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**Research Article**

# Heterosis studies for fruit yield and its component in long type brinjal (*Solanum melongena* l.)

**Dharmendra patidar[1], M. S. Shitap[2] and N. A. Patel[3]**
[1,3]Assistant Research Scientist, Anand Agriucltural University, Anand
[2]Assistant Professor, Junagadh Agricultural University, Junagadh

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**Abstract**
The seeds of forty-five hybrids along with ten parents generated during *Kharif*, 2011 were evaluated for earliness, fruit yields and yield contributing characters during *kharif*, 2012 in a Randomized Block Design along with local check ABH-1 in three replications for middle Gujarat location. Heterosis analysis was carried out for days to 50% flowering, days to first picking, plant height (cm), primary branches per plant, plant spread (cm), number of fruits per plant, fruit length (cm), fruit girth (cm), average fruit weight (g), fruit volume (cc), fruit yield per plant(kg), total soluble sugars (mg/100 mg), total phenols (mg/100 mg) and dry matter content (mg/100mg). Highest economic heterosis was shown by AB-07-2 x AB-11-7 (20.75) followed by GBL-1 x Doli-5 (12.77) and AB-07-2 x Pusa Uttam (8.75) for total fruit yield per plant.
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**Key words**
Brinjal ,heterosis, hybrid yield

## Introduction

Brinjal or eggplant (*Solanum melongena* L. 2n=24) is an important solanaceous crop widely consumed as vegetable in Asia, Europe, Africa, and America. Brinjal originated in India, which is also considered as a centre of diversity (Genabus, 1963). In India, it is one of the most common, popular and principal vegetable crops grown throughout the country except higher altitudes. In the history of development of scientific concepts and their application in agriculture, heterosis deserves a prominent position. Most of the local as well as national varieties which are grown by the cultivators of India have not been fully utilized in any genetic improvement programs so far on scientific line, they are very well responding to the rainfed condition at middle Gujarat location. For the development of an effective heterosis breeding or outbreeding enhancement programme in brinjal one needs to elucidate the genetic nature and magnitude of quantitatively inherited traits and estimate prepotency of parents in hybrid combinations. The information generated in the process is used to understand the magnitude of heterosis for earliness along with higher yield. Hence, the present research work was undertaken with a view to understand the genetic architecture of parents and cross combinations for earliness, quality parameters, yield and yield contributing characters. Thus, keeping in view the above facts, the present study was conducted to find out the extent of heterosis for fruit yield and its components.

## Materials and methods

The experimental material used in the present study was supplied by Main Vegetable Research Station, Anand Agricultural University, Anand (GJ) which consisted of ten parents *viz.* AB-07-2, GBL-1, KS-331, Doli-5, NDB-18, Pusa Uttam, PPL-1, AB-11-7, AB-07-8, GP-180 and their 45 $F_1$'s with local check ABH-1. The parents were crossed during *Kharif*- 2011 and $F_1$'s were evaluated in *Kharif*- 2012 in Randomized Block Design with three replication at Main Vegetable Research Station, Anand Agricultural University, Anand (GJ), India. Observations were recorded for days to 50% flowering, days to first picking, plant height (cm), primary branches per plant, plant spread (cm), number of fruits per plant, fruit length (cm), fruit girth (cm), average fruit weight (g), fruit volume (cc), fruit yield per plant(kg), total soluble sugars (mg/100 mg), total phenols (mg/100 mg) and dry matter content (mg/100mg) on five randomly selected plant from each replication.

## Results and discussion

Analysis of variance was carried out which revealed that variance due to genotypes was significant for all the traits studied. Based on mean performance (table 1) of parents for fruit yield and its components, parent Pusa Uttam for first picking, GBL-1 for average fruit weight, PPL-1 for shortest plant height, Pusa Uttam for earlier first picking and plant spread, GP-180 for fruit length and fruit volume, KS-331 for fruit girth and AB-07-8 for plant height had the desired highest *per se* performance in *Kharif*. Among all $F_1$'s, the hybrids which gave consistent performance in desired direction were GBL-1 x Pusa Uttam for plant height; AB-07-2 x AB-07-8 for primary branches per plant; KS-331 x PPL-1 for plant spread, Doli-5 x AB-11-7 for fruit length, KS-331 x Doli-5 for fruit girth, GBL-1 x GP-180 for fruit volume. While, cross AB-07-2 x AB-11-7 had high desirable *per se* value for fruit yield per plant.

