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HETEROSIS STUDY OF MULTI-ENVIRONMENT TRIALS DATA FOR GRAIN YIELD AND ATTRIBUTES IN PEARL MILLET (*PENNISETUM GLAUCUM* L. R. BR.)

Kamlesh Kumar[1*], N. B. Patel[1], H. N. Zala[1], N. V. Soni[1], P. C. Patel[1], P. R. Patel[2], Sandeep Kumar[1], Akhil Donga[1] and K. G. Kugashiya[3]

[1]Department of Genetics and Plant Breeding, C. P. C. A, S. D. A. U., S.K. Nagar, Gujarat, India
[2]Centre for Oilseeds Research, S. D. A. U., S.K. Nagar, Gujarat, India
[3]Centre for Millets Research, S. D. A. U, Deesa, Gujarat India
*Corresponding author E-mail: agrico.kamlesh4511@gmail.com
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ABSTRACT

In the present investigation of heterosis, the hybrids were developed by employing line × tester mating design involving five lines and seven testers during *rabi* 2023-2024. The resultant 35 hybrids along with 12 parents and one check (GHB-1351) were evaluated in randomized block design (RBD) with three replications and four meters single raw of each genotype under four various environments. The existence of overall heterosis became apparent, with the significant genotype × environment interactions (GEI) observed for all studied traits, indicating a differential response of genotypes to varying environmental conditions. The hybrid ICMA05444 × ICMR15451 was recorded the highest extent of heterobeltiosis on pooled basis whereas, hybrids, such as ICMA21777 × ICMR20664 at Shihori (E1), ICMA21777 × ICMR20945 at Jagudan (E2), ICMA17555 × ICMR20945 at Sardarkrushinagar (E3), ICMA98444 × J-2539 at Vijapur (E4) and ICMA05444 × ICMR20664 in pooled over environments demonstrated high heterotic responses for grain yield per plant which indicated specific performance of these hybrids across different growing conditions.

***Keywords*:** Pearl millet, heterobeltiosis, standard heterosis, grain yield

Introduction

Pearl millet [*Pennisetum glaucum* (L.) R. Br.] belongs to the family *poaceae* and genus *Pennisetum*. It is diploid (2n=2x=14), heterozygous, protogynous with compound terminal spike, C_4 (Kranz anatomy) and drought tolerant in nature. It has a genome size of 1.79 GB, which was organized into seven linkage groups (Khandelwal *et al*., 2024).

Pearl millet is cultivating over 30 million hectares worldwide. In India, the cultivated area for pearl millet was classify into three main zones (A_1, A and B) based on soils and rainfall patterns (Sanjana *et al*., 2021). During 2023-24, cultivated area of pearl millet in India was 7.36 million ha with an average productivity of 1449 kg/ha and 10.67 million tons of production. The major pearl millet growing states are Rajasthan, Maharashtra, Uttar Pradesh, Gujrat and Haryana contributing to 90% of total production in the country. Rajasthan contributes nearly 45% followed by Uttar Pradesh (19%), Haryana (9%), Gujarat (9%), Maharashtra (6%) and Tamil Nadu (2%). Most of pearl millet in India is grown in the rainy (*kharif*) season (June/July to September/October). Pearl millet is also cultivated during the summer season (February-May) in parts of Gujarat, Rajasthan and Uttar Pradesh and during the post-rainy (*rabi*) season (November-February) at a small scale in Maharashtra and Gujarat (Anonymous, 2024). In Gujarat, pearl millet occupies 1.77 lakh ha area during *kharif* season with production of 3,08,240 tons and productivity of 1738.03 kg/ha. Whereas, in the summer season pearl millet occupies an area of 2.72 lakh ha and production of 7,82,720 tons with productivity of 2872.59 kg/ha (Anonymous, 2019-20).

The presence of cytoplasmic genetic male sterility has enabled the commercial exploitation of heterosis and large-scale hybrid seed production (Bhasker *et al*.

2017). Heterosis breeding has been acknowledged as the most effective and commercial method for enhancing yield in pearl millet. Heterosis breeding provides an opportunity for utilization of available variability and generates new variability that is important for development of climate resilient hybrid varieties. With this view, the present work was undertaken to investigate the heterobeltiosis and standard heterosis for quantifying the extent of heterosis for grain yield and its attributes in pearl millet.

Material and Methods

The experimental material comprised of five cytoplasmic male sterile line (female parents or A-lines) along with its counterpart five maintainer lines (B-lines), seven restorer lines (male parents or R-lines) and one standard check GHB-1351. The present investigation was undertaken with a view to estimating heterosis performance of hybrids for yield and its contributing traits. The hybrids were developed by employing line × tester mating design involving five lines and seven testers during *rabi* 2023-2024 at Centre for Millets Research (latitude 24°15'39", longitude 72°12'03" and 146 M above mean sea level), Sardarkrushinagar, Dantiwada Agricultural University, Deesa (District-Banaskantha, Gujarat, India). The resultant 35 hybrids along with 12 parents (B and R lines) and one check GHB-1351 were evaluated in randomized block design with three replications and four meters single raw of each genotype under four various environments *viz*., Agricultural Research Station, Shihori (E1, 27th February 2024), Seed Spices Research Station, Jagudan (E2, 29th February 2024), Agronomy Instructional Farm SDAU, Sardarkrushinagar (E3, 01st March 2024) and Wheat Research Station, Vijapur (E4, 06st March 2024) during summer 2024. In present paper along with grain yield per plant (g) other attributes such as days to flowering, plant height (cm), number of productive tillers per plant, flag leaf length (cm), flag leaf width (mm), flag leaf sheath (cm), number of nodes on main tiller, earhead length (cm), earhead girth (cm), test weight (g), days to maturity, dry fodder yield per plant (g) and harvest index (%) were included. Heterobeltiosis was calculated using the method described by Fonseca and Patterson (1968) for each trait whereas, standard heterosis was determined as per the method suggested by Meredith and Bridge (1972).

Results and Discussion

In the present investigation, the degree of heterosis varied from hybrid to hybrid and character to character. For a specific character, considerable high heterotic effects were observed in certain hybrids and low in others, which revealed that nature of gene action varied with the genetic makeup of parents. Majority of hybrids exhibited remarkable heterotic response over better parental value (heterobeltiosis) and over standard hybrid check (standard heterosis) GHB-1351 in all the four environments as well as in pooled.

In heterosis, positive effects were judged favourable for traits including number of productive tillers per plant, flag leaf length, flag leaf width, flag leaf sheath, number of nodes on main tiller, earhead length, earhead girth, test weight, grain yield per plant and harvest index. In contrast, negative effects were considered advantageous for traits such as days to flowering, days to maturity, plant height and dry fodder yield per plant. The character wise results are described in the subsequent paragraphs.

For days to flowering (Table 1) a total of thirty-four hybrid in E1, E2, E3, thirty-five in E4 as well as in pooled environments had demonstrated negative significant heterobeltiosis. Hybrids ICMA04999 × ICMR15063 in E1 (-34.20%) as well as in pooled (-27.17%), ICMA98444 × ICMR20664 in E2 (-29.26%), ICMA04999 × ICMR20945 in E3 (-26.70%) and ICMA04999 × ICMR15451 in E4 (-33.15%) exhibited largest magnitude of heterobeltiosis in negative direction, whereas heterosis over the standard check, in all environments, none of the hybrids in E1, E3, eight in E2, E4 and one in pooled environments demonstrated considerable negative heterosis. Top desirable hybrids *viz.,* ICMA98444 × ICMR20283 in E2 (-10.42%), ICMA04999 × ICMR18196 in E4 (-9.92%) as well as in pooled (-3.95%) were observed significantly negative heterosis over standard check GHB-1351. Above investigation was accordance with the study of Maheswari *et al.* (2024).

The hybrids ICMA98444 × ICMR20283 in E1 (-21.89 %) as well as in pooled (-10.08%), ICMA04999 × J-2539 in E3 (-16.04) and ICMA04999 × ICMR15063 in E4 (-10.89%) exhibited largest magnitude of heterobeltiosis in negative direction for plant height. Most desirable hybrids *viz.,* ICMA98444 × ICMR18196 in E3 (-9.67%) and ICMA05444 × ICMR18196 in E4 (-12.41%) were observed significantly negative heterosis over standard check GHB-1351 (Table 2). Similar findings obtained by Patel *et al.* (2016).

The hybrid ICMA05444 × ICMR15451 in E1 (150.00%), E2 (109.09%), E4 (70.71%) as well as in pooled (105.15%) and ICMA17555 × ICMR20664 in E3 (100.00%), exhibited largest magnitude of heterosis over better parents in positive direction for number of

productive tillers per plant. Top desirable hybrids *viz.,* ICMA05444 × ICMR15451 in E1 (146.03%), E4 (37.40%) as well as in pooled (34.27%), ICMA05444 × ICMR20664 in E2 (12.96%) and ICMA17555 × ICMR20664 in E3 (19.35%) were observed significantly positive heterosis over standard hybrid check GHB-1351(Table 3). The results agreed with findings of Pallavi *et al.* (2020).

The hybrid ICMA05444 × ICMR20664 in E1 (71.79%), E3 (23.10%) as well as in pooled (7.95%) and ICMA17555 × ICMR20664 in E4 (29.54%) exhibited largest magnitude of heterosis over better parent in positive direction for flag leaf length and for standard heterosis, hybrids *viz.,* ICMA21777 × ICMR20664 in E1 (29.00%), E2 (24.55 %) and ICMA17555 × ICMR20664 in E3 (43.67%), E4 (40.13%) as well as in pooled (23.07%), ICMA05444 × ICMR20664 in E2 (12.96%) and ICMA17555 × ICMR20664 in E3 (19.35%) were observed significantly positive (Table 4). These results of heterobeltiosis and standard heterosis agreed with Maheswari *et al.* (2024).

The hybrids ICMA05444 × J-2539 in E1 (90.51%), ICMA17555 × ICMR20664 in E2 (45.85%), E4 (22.90%) as well as in pooled (26.36%) and ICMA05444 × ICMR15451 in E3 (86.34%) observed largest magnitude of heterobeltiosis in positive direction for flag leaf width whereas, top desirable hybrids *viz.,* ICMA17555 × ICMR20945 in E1 (67.26%), E3 (80.54%), E4 (44.83) as well as in pooled (44.54%) and ICMA17555 × ICMR20664 in E2 (29.33%) were recorded significantly positive heterosis over standard check GHB-1351 (Table 5). The present study of heterosis agreed with findings of Maheswari *et al.* (2024).

The hybrids ICMA05444 × J-2539 in E1 (81.75%), ICMA17555 × ICMR15451 in E2 (26.51%) and ICMA17555 × ICMR20664 in E3 (16.03%), E4 (28.54%) as well as in pooled (25.92%) noticed largest magnitude of heterobeltiosis in positive direction for flag leaf sheath and for standard heterosis top desirable hybrids *viz.,* ICMA17555 × ICMR20945 in E1 (76.07%) as well as in pooled (30.30%), ICMA17555 × ICMR18196 in E2 (15.61%) and ICMA17555 × ICMR20664 in E3 (48.05%), E4 (34.50%) were found significantly positive over check (Table 6). The present investigation agreed with Acharya *et al.* (2017).

For number of nodes on main tiller (Table 7) hybrids ICMA17555 × ICMR15451 in E2 (27.65%), E3 (29.56%) as well as in pooled (17.40%) and ICMA21777 × ICMR15063 in E4 (27.60%) exhibited largest magnitude of heterobeltiosis in positive direction and top desirable hybrids *viz.,* ICMA17555 × ICMR20664 in E1 (27.15%) and ICMA17555 × ICMR20283 in E2 (14.34%), E3 (33.33%), E4 (36.32%) as well as in pooled (24.55%) were observed significantly positive heterosis over standard check GHB-1351. The similar results of heterosis agreed with Mungra *et al.* (2014).

The hybrids ICMA21777 × ICMR20664 in E1 (55.11%), ICMA98444 × ICMR20664 in E2 (50.86%), ICMA17555 × ICMR20664 in E3 (37.35%) and ICMA17555 × ICMR20945 in E4 (45.97%) as well as in pooled (45.92%) exhibited largest magnitude of heterosis over better parent in positive direction for earhead length, whereas most desirable hybrids *viz.,* ICMA17555 × ICMR20945 in E1 (73.72%), E4 (49.13%) as well as in pooled (65.60%) and ICMA17555 × ICMR20664 in E2 (65.67%), E3 (103.82%) were exhibited significantly positive heterosis over standard check (Table 8). Earlier the same results were noticed by Kapildev *et al.* (2023).

The hybrids ICMA17555 × ICMR18196 in E1 (34.83%), ICMA05444 × ICMR15451 in E3 (28.13%), ICMA04999 × ICMR15063 in E4 (57.24%) and ICMA05444 × ICMR15063 in pooled (23.99%) found largest magnitude of heterosis over better parent in positive direction for earhead girth and similarly most desirable hybrids *viz.,* ICMA21777 × ICMR20664 in E1 (55.38%) as well as in pooled (16.81%) and ICMA21777 × ICMR18196 in E3 (42.93%), E4 (22.32%) were recorded significantly positive heterosis over standard check (Table 9). The present results of standard heterosis were similar to findings of Singh *et al.* (2022).

The hybrids ICMA17555 × ICMR18196 in E1 (-25.07%), ICMA98444 × ICMR20664 in E2 (-18.81%), ICMA04999 × ICMR20945 in E3 (-16.39%) and E4 (-19.26%), ICMA04999 × ICMR20664 in E4 (-19.26%) and ICMA04999 × ICMR15063 in pooled (-17.15%) exhibited largest magnitude of heterobeltiosis in negative direction for days to maturity whereas, most desirable hybrid ICMA98444 × ICMR20283 in E2 (-5.43%) was observed significantly negative standard heterosis (Table 10). The similar results reported by Maheswari *et al.* (2024).

The hybrid ICMA05444 × ICMR18196 in E1 (51.98%), E3 (50.87%), E4 (91.56%) as well as in pooled (49.38%) and ICMA98444 × ICMR20664 in E2 (36.09%) exhibited largest magnitude of heterosis over better parent in positive direction for test weight and top desirable hybrids *viz.,* ICMA98444 × J-2539 in E1 (8.24%), ICMA05444 × ICMR18196 in E2 (24.59%) as well as in pooled (15.04%), ICMA21777

× ICMR18196 in E3 (55.83%) and ICMA05444 × ICMR20664 in E4 (4.04%) were recorded significantly positive heterosis over standard check GHB-1351 (Table 11). Above investigation found accordance with the study of Singh *et al.* (2022).

The hybrids ICMA05444 × ICMR20664 in E1 (456.82%), ICMA21777 × ICMR20945 in E2 (393.44%), ICMA04999 × ICMR20664 in E3 (244.71%), E4 (354.46%) and ICMA05444 × ICMR15451 in pooled (288.50%) recorded largest magnitude of heterosis over better parent in positive direction for grain yield per plant. Most desirable hybrids *viz.,* ICMA21777 × ICMR20664 in E1 (139.65%), ICMA21777 × ICMR20945 in E2 (91.54%), ICMA17555 × ICMR20945 in E3 (162.92%), ICMA98444× J-2539 in E4 (94.17%) and ICMA05444 × ICMR20664 in pooled (54.61%) were recorded significantly positive heterosis over standard check GHB-1351 (Table 12) these results indicated the possibility and scope of exploitation of heterosis in pearl millet due to the availability of 100 *per cent* cytoplasmic male sterile lines. The above results agreed with findings of Rafiq *et al.* (2016), Acharya *et al.* (2017), Chittora and Patel (2017), Pallavi *et al.* (2020), Warrier *et al.* (2020), Singh *et al.* (2022) and Kapildev *et al.* (2023).

