamination. Standard agronomic practices recommended by the University of Agricultural Sciences, Raichur, were followed for raising the crop.

Pre-harvest observations included days to 50 per cent anthesis, days to 50 per cent silking, plant height (cm) and ear height (cm). Post-harvest observations *viz.,* cob length (cm), cob girth (cm), number of kernel rows per cob, number of kernels per row, shelling per cent (%), 100-grain weight (g) and grain yield (q/ ha) were recorded.

Results and Discussion

Analysis of variance for heterosis

The analysis of variance conducted for 11 quantitative traits, including days to 50 per cent anthesis, days to 50 per cent silking, plant height, ear height, cob length, cob girth, number of kernel rows per cob, number of kernels per row, shelling per cent, 100-grain weight and grain yield, revealed highly significant variation among genotypes (table 3) indicating the presence of sufficient genetic variability for effective selection (Bhat *et al.*, 2021; Yousaf *et al.*, 2023).

Mean performance of hybrids and estimates of standard heterosis for yield and yield related traits

The evaluation of 100 hybrids for grain yield and yield related traits revealed significant variability among the hybrids. The hybrids DH190 × CML451, DH256 × CML451 and DH256 × CML451 and DH256 × CML451 were the earliest to reach 50 per cent anthesis, while hybrid *viz*., DH229 × CML451, DH238 × ZL153493 and DH252 × CML451, were late flowering. The hybrids, DH189 × CML451, DH190 × CML451 were earliest to reach 50 per cent silking, while DH79 × CML451, DH205 × ZL153493, DH208 × CML451, DH212 × ZL153493, DH229 × CML45, DH238 × ZL153493 and DH252 × CML451 were the crosses to mature late.

Among the hybrids DH241 × ZL153493 recorded the highest height, while the shortest was DH222 × CML451. Ear height was recorded highest in DH241 × ZL153493. The longest cob was found in DH94 × ZL153493 and DH212 × ZL153493 hybrids exhibited the shortest cob. The cob girth was highest in DH202 × CML451, while DH222 × CML451 exhibited the smallest cob girth. DH197 × CML451 had the maximum number of kernel rows per cob, while DH212 × ZL153493 exhibited the minimum. Among the hybrids DH79 × CML451 recorded the highest number of kernels per row, while DH212 × ZL153493 exhibited the lowest. DH85 × ZL153493 recorded the highest shelling per cent, while the lowest shelling per cent was exhibited by DH232 × CML451. The line DH202 × CML451 exhibited the highest 100-grain weight, while DH218 × CML451 exhibited the lowest 100-grain weight. Grain yield expressed in quintals per hectare is a direct indicator of a hybrid productivity. Among the hybrids DH250 × CML451, DH256 × CML451 and DH250 × ZL153493 recorded the highest grain yield per hectare, while DH222 × CML451 exhibited the lowest.

None of the hybrids showed significant negative heterosis for days to 50 per cent anthesis or silking over the best check RCRMH-4, indicating limited scope for improvement in earliness (Matin *et al.*, 2016). For morphological traits, plant height exhibited higher positive heterosis in DH241 × ZL153493 over the best check RCRMH-4 (Reddy *et al.,* 2018). The hybrids that showed higher heterosis for ear height were DH241 × ZL153493, DH250 × ZL153493 and

DH88 × CML451 (Shamarka *et al.,* 2015).

Yield related attributes exhibited considerable variability and positive heterosis. Hybrids like DH94 × ZL153493, DH71 × ZL153493 and DH82 × CML451 were superior for cob length (Patel *et al.*, 2022). None of the hybrids displayed significant positive heterosis over the best check for cob girth (Mekasha *et al.*, 2022). The lines DH197 × CML451, DH193 × CML451 and DH238 × CML451 showed significant positive heterosis for kernel rows per cob. For kernel number per row, hybrids such as DH79 × CML451, DH217 × ZL153493 and DH93 × CML451 performed well (Sharma *et al.*, 2017). Shelling per cent showed promising heterosis in hybrids including DH85 × ZL153493, DH79 × CML451 and DH202 × CML451 (Nandhitha *et al.*, 2018), while DH202 × CML451, DH75 × CML451, DH198 × CML451 and DH209 × CML451 exhibited positive heterosis for 100-grain weight (Patel *et al.*, 2022).

Most importantly, grain yield exhibited high standard heterosis across checks. The hybrid DH250 × CML451 recorded the highest positive significant heterosis, followed by DH256 × CML451, DH205 × ZL153493 and DH250 × ZL153493 indicating enhanced yield performance (Aswin *et al*., 2020). The consistent superiority of DH250 × CML451 across other checks (47.14 % over RCRMH-2, 51.92 % over DKC9133 and 56.40 % over NK6240) highlights its promising potential for high yielding hybrid development. These hybrids consistently surpassed all standard checks across environments, establishing their strong hybrid vigor and commercial potential.

Conclusion

The present investigation successfully demonstrated the potential of double haploid based breeding approach in developing high yielding maize hybrids with desirable agronomic traits. Heterosis analysis revealed that while earliness traits showed limited scope for improvement, substantial hybrid vigour was expressed for yield and its contributing characters, particularly in crosses involving CML451 as tester. The hybrid DH250 × CML451 consistently outperformed all commercial checks across multiple yield parameters, demonstrating its robust adaptability and stability under varied environmental conditions. Additionally, hybrids such as DH256 × CML451 and DH250 × ZL153493 exhibited comparable yield superiority, indicating the availability of multiple genetic combinations for commercial deployment. The identification of specific hybrids with enhanced performance for individual traits provides valuable genetic resources for further improvement through recombination breeding. These findings validate the efficiency of double haploid technology in accelerating genetic gains and offer practical solutions for developing next generation maize hybrids capable of meeting the increasing food and nutritional demands while ensuring sustainable productivity in diverse agro-ecological regions.

Table 1 : Description of DH lines, testers and checks used in the study with their pedigree.