These parents can be further utilized for hybridization programmed in brinjal improvement for middle Gujarat.

The magnitude of RH (relative heterosis), HB (heterobeltiosis) and SH (standard heterosis) in negative direction for days to 50 % flowering are desirable. Ninteen crosses depicted significant and negative estimates. The estimates of RH varied from -12.40 to 7.40 % (table 2). The least estimate of RH was registered with cross AB-07-2 x Doli-5 (-12.40%). The crosses NDB-18 x AB-07-8 (-8.88 %) registered the least estimates of HB. The crosses AB-07-2 x Doli-5 (-9.96%) registered the least estimates of SH. The maximum SH were recorded with hybrid AB-11-7 x AB-07-8 (10.36 %). In the present investigation, more or less half of the crosses exhibited significant and negative effects for RH, HB and SH. The results revealed that number of hybrids depicted significant estimates of all the heterotic effects in both the positive and negative direction with low to moderate magnitude. The results are in accordance with the findings of Singh and Maurya (2005); while, Das and Barua (2001) for RH and HB. Same results have been observed by Cowdhury *et al.* (2010) and Leena *et al.* (2013) for HB and SH. The finding was contradicted by Chadha *et al.* (2001) as HB was only in positive direction.

For plant height, estimates of RH, HB and SH in positive direction are desirable. Out of 45 $F_1$'s; 7 $F_1$'s exhibited significant and positive RH. The hybrid KS-331 x Pusa Uttam showed maximum estimates of RH (27.32 %). The magnitude of RH was high in negative direction. Higher number of $F_1$'s exhibited significant and negative RH. Total Three $F_1$'s exhibited significant and positive HB. The maximum value of HB was recorded with hybrid KS-331 x Pusa Uttam (21.83 %), and least value was recorded with the hybrid KS-331 x AB-11-7 (-55.35 %). The magnitude of HB was negative, as higher number of $F_1$S depicted significant and negative heterotic effect and values of average HB were negative. Out of 45 hybrids, 8 hybrids exhibited significant positive standard heterosis over ABH-1. The estimates of least SH was observed in the hybrid GBL-1 x Pusa Uttam (-46.02 %), and hybrid Doli-5 x AB-11-7 (59.40 %) showed maximum positive heterosis over standard check. In present study, the extent of RH, HB and SH was moderate to high in both the directions. The results are in accordance with Singh *et al.* (2004) and Singh and Maurya (2005) which have been also revealed that the magnitude was moderate to high in both the direction for either RH, HB and SH, alone or in any combination.

The range of RH for the character plant spread varied from -32.65 to 46.89%. Sixteen crosses depicted significant and positive effects. The least estimates of RH were registered with cross KS-331 x NDB-18 (-32.65 %). The highest estimates of RH were observed with hybrid NDB-18 x PPL-1. The values of HB varied from -42.00 % to 42.66 %. The least HB was observed with hybrid KS-331 x NDB-18 and highest value was recorded with the hybrid NDB-18 x PPL-1. Among all the hybrids, most of the hybrids depicted positive significant SH. The SH varied from -36.11 % to 40.35 %. The highest HB was observed with hybrid AB-07-2 x AB-11-7 and least value was recorded with hybrid KS-331 x NDB-18. The estimates of RH, HB and SH were moderate in negative direction and high in positive direction; therefore, the magnitude of all the heterotic effects was positive.