The hybrid ICMA98444 × ICMR20283 in E1 (-63.06%), E4 (-55.21%), in pooled (-44.07%), ICMA21777 × J-2539 in E2 (-67.80%) and ICMA04999 × J-2539 in E3 (-67.27%) recorded largest magnitude of heterobeltiosis in negative direction for dry fodder yield per plant whereas, most desirable hybrids *viz.,* ICMA98444 × ICMR18196 in E1 (-44.55%), ICMA98444 × ICMR15451 in E2 (-74.63%) as well as in pooled (-35.03%), ICMA04999 × J-2539 in E3 (-41.49%) and ICMA98444 × ICMR20283 in E4 (-40.86%) were recorded significantly negative standard heterosis (Table 13). The above results of heterosis agreed with Patel *et al.* (2016).

The hybrids ICMA17555 × ICMR15063 in E1 (41.26%), ICMA17555 × ICMR18196 in E2 (64.72%) as well as in pooled (33.60%) and ICMA04999 × J-2539 in E3 (19.27%) recorded largest magnitude of heterosis over better parent in positive direction for harvest index and top desirable hybrids *viz.,* ICMA05444 × ICMR18196 in E1 (18.49%), ICMA17555 × ICMR18196 in E2 (41.14%), ICMA04999 × ICMR20664 in E4 (23.42%) and ICMA04999 × ICMR18196 in pooled (14.20%) were recorded significantly positive heterosis over standard check GHB-1351 (Table 14). The similar results agreed with findings of Acharya *et al.* (2017).

In the present investigation, the degree of heterosis differs across hybrids for all studied traits. The standard heterosis helps to understand outperforming hybrids that may deliver improved yields or characteristics compared to recently released varieties, thus ensuring their practical significance in agriculture.

An examination of performance of hybrids pooled over the environments in respect of heterosis over better parent revealed that thirteen hybrids manifested significant positive heterobeltiosis for grain yield per plant. The hybrid ICMA05444 × ICMR15451 was recorded the highest extent of heterobeltiosis (Table 12) and also manifested heterotic effects for its contributing characters like days to flowering, number of productive tillers per plant, flag leaf width, earhead length, earhead girth, days to maturity, test weight and harvest index.

Table 15 summarises the best crosses that demonstrate high significant standard heterosis with standard check (GHB-1351) for grain yield per plant. Hybrids ICMA21777 × ICMR20664, ICMA05444 × ICMR15451, ICMA17555 × ICMR20945 at E1, ICMA21777 × ICMR20945, ICMA21777 × ICMR20283, ICMA21777 × ICMR20664 at E2, ICMA17555 × ICMR20945, ICMA17555 × ICMR20664, ICMA21777 × ICMR20283 at E3, ICMA98444 × J-2539, ICMA98444 × ICMR18196, ICMA04999 × ICMR20664 at E4 and ICMA05444 × ICMR20664, ICMA21777 × ICMR20945, ICMA17555 × ICMR20945 in pooled over environments are the top heterotic hybrids over a check. Within the context of grain yield per plant, they demonstrated significant positive standard heterosis ranging from 86.16 to 139.65 *per cent*, 35.44 to 91.54 *per cent*, 144.67 to 162.92 *per cent*, 90.97 to 94.17 *per cent* and 45.25 to 54.61 *per cent* at E1, E2, E3, E4 and pooled over environments respectively. This suggested that improved growth and yield characteristics in these hybrids, as opposed to check, were responsible for the enhanced productivity shown in them. Thus, it is recommended to include these hybrids for further assessment in the generation advancement to obtain desirable transgressive segregants.

Table 1 *Per cent* heterosis over better parent and standard check (GHB-1351) in individual and pooled over the environments for days to flowering in Pearl millet

Sr. No.	Hybrids	Heterobeltiosis (HB)					Standard Heterosis (SH)				
		E1	E2	E3	E4	Pooled	E1	E2	E3	E4	Pooled
1	ICMA17555 × ICMR20945	-27.43 **	-5.73 **	-23.83 **	-8.67 **	-17.16 **	34.38 **	25.69 **	26.36 **	36.64 **	30.64 **
2	ICMA17555 × ICMR20664	-17.72 **	-5.21 **	-21.50 **	-7.14 **	-13.35 **	52.34 **	26.39 **	30.23 **	38.93 **	36.65 **
3	ICMA17555 × ICMR20283	-29.11 **	-9.90 **	-21.03 **	-6.12 **	-17.28 **	31.25 **	20.14 **	31.01 **	40.46 **	30.45 **
4	ICMA17555 × ICMR15063	-24.05 **	-4.69 *	-21.03 **	-10.71 **	-15.73 **	40.63 **	27.08 **	31.01 **	33.59 **	32.89 **
5	ICMA17555 × ICMR15451	-29.96 **	-13.54 **	-23.36 **	-14.80 **	-20.98 **	29.69 **	15.28 **	27.13 **	27.48 **	24.62 **
6	ICMA17555 × ICMR18196	-30.80 **	-10.94 **	-26.64 **	-10.20 **	-20.38 **	28.13 **	18.75 **	21.71 **	34.35 **	25.56 **
7	ICMA17555 × J-2539	-20.68 **	-9.38 **	-24.77 **	-11.73 **	-17.04 **	46.88 **	20.83 **	24.81 **	32.06 **	30.83 **
8	ICMA21777 × ICMR20945	-6.97 *	-3.80	-18.32 **	-3.26 *	-7.30 **	46.09 **	22.92 **	20.93 **	35.88 **	31.20 **
9	ICMA21777 × ICMR20664	-16.92 **	-9.57 **	-20.22 **	-13.04 **	-13.81 **	30.47 **	18.06 **	13.18 **	22.14 **	20.86 **
10	ICMA21777 × ICMR20283	-21.89 **	-14.13 **	-14.12 **	-11.41 **	-15.55 **	22.66 **	9.72 **	17.83 **	24.43 **	18.42 **
11	ICMA21777 × ICMR15063	-16.42 **	-19.02 **	-13.74 **	-12.50 **	-14.88 **	31.25 **	3.47	21.71 **	22.90 **	19.36 **
12	ICMA21777 × ICMR15451	-22.39 **	-21.20 **	-12.43 **	-3.80 **	-15.15 **	21.88 **	0.69	20.16 **	35.11 **	18.98 **
13	ICMA21777 × ICMR18196	-19.90 **	-17.39 **	-20.90 **	-16.30 **	-18.63 **	25.78 **	5.56 *	8.53 *	17.56 **	14.10 **
14	ICMA21777 × J-2539	-18.91 **	-14.13 **	-18.64 **	-13.04 **	-16.22 **	27.34 **	9.72 **	11.63 **	22.14 **	17.48 **
15	ICMA98444 × ICMR20945	-25.25 **	-26.23 **	-21.47 **	-27.62 **	-25.10 **	15.63 **	-6.25 *	16.28 **	0.00	6.02 **
16	ICMA98444 × ICMR20664	-17.10 **	-29.26 **	-19.67 **	-11.43 **	-19.49 **	25.00 **	-7.64 **	13.95 **	18.32 **	11.84 **
17	ICMA98444 × ICMR20283	-16.30 **	-22.29 **	-14.81 **	-18.86 **	-17.57 **	20.31 **	-10.42 **	6.98	8.40 **	5.83 **
18	ICMA98444 × ICMR15063	-23.83 **	-22.78 **	-14.29 **	-19.89 **	-20.24 **	14.84 **	-3.47	20.93 **	10.69 **	10.34 **
19	ICMA98444 × ICMR15451	-11.41 **	-15.03 **	-16.96 **	-29.78 **	-17.57 **	27.34 **	2.08	10.08 *	-4.58 *	8.46 **
20	ICMA98444 × ICMR18196	-17.93 **	-21.08 **	-14.97 **	-28.00 **	-19.47 **	17.97 **	-9.03 **	10.08 *	-3.82	3.38 *
21	ICMA98444 × J-2539	-15.22 **	-10.24 **	-9.49 **	-26.86 **	-15.67 **	21.88 **	3.47	10.85 *	-2.29	8.27 **
22	ICMA04999 × ICMR20945	-13.64 **	-16.94 **	-26.70 **	-32.60 **	-22.31 **	33.59 **	5.56 *	8.53 *	-6.87 **	9.96 **
23	ICMA04999 × ICMR20664	-18.13 **	-26.60 **	-22.95 **	-29.14 **	-24.09 **	23.44 **	-4.17	9.30 *	-5.34 *	5.45 **
24	ICMA04999 × ICMR20283	-17.75 **	-20.12 **	-14.81 **	-25.30 **	-19.52 **	8.59 *	-9.03 **	6.98	-5.34 *	0.00
25	ICMA04999 × ICMR15063	-34.20 **	-22.78 **	-21.98 **	-29.28 **	-27.17 **	-0.78	-3.47	10.08 *	-2.29	0.75
26	ICMA04999 × ICMR15451	-32.02 **	-16.76 **	-18.71 **	-33.15 **	-25.29 **	-5.47	0.00	7.75	-9.16 **	-1.69
27	ICMA04999 × ICMR18196	-23.31 **	-19.14 **	-17.96 **	-27.16 **	-21.87 **	-2.34	-9.03 **	6.20	-9.92 **	-3.95 *
28	ICMA04999 × J-2539	-17.42 **	-17.58 **	-3.82	-18.42 **	-14.31 **	0.00	-5.56 *	17.05 **	-5.34 *	1.32
29	ICMA05444 × ICMR20945	-24.75 **	-22.95 **	-25.13 **	-27.07 **	-24.97 **	16.41 **	-2.08	10.85 *	0.76	6.20 **
30	ICMA05444 × ICMR20664	-18.13 **	-21.28 **	-19.13 **	-26.29 **	-21.11 **	23.44 **	2.78	14.73 **	-1.53	9.59 **
31	ICMA05444 × ICMR20283	-23.08 **	-19.51 **	-12.96 **	-23.49 **	-19.82 **	1.56	-8.33 **	9.30 *	-3.05	-0.38
32	ICMA05444 × ICMR15063	-21.76 **	-16.67 **	-21.98 **	-27.62 **	-22.01 **	17.97 **	4.17	10.08 *	0.00	7.89 **
33	ICMA05444 × ICMR15451	-14.04 **	-12.14 **	-16.96 **	-22.47 **	-16.43 **	19.53 **	5.56 *	10.08 *	5.34 *	9.96 **
34	ICMA05444 × ICMR18196	-15.34 **	-13.58 **	-18.56 **	-23.46 **	-17.74 **	7.81	-2.78	5.43	-5.34 *	1.13
35	ICMA05444 × J-2539	-6.45	-15.15 **	-8.92 *	-13.16 **	-10.97 **	13.28 **	-2.78	10.85 *	0.76	5.26 **
Range	Min.	-34.20	-29.26	-26.70	-33.15	-27.17	-5.47	-10.42	5.43	-9.92	-3.95
	Max.	-6.45	-3.80	-3.82	-3.26	-7.30	52.34	27.08	31.01	40.46	36.65
S. E. ±		1.77	1.18	1.79	0.77	0.72	1.79	1.19	1.79	0.89	0.73
No. of significant crosses		34	34	34	35	35	29	23	30	26	29
Positive significant crosses		-	-	-	-	-	29	15	30	18	28
Negative significant crosses		34	34	34	35	35	-	8	-	8	1

*, ** Significant at P = 0.05 and P = 0.01 levels of probability, respectively and E1, E2, E3 and E4 were different environments *viz*., Shihori, Jagudan, Sardarkrushinagar and Vijapur, respectively

Table 2 : *Per cent* heterosis over better parent and standard check (GHB-1351) in individual and pooled over the environments for plant height in Pearl millet

Sr. No.	Hybrids	Heterobeltiosis (HB)					Standard Heterosis (SH)				
		E1	E2	E3	E4	Pooled	E1	E2	E3	E4	Pooled
1	ICMA17555 × ICMR20945	23.64 **	9.61 **	39.02 **	42.31 **	26.73 **	31.61 **	27.56 **	31.89 **	13.64 **	25.60 **
2	ICMA17555 × ICMR20664	52.61 **	28.08 **	58.25 **	31.13 **	41.31 **	33.16 **	26.38 **	54.52 **	14.77 **	31.09 **
3	ICMA17555 × ICMR20283	-9.37 **	0.22	4.82 *	-2.15	-1.40	12.62 **	28.12 **	42.02 **	8.75 **	22.40 **
4	ICMA17555 × ICMR15063	3.63	6.00 *	22.78 **	9.84 **	10.51 **	20.45 **	34.79 **	56.59 **	19.42 **	32.23 **
5	ICMA17555 × ICMR15451	10.87 **	16.65 **	31.67 **	37.46 **	24.03 **	16.34 **	28.79 **	47.36 **	24.43 **	28.98 **
6	ICMA17555 × ICMR18196	25.40 **	3.71	27.82 **	25.61 **	19.17 **	14.64 **	20.46 **	31.50 **	7.10 *	17.95 **
7	ICMA17555 × J-2539	15.70 **	14.45 **	19.36 **	19.83 **	17.27 **	21.13 **	22.24 **	34.86 **	8.57 **	21.06 **
8	ICMA21777 × ICMR20945	13.05 **	3.00	52.52 **	44.02 **	25.38 **	20.33 **	19.86 **	44.69 **	15.01 **	24.26 **
9	ICMA21777 × ICMR20664	39.95 **	16.18 **	34.61 **	27.84 **	28.70 **	22.11 **	14.64 **	31.43 **	11.89 **	19.38 **
10	ICMA21777 × ICMR20283	-5.04 *	-3.57	-2.16	4.64	-1.51	18.00 **	23.28 **	32.57 **	16.30 **	22.26 **
11	ICMA21777 × ICMR15063	1.00	1.30	16.17 **	13.52 **	7.91 **	17.39 **	28.81 **	48.16 **	23.41 **	29.13 **
12	ICMA21777 × ICMR15451	17.25 **	18.46 **	26.84 **	40.06 **	25.45 **	23.03 **	30.79 **	41.96 **	26.78 **	30.46 **
13	ICMA21777 × ICMR18196	26.28 **	2.52	33.32 **	39.42 **	23.58 **	15.45 **	19.07 **	37.17 **	18.87 **	22.31 **
14	ICMA21777 × J-2539	-0.77	12.46 **	9.40 **	19.83 **	10.46 **	3.89	20.11 **	23.60 **	8.57 **	14.03 **
15	ICMA98444 × ICMR20945	-5.74 *	0.73	27.72 **	24.38 **	10.31 **	0.33	17.22 **	21.17 **	-0.67	9.33 **
16	ICMA98444 × ICMR20664	21.40 **	40.19 **	28.54 **	36.51 **	32.44 **	5.92 *	38.34 **	25.51 **	19.48 **	22.86 **
17	ICMA98444 × ICMR20283	-21.89 **	-2.51	-12.55 **	-5.30 *	-10.08 **	-2.94	24.63 **	18.48 **	5.25	11.62 **
18	ICMA98444 × ICMR15063	-1.04	7.98 **	4.38	6.33 *	4.71 **	15.02 **	37.31 **	33.12 **	15.60 **	25.29 **
19	ICMA98444 × ICMR15451	6.66 *	16.36 **	3.40	13.14 **	10.20 **	11.92 **	28.48 **	15.72 **	2.42	14.60 **
20	ICMA98444 × ICMR18196	18.14 **	12.34 **	-12.21 **	28.88 **	11.71 **	8.01 **	30.48 **	-9.67 **	9.89 **	10.56 **
21	ICMA98444 × J-2539	1.74	9.92 **	9.11 **	17.99 **	9.81 **	6.52 *	17.40 **	23.27 **	6.90 *	13.36 **
22	ICMA04999 × ICMR20945	1.38	8.48 **	35.16 **	23.20 **	15.85 **	7.91 **	26.24 **	28.22 **	-1.62	14.82 **
23	ICMA04999 × ICMR20664	20.21 **	26.14 **	27.69 **	14.58 **	22.22 **	4.88	24.47 **	24.68 **	0.29	13.38 **
24	ICMA04999 × ICMR20283	-11.75 **	3.10	-9.96 **	-10.47 **	-6.87 **	9.67 **	31.80 **	21.99 **	-0.49	15.61 **
25	ICMA04999 × ICMR15063	-8.81 **	4.59	-3.33	-10.89 **	-4.17 *	6.00 *	32.99 **	23.29 **	-3.12	14.66 **
26	ICMA04999 × ICMR15451	0.27	6.27 *	1.37	4.12	3.19	5.21	17.34 **	13.45 **	-5.75 *	7.31 **
27	ICMA04999 × ICMR18196	10.32 **	6.71 **	8.37 **	12.02 **	9.12 **	0.85	23.94 **	11.49 **	-4.49	8.00 **
28	ICMA04999 × J-2539	-5.12	16.73 **	-16.04 **	3.47	0.34	-0.66	24.67 **	-5.14	-6.25 *	3.59 *
29	ICMA05444 × ICMR20945	7.57 **	14.99 **	33.12 **	33.77 **	21.33 **	14.50 **	33.81 **	26.29 **	6.83 *	20.25 **
30	ICMA05444 × ICMR20664	28.44 **	34.19 **	11.16 **	23.79 **	24.74 **	12.06 **	32.42 **	8.54 **	8.35 **	15.71 **
31	ICMA05444 × ICMR20283	-11.21 **	5.05 *	-16.00 **	-5.46 *	-6.47 **	10.33 **	34.29 **	13.81 **	5.07	16.11 **
32	ICMA05444 × ICMR15063	-7.42 **	-0.36	-6.77 **	-4.18	-4.43 **	7.61 **	26.70 **	18.90 **	4.17	14.36 **
33	ICMA05444 × ICMR15451	-0.95	5.43 *	2.26	18.33 **	6.31 **	3.93	16.41 **	14.44 **	7.11 *	10.56 **
34	ICMA05444 × ICMR18196	7.59 *	-4.24	-2.72	2.73	0.26	-1.64	11.23 **	0.08	-12.41 **	-0.77
35	ICMA05444 × J-2539	-5.32 *	0.95	-1.25	3.79	-0.34	-0.88	7.82 **	11.56 **	-5.96 *	2.88 *
Range	Min.	-21.89	-4.24	-16.04	-10.89	-10.08	-2.94	7.82	-9.67	-12.41	-0.77
	Max.	52.61	40.19	58.25	44.02	41.31	33.16	38.34	56.59	26.78	32.23
S. E. ±		3.92	5.00	4.03	4.64	2.21	3.92	4.95	4.00	4.79	2.22
No. of significant crosses		26	22	27	28	29	25	35	33	25	34
Positive significant crosses		17	22	21	24	24	25	35	32	21	34
Negative significant crosses		9	-	6	4	5	-	-	1	4	-

