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## Hybrid Vigour Studies in Brinjal (*Solanum Melongena* L.)

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## I. INTRODUCTION

Brinjal (*Solanum melongena* L.  $2n = 24$ ) also known as eggplant or aubergine, is an important solanaceous crop of sub-tropics and tropics. It is a member of the family *Solanaceae* (also known as the nightshades), which includes other vegetable crops such as tomatoes, potatoes and capsicums. Most of the local varieties which are grown by the cultivators of Chhattisgarh have not been fully utilized in any genetic improvement programs so far on scientific line, they are very well responding to the high temperature of summer in Chhattisgarh. For the development of an effective heterosis breeding 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 alongwith heat tolerance for Chhattisgarh State. Hence, the present research work was undertaken with a view to understand the genetic architecture of parents and cross combinations for earliness over hot/summer season. Thus, keeping in view the above facts, the present study entitled "Heterosis in Brinjal (*Solanum melongena* L.)" was carried out.

## II. MATERIAL AND METHODS

The experimental material used in the present study was supplied by All India Coordinated Vegetable

Improvement Project, Department of Plant Breeding and Genetics, IGKV, Raipur (C.G) which consisted of ten parents viz., Green Long, Mukta Keshi, Pusa Purple Long, IBWL-2007-1, White Brinjal Purple Flower, Pusa Purple Cluster, Pant Rituraj, Pusa Purple Round, Safed Round, Punjab Sadabahar and their 60  $F_1$ 's with national check Pusa Hybrid-6. The parents were crossed during *Rabi*- 2009 and  $F_1$ 's were evaluated in *Summer*- 2010 in Randomized Block Design with three replication at Horticulture Research Farm in AICVIP (All India Coordinated Vegetable Improvement Project), Department of Plant Breeding and Genetics, Indira Gandhi Krishi Vishwavidyalaya, Raipur (Chhattisgarh), India. Observations were recorded for days to 50% flowering, days to first picking, plant height (cm), number of primary branches per plant, average fruit length (cm), average fruit girth (cm), average fruit weight (g), number of fruits per plant, number of fruits per picking, total fruit yield per plant (g), marketable fruit yield per plant (g) and total soluble solids (%) on five randomly selected plant from each replication.

## III. RESULTS AND DISCUSSION

Analysis of variance was carried out which revealed that variance due to lines was significant for all the traits studied. Based on mean performance of parents for fruit yield and its components in brief, the earliest days to 50% flowering was recorded in parents GL, MK, PPL and IBWL (each 42 days): days to first picking is noted earliest in PPL and PH-6 whereas, maximum plant height recorded in GL and SR; maximum number of primary branches counted in IBWL, PS and PH-6; maximum average fruit length observed in GL; whereas, fruit girth was maximum PPR and PPL; while average weight was maximum in MK, PH-6 and PPR; total number of fruits per plant recorded maximum in IBWL, PPC and SR; total number of fruits per plant per picking recorded maximum in PPL, GL and SR whereas, marketable fruit yield per plant recorded maximum in GL, IBWL, PH-6 and PPC; total fruit yield per plant recorded maximum in GL, IBWL and PH-6 check while total soluble solids was maximum in PH-6 and PPR. These parents can be further utilized for hybridization programmed in brinjal improvement for C.G. plains. In case of  $F_1$ 's earliest flowering recorded in MK x IBWL, MK x IBWL, MK x WBPF, MK x PS, MK x SR, IBWL x NK, IBWL X PPL, IBWL X PPC, IBWL X PS, WBPF x GL and PPC X PR; earliest days to first picking recorded in IBWL

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x PS MK x WBPF MK x SR and IBWL x PPR; maximum plant height was observed in GL x MK, GL x PPL and MK x PPL; whereas maximum number of primary branch recorded in GL x MK, IBWL x PPL, WBPF x PPR; while fruit length recorded maximum in PS x SR, SR x MK, PS x MK and WBPF x PPL; while maximum fruit girth was observed in IBWL x MK, GL x PR, GL x MK and MK x PR; average fruit weight was recorded maximum in MK x PPC, MK x WBPF and MK x PR; total number of fruits per plant counted in PPC x PR, PPC x SR; maximum number of fruits per plant per picking counted in MK x PPL, IBWL x PPL, PPL x PPC and PPL x GL; maximum marketable fruit yield per plant observed in GL x PPL, MK x IBWL, PPC x WBPF, GL x PS and PPL x PPC finally total fruit yield per plant was recorded in GL x PPL, MK x IBWL, GL x PPR, IBWL x PPC, IBWL x GL, IBWL x MK and PPL x WBPF; a quality trait total soluble solids was recorded maximum in GL x PS and PPC x SR. In these way this desirable hybrids can be repeated for their verification.