The highest value of RH was 46.78 % (KS-331 x Doli-5) for Fruit length; while, its least values were -30.89 % (NDB-18 x AB-11-7). The numbers of crosses, which depicted significant and positive RH, were 8 for the fruit length. The mean values of RH were negative and low. The average values of HB were negative; however, out of 45 crosses, 6 crosses depicted significant and positive heterosis. The estimates of HB ranged from -38.52 % (PPL-1 x GP-180) to 44.37 % (KS-331 x Doli-5). All the hybrids showed significant and positive SH. The highest SH were observed with hybrid Doli-5 x AB-11-7 (119.54 %). The extent of RH and HB was moderate to high in both the negative and positive directions. Whereas, for SH, the extent of heterotic effect was high in positive direction. Therefore, magnitude of both RH and HB was negative and for SH it was positive. The results are in agreement with the findings of Indiresh and Kulkarni (2002) for RH and HB; while, Mallikarjun (2002), Safeeq (2005), Chowdhury *et al.* (2010) and Leena *et al.* (2013) reported magnitude of SH in positive direction.

For the character average fruit weight, 3 hybrids exhibited significant and positive RH. The hybrid GBL-1 x KS-331 (14.18 %) had the highest estimates of RH. Total number of hybrids, which registered positive HB were six. The highest estimates of HB was observed with hybrid KS-331 x AB-07-8 (6.72 %). Out of 45 hybrids, 37 hybrids exhibited significant and negative standard heterosis. The hybrid GBL-1 x KS-331 (10.27 %) had recorded the maximum values of SH. Average values of RH, HB and SH were negative, which revealed negative magnitude of all the heterotic effects. In the present investigation, the estimates of RH, HB and SH were low in positive direction and high in negative direction. The results are also in partial agreement with reports of Indiresh and Kulkarni (2002) and Leena *et al*. (2013).

The extent of RH for Fruit yield per plant was high in positive direction, and a total of five hybrids exhibited significant and positive RH. Moreover, magnitude of RH was in positive direction for the trait. The values of RH varied from -26.42 % (Doli-5 x NDB-18) to 69.63 % (AB-07-2 x AB-11-

7). The magnitude of HB was high in negative direction. Total three hybrids exhibited significant and positive HB while, 11 hybrids registered significant and negative HB. The estimates of HB varied from -38.50 % (GBL-1 x AB-11-7) to 52.62 % (AB-07-2 x AB-11-7). The estimates of SH ranged from -37.09 % (GBL-1 x AB-11-7) to 20.75 % (AB-07-2 x AB-11-7). The extent of RH was moderate in negative direction and moderate to high in positive direction with positive magnitude. The extent of heterotic effect for HB was moderate to high in positive direction and moderate in negative direction; however, the magnitude of HB was negative. The results are in accordance with findings of Chadha *et al.* (2001), Das and Barua (2001),and Indiresh and Kulkarni (2002). The magnitude of SH was found to be negative and results are in accordance with the finding of Suneetha *et al.* (2008).

**Conclusion**

Among the parental genotypes, AB-07-2, GBL-1, KS-331, Doli-5, NDB-18, Pusa Uttam and AB-11-7 were involved in superior heterotic crosses for fruit yield and its component characters; however, undesirable effects of these parents for some of the characters need to be looked while developing superior hybrids in respect to all the economic attributes. The results revealed that crosses AB-07-2 x AB-11-7, PPL-1 x AB-11-7 and AB-07-2 x Pusa Uttam depicted high RH for fruit yield per plant. While, crosses AB-07-2 x AB-11-7, AB-07-2 x Pusa Uttam and PPL-1 x AB-07-8 had high values for heterobeltiosis for fruit yield per plant; crosses AB-07-2 x AB-11-7, GBL-1 x NDB-18 and AB-07-2 x Pusa Uttam had depicted high values of SH for fruit yield per plant.