Sl. No.	DH Lines	Pedigree	Sl. No.	DH Lines	Pedigree
1	DH68	(MH2021-3)@68	31	DH210	(MH2021-5)@210
2	DH69	(MH2021-3)@69	32	DH212	(MH2021-5)@212
3	DH70	(MH2021-3)@70	33	DH214	(MH2021-5)@214
4	DH71	(MH2021-3)@71	34	DH216	(MH2021-5)@216
5	DH75	(MH2021-3)@75	35	DH217	(MH2021-5)@217
6	DH76	(MH2021-3)@76	36	DH218	(MH2021-5)@218
7	DH79	(MH2021-3)@79	37	DH221	(MH2021-5)@221
8	DH82	(MH2021-3)@82	38	DH222	(MH2021-5)@222
9	DH85	(MH2021-3)@85	39	DH227	(MH2021-5)@227
10	DH87	(MH2021-3)@87	40	DH229	(MH2021-5)@229
11	DH88	(MH2021-3)@88	41	DH230	(MH2021-5)@230
12	DH93	(MH2021-3)@93	42	DH231	(MH2021-5)@231
13	DH94	(MH2021-3)@94	43	DH232	(MH2021-5)@232
14	DH97	(MH2021-3)@97	44	DH238	(MH2021-5)@238
15	DH98	(MH2021-3)@98	45	DH241	(MH2021-5)@241
16	DH184	(MH2021-5)@184	46	DH250	(MH2021-5)@250
17	DH189	(MH2021-5)@189	47	DH252	(MH2021-5)@252
18	DH190	(MH2021-5)@190	48	DH254	(MH2021-5)@254
19	DH193	(MH2021-5)@193	49	DH256	(MH2021-5)@256
20	DH197	(MH2021-5)@197	50	DH263	(MH2021-5)@263

21	DH198	(MH2021-5)@198			
22	DH200	(MH2021-5)@200	**TESTERS**		
23	DH202	(MH2021-5)@202	1.	CML451	CIMMYT- Asia, Hyderabad
24	DH203	(MH2021-5)@203	2.	ZL153493	CIMMYT- Asia, Hyderabad
25	DH204	(MH2021-5)@204			
26	DH205	(MH2021-5)@205	**CHECKS**		
27	DH206	(MH2021-5)@206	1.	RCRMH-2	Local check
28	DH207	(MH2021-5)@207	2.	RCRMH-4	Local check
29	DH208	(MH2021-5)@208	3.	DKC9133	Private check
30	DH209	(MH2021-5)@209	4.	NK6240	National check

Table 2: List of single cross hybrids developed through Line × Tester design.

Sl. No.	Hybrids	Sl. No.	Hybrids
1	DH68 × CML451	45	DH241 × CML451
2	DH69 × CML451	46	DH250 × CML451
3	DH70 × CML451	47	DH252 × CML451
4	DH71 × CML451	48	DH254 × CML451
5	DH75 × CML451	49	DH256 × CML451
6	DH76 × CML451	50	DH263 × CML451
7	DH79 × CML451	51	DH68 × ZL153493
8	DH82 × CML451	52	DH69 × ZL153493
9	DH85 × CML451	53	DH70 × ZL153493
10	DH87 × CML451	54	DH71 × ZL153493
11	DH88 × CML451	55	DH75 × ZL153493
12	DH93 × CML451	56	DH76 × ZL153493
13	DH94 × CML451	57	DH79 × ZL153493
14	DH97 × CML451	58	DH82 × ZL153493
15	DH98 × CML451	59	DH85 × ZL153493
16	DH184 × CML451	60	DH87 × ZL153493
17	DH189 × CML451	61	DH88 × ZL153493
18	DH190 × CML451	62	DH93 × ZL153493
19	DH193 × CML451	63	DH94 × ZL153493
20	DH197 × CML451	64	DH97 × ZL153493
21	DH198 × CML451	65	DH98 × ZL153493
22	DH200 × CML451	66	DH184 × ZL153493
23	DH202 × CML451	67	DH189 × ZL153493
24	DH203 × CML451	68	DH190 × ZL153493
25	DH204 × CML451	69	DH193 × ZL153493
26	DH205 × CML451	70	DH197 × ZL153493
27	DH206 × CML451	71	DH198 × ZL153493
28	DH207 × CML451	72	DH200 × ZL153493
29	DH208 × CML451	73	DH202 × ZL153493
30	DH209 × CML451	74	DH203 × ZL153493
31	DH210 × CML451	75	DH204 × ZL153493
32	DH212 × CML451	76	DH205 × ZL153493
33	DH214 × CML451	77	DH206 × ZL153493
34	DH216× CML451	78	DH207 × ZL153493
35	DH217 × CML451	79	DH208 × ZL153493
36	DH218 × CML451	80	DH209 × ZL153493
37	DH221 × CML451	81	DH210 × ZL153493
38	DH222 × CML451	82	DH212 × ZL153493
39	DH227 × CML451	83	DH214 × ZL153493
40	DH229 × CML451	84	DH216 × ZL153493
41	DH230 × CML451	85	DH217 × ZL153493
42	DH231 × CML451	86	DH218 × ZL153493
43	DH232 × CML451	87	DH221 × ZL153493
44	DH238 × CML451	88	DH222 × ZL153493

Sl. No.	Hybrids	Sl. No.	Hybrids
89	DH227 × ZL153493	95	DH241 × ZL153493
90	DH229 × ZL153493	96	DH250 × ZL153493
91	DH230 × ZL153493	97	DH252 × ZL153493
92	DH231 × ZL153493	98	DH254 × ZL153493
93	DH232 × ZL153493	99	DH256 × ZL153493
94	DH238 × ZL153493	100	DH263 × ZL153493

Table 3 : Analysis of variance of alpha lattice for 11 quantitative traits in maize.

Source of variation	Degrees of freedom (df)	Days to 50 per cent anthesis	Days to 50 per cent silking	Plant height (cm)	Ear height (cm)	Cob length (cm)	Cob girth (cm)
Replication	1	0.541	1.551	7.310	0.050	0.083	1.680
Blocks (within replication)	11	1.842	1.984	11.730	0.620	0.609	0.949
Genotypes (adjusted for blocks)	155	25.770**	27.916**	1490.250**	563.070**	13.359**	5.139**
Error	144	1.560	0.816	16.080	2.210	0.801	0.750

Table 3. continued

Source of variation	Degrees of freedom (df)	Number of kernel rows per cob	Number of kernels per row	Shelling per cent	100- grain weight (g)	Grain yield (q/ha)
Replication	1	0.819	6.336	0.237	1.542	0.810
Blocks (within replication)	11	0.598	3.151	3.562	0.423	17.500
Genotypes (adjusted for blocks)	155	7.824**	53.261**	87.611**	27.476**	664.030**
Error	144	0.682	2.507	3.729	3.899	20.170

* Significant at p = 0.05, ** Significant at p = 0.01

Table 4 : Mean performance of crosses and checks for grain yield and yield related traits.