*, ** Significant at P = 0.05 and P = 0.01 levels of probability respectively and E1, E2, E3 and E4 were different environments *viz.,* Shihori, Jagudan, Sardarkrushinagar and Vijapur, respectively

Table 3 : *Per cent* heterosis over better parent and standard check (GHB-1351) in individual and pooled over the environments for number of productive tillers per plant in Pearl millet

Sr. No.	Hybrids	Heterobeltiosis (HB)					Standard Heterosis (SH)				
		E1	E2	E3	E4	Pooled	E1	E2	E3	E4	Pooled
1	ICMA17555 × ICMR20945	74.42 **	-17.65 **	88.89 **	56.12 **	35.40 **	19.05 **	-9.26	9.68	24.39 **	10.67 **
2	ICMA17555 × ICMR20664	54.55 **	-54.62 **	100.00 **	14.43 *	5.50	7.94	-50.00 **	19.35 **	-9.76	-13.76 **
3	ICMA17555 × ICMR20283	-15.28 **	-45.38 **	17.65	17.86 **	-3.25	-3.17	-39.81 **	-35.48 **	7.32	-16.29 **
4	ICMA17555 × ICMR15063	-40.00 **	-16.67 **	-33.93 **	0.00	-19.26 **	-23.81 **	1.85	-40.32 **	-9.76	-14.04 **
5	ICMA17555 × ICMR15451	51.61 **	-19.33 **	80.00 **	27.27 **	30.24 **	49.21 **	-11.11 *	1.61	2.44	6.46 *
6	ICMA17555 × ICMR18196	25.49 **	-62.18 **	23.53 *	2.78	-9.97 *	1.59	-58.33 **	-32.26 **	-9.76	-26.40 **
7	ICMA17555 × J-2539	-4.55	-53.78 **	-29.17 **	-11.02	-28.27 **	-33.33 **	-49.07 **	-45.16 **	-14.63 *	-33.71 **
8	ICMA21777 × ICMR20945	3.45	14.10	2.78	-37.50 **	-13.00 **	-4.76	-17.59 **	-40.32 **	-22.76 **	-21.07 **
9	ICMA21777 × ICMR20664	25.86 **	-16.67 **	-10.81	-32.24 **	-7.43	15.87 **	-16.67 **	-46.77 **	-16.26 **	-16.01 **
10	ICMA21777 × ICMR20283	-30.56 **	-1.11	0.00	-17.11 **	-7.12	-20.63 **	-17.59 **	-43.55 **	2.44	-15.73 **
11	ICMA21777 × ICMR15063	-41.25 **	-40.15 **	-39.29 **	-25.00 **	-27.70 **	-25.40 **	-26.85 **	-45.16 **	-7.32	-23.03 **
12	ICMA21777 × ICMR15451	4.84	-7.69	8.57	-24.34 **	-10.22 *	3.17	-33.33 **	-38.71 **	-6.50	-18.54 **
13	ICMA21777 × ICMR18196	3.45	-22.35 **	0.00	-17.11 **	-11.15 *	-4.76	-38.89 **	-43.55 **	2.44	-19.38 **
14	ICMA21777 × J-2539	-5.17	-49.58 **	-18.75 *	-17.11 **	-14.89 **	-12.70 *	-44.44 **	-37.10 **	2.44	-21.35 **
15	ICMA98444 × ICMR20945	51.22 **	-25.44 **	-8.33	-14.96 **	-7.40	-1.59	-21.30 **	-46.77 **	-12.20 *	-19.10 **
16	ICMA98444 × ICMR20664	22.73 **	-42.11 **	-2.70	-8.66	-12.54 **	-14.29 *	-38.89 **	-41.94 **	-5.69	-23.60 **
17	ICMA98444 × ICMR20283	-15.28 **	-37.72 **	-5.88	-24.41 **	-16.40 **	-3.17	-34.26 **	-48.39 **	-21.95 **	-26.97 **
18	ICMA98444 × ICMR15063	-10.00 *	-45.45 **	-19.64 **	-12.60 *	-20.84 **	14.29 *	-33.33 **	-27.42 **	-9.76	-15.73 **
19	ICMA98444 × ICMR15451	-4.84	-52.63 **	11.43	-11.02 *	-14.79 **	-6.35	-50.00 **	-37.10 **	-8.13	-25.56 **
20	ICMA98444 × ICMR18196	-25.49 **	-47.37 **	-8.82	31.50 **	-4.82	-39.68 **	-44.44 **	-50.00 **	35.77 **	-16.85 **
21	ICMA98444 × J-2539	29.55 **	-39.50 **	-33.33 **	-1.57	-13.07 **	-9.52	-33.33 **	-48.39 **	1.63	-19.66 **
22	ICMA04999 × ICMR20945	-16.67 **	-51.72 **	2.78	22.22 **	-14.11 **	-12.70 *	-48.15 **	-40.32 **	7.32	-21.35 **
23	ICMA04999 × ICMR20664	-9.09	-47.41 **	-5.41	35.19 **	-7.36	-4.76	-43.52 **	-43.55 **	18.70 **	-15.17 **
24	ICMA04999 × ICMR20283	-41.67 **	-33.62 **	-8.33	28.57 **	-9.20 *	-33.33 **	-28.70 **	-46.77 **	17.07 **	-16.85 **
25	ICMA04999 × ICMR15063	-30.00 **	-21.21 **	-35.71 **	29.73 **	-10.29 **	-11.11	-3.70	-41.94 **	17.07 **	-4.49
26	ICMA04999 × ICMR15451	-7.58	-26.72 **	5.56	54.63 **	7.67	-3.17	-21.30 **	-38.71 **	35.77 **	-1.40
27	ICMA04999 × ICMR18196	-22.73 **	-31.90 **	-5.56	11.11	-12.88 **	-19.05 **	-26.85 **	-45.16 **	-2.44	-20.22 **
28	ICMA04999 × J-2539	10.61	-34.45 **	-14.58	7.63	-3.04	15.87 **	-27.78 **	-33.87 **	3.25	-10.39 **
29	ICMA05444 × ICMR20945	12.20	-3.90	25.00 *	42.86 **	21.03 **	-26.98 **	-31.48 **	-27.42 **	13.82 *	-14.33 **
30	ICMA05444 × ICMR20664	54.55 **	12.96 *	-16.22	29.59 **	21.68 **	7.94	12.96 *	-50.00 **	3.25	-2.25
31	ICMA05444 × ICMR20283	-1.39	-6.67	0.00	-7.14	-4.87	12.70 *	-22.22 **	-45.16 **	-15.45 **	-17.70 **
32	ICMA05444 × ICMR15063	-16.25 **	-31.82 **	-37.50 **	49.55 **	-5.54	6.35	-16.67 **	-43.55 **	34.96 **	0.56
33	ICMA05444 × ICMR15451	150.00 **	109.09 **	11.43	70.71 **	105.15 **	146.03 **	6.48	-37.10 **	37.40 **	34.27 **
34	ICMA05444 × ICMR18196	17.65 *	4.71	58.82 **	16.67 *	18.35 **	-4.76	-17.59 **	-12.90 *	2.44	-7.58 **
35	ICMA05444 × J-2539	-9.09	-14.29 **	-25.00 **	43.22 **	5.47	-36.51 **	-5.56	-41.94 **	37.40 **	-2.53
Range	Min.	-41.67	-62.18	-39.29	-37.50	-28.27	-39.68	-58.33	-50.00	-22.76	-33.71
	Max.	150.00	109.09	100.00	70.71	105.15	146.03	12.96	19.35	37.40	34.27
S. E. ±		0.12	0.19	0.12	0.23	0.09	0.12	0.19	0.12	0.23	0.09
No. of significant crosses		23	29	16	27	23	19	30	33	16	30
Positive significant crosses		13	2	6	16	6	7	1	1	10	3
Negative significant crosses		12	27	10	11	17	12	29	32	6	27

*, ** Significant at P = 0.05 and P = 0.01 levels of probability respectively and E1, E2, E3 and E4 were different environments *viz.,* Shihori, Jagudan, Sardarkrushinagar and Vijapur, respectively

Table 4 : *Per cent* heterosis over better parent and standard check (GHB-1351) in individual and pooled over the environments for flag leaf length in Pearl millet

Sr. No.	Hybrids	Heterobeltiosis (HB)					Standard Heterosis (SH)				
		E1	E2	E3	E4	Pooled	E1	E2	E3	E4	Pooled
1	ICMA17555 × ICMR20945	14.85 **	0.76	-23.08 **	-2.27	-3.09	16.51 **	18.37 **	25.34 **	11.93 *	17.54 **
2	ICMA17555 × ICMR20664	18.85 **	-14.97 **	-12.05	29.54 **	5.65	2.17	12.68 *	43.67 **	40.13 **	23.07 **
3	ICMA17555 × ICMR20283	-4.42	-25.37 **	-22.46 **	-1.89	-14.54 **	-15.17 **	-9.11	7.01	14.82 **	-1.33
4	ICMA17555 × ICMR15063	8.04	-21.31 **	-21.00 **	13.43 *	-2.23	-7.12	-2.44	9.03	16.27 **	3.44
5	ICMA17555 × ICMR15451	-11.88 *	-26.84 **	-23.89 **	-5.92	-13.01 **	-24.25 **	-13.33 *	5.04	-3.56	-10.02 **
6	ICMA17555 × ICMR18196	19.81 **	-11.83 *	-22.95 **	-10.89 *	-4.57	2.99	-3.01	6.33	-8.66	-1.28
7	ICMA17555 × J-2539	-23.17 **	1.68	-16.80 **	-15.77 **	-8.06 *	-33.95 **	13.50 *	14.82 *	-13.67 *	-4.90
8	ICMA21777 × ICMR20945	-5.05	-4.43	-36.81 **	-11.09 *	-13.38 **	0.93	12.28 *	2.96	1.83	5.05
9	ICMA21777 × ICMR20664	21.36 **	-6.01	-25.08 **	1.51	4.21	29.00 **	24.55 **	22.37 **	9.82	21.38 **
10	ICMA21777 × ICMR20283	-0.19	-9.48 *	-13.91 *	-13.08 **	-5.98 *	6.09	10.24	18.46 *	1.73	8.54 **
11	ICMA21777 × ICMR15063	-5.24	-6.56	-5.68	17.60 **	6.10	0.72	15.85 **	16.44 *	15.78 **	12.26 **
12	ICMA21777 × ICMR15451	-22.43 **	-2.33	23.10 **	0.29	7.95 *	-17.54 **	15.69 **	35.04 **	-1.25	6.78 *
13	ICMA21777 × ICMR18196	-11.17 *	4.88	6.70	-0.29	6.76 *	-5.57	15.37 **	31.00 **	-1.83	8.69 **
14	ICMA21777 × J-2539	-6.02	-25.27 **	-6.76	-4.69	-5.03	-0.10	-16.59 **	13.48	-6.16	-4.25
15	ICMA98444 × ICMR20945	-16.58 **	-10.17 *	-39.78 **	-29.24 **	-23.60 **	-15.38 **	5.53	-1.89	-18.96 **	-7.34 **
16	ICMA98444 × ICMR20664	46.14 **	-10.67 **	-32.01 **	-3.91	-5.46	5.57	18.37 **	11.05	3.95	10.13 **
17	ICMA98444 × ICMR20283	-23.37 **	-29.11 **	-22.53 **	-21.13 **	-24.46 **	-31.99 **	-13.66 **	6.60	-7.70	-12.79 **
18	ICMA98444 × ICMR15063	29.56 **	-16.20 **	-12.88 *	1.03	-2.85	6.30	3.90	7.55	-5.20	2.79
19	ICMA98444 × ICMR15451	4.93	-20.93 **	-4.79	7.42	-6.07	-18.78 **	-6.34	4.45	-5.29	-7.09 *
20	ICMA98444 × ICMR18196	19.69 **	-5.54	-0.33	5.00	3.06	-5.26	3.90	22.37 **	3.18	4.92
21	ICMA98444 × J-2539	0.77	-7.65	-10.41	6.71	-3.21	-18.58 **	3.09	9.03	-2.02	-2.41
22	ICMA04999 × ICMR20945	-2.64	-19.17 **	-34.74 **	-15.63 **	-18.83 **	-1.24	-5.04	6.33	-3.37	-1.56
23	ICMA04999 × ICMR20664	67.40 **	-8.71 *	-25.50 **	-11.30 *	-2.33	17.65 **	20.98 **	21.70 **	-4.04	13.77 **
24	ICMA04999 × ICMR20283	12.56 *	-17.42 **	-9.11	-26.99 **	-12.50 **	-0.10	0.57	25.07 **	-14.55 **	1.03
25	ICMA04999 × ICMR15063	20.00 **	-28.39 **	-2.12	-9.98	-9.28 *	-1.55	-11.22 *	20.84 **	-15.53 **	-4.01
26	ICMA04999 × ICMR15451	0.40	-30.40 **	10.69	2.40	-8.41 *	-22.29 **	-17.56 **	21.43 **	-9.72	-9.40 **
27	ICMA04999 × ICMR18196	47.72 **	-9.24	-2.31	-4.60	4.27	16.92 **	-0.16	19.95 **	-6.26	6.16 *
28	ICMA04999 × J-2539	35.50 **	-20.54 **	-12.51 *	4.51	-1.84	9.49 *	-11.30 *	6.47	-4.04	-1.03
29	ICMA05444 × ICMR20945	7.73	-9.00 *	-24.15 **	-23.70 **	-13.01 **	9.29	6.91	23.58 **	-12.61 *	5.50 *
30	ICMA05444 × ICMR20664	71.79 **	-8.96 *	-20.13 **	-4.80	0.80	18.78 **	20.65 **	30.46 **	2.98	17.41 **
31	ICMA05444 × ICMR20283	16.05 **	-5.67	-25.56 **	-15.05 **	-8.51 *	2.99	14.88 **	2.43	-0.58	5.63 *
32	ICMA05444 × ICMR15063	30.57 **	-21.57 **	-6.66	3.49	-2.68	7.12	-2.76	15.23 *	-2.89	2.96
33	ICMA05444 × ICMR15451	26.40 **	-19.70 **	6.51	-6.55	-2.44	-2.17	-4.88	16.85 *	-17.61 **	-3.49
34	ICMA05444 × ICMR18196	29.07 **	-2.14	10.21	-9.60	4.66	2.17	7.64	35.31 **	-11.16 *	6.56 *
35	ICMA05444 × J-2539	36.40 **	3.13	1.22	-4.61	7.35 *	10.22 *	15.12 **	23.18 **	-12.42 *	8.24 **
Range	Min.	-23.37	-30.40	-39.78	-29.24	-24.46	-33.95	-17.56	-1.89	-18.96	-12.79
	Max.	71.79	4.88	23.10	29.54	7.95	29.00	24.55	43.67	40.13	23.07
S. E. ±		1.56	2.14	1.82	1.82	0.92	1.54	2.13	1.86	1.81	0.92
No. of significant crosses		24	22	20	14	16	16	19	20	13	20
Positive significant crosses		18	-	1	3	3	7	13	20	5	15
Negative significant crosses		6	22	19	11	13	9	6	-	8	5