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**Table1. Mean performance of parents, hybrids and check for different characters**

| SI.NO. | Entries | Days to 50 % flowering | Days to first picking | Plant height (cm) | Primary branches per plant | Plant Spread (cm) | Number of fruit per plant | Fruit length (cm) |
|---|---|---|---|---|---|---|---|---|
| 1 | AB-07-2 | 81.00 | 105.00 | 67.67 | 7.47 | 79.77 | 69.79 | 13.82 |
| 2 | GBL-1 | 83.00 | 98.33 | 61.60 | 6.33 | 87.51 | 73.20 | 16.83 |
| 3 | KS-331 | 80.00 | 104.00 | 39.40 | 6.33 | 81.43 | 64.80 | 13.73 |
| 4 | Doli-5 | 91.00 | 106.00 | 67.20 | 8.00 | 86.70 | 86.43 | 14.20 |
| 5 | NDB-18 | 86.33 | 99.33 | 44.53 | 8.13 | 58.82 | 74.75 | 18.67 |
| 6 | Pusa Uttam | 77.67 | 95.67 | 36.00 | 5.80 | 47.63 | 95.34 | 14.75 |
| 7 | PPL-1 | 75.33 | 112.67 | 35.27 | 4.93 | 55.43 | 98.38 | 15.75 |
| 8 | AB-11-7 | 88.33 | 109.33 | 96.00 | 7.47 | 90.87 | 62.77 | 18.76 |
| 9 | AB-07-8 | 87.67 | 107.67 | 57.80 | 8.53 | 85.03 | 66.47 | 14.52 |
| 10 | GP-180 | 87.33 | 106.33 | 61.20 | 7.93 | 85.27 | 57.06 | 20.27 |
| 11 | P1 x P2 | 84.67 | 111.00 | 41.73 | 7.07 | 82.57 | 75.95 | 13.26 |
| 12 | P1 x P3 | 76.00 | 105.67 | 46.40 | 7.67 | 90.50 | 69.70 | 13.59 |
| 13 | P1 x P4 | 75.33 | 110.33 | 51.40 | 6.27 | 77.33 | 69.06 | 14.20 |
| 14 | P1 x P5 | 77.00 | 97.33 | 49.00 | 8.33 | 80.27 | 80.28 | 14.78 |
| 15 | P1 x P6 | 79.67 | 98.00 | 42.00 | 8.13 | 71.10 | 96.69 | 19.87 |
| 16 | P1 x P7 | 77.67 | 103.33 | 43.00 | 8.33 | 72.47 | 100.13 | 13.25 |
| 17 | P1 x P8 | 76.67 | 95.67 | 70.60 | 8.20 | 103.77 | 76.83 | 21.60 |
| 18 | P1 x P9 | 79.67 | 106.33 | 49.33 | 8.67 | 79.71 | 79.08 | 16.57 |
| 19 | P1xP10 | 80.33 | 102.00 | 76.67 | 8.00 | 86.27 | 80.28 | 15.37 |
| 20 | P2 x P3 | 79.33 | 108.33 | 37.40 | 8.20 | 79.93 | 76.23 | 12.88 |
| 21 | P2 x P4 | 77.00 | 97.33 | 55.20 | 6.60 | 81.84 | 85.60 | 20.00 |
| 22 | P2 x P5 | 79.00 | 113.67 | 44.80 | 8.07 | 70.50 | 85.75 | 16.47 |
| 23 | P2 x P6 | 85.33 | 116.33 | 31.20 | 4.93 | 62.27 | 86.93 | 12.83 |
| 24 | P2 x P7 | 80.00 | 115.33 | 44.53 | 4.80 | 81.21 | 84.17 | 15.03 |
| 25 | P2 x P8 | 79.33 | 117.00 | 44.67 | 4.80 | 61.67 | 76.30 | 14.13 |
| 26 | P2 x P9 | 80.67 | 123.00 | 57.07 | 8.53 | 64.78 | 72.77 | 18.20 |
| 27 | P2xP10 | 89.67 | 104.67 | 63.73 | 8.60 | 77.20 | 67.65 | 19.89 |
| 28 | P3 x P4 | 81.67 | 110.33 | 52.53 | 5.40 | 65.30 | 89.17 | 20.50 |