The range of mid-parent heterosis *i.e.* per cent deviation of hybrid value from its mid parental value for days to first picking varied from -22.41% (IBWL x PS) to 24.32 % (GL x PPL, PPL x PS). The top ranking hybrids for this trait were, IBWL x PS, WBPF x PPL, MK x WBPF, MK x SR, MK x PPC. The better parent heterosis ranged from -22.41 % (IBWL x PS) to 30.19 % (GL x PPL, PS x PPL). Out of sixty hybrids, forty eight hybrids showed significant heterosis, over their better parent. The range of standard heterosis *i.e.* per cent deviation of hybrid from the standard parent for this trait ranged from -16.67% (IBWL x PS) to -29.63% (WBPF x PS). In this out of sixty  $F_1$ 's fifty two hybrids showed significant heterosis of which forty nine exhibited positive heterosis. Maximum negative standard heterosis were shown by IBWL x PS, MK x WBPF, MK x SR, IBWL x PPR. Early first picking is highly desirable trait for any local and distant market for vegetables in general and for brinjal in particular. Early summer hybrids of this study may be exploited for the same. These results are in agreement with the finding of Das and Barua (2001).

The range of the mid-parent heterosis for the trait plant height (cm) varied from -28.41 % (PS x GL) to 62.87 % (WBPF x PR). Thirty eight hybrids out of sixty showed significant negative mid-parent heterosis and twenty five  $F_1$ 's revealed significant positive heterosis. The top ranking hybrids for this trait were PS x GL, WBPF x SR, GL x SR, WBPF x PPL and PPC x PPL. The better parent heterosis for plant height ranged from -18.64% (WBPF x PPL) to 86.05% (MK x PS). Out of sixty hybrids, forty four hybrids exhibited significant heterosis over better parent (better parent heterosis). Six hybrids showed significant negative better parent heterosis, some superior hybrids of them were PS x GL, WBPF x SR, GL x SR, WBPF x PPL and PPC x PPL. As far as standard heterosis is concerned plant height ranged from -26.15 % (WBPF x PPL) to 69.74% (GL x MK) of

thirty six significant hybrids only nine showed check and twenty seven  $F_1$ 's showed significant positive standard heterosis. Top  $F_1$ 's were WBPF x PPC, PPC x PPL, WBPF x SR, IBWL x PS, PS x GL. In general tall and dwarf plants both are desirable in brinjal which is coupled with the fruit and stalk length. Dwarf plants are being exploited particularly for small round group whereas, rest of the group *i.e.* long, oblong round etc. tall plant will be preferred. In this study heterosis is available for both the direction. Present findings are in agreement with the finding of Babu and Thirumurgan (2000).

Mid-parent heterosis for average fruit weight ranged from -69.06% (PR x MK) to 18.87% (IBWL x PPC). Fifty six out of sixty hybrids showed significant mid-parent heterosis for this trait. Two hybrids exhibited significant positive mid-parent heterosis. The top ranking hybrids were PPL x SR and PPC x IBWL. Better parent heterosis for average fruit weight ranged from -79.47% (SR x MK) to 4.26% (PPC x IBWL). Out of twenty one hybrids, only five hybrids showed significant positive better parent heterosis, top rankers were, SR x PPC, IBWL x PPL, PPC x PPL, PPC x GL, GL x PR and WBPF x SR. The standard heterosis for this character ranged from -84.81 % (PPC x SR) to -39.87% (MK x PPC) all hybrids showing significant negative standard heterosis. Present study showed most of the  $F_1$ 's are with small are in accordance with findings of Singh *et al.* (2003).