Sl. No.	Crosses	DFA	DFS	PH	EH	CL	CG	NKRC	NKR	SP	HGW	GY
1	DH68 × CML451	73.50	77.00	146.00	70.00	12.30	13.50	15.80	22.80	64.11	26.50	53.13
2	DH68 × ZL153493	73.50	77.50	150.50	73.00	16.00	15.80	13.50	25.80	67.68	28.50	65.00
3	DH69 × CML451	75.50	79.50	147.00	68.00	16.10	13.60	17.50	28.50	80.15	28.50	81.63
4	DH69 × ZL153493	72.50	76.50	138.00	66.00	14.30	14.50	14.80	25.10	80.95	26.50	48.96
5	DH70 × CML451	73.00	77.50	114.00	36.00	13.50	13.80	14.80	21.80	85.72	33.50	71.82
6	DH70 × ZL153493	73.50	78.50	134.50	65.00	14.50	13.60	12.80	33.50	81.70	26.50	68.33
7	DH71 × CML451	78.50	82.50	131.00	40.50	15.30	13.60	13.80	27.10	82.79	31.50	70.24
8	DH71 × ZL153493	71.50	74.50	140.50	74.00	19.80	14.00	13.50	30.80	84.16	33.50	81.46
9	DH75 × CML451	75.50	80.50	163.00	60.50	18.50	15.80	15.10	28.50	81.23	37.50	75.88
10	DH75 × ZL153493	71.50	74.50	129.00	53.50	18.50	14.80	13.10	33.50	92.57	31.50	85.21
11	DH76 × CML451	74.50	77.50	117.50	41.50	14.30	13.50	15.50	22.50	63.07	29.50	43.65
12	DH76 × ZL153493	73.50	75.50	137.00	67.00	13.80	12.10	13.50	23.10	73.77	27.50	50.21
13	DH79 × CML451	79.50	83.50	148.00	58.50	17.30	15.80	15.80	37.10	95.44	31.50	79.77
14	DH79 × ZL153493	74.50	76.50	99.50	50.00	13.80	13.00	11.50	26.10	79.61	27.50	41.88
15	DH82 × CML451	69.50	74.50	155.50	79.00	19.50	14.60	15.10	31.50	83.46	19.50	82.32
16	DH82 × ZL153493	73.50	77.50	140.00	67.50	16.50	14.00	11.50	29.10	84.89	32.50	68.75
17	DH85 × CML451	77.50	82.50	138.50	81.50	11.00	14.80	13.50	18.50	89.07	30.50	40.92
18	DH85 × ZL153493	71.50	75.50	141.00	59.00	14.30	15.00	12.10	23.50	96.83	29.50	69.38
19	DH87 × CML451	73.50	76.50	135.00	77.00	15.60	14.60	13.80	30.50	86.81	32.50	78.93
20	DH87 × ZL153493	73.50	77.50	107.00	67.50	17.60	14.30	12.80	30.80	69.42	29.50	53.96
21	DH88 × CML451	71.00	76.50	164.50	86.50	14.60	13.80	13.80	24.50	81.26	30.00	78.24
22	DH88 × ZL153493	72.50	76.50	119.50	56.00	13.30	11.30	13.10	21.80	81.86	25.50	39.17
23	DH93 × CML451	73.00	77.50	142.50	74.50	17.00	14.10	13.10	34.10	87.38	29.00	69.10
24	DH93 × ZL153493	74.50	77.50	113.00	44.00	14.80	12.50	15.10	24.10	75.61	28.50	45.84
25	DH94 × CML451	69.50	73.50	154.50	83.50	12.00	12.60	11.80	23.80	81.68	27.50	78.50
26	DH94 × ZL153493	71.50	73.50	88.50	31.00	20.10	13.80	14.50	30.80	81.54	31.50	79.58
27	DH97 × CML451	78.00	82.50	146.50	66.00	14.10	13.10	15.80	25.10	83.63	31.00	70.25