*, ** Significant at P = 0.05 and P = 0.01 levels of probability, respectively, E1, E2, E3 and E4 were different environments *viz*., Shihori, Jagudan, Sardarkrushinagar and Vijapur, respectively

Table 5 : *Per cent* heterosis over better parent and standard check (GHB-1351) in individual and pooled over the environments for flag leaf width in Pearl millet

Sr. No.	Hybrids	Heterobeltiosis (HB)					Standard Heterosis (SH)				
		E1	E2	E3	E4	Pooled	E1	E2	E3	E4	Pooled
1	ICMA17555 × ICMR20945	57.06 **	21.31 **	-1.55	19.81 **	25.20 **	67.26 **	11.48 *	80.54 **	44.83 **	44.54 **
2	ICMA17555 × ICMR20664	42.22 **	45.85 **	-10.53 *	22.90 **	26.36 **	51.30 **	29.33 **	64.08 **	43.06 **	43.72 **
3	ICMA17555 × ICMR20283	7.63	20.63 **	-26.06 **	-2.40	-0.60	14.50 *	0.90	35.60 **	13.61 *	13.05 **
4	ICMA17555 × ICMR15063	16.07 **	11.93 *	-28.73 **	-5.76	-2.53	23.48 **	-6.38	30.70 **	9.69	10.85 **
5	ICMA17555 × ICMR15451	-10.07	-4.81	-38.83 **	-10.49	-13.47 **	-4.33	-10.88 *	12.18	4.19	-1.59
6	ICMA17555 × ICMR18196	1.12	1.67	-33.39 **	-16.97 **	-9.34 *	7.58	-3.83	22.15 *	-3.36	3.10
7	ICMA17555 × J-2539	-6.31	-3.77	-23.90 **	-8.65	-10.85 **	-0.32	-19.50 **	39.56 **	6.34	1.39
8	ICMA21777 × ICMR20945	21.65 **	28.49 **	-26.50 **	-22.67 **	-0.33	29.55 **	18.08 **	24.21 *	-6.52	15.07 **
9	ICMA21777 × ICMR20664	31.64 **	23.10 **	-12.39 *	1.02	16.56 **	34.63 **	9.15	38.77 **	10.81	20.27 **
10	ICMA21777 × ICMR20283	14.07 *	1.89	7.91	-7.38	7.01	16.67 *	-15.23 **	42.41 **	2.98	6.34
11	ICMA21777 × ICMR15063	2.96	4.00	6.91	10.25	14.62 **	5.30	-14.10 **	32.12 **	9.23	4.11
12	ICMA21777 × ICMR15451	-23.07 **	-6.17	18.63 *	-13.83 *	1.36	-21.32 **	-12.15 *	31.96 **	-14.63 *	-7.93 *
13	ICMA21777 × ICMR18196	3.49	-3.01	22.16 *	5.78	13.46 **	5.84	-8.25	37.82 **	5.68	6.16
14	ICMA21777 × J-2539	29.95 **	35.02 **	9.86	-13.08	19.12 **	32.90 **	-10.05 *	48.10 **	-13.89 *	8.20 *
15	ICMA98444 × ICMR20945	-17.07 **	-5.06	-38.67 **	-39.24 **	-25.19 **	-11.69	-12.75 *	3.64	-26.56 **	-13.63 **
16	ICMA98444 × ICMR20664	28.85 **	10.91 *	-27.37 **	-20.82 **	-4.40	1.52	-1.65	15.03	-13.14	-1.36
17	ICMA98444 × ICMR20283	-20.10 **	-6.67	-6.59	-18.61 **	-13.00 **	-30.74 **	-22.36 **	23.26 *	-9.51	-13.55 **
18	ICMA98444 × ICMR15063	46.50 **	-11.08	-3.07	2.69	6.75	8.77	-26.56 **	19.78 *	-0.28	-3.81
19	ICMA98444 × ICMR15451	17.93 *	-24.68 **	30.33 *	5.40	7.48	-12.45	-29.48 **	5.38	-14.45 *	-15.88 **
20	ICMA98444 × ICMR18196	30.61 **	-7.69	0.98	11.85	7.34	-3.03	-12.68 *	13.92	11.74	0.43
21	ICMA98444 × J-2539	27.11 **	22.74 **	-10.21	-5.06	11.53 *	-5.63	-17.40 **	21.04 *	-10.90	-6.76 *
22	ICMA04999 × ICMR20945	-13.11 *	-6.29	-22.94 **	-12.03 *	-13.27 **	-7.47	-13.88 **	30.22 **	6.34	0.13
23	ICMA04999 × ICMR20664	23.49 **	13.62 *	-17.38 **	-6.12	2.10	-2.71	0.75	30.85 **	2.98	5.35
24	ICMA04999 × ICMR20283	11.86	3.34	6.35	-2.60	3.91	-3.03	-14.03 **	40.35 **	8.29	3.26
25	ICMA04999 × ICMR15063	19.79 *	-12.44 *	5.89	-0.29	1.15	-15.48 *	-27.68 **	30.85 **	-3.17	-8.86 **
26	ICMA04999 × ICMR15451	8.28	-22.04 **	7.87	-2.68	4.32	-23.59 **	-27.01 **	8.39	-18.83 **	-18.35 **
27	ICMA04999 × ICMR18196	50.08 **	-11.02 *	3.51	-1.40	5.45	7.36	-15.83 **	16.77	-1.49	-1.34
28	ICMA04999 × J-2539	58.28 **	24.12 **	-19.72 **	8.34	17.84 **	11.69	-17.78 **	8.23	1.68	-1.49
29	ICMA05444 × ICMR20945	-2.95	2.37	-12.27 *	-15.88 **	-7.37 *	3.35	-5.93	48.26 **	1.68	6.94 *
30	ICMA05444 × ICMR20664	54.26 **	33.33 **	-9.39	-2.04	16.41 **	21.54 **	18.23 **	43.51 **	7.46	20.12 **
31	ICMA05444 × ICMR20283	19.10 *	19.66 **	-10.67	-7.96	4.75	3.25	-0.45	17.88	2.33	4.09
32	ICMA05444 × ICMR15063	54.33 **	2.00	5.25	-4.32	10.34 *	7.90	-15.75 **	30.06 **	-7.08	-0.58
33	ICMA05444 × ICMR15451	43.34 **	-17.63 **	86.34 **	21.68 *	19.22 **	-3.35	-22.88 **	27.37 **	-9.51	-6.69 *
34	ICMA05444 × ICMR18196	37.52 **	-12.53 *	31.14 **	2.80	9.23 *	-1.62	-17.25 **	47.94 **	2.70	2.20
35	ICMA05444 × J-2539	90.51 **	18.83 **	2.11	3.08	24.70 **	21.65 **	-17.63 **	37.66 **	-3.26	4.24
Range	Min.	-23.07	-24.68	-38.83	-39.24	-25.19	-30.74	-29.48	3.64	-26.56	-18.35
	Max.	90.51	45.85	86.34	22.90	26.36	67.26	29.33	80.54	44.83	44.54
S. E. ±		1.99	2.16	2.02	2.39	1.07	1.98	2.16	2.01	2.37	1.07
No. of significant crosses		26	20	19	11	20	14	26	26	8	16
Positive significant crosses		22	14	5	3	13	10	4	26	3	8
Negative significant crosses		4	6	14	8	7	4	22	-	5	8

*, ** Significant at P = 0.05 and P = 0.01 levels of probability, respectively, E1, E2, E3 and E4 were different environments *viz*., Shihori, Jagudan, Sardarkrushinagar and Vijapur, respectively

Table 6 : *Per cent* heterosis over better parent and standard check (GHB-1351) in individual and pooled over the environments for flag leaf sheath in Pearl millet

Sr. No.	Hybrids	Heterobeltiosis (HB)					Standard Heterosis (SH)				
		E1	E2	E3	E4	Pooled	E1	E2	E3	E4	Pooled
1	ICMA17555 × ICMR20945	48.29 **	-3.14	15.82	19.74 **	25.75 **	76.07 **	-4.17	36.69 **	14.93 *	30.30 **
2	ICMA17555 × ICMR20664	30.04 **	-15.35 *	16.03 *	28.54 **	25.92 **	54.40 **	-8.02	48.05 **	34.50 **	30.24 **
3	ICMA17555 × ICMR20283	6.46	2.78	-4.69	5.46	9.90 *	26.41 **	-5.13	28.73 **	4.14	12.24 **
4	ICMA17555 × ICMR15063	2.76	-0.23	13.06	-9.97	10.38 *	22.01 **	-6.20	39.12 **	4.27	12.74 **
5	ICMA17555 × ICMR15451	-1.90	26.51 **	12.52	12.19	15.11 **	16.48 *	12.30	32.79 **	13.17 *	17.56 **
6	ICMA17555 × ICMR18196	-14.35 *	24.25 **	-7.63	2.55	7.54	1.69	15.61 *	17.86	5.90	9.83 **
7	ICMA17555 × J-2539	-1.81	3.76	9.49	-3.01	6.33	16.59 *	-2.67	29.22 **	-3.01	8.60 *
8	ICMA21777 × ICMR20945	25.95 **	-3.68	-11.56	2.15	10.00 *	45.15 **	-4.71	29.22 **	7.40	18.40 **
9	ICMA21777 × ICMR20664	44.10 **	-19.09 **	-9.44	-2.39	6.66	41.99 **	-12.09	32.31 **	2.63	14.81 **
10	ICMA21777 × ICMR20283	37.00 **	0.80	-5.44	4.77	9.22 *	34.99 **	-6.20	38.15 **	10.16	17.56 **
11	ICMA21777 × ICMR15063	19.47 **	3.75	-7.44	-9.86	3.99	17.72 *	-2.46	35.23 **	4.39	11.94 **
12	ICMA21777 × ICMR15451	-29.44 **	17.70 *	-11.89	1.19	-5.75	-30.47 **	9.52	28.73 **	6.40	1.45
13	ICMA21777 × ICMR18196	10.19	3.56	-7.56	11.81	4.34	8.58	-3.64	35.06 **	17.57 **	12.31 **
14	ICMA21777 × J-2539	45.48 **	0.00	-18.56 **	-5.61	5.46	43.34 **	-6.20	18.99 *	-0.75	13.51 **
15	ICMA98444 × ICMR20945	-26.15 **	1.84	-9.84	1.96	-8.89 *	-14.90 *	0.75	-6.33	-2.13	-5.60
16	ICMA98444 × ICMR20664	27.08 **	-9.84	-13.99	-1.56	-0.93	1.69	-2.03	9.74	3.01	2.47
17	ICMA98444 × ICMR20283	-28.63 **	-5.67	-26.08 **	1.27	-13.62 **	-37.25 **	-9.20	-0.16	0.00	-12.89 **
18	ICMA98444 × ICMR15063	65.08 **	-8.89	-12.80	-9.32	6.93	21.67 **	-12.30	7.31	5.02	5.01
19	ICMA98444 × ICMR15451	7.72	-21.78 **	-4.88	0.50	-3.50	-19.64 **	-24.71 **	4.38	1.38	-11.35 **
20	ICMA98444 × ICMR18196	45.09 **	-12.22	-18.83 *	7.17	4.51	13.32	-15.51 *	3.57	10.66	2.47
21	ICMA98444 × J-2539	19.60 *	-17.22 *	-2.88	5.14	0.60	-11.85	-20.32 **	9.58	5.14	-6.03
22	ICMA04999 × ICMR20945	-14.69 *	-18.81 **	-3.91	-3.53	-11.22 *	-1.69	-19.68 **	-0.16	-7.40	-8.01 *
23	ICMA04999 × ICMR20664	20.31 *	-15.16 *	-5.98	4.20	-0.66	-3.72	-7.81	19.97 *	9.03	2.75
24	ICMA04999 × ICMR20283	5.39	-6.72	-17.19 *	2.03	-3.10	-7.34	-9.41	11.85	0.75	-2.29
25	ICMA04999 × ICMR15063	9.92	-13.66 *	-5.94	-20.48 **	-7.08	-18.74 *	-16.15 *	15.75	-7.90	-8.75 *
26	ICMA04999 × ICMR15451	0.00	-11.89	-2.22	-11.94	-4.75	-25.40 **	-14.44 *	7.31	-11.17	-12.49 **
27	ICMA04999 × ICMR18196	56.94 **	-13.44	-19.21 *	-10.81	2.21	22.57 **	-15.94 *	3.08	-7.90	0.22
28	ICMA04999 × J-2539	37.71 **	-14.43 *	-11.22	-1.63	1.95	1.81	-16.90 *	0.16	-1.63	-4.76
29	ICMA05444 × ICMR20945	-5.97	-10.70	15.00	-0.13	-1.94	8.35	-11.66	19.48 *	-4.14	1.61
30	ICMA05444 × ICMR20664	70.66 **	-10.83	1.02	-4.92	10.70 *	36.57 **	-3.10	28.90 **	-0.50	14.50 **
31	ICMA05444 × ICMR20283	12.71	11.36	-17.67 *	6.86	3.19	-0.90	2.78	11.20	5.52	4.05
32	ICMA05444 × ICMR15063	46.43 **	-9.78	-3.83	-6.72	3.43	1.81	-15.19 *	18.34	8.03	1.58
33	ICMA05444 × ICMR15451	16.79	-3.86	4.29	2.61	4.34	-12.87	-14.65 *	14.45	3.51	-4.14
34	ICMA05444 × ICMR18196	45.38 **	-3.45	-9.80	3.28	7.38	13.54	-10.16	15.10	6.65	5.29
35	ICMA05444 × J-2539	81.75 **	4.33	-5.76	1.76	18.04 **	33.75 **	-2.14	6.33	1.76	10.27 **
Range	Min.	-29.44	-21.78	-26.08	-20.48	-13.62	-37.25	-24.71	-6.33	-11.17	-12.89
	Max.	81.75	26.51	16.03	28.54	25.92	76.07	15.61	48.05	34.50	30.30
S. E. ±		2.13	2.04	1.93	1.74	0.98	2.11	2.05	1.92	1.73	0.98
No. of significant crosses		23	11	7	3	12	21	11	16	4	20
Positive significant crosses		18	3	1	2	9	15	1	16	4	15
Negative significant crosses		5	8	6	1	3	6	10	-	-	5