| 29 | P3 x P5 | 80.00 | 102.00 | 40.00 | 7.93 | 47.23 | 73.92 | 15.79 |
| 30 | P3 x P6 | 84.67 | 97.67 | 48.00 | 7.93 | 71.93 | 84.59 | 14.20 |
| 31 | P3 x P7 | 81.67 | 100.67 | 41.67 | 7.53 | 71.03 | 84.56 | 14.40 |
| 32 | P3 x P8 | 83.67 | 105.33 | 42.87 | 7.60 | 80.63 | 73.67 | 15.47 |
| 33 | P3 x P9 | 79.00 | 104.00 | 40.47 | 4.60 | 65.37 | 77.96 | 13.62 |
| 34 | P3xP10 | 79.67 | 100.00 | 63.33 | 7.13 | 86.67 | 73.86 | 13.77 |
| 35 | P4 x P5 | 82.33 | 107.00 | 50.07 | 7.73 | 70.49 | 69.52 | 17.47 |
| 36 | P4 x P6 | 85.67 | 99.00 | 38.80 | 4.80 | 69.90 | 90.74 | 13.60 |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 37 | P4 x P7 | 85.33 | 105.00 | 41.20 | 8.47 | 57.16 | 85.08 | 16.77 |
| 38 | P4 x P8 | 89.00 | 117.00 | 92.13 | 8.33 | 90.98 | 84.25 | 21.80 |
| 39 | P4 x P9 | 87.33 | 114.00 | 71.53 | 5.40 | 89.70 | 68.15 | 15.13 |
| 40 | P4xP10 | 91.67 | 113.33 | 40.33 | 4.33 | 65.79 | 73.37 | 14.47 |
| 41 | P5 x P6 | 81.67 | 98.67 | 37.60 | 5.27 | 66.30 | 80.06 | 14.30 |
| 42 | P5 x P7 | 75.67 | 94.00 | 43.47 | 7.53 | 83.91 | 85.14 | 14.85 |
| 43 | P5 x P8 | 88.00 | 110.00 | 66.40 | 8.27 | 82.37 | 72.87 | 12.93 |
| 44 | P5 x P9 | 78.67 | 96.67 | 41.13 | 4.80 | 68.33 | 72.51 | 14.25 |
| 45 | P5xP10 | 90.00 | 119.00 | 48.60 | 6.47 | 83.07 | 67.72 | 21.07 |
| 46 | P6 x P7 | 78.33 | 100.33 | 40.07 | 4.73 | 54.83 | 92.90 | 12.32 |
| 47 | P6 x P8 | 84.33 | 98.33 | 57.60 | 5.33 | 87.77 | 82.33 | 18.17 |
| 48 | P6 x P9 | 79.67 | 96.00 | 37.53 | 7.00 | 72.48 | 100.73 | 12.07 |
| 49 | P6xP10 | 81.00 | 97.00 | 46.87 | 6.73 | 60.50 | 85.83 | 12.57 |
| 50 | P7 x P8 | 80.33 | 95.00 | 58.00 | 4.73 | 87.35 | 103.01 | 18.57 |
| 51 | P7 x P9 | 80.67 | 94.00 | 59.00 | 8.40 | 82.87 | 98.64 | 11.53 |
| 52 | P7xP10 | 76.67 | 98.00 | 42.33 | 7.67 | 77.77 | 87.09 | 12.46 |
| 53 | P8 x P9 | 92.33 | 113.67 | 65.20 | 6.80 | 81.83 | 69.55 | 17.87 |
| 54 | P8xP10 | 89.00 | 109.67 | 69.73 | 6.53 | 96.77 | 75.53 | 15.97 |
| 55 | P9xP10 | 89.00 | 118.33 | 71.60 | 5.87 | 74.35 | 69.77 | 17.80 |
| 56 | ABH-1 (Check) | 83.67 | 99.00 | 57.80 | 4.87 | 73.93 | 66.04 | 9.93 |
| | Mean | **82.42** | **105.05** | **52.17** | **6.86** | **75.87** | **79.48** | **15.66** |
| | CD at 5% | **2.88** | **3.61** | **6.59** | **0.68** | **5.84** | **15.14** | **1.88** |
| | CV (%) | **2.16** | **2.13** | **7.80** | **6.15** | **4.76** | **11.77** | **7.41** |