The mid-parent heterosis for marketable fruit yield per plant ranged from -79.15% (WBPF x IBWL) to 81.18% (MK x PR). Out of sixty hybrids seventeen exhibited significant positive mid-parent heterosis for this trait. Highest mid-parent heterosis was recorded by MK x PR, WBPF x PR, MK x PS, PR x PS, MK x PPR. The better parent heterosis over better parent ranged from -79.15% (WBPF x IBWL) to 81.18% (MK x PR). Out of sixty hybrids seventeen exhibited significant positive better-parent heterosis for this trait. The extent of standard heterosis for this character was observed from -52.83% (PS x PPL) to 47.9% (GL x PPL). Forty seven hybrids reported significant standard heterosis and twenty two out of them had positive value for this trait. Highest standard heterosis was observed for GL x PPL, IBWL x PPC, MK x IBWL, PPC x WBPF, WBPF x PR the hybrid, whereas, other twenty five hybrids showed significant negative standard heterosis for marketable fruit yield per plant. Present findings are in accordance with the findings of Deep *et al.* (2000), Choudhary (2006), Sunitha and Katharia (2006), Vadadoria *et al.* (2007), Prakash *et al.* (2008). Range of heterosis and top crosses showing significant heterosis for twelve characters in Brinjal given in table 1.

Table 1 : Range of heterosis and top crosses showing significant heterosis for twelve characters in Brinjal

| S. No. | Characters                                   | Range of heterosis (%) |                 | Top crosses showing significant heterosis                       |
|--------|----------------------------------------------|------------------------|-----------------|-----------------------------------------------------------------|
|        |                                              | BP                     | SV              |                                                                 |
| 1      | Days to 50% flowering                        | -9.52-38.64            | -13.6-38.64     | MKxIBWL, MK x WBPF, MK x PPR                                    |
| 2      | Days to first picking                        | -22.41-30.19           | -16.67-(-29.63) | IBWL x PS, MK X WBPF, IBWL x PPR                                |
| 3      | Plant height                                 | -18.64-86.05           | -26.15-69.74    | WBPF x PPC, GL x PPL, MK x PPL                                  |
| 4      | Number of primary branches                   | -37.78-33.75           | -48.89-18.89    | GL x MK, IBWL x PPL                                             |
| 5      | Average fruit length                         | -69.94-27.55           | -43.18-80.46    | PPL x PPR, IBWL x GL, MK x PS, PPL x MK                         |
| 6      | Average fruit girth                          | -69.91-147.7           | -64.95-71.13    | IBWL x MK, GL x PPR, GL x MK, MK x PPR                          |
| 7      | Average fruit weight                         | -79.47-4.26            | -84.81-(-39.87) | MK x PPC, MK x PR                                               |
| 8      | Total number of fruits per plant             | -63.33-471.43          | -9.09-845.45    | PPC x PR, PPC x SR                                              |
| 9      | Total number of fruits per plant per picking | -84.62-266.67          | -50.00-345.00   | IBWL x PPL, MK x PPL, PPL x PPC, PPL x GL                       |
| 10     | Total fruit yield per plant                  | -50.24-88.18           | -51.37-46.86    | GL x PPL, PPC x WBPF, MK x IBWL, GL x PS, PPL x PPC             |
| 11     | Marketable fruit yield                       | -79.15- 81.18          | -52.83-47.9     | GL x PPL, MK x IBWL, GL x PPR, IBWL x GL, IBWL x MK, PPL x WBPF |
| 12     | Total Soluble Solids                         | -32.00-15.22           | -24.44-18.44    | GL x PS, PPC x SR                                               |

BP = Better parent;

SV = Standard variety

The estimates of mid-parent heterosis, better parent heterosis and standard heterosis were also obtained for fruit yield and its components. The mid-parent heterosis for this trait ranged from -67.53% (GL x SR) to 24.95% (MK x PPL). Four showed positive mid-parent heterosis and for this trait. The highest mid-parent heterosis was exhibited by MK x PPL, MK x PR, WBPF x PR, PPL x PPC. The better parent heterosis for this trait ranged from -50.24% (PPC x IBWL) to 88.18% (WBPF x PR). Out of sixty hybrids, twenty seven showed significant positive better parent heterosis for this trait. Highest better parent heterosis was reported in WBPF x PR, MK x PPL, MK x PR, PPL x PR, PPL x WBPF. The heterosis over check for total fruit yield per plant was observed from -51.37% (PS x PPL) to 46.86% (IBWL x PPC) (Table 1). Forty nine hybrids showed significant standard heterosis and twenty two out of them had positive value for this trait. Highest standard heterosis was shown by IBWL x PPC, GL x PPL (Table 1), MK x IBWL, IBWL x PPC, PPC x WBPF, WBPF x PR. Present findings are in accordance with the findings of Deep *et al* (2000), Choudhary (2006), Sunitha and Katharia (2006), Vadadoria *et al*. (2007), Prakash *et al*. (2008).

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