*, ** Significant at P = 0.05 and P = 0.01 levels of probability, respectively, E1, E2, E3 and E4 were different environments *viz*., Shihori, Jagudan, Sardarkrushinagar and Vijapur, respectively

Table 7 : *Per cent* heterosis over better parent and standard check (GHB-1351) in individual and pooled over the environments for number of nodes on main tiller in Pearl millet

Sr. No.	Hybrids	Heterobeltiosis (HB)					Standard Heterosis (SH)				
		E1	E2	E3	E4	Pooled	E1	E2	E3	E4	Pooled
1	ICMA17555 × ICMR20945	-20.20 **	-16.67 **	-2.92	0.75	-5.19	10.86 *	6.59	7.87	33.83 **	14.06 **
2	ICMA17555 × ICMR20664	3.69	-0.38	20.36 **	-8.24 *	4.77	27.15 **	1.94	23.15 **	21.89 **	17.75 **
3	ICMA17555 × ICMR20283	-18.81 **	4.98	0.00	2.62	-1.50	17.19 **	14.34 **	33.33 **	36.32 **	24.55 **
4	ICMA17555 × ICMR15063	-7.20	7.22	9.96 *	-10.86 **	5.32	10.86 *	9.30	22.69 **	18.41 **	14.96 **
5	ICMA17555 × ICMR15451	-5.81	27.65 **	29.56 **	-8.24 *	17.40 **	2.71	7.36	21.76 **	21.89 **	12.95 **
6	ICMA17555 × ICMR18196	3.35	-1.52	22.22 **	-12.73 **	9.14 *	11.76 *	0.39	22.22 **	15.92 **	11.94 **
7	ICMA17555 × J-2539	6.18	-4.80	7.05	-5.99	5.15	24.43 **	0.00	19.44 **	24.88 **	16.29 **
8	ICMA21777 × ICMR20945	-24.10 **	-21.52 **	-2.50	27.36 **	-8.91 **	5.43	0.39	8.33	27.36 **	9.60 **
9	ICMA21777 × ICMR20664	-13.65 **	-0.38	8.60	-7.17	-3.67	5.88	1.94	11.11 *	15.92 **	8.26 **
10	ICMA21777 × ICMR20283	-27.27 **	-6.05	-20.49 **	-7.35	-15.98 **	4.98	2.33	6.02	12.94 *	6.25 *
11	ICMA21777 × ICMR15063	-18.56 **	-3.80	2.07	27.62 **	0.41	-2.71	-1.94	13.89 *	33.33 **	9.60 **
12	ICMA21777 × ICMR15451	-4.98	19.35 **	6.90	14.93 **	8.58 *	3.62	0.39	0.46	14.93 **	4.46
13	ICMA21777 × ICMR18196	-6.69	-4.56	5.09	15.42 **	1.52	0.90	-2.71	5.09	15.42 **	4.13
14	ICMA21777 × J-2539	-16.60 **	-7.01	-6.22	13.18 **	-4.84	-2.26	-2.33	4.63	23.88 **	5.25 *
15	ICMA98444 × ICMR20945	-29.97 **	-20.61 **	2.08	17.91 **	-11.04 **	-2.71	1.55	13.43 *	17.91 **	7.03 **
16	ICMA98444 × ICMR20664	-13.28 **	-4.17	-1.81	-10.36 *	-7.65 *	6.33	-1.94	0.46	11.94 *	3.79
17	ICMA98444 × ICMR20283	-30.09 **	-12.46 **	-14.24 **	-0.82	-15.36 **	0.90	-4.65	14.35 *	20.90 **	7.03 **
18	ICMA98444 × ICMR15063	-17.80 **	-9.13	0.00	12.86 **	-4.50	-1.81	-7.36	11.57 *	17.91 **	4.24
19	ICMA98444 × ICMR15451	-10.79 *	19.35 **	15.76 **	8.96	7.66 *	-2.71	0.39	8.80	8.96	3.57
20	ICMA98444 × ICMR18196	-7.53	3.04	-8.80	6.47	-1.74	0.00	5.04	-8.80	6.47	0.78
21	ICMA98444 × J-2539	-6.95	-4.43	-9.96 *	0.00	-5.45	9.05	0.39	0.46	9.45	4.58
22	ICMA04999 × ICMR20945	-17.59 **	-22.12 **	7.08	11.94 *	-7.98 *	14.48 **	-0.39	18.98 **	11.94 *	10.71 **
23	ICMA04999 × ICMR20664	-11.81 **	-11.36 *	11.76 *	-15.14 **	-7.35 *	8.14	-9.30	14.35 *	5.97	4.13
24	ICMA04999 × ICMR20283	-17.24 **	-16.37 **	-14.93 **	-8.16	-14.47 **	19.46 **	-8.91	13.43 *	11.94 *	8.15 **
25	ICMA04999 × ICMR15063	-15.15 **	-6.08	-0.41	-0.95	-6.03 *	1.36	-4.26	11.11 *	3.48	2.57
26	ICMA04999 × ICMR15451	-2.07	23.96 **	18.23 **	9.95	12.06 **	6.79	4.26	11.11 *	9.95	7.81 **
27	ICMA04999 × ICMR18196	-6.69	-8.37	14.35 *	8.96	1.20	0.90	-6.59	14.35 *	8.96	3.79
28	ICMA04999 × J-2539	-16.22 **	-2.95	-17.84 **	0.00	-9.38 **	-1.81	1.94	-8.33	9.45	0.22
29	ICMA05444 × ICMR20945	-17.59 **	-25.15 **	-2.50	-2.99	-13.82 **	14.48 **	-4.26	8.33	-2.99	3.68
30	ICMA05444 × ICMR20664	-9.23 *	-8.71	-15.38 **	-14.74 **	-11.82 **	11.31 *	-6.59	-13.43 *	6.47	-0.89
31	ICMA05444 × ICMR20283	-18.50 **	-9.61 *	-25.00 **	-12.24 **	-16.59 **	17.65 **	-1.55	0.00	6.97	5.47 *
32	ICMA05444 × ICMR15063	-13.26 **	-6.08	-4.98	-12.86 **	-9.20 **	3.62	-4.26	6.02	-8.96	-0.89
33	ICMA05444 × ICMR15451	-3.32	13.36 *	3.94	6.97	4.99	5.43	-4.65	-2.31	6.97	1.00
34	ICMA05444 × ICMR18196	-9.21	-3.80	-6.02	-17.91 **	-8.81 *	-1.81	-1.94	-6.02	-17.91 **	-6.47 *
35	ICMA05444 × J-2539	-9.27 *	-11.81 *	4.98	-11.36 *	-6.96 *	6.33	-7.36	17.13 **	-2.99	2.90
Range	Min.	-30.09	-25.15	-25.00	-17.91	-16.59	-2.71	-9.30	-13.43	-17.91	-6.47
	Max.	6.18	27.65	29.56	27.62	17.40	27.15	14.34	33.33	36.32	24.55
S. E. ±		0.39	0.42	0.40	0.34	0.19	0.39	0.41	0.40	0.34	0.19
No. of significant crosses		22	15	15	19	21	11	1	19	21	19
Positive significant crosses		-	5	6	8	5	11	1	18	20	18
Negative significant crosses		22	10	9	11	16	-	-	1	1	1

*, ** Significant at P = 0.05 and P = 0.01 levels of probability, respectively, E1, E2, E3 and E4 were different environments *viz*., Shihori, Jagudan, Sardarkrushinagar and Vijapur, respectively

Table 8 : *Per cent* heterosis over better parent and standard check (GHB-1351) in individual and pooled over the environments for earhead length in Pearl millet

Sr. No.	Hybrids	Heterobeltiosis (HB)					Standard Heterosis (SH)				
		E1	E2	E3	E4	Pooled	E1	E2	E3	E4	Pooled
1	ICMA17555 × ICMR20945	48.66 **	45.71 **	22.73 **	45.97 **	45.92 **	73.72 **	62.97 **	82.13 **	49.13 **	65.60 **
2	ICMA17555 × ICMR20664	27.06 **	48.32 **	37.35 **	43.56 **	39.66 **	24.96 **	65.67 **	103.82 **	46.68 **	58.04 **
3	ICMA17555 × ICMR20283	-12.75 **	18.33 **	9.70 **	27.04 **	10.71 **	14.21 **	49.03 **	74.90 **	45.95 **	44.84 **
4	ICMA17555 × ICMR15063	14.45 **	23.51 **	10.69 **	0.68	14.20 **	17.85 **	43.33 **	64.26 **	28.76 **	37.21 **
5	ICMA17555 × ICMR15451	13.11 **	13.29 **	-1.89	24.05 **	11.95 **	11.24 *	26.54 **	45.58 **	26.73 **	26.69 **
6	ICMA17555 × ICMR18196	12.94 **	19.87 **	-18.00 **	0.14	3.34	11.07 *	33.88 **	21.69 **	2.31	16.94 **
7	ICMA17555 × J-2539	16.30 **	19.46 **	-7.31	4.95	8.00 *	14.38 **	33.43 **	37.55 **	7.23	22.22 **
8	ICMA21777 × ICMR20945	14.71 **	18.36 **	6.33	20.69 **	15.07 **	34.05 **	32.38 **	44.98 **	15.46 **	30.58 **
9	ICMA21777 × ICMR20664	55.11 **	30.17 **	0.85	31.01 **	30.72 **	47.93 **	25.49 **	42.17 **	16.62 **	31.88 **
10	ICMA21777 × ICMR20283	-2.40	-4.52	-4.79	2.14	-2.42	27.77 **	20.24 **	51.81 **	17.34 **	27.66 **
11	ICMA21777 × ICMR15063	4.82	7.88	3.99	-2.49	3.25	7.93	25.19 **	41.16 **	24.71 **	24.05 **
12	ICMA21777 × ICMR15451	26.00 **	38.77 **	35.74 **	32.17 **	35.85 **	20.17 **	21.29 **	35.74 **	14.60 **	22.06 **
13	ICMA21777 × ICMR18196	25.82 **	-4.11	22.54 **	35.58 **	21.85 **	20.00 **	1.35	37.55 **	15.20 **	17.15 **
14	ICMA21777 × J-2539	-1.70	4.02	3.37	11.15	4.29	-4.63	8.55	10.84 *	-2.02	2.80
15	ICMA98444 × ICMR20945	-20.37 **	-7.37	-27.25 **	-4.08	-14.71 **	-6.94	3.60	-0.80	-8.24	-3.21
16	ICMA98444 × ICMR20664	-11.85 *	50.86 **	-13.68 **	33.60 **	17.83 **	-12.73 **	45.43 **	21.69 **	18.93 **	18.89 **
17	ICMA98444 × ICMR20283	-36.24 **	-7.38	-31.86 **	-9.56 *	-21.05 **	-16.53 **	16.64 **	8.63	3.90	3.29
18	ICMA98444 × ICMR15063	3.21	-5.81	-19.23 **	-9.15 *	-7.98 *	6.28	9.30	9.64	16.18 **	10.56 **
19	ICMA98444 × ICMR15451	-0.67	16.90 *	14.66 **	7.67	12.25 **	-1.65	0.60	14.66 **	-6.65	0.85
20	ICMA98444 × ICMR18196	3.34	9.08	9.30	43.37 **	20.07 **	2.31	15.29 **	22.69 **	21.82 **	15.43 **
21	ICMA98444 × J-2539	-6.01	-7.18	5.99	21.64 **	3.71	-6.94	-3.15	13.65 *	7.23	2.23
22	ICMA04999 × ICMR20945	-19.24 **	15.68 **	-15.02 **	19.79 **	0.36	-5.62	29.39 **	15.86 **	14.60 **	13.89 **
23	ICMA04999 × ICMR20664	-1.70	42.92 **	-3.56	35.23 **	21.01 **	-4.63	37.78 **	35.94 **	20.38 **	22.10 **
24	ICMA04999 × ICMR20283	-7.45 *	15.12 **	-7.05 *	8.93	2.58	21.16 **	44.98 **	48.19 **	25.14 **	34.20 **
25	ICMA04999 × ICMR15063	-12.52 **	14.86 **	3.99	-20.00 **	-3.82	-9.92 *	33.28 **	41.16 **	2.31	15.56 **
26	ICMA04999 × ICMR15451	-4.77	20.56 **	15.63 **	1.83	10.26 *	-7.60	3.75	15.86 **	-11.71 *	-0.93
27	ICMA04999 × ICMR18196	12.61 **	4.54	3.22	17.86 **	12.72 **	9.26 *	10.49	15.86 **	0.14	8.37 **
28	ICMA04999 × J-2539	31.01 **	0.57	-1.31	7.70	9.31 *	27.11 **	4.95	5.82	-5.06	7.76 **
29	ICMA05444 × ICMR20945	-14.14 **	6.03	-7.95	32.48 **	3.79	0.33	18.59 **	25.50 **	26.73 **	17.79 **
30	ICMA05444 × ICMR20664	13.64 **	28.30 **	0.71	12.34 *	13.69 **	-0.83	23.69 **	41.97 **	0.00	14.70 **
31	ICMA05444 × ICMR20283	-10.48 **	-10.36 *	-24.31 **	-5.66	-12.67 **	17.19 **	12.89 *	20.68 **	8.38	14.26 **
32	ICMA05444 × ICMR15063	3.21	2.45	-4.14	-6.21	-1.49	6.28	18.89 **	30.12 **	19.94 **	18.36 **
33	ICMA05444 × ICMR15451	20.19 **	14.29 *	18.27 **	7.67	14.83 **	7.27	-1.65	18.27 **	-6.65	3.17
34	ICMA05444 × ICMR18196	39.96 **	7.23	11.63 *	15.31 *	18.17 **	22.15 **	13.34 *	25.30 **	-2.02	13.61 **
35	ICMA05444 × J-2539	3.41	-3.30	-0.94	3.77	0.62	0.33	0.90	6.22	-8.53	-0.81
Range	Min.	-36.24	-10.36	-31.86	-20.00	-21.05	-16.53	-3.15	-0.80	-11.71	-3.21
	Max.	55.11	50.86	37.35	45.97	45.92	73.72	65.67	103.82	49.13	65.60
S. E. ±		0.92	1.24	0.91	1.24	0.55	0.91	1.26	0.90	1.23	0.54
No. of significant crosses		24	20	18	20	24	20	24	30	20	27
Positive significant crosses		15	19	11	18	20	17	24	30	19	27
Negative significant crosses		9	1	7	2	4	3	-	-	1	-

*, ** Significant at P = 0.05 and P = 0.01 levels of probability, respectively, E1, E2, E3 and E4 were different environments *viz*., Shihori, Jagudan, Sardarkrushinagar and Vijapur, respectively

Table 9 : *Per cent* heterosis over better parent and standard check (GHB-1351) in individual and pooled over the environments for earhead girth in Pearl millet