**P1.**AB-07-2; **P2.**GBL-1; **P3.**KS-331; **P4.**Doli-5; **P5.**NDB-18; **P6.**Pusa Uttam; **P7.**PPL-1; **P8.**AB-11-7; **P9.**AB-07-8; **P10**. GP-180

**Table 1. Mean performance of parents, hybrids and check for different characters (continue…)**

| SI.NO. | Entries | Fruit girth (cm) | Average Fruit weight (g) | Fruit volume | Fruit Yield per plant (kg) | Total soluble solids (mg/100mg) | Total Phenol (mg/100mg) | Dry matter content (mg/100mg) |
|---|---|---|---|---|---|---|---|---|
| 1 | AB-07-2 | 11.83 | 104.00 | 110.00 | 4.01 | 2.62 | 0.43 | 8.44 |
| 2 | GBL-1 | 14.00 | 105.33 | 108.00 | 5.18 | 1.83 | 0.33 | 8.37 |
| 3 | KS-331 | 14.13 | 82.67 | 121.00 | 3.91 | 2.18 | 0.34 | 7.39 |
| 4 | Doli-5 | 12.66 | 84.67 | 93.33 | 4.88 | 1.88 | 0.30 | 6.56 |
| 5 | NDB-18 | 7.88 | 89.67 | 90.33 | 4.35 | 2.35 | 0.37 | 6.96 |
| 6 | Pusa Uttam | 11.45 | 72.00 | 83.67 | 4.41 | 2.58 | 0.44 | 7.53 |
| 7 | PPL-1 | 7.71 | 66.67 | 73.33 | 4.23 | 2.12 | 0.47 | 7.11 |
| 8 | AB-11-7 | 12.67 | 89.33 | 151.33 | 3.21 | 2.49 | 0.31 | 7.54 |
| 9 | AB-07-8 | 12.05 | 89.33 | 108.33 | 4.11 | 1.94 | 0.58 | 7.62 |
| 10 | GP-180 | 11.49 | 94.00 | 160.27 | 3.46 | 1.92 | 0.56 | 7.41 |
| 11 | P1 x P2 | 8.97 | 78.00 | 83.33 | 4.69 | 2.62 | 0.49 | 7.12 |
| 12 | P1 x P3 | 13.01 | 66.00 | 141.00 | 4.11 | 1.83 | 0.47 | 6.74 |
| 13 | P1 x P4 | 10.33 | 70.00 | 94.00 | 4.26 | 2.18 | 0.55 | 6.80 |
| 14 | P1 x P5 | 14.82 | 73.33 | 92.67 | 4.73 | 1.88 | 0.49 | 7.06 |
| 15 | P1 x P6 | 11.68 | 88.00 | 107.00 | 5.51 | 2.35 | 0.47 | 7.04 |
| 16 | P1 x P7 | 8.58 | 78.00 | 97.67 | 4.20 | 2.58 | 0.40 | 7.31 |
| 17 | P1 x P8 | 12.34 | 100.00 | 143.67 | 6.12 | 2.12 | 0.55 | 7.21 |
| 18 | P1 x P9 | 10.52 | 83.33 | 116.33 | 3.95 | 2.49 | 0.48 | 7.72 |
| 19 | P1xP10 | 10.16 | 89.33 | 124.67 | 4.44 | 1.94 | 0.50 | 7.27 |
| 20 | P2 x P3 | 10.38 | 107.33 | 98.00 | 3.97 | 1.92 | 0.34 | 7.30 |
| 21 | P2 x P4 | 14.69 | 90.67 | 149.33 | 5.71 | 1.50 | 0.69 | 7.07 |
| 22 | P2 x P5 | 8.46 | 73.33 | 91.33 | 3.77 | 2.27 | 0.47 | 6.85 |
| 23 | P2 x P6 | 11.17 | 55.33 | 82.33 | 3.79 | 2.43 | 0.39 | 7.33 |
| 24 | P2 x P7 | 12.56 | 67.33 | 107.00 | 3.96 | 1.54 | 0.30 | 7.10 |
| 25 | P2 x P8 | 12.41 | 69.33 | 103.67 | 3.19 | 1.88 | 0.29 | 6.49 |
| 26 | P2 x P9 | 8.44 | 72.00 | 68.00 | 3.55 | 1.62 | 0.32 | 7.51 |
| 27 | P2xP10 | 10.56 | 65.33 | 170.00 | 3.78 | 2.24 | 0.38 | 7.05 |