Sl. No.	Crosses	DFA	DFS	PH	EH	CL	CG	NKRC	NKR	SP	HGW	GY
28	DH97 × ZL153493	71.50	75.50	157.50	77.50	16.00	12.90	13.10	30.50	82.45	27.50	74.38
29	DH98 × CML451	76.50	82.00	138.00	71.50	13.80	14.00	15.50	28.80	83.25	27.50	62.75
30	DH98 × ZL153493	72.50	76.50	117.00	58.50	15.50	13.30	12.50	28.10	79.70	28.50	58.75
31	DH184 × CML451	77.00	79.50	141.00	61.50	13.80	13.00	14.10	19.50	83.67	22.50	47.70
32	DH184 × ZL153493	74.50	78.50	143.00	63.50	16.00	13.00	16.50	27.80	80.94	22.50	59.80
33	DH189 × CML451	68.50	71.50	158.00	74.50	18.00	14.60	17.10	33.50	77.56	29.50	82.92
34	DH189 × ZL153493	72.50	76.50	125.00	63.00	15.50	13.80	13.80	26.50	84.19	28.50	58.33
35	DH190 × CML451	68.00	71.50	152.00	60.50	17.90	15.60	16.50	30.10	90.67	31.50	84.45
36	DH190 × ZL153493	70.50	75.50	142.00	67.00	18.10	15.10	14.50	26.10	82.84	30.50	83.13
37	DH193 × CML451	70.00	73.50	151.00	77.50	12.80	13.80	18.80	20.80	82.41	24.50	57.66
38	DH193 × ZL153493	74.50	77.50	125.00	66.50	13.30	14.50	15.80	19.80	78.19	23.50	37.71
39	DH197 × CML451	71.50	75.00	137.50	64.50	15.60	16.50	19.80	33.80	86.80	29.50	86.38
40	DH197 × ZL153493	75.50	79.50	96.50	42.50	12.50	12.60	15.50	19.80	76.66	24.50	48.54
41	DH198 × CML451	71.50	75.50	143.00	61.00	16.60	15.80	16.80	31.10	83.47	36.50	84.66
42	DH198 × ZL153493	72.50	76.50	134.00	69.00	17.20	14.80	14.10	30.10	87.92	27.50	60.21
43	DH200 × CML451	75.00	77.50	127.00	62.50	14.50	14.30	16.50	20.50	83.62	28.50	72.67
44	DH200 × ZL153493	78.50	82.50	114.00	37.50	14.80	12.80	13.80	26.50	91.58	20.50	37.92
45	DH202 × CML451	74.50	77.50	141.50	63.50	15.10	17.10	15.80	28.10	89.31	38.00	83.39
46	DH202 × ZL153493	74.50	78.50	108.50	36.50	10.30	12.60	14.50	16.50	75.59	23.50	27.50
47	DH203 × CML451	78.50	81.50	131.50	50.50	15.00	15.80	15.10	23.50	83.42	35.00	68.48
48	DH203 × ZL153493	72.50	76.50	110.50	50.50	11.20	11.50	12.50	17.50	70.07	25.50	35.84
49	DH204 × CML451	74.50	79.50	146.50	60.50	12.80	14.80	13.50	22.10	81.82	31.00	74.24
50	DH204 × ZL153493	74.50	76.50	129.00	58.50	13.50	12.80	13.80	23.80	78.68	26.50	50.42
51	DH205 × CML451	79.50	82.50	148.50	75.50	16.00	15.00	15.80	24.80	67.98	22.50	50.50
52	DH205 × ZL153493	78.50	83.50	116.00	44.00	15.30	12.50	13.50	28.80	85.46	25.50	86.46
53	DH206 × CML451	74.50	77.50	127.00	49.50	14.80	13.50	13.80	28.80	80.64	27.50	63.63
54	DH206 × ZL153493	73.50	77.50	140.00	54.50	13.50	13.80	10.10	23.80	80.13	27.50	49.38
55	DH207 × CML451	75.00	78.50	134.50	56.50	16.90	15.50	14.60	28.60	86.60	32.50	63.38
56	DH207 × ZL153493	78.50	81.50	139.50	51.00	11.30	12.50	12.50	16.50	92.66	25.50	37.09
57	DH208 × CML451	78.50	83.50	137.50	54.50	16.00	16.70	15.50	27.50	95.44	29.50	63.96
58	DH208 × ZL153493	73.50	78.50	122.00	65.00	13.50	12.50	13.10	23.50	77.48	29.50	44.38
59	DH209 × CML451	71.50	74.50	140.00	54.00	18.30	15.50	13.50	23.50	86.99	35.50	84.28
60	DH209 × ZL153493	70.50	75.50	123.00	54.50	11.80	11.80	13.80	23.10	78.19	25.50	48.13
61	DH210 × CML451	74.50	79.50	139.00	48.00	16.50	13.30	16.10	27.10	87.10	26.50	73.81
62	DH210 × ZL153493	72.50	76.50	134.00	66.50	16.00	13.00	13.50	29.10	70.13	28.50	59.17
63	DH212 × CML451	71.50	74.50	131.50	58.50	18.30	13.10	15.80	28.10	81.99	31.50	78.35
64	DH212 × ZL153493	78.50	83.50	101.00	39.00	9.00	12.50	9.50	11.50	68.50	27.50	32.30
65	DH214 × CML451	72.50	76.50	150.00	76.00	16.10	14.80	14.50	28.80	76.60	27.50	63.50
66	DH214 × ZL153493	74.50	77.50	160.50	68.00	16.50	14.10	12.80	29.80	76.55	29.50	67.92
67	DH216 × CML451	79.50	82.00	134.50	55.50	16.00	14.00	13.50	28.10	80.95	28.50	80.32
68	DH216 × ZL153493	73.50	76.50	138.00	72.00	13.50	11.50	12.50	16.10	69.95	24.50	36.88
69	DH217 × CML451	77.50	82.00	131.50	62.50	15.60	14.00	12.10	26.80	85.26	25.50	72.66
70	DH217 × ZL153493	70.50	74.50	148.00	76.50	18.80	13.30	14.10	35.50	85.52	29.50	86.04
71	DH218 × CML451	74.50	77.50	125.50	57.50	13.10	11.50	13.80	23.50	76.72	17.50	31.44
72	DH218 × ZL153493	73.50	75.50	160.00	73.00	16.00	14.10	14.50	31.80	82.65	28.00	82.50
73	DH221 × CML451	74.00	77.00	127.50	62.50	15.30	15.10	13.50	28.50	78.62	28.50	48.75
74	DH221 × ZL153493	72.50	76.50	152.00	78.50	14.50	13.50	15.10	25.50	81.73	26.50	60.63
75	DH222 × CML451	77.50	81.50	70.00	33.50	10.00	10.50	13.50	15.80	89.09	21.50	21.93
76	DH222 × ZL153493	73.50	76.50	157.50	81.50	17.60	15.50	14.50	27.10	77.18	27.50	74.59
77	DH227 × CML451	73.50	76.50	124.00	38.50	14.60	12.50	10.80	27.50	79.32	27.50	41.25
78	DH227 × ZL153493	72.50	76.50	170.00	73.50	18.30	13.30	12.50	31.80	81.79	27.50	61.88
79	DH229 × CML451	80.50	83.50	93.50	39.00	14.70	13.10	15.00	21.70	80.46	27.50	33.17
80	DH229 × ZL153493	73.50	76.50	133.00	64.50	17.30	13.50	13.80	27.10	84.39	31.50	71.04
81	DH230 × CML451	77.00	79.50	133.50	66.00	15.60	13.60	13.10	26.80	85.11	31.50	79.25
82	DH230 × ZL153493	70.50	74.50	127.50	43.50	16.10	12.30	13.10	32.80	86.52	31.50	78.33
83	DH231 × CML451	73.50	76.50	141.50	66.00	16.30	17.00	18.10	27.10	83.77	31.50	83.22