Sr. No.	Hybrids	Heterobeltiosis (HB)					Standard Heterosis (SH)				
		E1	E2	E3	E4	Pooled	E1	E2	E3	E4	Pooled
1	ICMA17555 × ICMR20945	24.41 **	-3.12	3.90	16.66 *	15.08 **	32.56 **	-18.51 **	23.32 **	3.69	6.58 *
2	ICMA17555 × ICMR20664	30.69 **	-3.86	-4.34	13.84	7.23 *	39.26 **	-4.64	37.20 **	8.88	16.78 **
3	ICMA17555 × ICMR20283	-7.55	-21.93 **	8.04	14.09	2.49	-1.49	-34.58 **	30.39 **	1.40	-5.35
4	ICMA17555 × ICMR15063	-4.53	8.43	9.05	32.91 **	11.44 *	1.73	-33.09 **	29.44 **	18.12 *	-0.27
5	ICMA17555 × ICMR15451	-9.97	-11.26	-1.48	8.42	-3.53	-4.06	-45.90 **	16.93 *	-3.64	-13.66 **
6	ICMA17555 × ICMR18196	34.83 **	1.35	14.38 *	17.55 *	21.68 **	43.67 **	-14.07 **	35.75 **	9.09	14.35 **
7	ICMA17555 × J-2539	-1.07	-13.55 *	16.78 **	9.13	3.84	5.41	-29.40 **	38.61 **	9.99	1.65
8	ICMA21777 × ICMR20945	-2.21	-5.14	12.45 *	-11.98	-1.55	32.01 **	-20.21 **	39.80 **	-8.97	6.17 *
9	ICMA21777 × ICMR20664	15.11 **	-13.15 **	-3.83	3.05	7.26 *	55.38 **	-13.85 **	37.92 **	6.57	16.81 **
10	ICMA21777 × ICMR20283	-14.36 **	-16.38 **	14.87 **	-10.86	-7.06 *	15.61 *	-29.93 **	42.80 **	-7.81	0.23
11	ICMA21777 × ICMR15063	-27.17 **	-11.83 *	-1.34	-12.45	-13.71 **	-1.68	-26.58 **	22.64 **	-9.46	-6.94 *
12	ICMA21777 × ICMR15451	-15.27 **	-4.52	7.57	-8.15	-5.47	14.37 *	-20.49 **	33.73 **	-5.01	1.95
13	ICMA21777 × ICMR18196	-14.83 **	2.98	14.97 **	18.28 *	4.97	14.97 *	-12.68 **	42.93 **	22.32 **	13.21 **
14	ICMA21777 × J-2539	-11.80 *	-0.40	12.40 *	5.98	0.97	19.06 **	-17.06 **	39.73 **	9.60	8.90 **
15	ICMA98444 × ICMR20945	-21.97 **	-29.64 **	-8.38	7.82	-11.01 *	-13.46 *	-40.82 **	4.26	-7.67	-17.58 **
16	ICMA98444 × ICMR20664	6.55	-23.33 **	-26.69 **	-2.58	-12.44 **	18.16 **	-23.95 **	5.14	-6.83	-4.65
17	ICMA98444 × ICMR20283	-14.53 *	-22.99 **	-9.52	13.02	-4.61	-5.22	-35.47 **	9.19	-3.22	-11.90 **
18	ICMA98444 × ICMR15063	-10.39	8.48	-11.93 *	2.09	-3.14	-0.62	-33.06 **	0.22	-12.58	-14.20 **
19	ICMA98444 × ICMR15451	-18.25 **	-15.60	-11.00	1.63	-11.07 *	-9.34	-48.74 **	1.29	-12.97	-21.23 **
20	ICMA98444 × ICMR18196	-1.41	-20.67 **	-20.12 **	7.54	-5.08	9.34	-32.74 **	-9.09	-0.20	-10.80 **
21	ICMA98444 × J-2539	-8.14	-6.77	12.25 *	-0.18	0.35	1.87	-23.87 **	27.74 **	0.60	-1.77
22	ICMA04999 × ICMR20945	-7.77	-29.34 **	1.36	3.83	-9.70 *	-3.10	-40.56 **	7.99	-15.43 *	-16.36 **
23	ICMA04999 × ICMR20664	3.19	-29.58 **	-20.07 **	17.93 *	-9.88 *	9.74	-30.14 **	14.64 *	12.79	-1.85
24	ICMA04999 × ICMR20283	3.51	-20.67 **	-10.19	18.90 *	-4.33	-0.99	-33.52 **	8.39	-7.95	-11.64 **
25	ICMA04999 × ICMR15063	9.87	-0.51	21.86 *	57.24 **	21.42 **	-9.45	-34.87 **	-1.15	-14.85 *	-17.57 **
26	ICMA04999 × ICMR15451	3.93	-17.15 *	21.80 *	25.10 *	11.16 *	-14.34 *	-45.77 **	-6.30	-19.81 **	-24.54 **
27	ICMA04999 × ICMR18196	25.04 **	-24.27 **	-7.48	1.72	-3.45	13.76 *	-35.79 **	5.14	-5.60	-9.27 **
28	ICMA04999 × J-2539	2.64	-21.74 **	-19.07 **	-0.25	-9.96 *	8.75	-36.09 **	-9.03	0.54	-11.86 **
29	ICMA05444 × ICMR20945	0.87	-14.97 **	1.46	26.59 **	1.70	5.98	-28.48 **	8.10	3.11	-5.80
30	ICMA05444 × ICMR20664	1.35	-18.81 **	-17.55 **	22.59 **	-5.32	7.78	-19.46 **	18.25 **	17.24 *	3.11
31	ICMA05444 × ICMR20283	0.60	-17.34 **	-10.17	22.06 *	-3.33	-3.77	-30.73 **	8.42	-5.50	-10.72 **
32	ICMA05444 × ICMR15063	28.60 **	6.45	26.70 **	41.62 **	23.99 **	-6.22	-34.31 **	2.78	-22.85 **	-17.82 **
33	ICMA05444 × ICMR15451	26.95 **	5.03	28.13 **	32.72 **	22.21 **	-13.82 *	-40.80 **	-5.21	-14.93 *	-21.35 **
34	ICMA05444 × ICMR18196	25.59 **	-26.78 **	2.27	-4.51	-3.18	14.27 *	-37.92 **	16.22 *	-11.39	-9.02 **
35	ICMA05444 × J-2539	-8.26	-7.76	-2.74	-3.90	-5.74	-2.80	-24.68 **	9.32	-3.15	-7.73 *
Range	Min.	-27.17	-29.64	-26.69	-12.45	-13.71	-14.34	-48.74	-9.09	-22.85	-24.54
	Max.	34.83	8.48	28.13	57.24	23.99	55.38	-4.64	42.93	22.32	16.81
S. E. ±		0.53	0.61	0.53	0.67	0.29	0.53	0.60	0.52	0.67	0.29
No. of significant crosses		16	19	19	13	17	15	34	18	8	25
Positive significant crosses		8	-	11	13	9	12	-	18	3	9
Negative significant crosses		8	19	6	-	8	3	34	-	5	16

*, ** Significant at P = 0.05 and P = 0.01 levels of probability, respectively, E1, E2, E3 and E4 were different environments *viz*., Shihori, Jagudan, Sardarkrushinagar and Vijapur, respectively

Table 10 : *Per cent* heterosis over better parent and standard check (GHB-1351) in individual and pooled over the environments for days to maturity in Pearl millet

Sr. No.	Hybrids	Heterobeltiosis (HB)					Standard Heterosis (SH)				
		E1	E2	E3	E4	Pooled	E1	E2	E3	E4	Pooled
1	ICMA17555 × ICMR20945	-22.01 **	-4.53 **	-14.51 **	-5.54 **	-12.09 **	17.15 **	14.34 **	13.99 **	23.93 **	17.25 **
2	ICMA17555 × ICMR20664	-15.32	-4.85	-12.35 *	-4.56	-9.55 **	27.20 **	13.95 **	16.87 **	25.21 **	20.64 **
3	ICMA17555 × ICMR20283	-21.45 **	-7.12 **	-12.65 **	-2.28	-11.32 **	17.99 **	11.24 **	16.46 **	28.21 **	18.28 **
4	ICMA17555 × ICMR15063	-17.27 **	-3.88 *	-12.65 **	-5.86 **	-10.24 **	24.27 **	15.12 **	16.46 **	23.50 **	19.71 **
5	ICMA17555 × ICMR15451	-22.56 **	-5.18 **	-15.74 **	-8.14 **	-13.32 **	16.32 **	13.57 **	12.35 **	20.51 **	15.61 **
6	ICMA17555 × ICMR18196	-25.07 **	-8.09 **	-16.36 **	-4.23 **	-13.93 **	12.55 **	10.08 **	11.52 **	25.64 **	14.78 **
7	ICMA17555 × J-2539	-13.37 **	-6.15 **	-15.12 **	-5.21 **	-10.16 **	30.13 **	12.40 **	13.17 **	24.36 **	19.82 **
8	ICMA21777 × ICMR20945	-3.85 *	-4.32 **	-11.48 **	-3.02	-4.97 **	25.52 **	11.63 **	11.11 **	23.50 **	17.76 **
9	ICMA21777 × ICMR20664	-10.58 **	-4.62 **	-12.46 **	-6.38 **	-7.90 **	16.74 **	12.02 **	7.00 **	19.23 **	13.66 **
10	ICMA21777 × ICMR20283	-11.54 **	-8.64 **	-7.90 **	-4.36 **	-8.15 **	15.48 **	6.59 **	10.29 **	21.79 **	13.35 **
11	ICMA21777 × ICMR15063	-14.42 **	-11.96 **	-8.75 **	-7.05 **	-10.15 **	11.72 **	2.71	11.52 **	18.38 **	10.88 **
12	ICMA21777 × ICMR15451	-13.46 **	-13.95 **	-7.56 **	-4.03 *	-9.82 **	12.97 **	0.39	10.70 **	22.22 **	11.29 **
13	ICMA21777 × ICMR18196	-11.86 **	-11.63 **	-11.68 **	-10.40 **	-11.40 **	15.06 **	3.10	5.76 *	14.10 **	9.34 **
14	ICMA21777 × J-2539	-6.73 **	-9.97 **	-11.34 **	-11.41 **	-9.82 **	21.76 **	5.04 **	6.17 *	12.82 **	11.29 **
15	ICMA98444 × ICMR20945	-11.76 **	-16.33 **	-13.44 **	-17.23 **	-14.66 **	12.97 **	-2.71	8.64 **	4.70 *	5.75 **
16	ICMA98444 × ICMR20664	-7.95 **	-18.81 **	-12.12 **	-14.86 **	-13.44 **	16.32 **	-4.65 *	7.41 **	7.69 **	6.47 **
17	ICMA98444 × ICMR20283	-10.81 **	-12.86 **	-8.70 **	-12.37 **	-10.89 **	10.46 **	-5.43 **	3.70	8.97 **	4.21 **
18	ICMA98444 × ICMR15063	-13.68 **	-12.93 **	-9.09 **	-13.80 **	-12.38 **	10.88 **	-0.78	11.11 **	9.40 **	7.49 **
19	ICMA98444 × ICMR15451	-9.46 **	-10.45 **	-10.18 **	-17.81 **	-10.91 **	12.13 **	-0.39	5.35 *	2.56	4.83 **
20	ICMA98444 × ICMR18196	-6.76 **	-12.14 **	-8.90 **	-18.21 **	-10.80 **	15.48 **	-4.65 *	5.35 *	1.71	4.31 **
21	ICMA98444 × J-2539	-7.77 **	-5.00 **	-5.51 *	-16.49 **	-8.78 **	14.23 **	3.10	5.76 *	3.85	6.67 **
22	ICMA04999 × ICMR20945	-12.09 **	-12.33 **	-16.39 **	-19.26 **	-15.00 **	12.55 **	1.94	4.94 *	2.14	5.34 **
23	ICMA04999 × ICMR20664	-8.28 **	-15.84 **	-14.14 **	-19.26 **	-14.36 **	15.90 **	-1.16	4.94 *	2.14	5.34 **
24	ICMA04999 × ICMR20283	-9.68 **	-11.83 **	-8.70 **	-14.59 **	-11.21 **	5.44 *	-4.65 *	3.70	2.56	1.64
25	ICMA04999 × ICMR15063	-20.52 **	-15.31 **	-14.48 **	-18.18 **	-17.15 **	2.09	-3.49	4.53	3.85	1.64
26	ICMA04999 × ICMR15451	-17.02 **	-10.10 **	-10.88 **	-18.15 **	-14.05 **	-2.09	0.00	4.53	2.14	1.13
27	ICMA04999 × ICMR18196	0.76	-10.91 **	-10.68 **	-15.52 **	-9.22 **	10.46 **	-5.04 **	3.29	0.00	2.05
28	ICMA04999 × J-2539	-5.58 *	-8.27 **	-2.21	-10.37 **	-6.62 **	6.28 *	-1.16	9.05 **	3.42	4.31 **
29	ICMA05444 × ICMR20945	-15.03 **	-15.00 **	-15.74 **	-17.23 **	-15.74 **	8.79 **	-1.16	5.76 *	4.70 *	4.41 **
30	ICMA05444 × ICMR20664	-9.93 **	-13.86 **	-11.78 **	-18.58 **	-13.52 **	13.81 **	1.16	7.82 **	2.99	6.37 **
31	ICMA05444 × ICMR20283	-13.26 **	-11.83 **	-6.88 **	-13.17 **	-11.30 **	1.26	-4.65 *	5.76 *	4.27 *	1.54
32	ICMA05444 × ICMR15063	-15.31 **	-10.88 **	-13.80 **	-18.18 **	-14.56 **	8.79 **	1.55	5.35 *	3.85	4.83 **
33	ICMA05444 × ICMR15451	-3.19	-5.92 **	-10.18 **	-14.04 **	-8.38 **	14.23 **	4.65 *	5.35 *	7.26 **	7.80 **
34	ICMA05444 × ICMR18196	-1.53	-9.45 **	-11.03 **	-13.00 **	-8.86 **	7.95 **	-3.49	2.88	2.99	2.46 *
35	ICMA05444 × J-2539	0.00	-7.19 **	-5.17 *	-7.41 **	-4.96 **	12.55 **	0.00	5.76 *	6.84 **	6.16 **
Range	Min.	-25.07	-18.81	-16.39	-19.26	-17.15	-2.09	-5.43	2.88	0.00	1.13
	Max.	0.76	-3.88	-2.21	-2.28	-4.96	30.13	15.12	16.87	28.21	20.64
S. E. ±		1.94	1.64	1.95	1.61	0.90	1.93	1.65	1.94	1.61	0.89
No. of significant crosses		30	34	34	32	35	32	18	29	22	30
Positive significant crosses		-	-	-	-	-	32	12	29	22	30
Negative significant crosses		30	34	34	32	35	-	6	-	-	-

*, ** Significant at P = 0.05 and P = 0.01 levels of probability, respectively, E1, E2, E3 and E4 were different environments *viz*., Shihori, Jagudan, Sardarkrushinagar and Vijapur, respectively

Table 11 : *Per cent* heterosis over better parent and standard check (GHB-1351) in individual and pooled over the environments for test weight in Pearl millet