| 28 | P3 x P4 | 17.93 | 74.00 | 169.67 | 5.15 | 2.39 | 0.58 | 7.89 |
| 29 | P3 x P5 | 10.28 | 79.33 | 93.67 | 3.60 | 1.84 | 0.36 | 7.63 |
| 30 | P3 x P6 | 12.31 | 68.67 | 146.00 | 3.67 | 2.22 | 0.56 | 7.37 |
| 31 | P3 x P7 | 12.41 | 78.67 | 130.33 | 4.33 | 1.71 | 0.25 | 7.34 |
| 32 | P3 x P8 | 13.14 | 78.67 | 147.33 | 3.82 | 1.80 | 0.47 | 6.85 |
| 33 | P3 x P9 | 12.05 | 95.33 | 86.00 | 4.03 | 1.10 | 0.50 | 6.94 |
| 34 | P3xP10 | 13.24 | 98.67 | 105.00 | 3.98 | 2.06 | 0.42 | 7.52 |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 35 | P4 x P5 | 10.50 | 70.33 | 91.00 | 3.40 | 2.69 | 0.46 | 7.97 |
| 36 | P4 x P6 | 10.65 | 74.00 | 82.00 | 4.92 | 1.69 | 0.32 | 7.85 |
| 37 | P4 x P7 | 9.30 | 70.00 | 147.00 | 3.79 | 2.20 | 0.49 | 8.25 |
| 38 | P4 x P8 | 12.32 | 73.33 | 122.20 | 4.08 | 1.87 | 0.59 | 7.38 |
| 39 | P4 x P9 | 7.48 | 66.00 | 56.00 | 4.07 | 2.45 | 0.48 | 7.73 |
| 40 | P4xP10 | 12.52 | 84.67 | 161.33 | 3.60 | 2.60 | 0.51 | 8.03 |
| 41 | P5 x P6 | 5.40 | 69.33 | 48.33 | 3.82 | 2.68 | 0.60 | 6.80 |
| 42 | P5 x P7 | 9.24 | 77.33 | 45.00 | 4.95 | 2.60 | 0.35 | 7.81 |
| 43 | P5 x P8 | 5.28 | 91.33 | 54.67 | 4.17 | 2.00 | 0.68 | 7.42 |
| 44 | P5 x P9 | 7.47 | 94.67 | 74.00 | 4.25 | 2.06 | 0.62 | 8.38 |
| 45 | P5xP10 | 9.77 | 93.67 | 128.67 | 4.17 | 1.57 | 0.29 | 7.05 |
| 46 | P6 x P7 | 7.68 | 64.67 | 68.33 | 3.45 | 2.35 | 0.60 | 7.98 |
| 47 | P6 x P8 | 7.95 | 62.00 | 85.00 | 4.40 | 2.39 | 0.59 | 7.52 |
| 48 | P6 x P9 | 9.50 | 78.00 | 74.67 | 5.17 | 1.69 | 0.53 | 6.55 |
| 49 | P6xP10 | 10.89 | 78.00 | 86.67 | 4.11 | 1.91 | 0.60 | 7.54 |
| 50 | P7 x P8 | 9.89 | 72.67 | 84.00 | 5.10 | 1.76 | 0.39 | 7.45 |
| 51 | P7 x P9 | 7.05 | 73.33 | 54.33 | 5.19 | 1.92 | 0.30 | 7.46 |
| 52 | P7xP10 | 7.83 | 67.33 | 81.33 | 4.37 | 2.32 | 0.62 | 7.36 |
| 53 | P8 x P9 | 10.85 | 70.67 | 112.67 | 3.73 | 2.46 | 0.46 | 7.91 |
| 54 | P8xP10 | 10.31 | 77.33 | 109.00 | 3.82 | 2.29 | 0.64 | 7.80 |
| 55 | P9xP10 | 11.71 | 86.67 | 142.33 | 4.43 | 1.69 | 0.75 | 7.09 |
| 56 | ABH-1 (Check) | 15.31 | 97.33 | 145.33 | 5.07 | 2.08 | 0.71 | 7.65 |
| | Mean | **10.81** | **79.98** | **105.38** | **4.25** | **2.10** | **0.47** | **7.40** |
| | CD at 5% | **0.94** | **8.29** | **8.37** | **0.79** | **0.14** | **0.07** | **1.04** |
| | CV (%) | **5.37** | **6.41** | **4.91** | **11.52** | **4.22** | **9.48** | **8.66** |