Sl. No.	Crosses	DFA	DFS	PH	EH	CL	CG	NKRC	NKR	SP	HGW	GY
84	DH231 × ZL153493	74.50	77.50	149.50	77.50	14.00	15.50	15.50	19.00	81.88	27.50	50.21
85	DH232 × CML451	70.50	74.50	129.00	53.00	13.10	11.80	15.10	22.10	46.85	24.50	32.46
86	DH232 × ZL153493	68.50	72.50	124.50	69.00	17.60	12.60	12.80	24.50	67.56	29.50	37.71
87	DH238 × CML451	74.50	78.50	139.00	44.00	16.50	15.50	18.50	24.50	80.59	27.50	49.11
88	DH238 × ZL153493	80.50	83.50	105.00	46.50	14.60	12.30	13.50	19.80	80.95	24.50	36.88
89	DH241 × CML451	69.00	72.50	138.00	66.50	18.10	13.60	13.10	32.50	81.72	30.50	81.97
90	DH241 × ZL153493	70.50	73.50	173.50	93.50	15.80	13.10	11.80	28.50	87.85	28.50	69.17
91	DH250 × CML451	79.50	82.50	145.00	63.50	16.50	14.50	14.50	28.50	85.02	27.50	87.98
92	DH250 × ZL153493	70.50	74.50	154.00	91.00	18.60	15.70	15.80	32.80	86.62	24.50	86.46
93	DH252 × CML451	80.50	83.50	123.00	37.50	17.10	12.30	14.80	27.10	83.19	28.50	69.81
94	DH252 × ZL153493	77.50	82.50	105.50	49.00	12.10	12.10	12.50	16.10	62.60	26.50	33.34
95	DH254 × CML451	73.50	77.00	132.50	59.50	15.10	14.30	15.10	28.10	83.34	33.50	86.28
96	DH254 × ZL153493	73.50	75.50	132.00	68.50	16.10	13.80	13.10	25.80	76.92	24.50	52.29
97	DH256 × CML451	68.00	72.00	143.00	64.50	19.00	15.50	16.80	30.80	87.60	30.50	87.08
98	DH256 × ZL153493	74.50	78.50	115.00	53.50	13.60	12.60	12.80	24.80	79.82	25.50	55.00
99	DH263 × CML451	73.00	78.00	143.50	52.50	17.10	14.60	14.80	32.80	84.08	33.00	82.42
100	DH263 × ZL153493	75.50	77.50	146.50	67.50	13.00	13.50	13.50	16.50	88.37	26.50	67.71
	MEAN	**73.98**	**77.66**	**134.21**	**61.11**	**15.29**	**13.83**	**14.23**	**26.10**	**81.17**	**28.31**	**62.86**
RANGE	**MINIMUM**	**68.00**	**71.50**	**70.00**	**31.00**	**9.00**	**10.50**	**9.50**	**11.50**	**46.85**	**17.50**	**21.93**
	MAXIMUM	**80.50**	**83.50**	**173.50**	**93.50**	**20.10**	**17.10**	**19.80**	**37.10**	**96.83**	**38.00**	**87.98**
	CV (%)	**1.70**	**1.20**	**3.30**	**2.70**	**6.30**	**6.60**	**6.00**	**6.60**	**2.40**	**7.30**	**8.10**
	SD	**3.00**	**3.06**	**18.00**	**13.41**	**2.25**	**1.34**	**1.76**	**5.00**	**7.54**	**3.62**	**0.42**

Where,

DFA= Days to 50 per cent anthesis; DFS = Days to 50% silking; PH = Plant height (cm);
EH = Ear height (cm); CL= Cob length (cm); CG = Cob girth (cm);
NKRC= Number of kernel rows per cob; NKR = Number of kernels per row; HGW = 100-grain weight (g);
SP = Shelling per cent; GY = Grain yield (q/ha); CV= Coefficient of Variance (%);
SD = Standard Deviation.

Sl. No.	CHECKS	DFA	DFS	PH	EH	CL	CG	NKRC	NKR	SP	HGW	GY
1	RCRMH2	67.50	71.50	138.00	69.50	15.60	15.70	13.80	23.70	85.07	31.50	59.79
2	RCRMH4	66.50	69.50	171.00	83.50	12.10	11.10	13.80	21.50	85.30	23.50	63.05
3	DKC9133	68.50	72.50	152.50	72.50	12.00	13.10	12.10	28.10	83.89	27.50	57.92
4	NK6240	67.50	71.50	157.00	75.50	11.80	13.80	13.20	25.90	81.92	26.50	56.25
	MEAN	**67.50**	**71.25**	**154.63**	**75.25**	**12.88**	**13.43**	**13.23**	**24.80**	**84.04**	**27.25**	**59.25**
RANGE	**MINIMUM**	**66.50**	**69.50**	**138.00**	**69.50**	**11.80**	**11.10**	**12.10**	**21.50**	**81.92**	**23.50**	**56.25**
	MAXIMUM	**68.50**	**72.50**	**171.00**	**83.50**	**15.60**	**15.70**	**13.80**	**28.10**	**85.30**	**31.50**	**63.05**

Where,

DFA= Days to 50 per cent anthesis; DFS = Days to 50% silking; PH = Plant height (cm);
EH = Ear height (cm); CL= Cob length (cm); CG = Cob girth (cm);
NKRC= Number of kernel rows per cob; NKR = Number of kernels per row; HGW = 100-grain weight (g);
SP = Shelling per cent; GY = Grain yield (q/ha).

Table 5 : Estimates of standard heterosis of maize hybrids over best check for grain yield and yield related traits.

Sl. No	Crosses	DFA	DFS	PH	EH	CL	CG	NKRC	NKR	SP	HGW	GY
		BC: RCRMH 4	BC: RCRMH 4	BC: RCRMH 4	BC: RCRMH 4	BC: RCRMH 2	BC: RCRMH 2	BC: RCRMH 4	BC: DKC 9133	BC: RCRMH 4	BC: RCRMH 2	BC: RCRM H4
1	DH68 ×CML451	10.53**	10.79**	-14.62**	-16.17**	-21.15**	-14.01*	14.49*	-18.86**	-24.84**	-15.87*	-15.73*
2	DH68 ×ZL153493	10.53**	11.51**	-11.99**	-12.57**	2.56	0.64	-2.17	-8.19	-20.65**	-9.52	3.1
3	DH69 × CML451	13.53**	14.39**	-14.04**	-18.56**	3.21	-13.38*	26.81**	1.42	-6.04**	-9.52	29.47**
4	DH69 ×ZL153493	9.02**	10.07**	-19.30**	-20.96**	-8.33	-7.64	7.25	-10.68	-5.09*	-15.87*	-22.34**
5	DH70 × CML451	9.77**	11.51**	-33.33**	-56.89**	-13.46*	-12.10*	7.25	-22.42**	0.5	6.35	13.92
6	DH70 × ZL153493	10.53**	12.95**	-21.35**	-22.16**	-7.05	-13.38*	-7.25	19.22**	-4.21	-15.87*	8.38