Sr. No.	Hybrids	Heterobeltiosis (HB)					Standard Heterosis (SH)				
		E1	E2	E3	E4	Pooled	E1	E2	E3	E4	Pooled
1	ICMA17555 × ICMR20945	38.84 **	4.55 **	28.20 **	27.52 **	24.31 **	1.23	-1.21 *	25.28 **	-5.52 **	3.63 **
2	ICMA17555 × ICMR20664	25.46 **	4.87 **	-10.38 **	-1.39 *	3.15 **	-6.21 **	-2.10 **	16.53 **	-11.14 **	-2.03 **
3	ICMA17555 × ICMR20283	-26.39 **	1.96 **	-6.41 **	1.55 **	-7.10 **	-39.02 **	-14.96 **	25.40 **	-7.05 **	-10.75 **
4	ICMA17555 × ICMR15063	37.26 **	21.13 **	30.74 **	24.55 **	31.84 **	-23.99 **	-11.58 **	29.47 **	-21.56 **	-9.39 **
5	ICMA17555 × ICMR15451	27.21 **	21.67 **	37.77 **	16.61 **	29.01 **	-26.11 **	-11.19 **	9.11 **	-31.36 **	-16.96 **
6	ICMA17555 × ICMR18196	32.01 **	14.89 **	32.71 **	50.72 **	38.78 **	-11.75 **	-4.02 **	21.37 **	-15.15 **	-4.14 **
7	ICMA17555 × J-2539	17.51 **	13.90 **	19.38 **	11.82 **	15.58 **	-17.25 **	14.18 **	22.28 **	-21.75 **	-3.17 **
8	ICMA21777 × ICMR20945	13.04 **	14.30 **	2.35 **	-6.28 **	7.51 **	-10.95 **	13.65 **	30.35 **	-30.56 **	-2.54 **
9	ICMA21777 × ICMR20664	30.68 **	-3.97 **	-11.73 **	3.43 **	6.11 **	2.95 **	-4.51 **	14.78 **	-6.80 **	0.78 *
10	ICMA21777 × ICMR20283	-7.91 **	-6.43 **	-1.49 *	-17.71 **	-4.91 **	-23.71 **	-6.97 **	31.99 **	-24.68 **	-8.65 **
11	ICMA21777 × ICMR15063	-20.61 **	-12.44 **	-14.61 **	15.84 **	-8.62 **	-37.45 **	-12.94 **	8.75 **	-20.17 **	-17.16 **
12	ICMA21777 × ICMR15451	6.05 **	-2.75 **	12.95 **	4.00 **	5.35 **	-16.45 **	-3.30 **	43.85 **	-28.33 **	-4.50 **
13	ICMA21777 × ICMR18196	6.40 **	18.37 **	22.36 **	41.11 **	21.85 **	-16.17 **	17.70 **	55.83 **	-2.76 **	10.45 **
14	ICMA21777 × J-2539	10.73 **	-3.97 **	3.39 **	19.39 **	7.43 **	-12.76 **	-3.73 **	31.67 **	-16.46 **	-2.62 **
15	ICMA98444 × ICMR20945	8.05 **	1.65 **	-3.72 **	1.72 *	7.76 **	-7.10 **	-3.94 **	-5.91 **	-20.78 **	-10.16 **
16	ICMA98444 × ICMR20664	-1.14	21.01 **	-23.37 **	4.64 **	2.37 **	-15.01 **	12.97 **	-0.36	-5.71 **	-2.77 **
17	ICMA98444 × ICMR20283	-2.93 **	36.09 **	-38.18 **	-31.50 **	-12.40 **	-16.54 **	13.50 **	-17.17 **	-37.30 **	-15.85 **
18	ICMA98444 × ICMR15063	-24.14 **	2.90 **	-10.88 **	2.50 **	-5.74 **	-34.78 **	-18.09 **	-11.74 **	-20.17 **	-21.86 **
19	ICMA98444 × ICMR15451	-11.91 **	1.88 *	18.27 **	6.22 **	2.92 **	-24.26 **	-18.91 **	6.23 **	-17.27 **	-14.68 **
20	ICMA98444 × ICMR18196	5.87 **	30.37 **	49.52 **	23.03 **	27.85 **	-8.98 **	8.92 **	36.74 **	-4.18 **	6.00 **
21	ICMA98444 × J-2539	25.89 **	19.18 **	26.94 **	18.45 **	32.02 **	8.24 **	19.47 **	30.03 **	-7.74 **	10.61 **
22	ICMA04999 × ICMR20945	-9.85 **	-2.37 **	-6.86 **	13.46 **	-0.74	-18.70 **	-7.75 **	-4.63 **	-15.93 **	-12.45 **
23	ICMA04999 × ICMR20664	10.36 **	14.08 **	13.33 **	-6.28 **	12.33 **	-0.46	7.11 **	47.36 **	-15.54 **	6.69 **
24	ICMA04999 × ICMR20283	-6.03 **	19.15 **	-9.12 **	-13.30 **	1.03 *	-15.25 **	11.87 **	21.77 **	-20.64 **	-2.94 **
25	ICMA04999 × ICMR15063	-28.57 **	-12.23 **	11.00 **	10.25 **	-5.72 **	-35.58 **	-17.59 **	13.66 **	-20.58 **	-16.85 **
26	ICMA04999 × ICMR15451	-20.66 **	9.27 **	-10.65 **	-9.78 **	-8.27 **	-28.44 **	2.59 **	-8.51 **	-35.01 **	-19.10 **
27	ICMA04999 × ICMR18196	-2.59 **	-11.39 **	3.71 **	33.53 **	5.45 **	-12.15 **	-16.81 **	6.19 **	-3.82 **	-6.99 **
28	ICMA04999 × J-2539	-4.16 **	-4.40 **	-15.09 **	18.45 **	0.22	-13.56 **	-4.16 **	-13.02 **	-14.68 **	-11.60 **
29	ICMA05444 × ICMR20945	33.74 **	-20.38 **	31.02 **	28.08 **	22.81 **	-2.49 **	-5.29 **	28.04 **	-5.10 **	2.38 **
30	ICMA05444 × ICMR20664	36.40 **	-12.37 **	-4.73 **	15.46 **	13.31 **	1.97 *	4.23 **	23.88 **	4.04 **	7.62 **
31	ICMA05444 × ICMR20283	12.81 **	-16.43 **	-21.13 **	-9.07 **	-1.81 **	-6.55 **	-0.60	5.67 **	-16.77 **	-5.67 **
32	ICMA05444 × ICMR15063	35.41 **	-18.73 **	14.16 **	39.45 **	21.69 **	-17.22 **	-3.34 **	13.06 **	-12.17 **	-6.28 **
33	ICMA05444 × ICMR15451	21.88 **	-17.03 **	26.32 **	8.00 **	8.03 **	-25.49 **	-1.31 *	5.23 **	-36.43 **	-16.80 **
34	ICMA05444 × ICMR18196	51.98 **	4.75 **	50.87 **	91.56 **	49.38 **	1.60	24.59 **	37.98 **	3.73 **	15.04 **
35	ICMA05444 × J-2539	14.80 **	-7.32 **	16.41 **	13.61 **	13.57 **	-19.16 **	10.23 **	19.25 **	-20.50 **	-4.84 **
Range	Min.	-28.57	-20.38	-38.18	-31.50	-12.40	-39.02	-18.91	-17.17	-37.30	-21.86
	Max.	51.98	36.09	50.87	91.56	49.38	8.24	24.59	55.83	4.04	15.04
S. E. ±		0.09	0.05	0.07	0.06	0.04	0.09	0.05	0.07	0.06	0.04
No. of significant crosses		34	35	35	35	33	32	34	34	35	35
Positive significant crosses		22	20	20	27	26	3	13	28	2	8
Negative significant crosses		12	15	15	8	7	29	21	6	33	27

*, ** Significant at P = 0.05 and P = 0.01 levels of probability, respectively, E1, E2, E3 and E4 were different environments *viz*., Shihori, Jagudan, Sardarkrushinagar and Vijapur, respectively

Table 12 : *Per cent* heterosis over better parent and standard check (GHB-1351) in individual and pooled over the environments for grain yield per plant in Pearl millet

Sr. No.	Hybrids	Heterobeltiosis (HB)					Standard Heterosis (SH)				
		E1	E2	E3	E4	Pooled	E1	E2	E3	E4	Pooled
1	ICMA17555 × ICMR20945	332.56 **	128.72 **	151.92 **	332.75 **	268.65 **	86.16 **	-15.06	162.92 **	61.02 **	45.25 **
2	ICMA17555 × ICMR20664	379.47 **	-29.42 *	146.31 **	82.98 **	79.45 **	52.91 **	-41.72 **	157.06 **	-23.11 *	2.53
3	ICMA17555 × ICMR20283	-20.20	-22.50	28.07	97.25 **	8.80	-5.45	-29.80 **	33.66 *	28.46 **	-2.49
4	ICMA17555 × ICMR15063	30.77	34.13	41.09 **	62.84 **	48.12 **	-35.57 **	-15.88	47.25 **	-18.09	-16.39 **
5	ICMA17555 × ICMR15451	116.63 **	235.28 **	-8.70	137.72 **	202.78 **	0.05	14.05	-4.72	-11.77	1.89
6	ICMA17555 × ICMR18196	289.18 **	39.03	23.91	107.09 **	117.63 **	37.09 **	-30.65 **	29.32 *	-16.42	-5.21
7	ICMA17555 × J-2539	37.05	-41.96 **	-8.60	-41.92 **	-28.24 **	-31.02 *	-31.75 **	22.70	-41.80 **	-30.09 **
8	ICMA21777 × ICMR20945	62.45 **	393.44 **	188.63 **	14.66	141.66 **	57.59 **	91.54 **	128.34 **	-27.38 **	52.79 **
9	ICMA21777 × ICMR20664	147.03 **	64.02 **	59.95 **	11.69	125.20 **	139.65 **	35.44 **	26.54	-29.25 **	42.39 **
10	ICMA21777 × ICMR20283	-7.65	50.35 **	201.01 **	94.41 **	51.13 **	9.43	36.19 **	144.67 **	26.61 **	35.45 **
11	ICMA21777 × ICMR15063	-3.38	53.40 **	94.57 **	78.53 **	65.85 **	-6.27	-3.80	53.93 **	13.08	4.86
12	ICMA21777 × ICMR15451	34.71 **	181.84 **	59.40 **	49.29 **	76.86 **	30.69 *	9.40	26.10	-5.44	11.83
13	ICMA21777 × ICMR18196	22.54	58.67 **	165.88 **	132.86 **	87.28 **	18.88	-20.86	110.34 **	47.50 **	18.41 **
14	ICMA21777 × J-2539	70.56 **	-29.15 **	77.52 **	58.98 **	40.69 **	65.46 **	-16.69	138.31 **	59.30 **	37.07 **
15	ICMA98444 × ICMR20945	44.51	115.77 **	100.56 **	39.52 *	71.81 **	-21.26	-10.00	4.28	-26.85 **	-16.37 **
16	ICMA98444 × ICMR20664	70.51 **	-5.89	80.95 **	66.23 **	52.11 **	-7.09	-22.29 *	13.21	-12.84	-13.10 *
17	ICMA98444 × ICMR20283	-42.46 **	-12.10	18.05	10.01	-15.37	-31.82 *	-20.38	-4.04	-28.36 **	-24.15 **
18	ICMA98444 × ICMR15063	122.36 **	-16.21	-2.57	38.05 *	35.05 *	21.16	-47.45 **	-32.38 *	-27.62 **	-23.77 **
19	ICMA98444 × ICMR15451	31.36	-11.13	212.53 **	35.96	33.63 *	-28.43 *	-62.93 **	62.49 **	-28.71 **	-34.95 **
20	ICMA98444 × ICMR18196	12.64	16.47	140.37 **	268.06 **	109.34 **	-38.63 **	-41.90 **	24.97	92.98 **	1.90
21	ICMA98444 × J-2539	103.81 **	-30.81 **	8.93	93.78 **	28.67 **	11.05	-18.63	46.24 **	94.17 **	25.36 **
22	ICMA04999 × ICMR20945	-42.43 **	6.22	119.84 **	351.40 **	46.96 **	-26.99 *	-44.15 **	3.54	67.96 **	-4.80
23	ICMA04999 × ICMR20664	-16.64	23.60	244.71 **	354.46 **	111.14 **	5.72	2.06	115.67 **	90.97 **	36.78 **
24	ICMA04999 × ICMR20283	-49.09 **	-24.31 *	121.69 **	158.83 **	16.42	-35.44 **	-31.44 **	80.20 **	68.56 **	4.34
25	ICMA04999 × ICMR15063	-45.99 **	65.46 **	123.77 **	175.40 **	68.00 **	-31.51 *	3.77	55.29 **	38.53 **	8.83
26	ICMA04999 × ICMR15451	-37.99 **	73.37 **	208.12 **	182.48 **	45.25 **	-21.36	-8.85	19.13	4.85	-5.90
27	ICMA04999 × ICMR18196	-19.64	54.07 *	199.55 **	176.15 **	54.29 **	1.91	-19.00	47.88 **	11.45	-0.04
28	ICMA04999 × J-2539	-4.60	-25.42 **	-48.71 **	45.52 **	13.62	20.99	-12.30	-31.15 *	45.81 **	10.69
29	ICMA05444 × ICMR20945	24.14	67.17 *	218.72 **	283.15 **	126.88 **	-46.58 **	-37.92 **	50.12 **	42.57 **	-10.61
30	ICMA05444 × ICMR20664	456.82 **	59.44 **	124.72 **	306.10 **	170.61 **	77.58 **	31.66 **	40.60 **	70.65 **	54.61 **
31	ICMA05444 × ICMR20283	32.49 **	4.05	67.12 **	43.79 **	25.92 **	56.98 **	-5.75	35.84 *	-6.36	12.85 *
32	ICMA05444 × ICMR15063	135.36 **	22.76	75.16 **	184.96 **	92.54 **	15.96	-23.01 *	21.56	43.34 **	8.68
33	ICMA05444 × ICMR15451	328.60 **	351.79 **	181.58 **	234.20 **	288.50 **	97.94 **	-21.83 *	8.87	24.04 *	23.01 **
34	ICMA05444 × ICMR18196	314.19 **	88.99 **	202.40 **	251.89 **	186.33 **	45.90 **	-5.73	49.29 **	42.02 **	24.72 **
35	ICMA05444 × J-2539	41.28	8.52	24.25 *	72.02 **	32.67 **	-28.89 *	27.63 *	66.80 **	72.36 **	29.26 **
Range	Min.	-49.09	-41.96	-48.71	-41.92	-28.24	-46.58	-62.93	-32.38	-41.80	-34.95
	Max.	456.82	393.44	244.71	354.46	288.50	139.65	91.54	162.92	94.17	54.61
S. E. ±		4.56	6.18	1.67	4.06	2.21	4.56	6.13	1.66	4.01	2.20
No. of significant crosses		21	22	28	31	31	21	18	23	26	20
Positive significant crosses		16	16	27	30	30	11	5	21	18	13
Negative significant crosses		5	6	1	1	1	10	13	2	8	7

*, ** Significant at P = 0.05 and P = 0.01 levels of probability, respectively, E1, E2, E3 and E4 were different environments *viz*., Shihori, Jagudan, Sardarkrushinagar and Vijapur, respectively

Table 13 : *Per cent* heterosis over better parent and standard check (GHB-1351) in individual and pooled over the environments for dry fodder yield per plant in Pearl millet