**Table 2. Range of heterosis and top crosses showing significant heterosis for fourteen characters in brinjal for timely Sowing**

| SI.NO. | Characters | Range | | | Elite crosses showing significant relative heterosis |
|---|---|---|---|---|---|
| | | RH | HB | SH | |
| 1 | Days to 50% flowering | -12.40 - 7.40 | -8.88 - 13.27 | -9.96 - 10.36 | AB-07-2 x Doli-5, GBL-1 x Doli-5, NDB-18 x AB-07-8 |
| 2 | Days to first picking | -14.67 - 19.93 | -13.11 - 25.08 | -5.05 - 24.24 | PPL-1 x AB-07-8, PPL-1 x AB-11-7, NDB-18 x GP-180 |
| 3 | Plant height | -43.32 - 27.32 | -55.55 - 21.83 | -46.02 - 59.40 | GBL-1 x Pusa Uttam , GBL-1 x AB-07-8 NDB-18 x GP-180 |
| 4 | Primary branches per plant | -45.61 - 34.41 | -46.09 - 29.47 | -10.96 - 78.08 | AB-07-2 x PPL-1, KS-331 x PPL-1 , Doli-5 x PPL-1 |
| 5 | Plant spread | -32.65 - 46.89 | -42.00 - 42.66 | -36.11 - 40.35 | NDB-18 x PPL-1, Pusa Uttam x AB-11-7, NDB-18 x Pusa Uttam |
| 6 | Number of fruits per plant | -13.73 - 27.85 | -21.15 - 20.33 | 2.44 - 56.00 | PPL-1 x AB-11-7, AB-07-2 x GP-180, AB-11-7 x GP-180 |
| 7 | Fruit length | -30.89 - 46.78 | -38.52 - 44.37 | 16.15 - 119.54 | KS-331 x Doli-5, AB-07-2 x Pusa Uttam, AB-07-2 x AB-11-7 |
| 8 | Fruit girth | -48.67 - 50.32 | -58.36 - 26.86 | -65.54 - 17.10 | AB-07-2 x NDB-18, KS-331 x Doli-5, NDB-18 x PPL-1 |
| 9 | Average fruit weight | -37.59 - 14.18 | -47.47 - 10.45 | -43.15 - 10.27 | GBL-1 x KS-331 , KS 331 x GP-180, KS 331 x AB-07-8 |
| 10 | Fruit volume | -54.76 - 76.40 | -63.88 - 57.50 | -69.04 - 16.97 | Doli-5 x PPL-1, KS-331 x Doli-5, GBL-1 x Doli-5 |
| 11 | Fruit yield per plant | -26.42 - 69.63 | -38.50 - 52.62 | -37.09 - 20.75 | AB-07-2 x AB-11-7, PPL-1 x AB-11-7, AB-07-2 x Pusa Uttam |
| 12 | Total soluble sugars | -46.56 - 36.67 | -49.54 - 35.24 | -47.03 - 29.64 | Doli-5 x GP-180, Doli-5 x AB-07-8, Doli-5 x NDB-18 |
| 13 | Total phenols | -42.50 - 121.77 | -35.92 - 132.88 | -64.29 - 5.99 | PPL-1 x AB-07-8, KS-331 x PPL-1, NDB-18 x GP-180 |
| 14 | Dry matter content | -18.46 - 20.68 | -22.49 - 15.99 | -15.23 - 9.56 | Doli-5 x PPL-1, Doli-5 x NDB-18, NDB-18 x AB-07-8 |