Sl. No	Crosses	DFA	DFS	PH	EH	CL	CG	NKRC	NKR	SP	HGW	GY
		BC: RCRMH 4	BC: RCRMH 4	BC: RCRMH 4	BC: RCRMH 4	BC: RCRMH 2	BC: RCRMH 2	BC: RCRMH 4	BC: DKC 9133	BC: RCRMH 4	BC: RCRMH 2	BC: RCRM H4
7	DH71 × CML451	18.05**	18.71**	-23.39**	-51.50**	-1.92	-13.38*	0	-3.56	-2.94	0	11.41
8	DH71 × ZL153493	7.52**	7.19**	-17.84**	-11.38**	26.92**	-10.83	-2.17	9.61	-1.33	6.35	29.21**
9	DH75 × CML451	13.53**	15.83**	-4.68*	-27.54**	18.59**	0.64	9.42	1.42	-4.77*	19.05**	20.35**
10	DH75 × ZL153493	7.52**	7.19**	-24.56**	-35.93**	18.59**	-5.73	-5.07	19.22**	8.52**	0	35.16**
11	DH76 × CML451	12.03**	11.51**	-31.29**	-50.30**	-8.33	-14.01*	12.32*	-19.93**	-26.06**	-6.35	-30.76**
12	DH76 × ZL153493	10.53**	8.63**	-19.88**	-19.76**	-11.54*	-22.93**	-2.17	-17.79**	-13.51**	-12.70*	-20.37**
13	DH79 × CML451	19.55**	20.14**	-13.45**	-29.94**	10.9	0.64	14.49*	32.03**	11.89**	0	26.52**
14	DH79 × ZL153493	12.03**	10.07**	-41.81**	-40.12**	-11.54*	-17.20**	-16.67**	-7.12	-6.67**	-12.70*	-33.58**
15	DH82 × CML451	4.51*	7.19**	-9.06**	-5.39**	25.00**	-7.01	9.42	12.10*	-2.16	-38.10**	30.57**
16	DH82 × ZL153493	10.53**	11.51**	-18.13**	-19.16**	5.77	-10.83	-16.67**	3.56	-0.47	3.17	9.05
17	DH85 × CML451	16.54**	18.71**	-19.01**	-2.4	-29.49**	-5.73	-2.17	-34.16**	4.43	-3.17	-35.10**
18	DH85 × ZL153493	7.52**	8.63**	-17.54**	-29.34**	-8.33	-4.46	-12.32*	-16.37**	13.52**	-6.35	10.04
19	DH87 × CML451	10.53**	10.07**	-21.05**	-7.78**	0	-7.01	0	8.54	1.77	3.17	25.19**
20	DH87 × ZL153493	10.53**	11.51**	-37.43**	-19.16**	12.82*	-8.92	-7.25	9.61	-18.61**	-6.35	-14.42*
21	DH88 × CML451	6.77**	10.07**	-3.8	3.59*	-6.41	-12.10*	0	-12.81*	-4.73*	-4.76	24.10**
22	DH88 × ZL153493	9.02**	10.07**	-30.12**	-32.93**	-14.74*	-28.03**	-5.07	-22.42**	-4.03	-19.05**	-37.88**
23	DH93 × CML451	9.77**	11.51**	-16.67**	-10.78**	8.97	-10.19	-5.07	21.35**	2.44	-7.94	9.6
24	DH93 × ZL153493	12.03**	11.51**	-33.92**	-47.31**	-5.13	-20.38**	9.42	-14.23*	-11.36**	-9.52	-27.30**
25	DH94 × CML451	4.51*	5.76**	-9.65**	0	-23.08**	-19.75**	-14.49*	-15.30**	-4.24	-12.70*	24.51**
26	DH94 × ZL153493	7.52**	5.76**	-48.25**	-62.87**	28.85**	-12.10*	5.07	9.61	-4.4	0	26.23**
27	DH97 × CML451	17.29**	18.71**	-14.33**	-20.96**	-9.62	-16.56**	14.49*	-10.68	-1.95	-1.59	11.43
28	DH97 × ZL153493	7.52**	8.63**	-7.89**	-7.19**	2.56	-17.83**	-5.07	8.54	-3.34	-12.70*	17.97*
29	DH98 × CML451	15.04**	17.99**	-19.30**	-14.37**	-11.54*	-10.83	12.32*	2.49	-2.4	-12.70*	-0.47
30	DH98 × ZL153493	9.02**	10.07**	-31.58**	-29.94**	-0.64	-15.29**	-9.42	0	-6.57**	-9.52	-6.81
31	DH184 × CML451	15.79**	14.39**	-17.54**	-26.35**	-11.54*	-17.20**	2.17	-30.60**	-1.91	-28.57**	-24.34**
32	DH184 × ZL153493	12.03**	12.95**	-16.37**	-23.95**	2.56	-17.20**	19.57**	-1.07	-5.11*	-28.57**	-5.16
33	DH189 × CML451	3.01	2.88*	-7.60**	-10.78**	15.38**	-7.01	23.91**	19.22**	-9.07**	-6.35	31.53**
34	DH189 × ZL153493	9.02**	10.07**	-26.90**	-24.55**	-0.64	-12.10*	0	-5.69	-1.3	-9.52	-7.48
35	DH190 × CML451	2.26	2.88*	-11.11**	-27.54**	14.74*	-0.64	19.57**	7.12	6.30**	0	33.95**
36	DH190 × ZL153493	6.02**	8.63**	-16.96**	-19.76**	16.03**	-3.82	5.07	-7.12	-2.88	-3.17	31.85**