Sr. No.	Hybrids	Heterobeltiosis (HB)					Standard Heterosis (SH)				
		E1	E2	E3	E4	Pooled	E1	E2	E3	E4	Pooled
1	ICMA17555 × ICMR20945	332.97 **	103.01 **	273.97 **	522.19 **	226.93 **	294.84 **	86.33 **	484.64 **	233.30 **	180.51 **
2	ICMA17555 × ICMR20664	334.41 **	23.78 **	475.59 **	151.30 **	157.82 **	243.35 **	6.69	846.32 **	61.88 **	109.70 **
3	ICMA17555 × ICMR20283	-33.31 **	2.81	47.83 **	74.55 **	17.14 **	5.38	-8.92	205.75 **	130.46 **	38.07 **
4	ICMA17555 × ICMR15063	-21.11 *	121.43 **	117.33 **	56.96 **	75.39 **	-4.85	90.05 **	203.93 **	34.98 **	66.64 **
5	ICMA17555 × ICMR15451	47.74 **	172.98 **	59.04 **	277.63 **	152.23 **	17.22	64.67 **	122.40 **	102.29 **	68.08 **
6	ICMA17555 × ICMR18196	107.17 **	-36.34 **	9.03	53.17 *	17.21	63.74 **	-60.59 **	52.47 **	-17.95	-21.89 **
7	ICMA17555 × J-2539	42.80 **	-41.14 **	18.97 *	-8.93	-21.11 **	21.76 *	-7.55	112.68 **	-8.36	4.36
8	ICMA21777 × ICMR20945	126.75 **	128.11 **	98.97 **	-19.13	116.26 **	118.86 **	109.37 **	211.05 **	-25.80 *	85.56 **
9	ICMA21777 × ICMR20664	198.36 **	117.41 **	4.08	3.62	125.31 **	187.97 **	87.39 **	71.11 **	-4.92	83.25 **
10	ICMA21777 × ICMR20283	-21.14 **	14.94 *	43.01 **	11.44	8.10	24.61 *	1.83	195.78 **	47.14 **	27.41 **
11	ICMA21777 × ICMR15063	-19.54 *	-11.46	75.27 **	34.17 **	5.18	-2.96	-24.01 **	139.11 **	23.11 *	-0.07
12	ICMA21777 × ICMR15451	79.96 **	126.75 **	131.42 **	9.93	76.58 **	73.69 **	-13.51 *	152.94 **	0.87	14.97 **
13	ICMA21777 × ICMR18196	64.98 **	6.61	179.24 **	109.13 **	92.92 **	59.24 **	-34.00 **	207.17 **	91.90 **	25.61 **
14	ICMA21777 × J-2539	65.29 **	-67.80 **	51.30 **	40.49 **	-21.61 **	59.54 **	-49.42 **	170.47 **	41.38 **	3.70
15	ICMA98444 × ICMR20945	-19.51	-26.27 **	-21.73 *	18.04	-18.46 *	-26.60 *	-32.33 **	22.36	-40.28 **	-30.04 **
16	ICMA98444 × ICMR20664	68.15 **	-7.76	-3.83	88.07 **	20.80 *	5.35	-20.50 **	58.12 **	21.15	-1.75
17	ICMA98444 × ICMR20283	-63.06 **	-26.38 **	-39.89 **	-55.21 **	-44.07 **	-41.63 **	-34.78 **	24.32	-40.86 **	-34.08 **
18	ICMA98444 × ICMR15063	27.48 **	-46.47 **	2.39	1.62	-15.49 *	53.76 **	-54.05 **	39.69 *	-12.61	-19.71 **
19	ICMA98444 × ICMR15451	41.13 **	-14.74	193.87 **	66.58 **	63.83 **	11.98	-74.63 **	123.17 **	-19.42	-35.03 **
20	ICMA98444 × ICMR18196	-1.74	-19.48	-2.48	307.34 **	46.17 **	-44.55 **	-50.16 **	7.27	97.03 **	-11.83 *
21	ICMA98444 × J-2539	20.26	-59.34 **	5.83	62.05 **	-23.73 **	2.54	-36.13 **	89.19 **	63.08 **	0.90
22	ICMA04999 × ICMR20945	-32.20 **	-48.40 **	8.69	143.33 **	-13.24	-38.17 **	-52.64 **	69.92 **	23.11 *	-25.56 **
23	ICMA04999 × ICMR20664	63.40 **	-25.17 **	45.49 **	96.37 **	17.50 *	2.37	-35.51 **	139.19 **	26.49 *	-4.43
24	ICMA04999 × ICMR20283	-55.80 **	-16.73 *	-12.68	10.62	-18.69 **	-30.17 **	-26.23 **	80.60 **	46.06 **	-4.17
25	ICMA04999 × ICMR15063	-52.10 **	4.94	15.56	49.27 **	2.03	-42.23 **	-9.93	57.66 **	28.36 *	-3.07
26	ICMA04999 × ICMR15451	-5.38	52.73 **	81.65 **	95.51 **	79.70 **	-24.92 *	-45.74 **	37.95 *	-8.96	-28.74 **
27	ICMA04999 × ICMR18196	34.87	-15.18	52.09 **	59.03 *	13.75	-23.89 *	-47.49 **	67.30 **	-24.39 *	-31.39 **
28	ICMA04999 × J-2539	71.85 **	-62.75 **	-67.27 **	33.36 **	-30.53 **	46.53 **	-41.49 **	-41.49 **	34.21 **	-8.10
29	ICMA05444 × ICMR20945	-2.31	-13.67 *	7.41	177.53 **	16.77 *	-10.91	-20.77 **	67.91 **	40.42 **	0.19
30	ICMA05444 × ICMR20664	172.02 **	78.45 **	-27.00 **	111.41 **	85.42 **	70.43 **	53.80 **	20.03	36.18 **	50.81 **
31	ICMA05444 × ICMR20283	-9.41	11.69	-34.58 **	-33.95 **	-9.84 *	43.15 **	-1.05	35.30 *	-12.79	6.26
32	ICMA05444 × ICMR15063	5.66	-11.93	-3.28	66.25 **	9.18	27.44 *	-24.41 **	31.95 *	42.97 **	3.73
33	ICMA05444 × ICMR15451	186.12 **	494.50 **	82.47 **	254.99 **	273.44 **	127.03 **	14.84 *	38.58 *	65.30 **	48.10 **
34	ICMA05444 × ICMR18196	82.44 **	51.11 **	8.67	152.46 **	70.50 **	2.95	-6.45	19.53	20.02	2.84
35	ICMA05444 × J-2539	-27.66 *	-26.08 **	-8.84	39.04 **	-13.48 **	-38.32 **	16.11 **	62.95 **	39.93 **	14.46 **
Range	Min.	-63.06	-67.80	-67.27	-55.21	-44.07	-44.55	-74.63	-41.49	-40.86	-35.03
	Max.	334.41	494.50	475.59	522.19	273.44	294.84	109.37	846.32	233.30	180.51
S. E. ±		4.48	7.38	1.99	6.06	2.68	4.44	7.31	1.97	6.00	2.66
No. of significant crosses		26	25	22	27	28	25	28	30	25	22
Positive significant crosses		17	12	17	25	19	16	8	29	21	13
Negative significant crosses		9	13	5	2	9	9	20	1	4	9

*, ** Significant at P = 0.05 and P = 0.01 levels of probability, respectively, E1, E2, E3 and E4 were different environments *viz*., Shihori, Jagudan, Sardarkrushinagar and Vijapur, respectively

Table 14 : *Per cent* heterosis over better parent and standard check (GHB-1351) in individual and pooled over the environments for harvest index in Pearl millet

Sr. No.	Hybrids	Heterobeltiosis (HB)					Standard Heterosis (SH)				
		E1	E2	E3	E4	Pooled	E1	E2	E3	E4	Pooled
1	ICMA17555 × ICMR20945	-0.44	-15.10	-28.24 **	-24.98 *	-3.04	-37.35 **	-44.79 **	-39.39 **	-37.89 **	-39.47 **
2	ICMA17555 × ICMR20664	-7.86	-34.39 **	-51.18 **	-20.82	-21.50 *	-39.68 **	-36.49 **	-58.77 **	-38.52 **	-44.09 **
3	ICMA17555 × ICMR20283	10.83	-18.47	-29.38 **	9.62	2.74	-5.66	-17.42	-40.35 **	-31.20 **	-24.11 **
4	ICMA17555 × ICMR15063	41.26 **	-31.97 *	-25.48 **	5.18	2.29	-20.54 *	-45.64 **	-37.06 **	-25.69 **	-31.22 **
5	ICMA17555 × ICMR15451	29.18 *	-17.75	-30.64 **	-34.07 **	-9.27	-8.22	-23.12 *	-41.42 **	-42.32 **	-29.06 **
6	ICMA17555 × ICMR18196	19.82	64.72 **	7.69	11.58	33.60 **	-9.22	41.14 **	-9.05	0.84	2.98
7	ICMA17555 × J-2539	1.40	-1.49	-14.78	-24.10 **	-11.15	-26.85 **	-19.73	-28.03 **	-24.66 **	-25.27 **
8	ICMA21777 × ICMR20945	-15.66	-7.25	0.69	19.35	-0.50	-16.82	-5.55	-16.16 *	-1.18	-10.47 *
9	ICMA21777 × ICMR20664	-7.86	-22.10	1.47	6.78	-5.20	-9.12	-20.67	-15.51 *	-15.40	-14.70 **
10	ICMA21777 × ICMR20283	-5.51	18.49	8.06	15.27	7.85	-6.80	20.67	-10.02	-8.67	-2.97
11	ICMA21777 × ICMR15063	0.18	13.96	-7.25	20.67	5.87	-1.19	16.05	-22.77 **	-4.39	-4.74
12	ICMA21777 × ICMR15451	-13.67	14.35	-21.65 **	11.32	-1.42	-14.85	16.45	-34.76 **	-2.62	-11.30 **
13	ICMA21777 × ICMR18196	-14.24	10.70	-3.61	-5.50	-1.15	-15.41	12.73	-19.74 **	-14.59	-11.06 *
14	ICMA21777 × J-2539	3.52	32.45 **	11.55	10.38	19.84 **	2.10	34.89 **	-6.60	9.56	7.82
15	ICMA98444 × ICMR20945	-19.53 **	-3.50	-10.52	7.29	-7.70	4.53	20.37	-8.70	12.02	5.79
16	ICMA98444 × ICMR20664	-28.38 **	-21.10 *	-19.40 **	-21.57 *	-23.06 **	-6.96	-1.58	-17.76 **	-18.11 *	-11.81 **
17	ICMA98444 × ICMR20283	-16.24 *	-10.81	-14.09 *	6.15	-9.34 *	8.81	11.25	-12.34	10.84	3.91
18	ICMA98444 × ICMR15063	-32.58 **	-13.17	-36.62 **	-13.93	-25.20 **	-12.42	8.31	-35.33 **	-10.13	-14.27 **
19	ICMA98444 × ICMR15451	-40.85 **	0.44	-18.19 **	-10.79	-19.66 **	-23.16 **	25.29 *	-16.52 *	-6.85	-7.92
20	ICMA98444 × ICMR18196	-19.02 **	-11.51	6.52	-5.44	-7.96	5.19	10.37	8.69	-1.26	5.49
21	ICMA98444 × J-2539	-19.63 **	-6.08	-15.20 *	5.24	-9.90 *	4.40	17.16	-13.47 *	9.89	3.26
22	ICMA04999 × ICMR20945	-35.31 **	-15.18	-16.97 *	4.05	-18.48 **	8.08	9.44	-24.75 **	17.42 *	1.61
23	ICMA04999 × ICMR20664	-39.22 **	3.58	4.87	9.37	-10.58 *	1.54	33.65 **	-4.96	23.42 **	11.46 **
24	ICMA04999 × ICMR20283	-42.22 **	-26.84 **	10.31	-4.15	-19.71 **	-3.47	-5.60	-0.03	8.16	0.08
25	ICMA04999 × ICMR15063	-34.56 **	-14.80	7.05	-7.64	-15.99 **	9.32	9.94	-2.99	4.22	4.71
26	ICMA04999 × ICMR15451	-38.36 **	5.98	0.76	-4.18	-13.77 **	2.98	36.75 **	-8.68	8.13	7.47
27	ICMA04999 × ICMR18196	-30.79 **	1.74	3.53	8.20	-8.38	15.62	31.28 **	-6.18	22.10 *	14.20 **
28	ICMA04999 × J-2539	-46.47 **	-0.28	19.27 **	-7.27	-14.97 **	-10.58	28.68 *	8.09	4.64	5.98
29	ICMA05444 × ICMR20945	-51.28 **	-36.50 **	-13.31 *	-17.08 *	-31.02 **	-26.29 **	-21.30	-5.94	0.99	-12.66 **
30	ICMA05444 × ICMR20664	-32.40 **	-27.76 **	-0.13	-7.30	-17.64 **	2.28	-10.47	8.36	12.90	4.28
31	ICMA05444 × ICMR20283	-30.48 **	-21.92 *	-7.65	-14.72 *	-19.55 **	5.17	-3.24	0.20	3.87	1.86
32	ICMA05444 × ICMR15063	-37.25 **	-18.38	-11.97 *	-17.65 *	-22.87 **	-5.06	1.16	-4.48	0.30	-2.34
33	ICMA05444 × ICMR15451	-38.60 **	-38.57 **	-19.48 **	-30.68 **	-32.08 **	-7.11	-23.87 *	-12.63 *	-15.57	-14.00 **
34	ICMA05444 × ICMR18196	-21.68 **	-18.72 *	3.03	-9.89	-12.32 *	18.49 *	0.73	11.79	9.75	11.01 *
35	ICMA05444 × J-2539	-29.59 **	-13.98	-6.99	-8.04	-15.97 **	6.53	6.61	0.92	12.00	6.39
Range	Min.	-51.28	-38.57	-51.18	-34.07	-32.08	-39.68	-45.64	-58.77	-42.32	-44.09
	Max.	41.26	64.72	19.27	20.67	33.60	18.49	41.14	11.79	23.42	14.20
S. E. ±		4.07	3.70	2.98	3.79	1.83	4.06	3.67	2.96	3.75	1.82
No. of significant crosses		23	11	16	8	21	7	12	18	10	17
Positive significant crosses		2	2	1	-	2	1	7	-	3	3
Negative significant crosses		21	9	15	8	19	6	5	18	7	14

*, ** Significant at P = 0.05 and P = 0.01 levels of probability, respectively, E1, E2, E3 and E4 were different environments *viz*., Shihori, Jagudan, Sardarkrushinagar and Vijapur, respectively

Table 15 : Promising hybrids for grain yield per plant (g) in terms of significant desired standard heterosis and component traits showing significant desired heterosis for individual and pooled over environments

Sr. No.	Hybrids	Standard heterosis (%)	Useful and significant for component traits
			Standard heterosis (%)
		E1	
1	ICMA21777 × ICMR20664	139.65 **	PT, FLL, FLW, FLS, EL, EG, TW
2	ICMA05444 × ICMR15451	97.94 **	PT
3	ICMA17555 × ICMR20945	86.16 **	PT, FLL, FLW, FLS, NN, EL, EG
		E2	
1	ICMA21777 × ICMR20945	91.54 **	FLL, FLW, EL, TW
2	ICMA21777 × ICMR20283	36.19 **	EL
3	ICMA21777 × ICMR20664	35.44 **	FLL, EL
		E3	
1	ICMA17555 × ICMR20945	162.92 **	FLL, FLW, FLS, EL, EG, TW
2	ICMA17555 × ICMR20664	157.06 **	PT, FLL, FLW, FLS, NN, EL, EG, TW
3	ICMA21777 × ICMR20283	144.67**	FLL, FLW, FLS, EL, EG, TW
		E4	
1	ICMA98444 × J-2539	94.17**	
2	ICMA98444 × ICMR18196	92.98**	PT, EL
3	ICMA04999 × ICMR20664	90.97**	DF, PT, EL, HI
		POOLED	
1	ICMA05444 × ICMR20664	54.61**	FLL, FLW, FLS, EG, TW
2	ICMA21777 × ICMR20945	52.79**	FLW, FLS, NN, EL, EG
3	ICMA17555 × ICMR20945	45.25**	PT, FLL, FLW, FLS, NN, EL, EG, TW

*, ** Significant at 5 and 1 *per cent* level of significance, respectively

DF : Days to flowering
PH : Plant height
PT : Number of productive tillers per plant
FLL : Flag leaf length
FLW : Flag leaf width
FLS : Flag leaf sheath
NN : Number of nodes on main tiller
EL : Earhead length
EG : Earhead girth
DM : Days to maturity
TW : Test weight
GY : Grain yield per plant
DFY : Dry fodder yield per plant
HI : Harvest index.

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