Sl. No	Crosses	DFA	DFS	PH	EH	CL	CG	NKRC	NKR	SP	HGW	GY
		BC: RCRMH 4	BC: RCRMH 4	BC: RCRMH 4	BC: RCRMH 4	BC: RCRMH 2	BC: RCRMH 2	BC: RCRMH 4	BC: DKC 9133	BC: RCRMH 4	BC: RCRMH 2	BC: RCRM H4
37	DH193 × CML451	5.26**	5.76**	-11.70**	-7.19**	-17.95**	-12.10*	36.23**	-25.98**	-3.38	-22.22**	-8.54
38	DH193 × ZL153493	12.03**	11.51**	-26.90**	-20.36**	-14.74*	-7.64	14.49*	-29.54**	-8.34**	-25.40**	-40.19**
39	DH197 × CML451	7.52**	7.91**	-19.59**	-22.75**	0	5.1	43.48**	20.28**	1.76	-6.35	37.01**
40	DH197 × ZL153493	13.53**	14.39**	-43.57**	-49.10**	-19.87**	-19.75**	12.32*	-29.54**	-10.13**	-22.22**	-23.01**
41	DH198 × CML451	7.52**	8.63**	-16.37**	-26.95**	6.41	0.64	21.74**	10.68	-2.14	15.87*	34.28**
42	DH198 × ZL153493	9.02**	10.07**	-21.64**	-17.37**	10.26	-5.73	2.17	7.12	3.07	-12.70*	-4.5
43	DH200 × CML451	12.78**	11.51**	-25.73**	-25.15**	-7.05	-8.92	19.57**	-27.05**	-1.97	-9.52	15.26*
44	DH200 × ZL153493	18.05**	18.71**	-33.33**	-55.09**	-5.13	-18.47**	0	-5.69	7.37**	-34.92**	-39.86**
45	DH202 × CML451	12.03**	11.51**	-17.25**	-23.95**	-3.21	8.92	14.49*	0	4.71*	20.63**	32.27**
46	DH202 × ZL153493	12.03**	12.95**	-36.55**	-56.29**	-33.97**	-19.75**	5.07	-41.28**	-11.38**	-25.40**	-56.38**
47	DH203 × CML451	18.05**	17.27**	-23.10**	-39.52**	-3.85	0.64	9.42	-16.37**	-2.2	11.11	8.61
48	DH203 × ZL153493	9.02**	10.07**	-35.38**	-39.52**	-28.21**	-26.75**	-9.42	-37.72**	-17.86**	-19.05**	-43.16**
49	DH204 × CML451	12.03**	14.39**	-14.33**	-27.54**	-17.95**	-5.73	-2.17	-21.35**	-4.08	-1.59	17.75*
50	DH204 × ZL153493	12.03**	10.07**	-24.56**	-29.94**	-13.46*	-18.47**	0	-15.30**	-7.76**	-15.87*	-20.03**
51	DH205 × CML451	19.55**	18.71**	-13.16**	-9.58**	2.56	-4.46	14.49*	-11.74*	-20.30**	-28.57**	-19.90**
52	DH205 × ZL153493	18.05**	20.14**	-32.16**	-47.31**	-1.92	-20.38**	-2.17	2.49	0.19	-19.05**	37.14**
53	DH206 × CML451	12.03**	11.51**	-25.73**	-40.72**	-5.13	-14.01*	0	2.49	-5.46*	-12.70*	0.92
54	DH206 × ZL153493	10.53**	11.51**	-18.13**	-34.73**	-13.46*	-12.10*	-26.81**	-15.30**	-6.06**	-12.70*	-21.68**
55	DH207 × CML451	12.78**	12.95**	-21.35**	-32.34**	8.33	-1.27	5.8	1.78	1.52	3.17	0.52
56	DH207 × ZL153493	18.05**	17.27**	-18.42**	-38.92**	-27.56**	-20.38**	-9.42	-41.28**	8.63**	-19.05**	-41.18**
57	DH208 × CML451	18.05**	20.14**	-19.59**	-34.73**	2.56	6.37	12.32*	-2.14	11.89**	-6.35	1.44
58	DH208 × ZL153493	10.53**	12.95**	-28.65**	-22.16**	-13.46*	-20.38**	-5.07	-16.37**	-9.16**	-6.35	-29.61**
59	DH209 × CML451	7.52**	7.19**	-18.13**	-35.33**	17.31**	-1.27	-2.17	-16.37**	1.99	12.70*	33.67**
60	DH209 × ZL153493	6.02**	8.63**	-28.07**	-34.73**	-24.36**	-24.84**	0	-17.79**	-8.33**	-19.05**	-23.67**
61	DH210 × CML451	12.03**	14.39**	-18.71**	-42.51**	5.77	-15.29**	16.67**	-3.56	2.11	-15.87*	17.08*
62	DH210 × ZL153493	9.02**	10.07**	-21.64**	-20.36**	2.56	-17.20**	-2.17	3.56	-17.79**	-9.52	-6.15
63	DH212 × CML451	7.52**	7.19**	-23.10**	-29.94**	17.31**	-16.56**	14.49*	0	-3.88	0	24.27**
64	DH212 × ZL153493	18.05**	20.14**	-40.94**	-53.29**	-42.31**	-20.38**	-31.16**	-59.07**	-19.69**	-12.70*	-48.77**
65	DH214 × CML451	9.02**	10.07**	-12.28**	-8.98**	3.21	-5.73	5.07	2.49	-10.19**	-12.70*	0.72
66	DH214 × ZL153493	12.03**	11.51**	-6.14**	-18.56**	5.77	-10.19	-7.25	6.05	-10.25**	-6.35	7.72

Sl. No	Crosses	DFA	DFS	PH	EH	CL	CG	NKRC	NKR	SP	HGW	GY
		BC: RCRMH 4	BC: RCRMH 4	BC: RCRMH 4	BC: RCRMH 4	BC: RCRMH 2	BC: RCRMH 2	BC: RCRMH 4	BC: DKC 9133	BC: RCRMH 4	BC: RCRMH 2	BC: RCRM H4
67	DH216 × CML451	19.55**	17.99**	-21.35**	-33.53**	2.56	-10.83	-2.17	0	-5.09*	-9.52	27.40**
68	DH216 × ZL153493	10.53**	10.07**	-19.30**	-13.77**	-13.46*	-26.75**	-9.42	-42.70**	-18.00**	-22.22**	-41.51**
69	DH217 × CML451	16.54**	17.99**	-23.10**	-25.15**	0	-10.83	-12.32*	-4.63	-0.05	-19.05**	15.25*
70	DH217 × ZL153493	6.02**	7.19**	-13.45**	-8.38**	20.51**	-15.29**	2.17	26.33**	0.26		36.47**
71	DH218 × CML451	12.03**	11.51**	-26.61**	-31.14**	-16.03**	-26.75**	0	-16.37**	-10.06**	-44.44**	-50.14**
72	DH218 × ZL153493	10.53**	8.63**	-6.43**	-12.57**	2.56	-10.19	5.07	13.17*	-3.11	-11.11	30.86**
73	DH221 × CML451	11.28**	10.79**	-25.44**	-25.15**	-1.92	-3.82	-2.17	1.42	-7.83**	-9.52	-22.67**
74	DH221 × ZL153493	9.02**	10.07**	-11.11**	-5.99**	-7.05	-14.01*	9.42	-9.25	-4.19	-15.87*	-3.84
75	DH222 × CML451	16.54**	17.27**	-59.06**	-59.88**	-35.90**	-33.12**	-2.17	-43.77**	4.45	-31.75**	-65.22**
76	DH222 × ZL153493	10.53**	10.07**	-7.89**	-2.4	12.82*	-1.27	5.07	-3.56	-9.51**	-12.70*	18.30*
77	DH227 × CML451	10.53**	10.07**	-27.49**	-53.89**	-6.41	-20.38**	-21.74**	-2.14	-7.01**	-12.70*	-34.57**
78	DH227 × ZL153493	9.02**	10.07**	-0.58	-11.98**	17.31**	-15.29**	-9.42	13.17*	-4.12	-12.70*	-1.86
79	DH229 × CML451	21.05**	20.14**	-45.32**	-53.29**	-5.77	-16.56**	8.7	-22.78**	-5.67*	-12.70*	-47.39**
80	DH229 × ZL153493	10.53**	10.07**	-22.22**	-22.75**	10.9	-14.01*	0	-3.56	-1.06	0	12.68
81	DH230 × CML451	15.79**	14.39**	-21.93**	-20.96**	0	-13.38*	-5.07	-4.63	-0.22	0	25.70**
82	DH230 × ZL153493	6.02**	7.19**	-25.44**	-47.90**	3.21	-21.66**	-5.07	16.73**	1.44	0	24.24**
83	DH231 × CML451	10.53**	10.07**	-17.25**	-20.96**	4.49	8.28	31.16**	-3.56	-1.79	0	31.99**
84	DH231 × ZL153493	12.03**	11.51**	-12.57**	-7.19**	-10.26	-1.27	12.32*	-32.38**	-4	-12.70*	-20.36**
85	DH232 × CML451	6.02**	7.19**	-24.56**	-36.53**	-16.03**	-24.84**	9.42	-21.35**	-45.08**	-22.22**	-48.51**
86	DH232 × ZL153493	3.01	4.32**	-27.19**	-17.37**	12.82*	-19.75**	-7.25	-12.81*	-20.79**	-6.35	-40.19**
87	DH238 × CML451	12.03**	12.95**	-18.71**	-47.31**	5.77	-1.27	34.06**	-12.81*	-5.52*	-12.70*	-22.11**
88	DH238 × ZL153493	21.05**	20.14**	-38.60**	-44.31**	-6.41	-21.66**	-2.17	-29.54**	-5.09*	-22.22**	-41.51**
89	DH241 × CML451	3.76	4.32**	-19.30**	-20.36**	16.03**	-13.38*	-5.07	15.66**	-4.2	-3.17	30.02**
90	DH241 × ZL153493	6.02**	5.76**	1.46	11.98**	1.28	-16.56**	-14.49*	1.42	3	-9.52	9.72
91	DH250 × CML451	19.55**	18.71**	-15.20**	-23.95**	5.77	-7.64	5.07	1.42	-0.32	-12.70*	39.54**
92	DH250 × ZL153493	6.02**	7.19**	-9.94**	8.98**	19.23**	0	14.49*	16.73**	1.55	-22.22**	37.14**
93	DH252 × CML451	21.05**	20.14**	-28.07**	-55.09**	9.62	-21.66**	7.25	-3.56	-2.47	-9.52	10.73
94	DH252 × ZL153493	16.54**	18.71**	-38.30**	-41.32**	-22.44**	-22.93**	-9.42	-42.70**	-26.61**	-15.87*	-47.13**
95	DH254 × CML451	10.53**	10.79**	-22.51**	-28.74**	-3.21	-8.92	9.42	0	-2.29	6.35	36.85**
96	DH254 × ZL153493	10.53**	8.63**	-22.81**	-17.96**	3.21	-12.10*	-5.07	-8.19	-9.82**	-22.22**	-17.06*

Sl. No	Crosses	DFA	DFS	PH	EH	CL	CG	NKRC	NKR	SP	HGW	GY
		BC: RCRMH 4	BC: RCRMH 4	BC: RCRMH 4	BC: RCRMH 4	BC: RCRMH 2	BC: RCRMH 2	BC: RCRMH 4	BC: DKC 9133	BC: RCRMH 4	BC: RCRMH 2	BC: RCRM H4
97	DH256 × CML451	2.26	3.60**	-16.37**	-22.75**	21.79**	-1.27	21.74**	9.61	2.7	-3.17	38.12**
98	DH256 × ZL153493	12.03**	12.95**	-32.75**	-35.93**	-12.82*	-19.75**	-7.25	-11.74*	-6.42**	-19.05**	-12.76
99	DH263 × CML451	9.77**	12.23**	-16.08**	-37.13**	9.62	-7.01	7.25	16.73**	-1.43	4.76	30.72**
100	DH263 × ZL153493	13.53**	11.51**	-14.33**	-19.16**	-16.67**	-14.01*	-2.17	-41.28**	3.61	-15.87*	7.4

Where,

DFA= Days to 50 per cent anthesis; DFS = Days to 50% silking; PH = Plant height (cm);
EH = Ear height (cm); CL= Cob length (cm); CG = Cob girth (cm);
NKRC= Number of kernel rows per cob; NKR = Number of kernels per row; HGW = 100-grain weight (g);
SP = Shelling per cent; GY = Grain yield (q/ha); BC= Best check.

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