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RESEARCH PAPER

Heterotic combinations among advanced breeding lines of brinjal (*Solanum melongena* L.)

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Abstract

The present study aimed to examine the performance of hybrids developed from advanced breeding lines in brinjal. Fifty F_1 hybrids including three checks of different fruit groups were evaluated for yield and quality attributes in randomized block design with three replications. Analysis of variance indicated significant differences for different characters in small round, big round and long hybrids except fruit length among small round hybrids. Among small round hybrids, SR-5 × SR-9322 showed the highest heterosis for the number of fruits per plant (60.80%) and fruit yield per plant (6.17%) over the standard check PBH-3. Among big round hybrids, BR-15-2 × SR-9322, PC-123 × JG, BR-324 × SR-9322 and MR-494 × SR-6793 showed significant heterosis for a number of fruits per plant and fruit yield per plant in comparison to standard check PBHR-41. Among long hybrids, the hybrid combinations, BL-47 × MR-494, BL-47 × BR-21-6, BL-47 × MR-431, BL-47 × BR-1142 performed the best for fruit yield per plant overcheck hybrid PBH-5. For quality traits such as dry matter percentage, total phenols and anthocyanin, SR-5 × SR-9322 and MR-494 × SR-9322 (small round hybrids), BR-15-2 × SR-9322 and BR-1142 × SR-6793 (big round hybrids) and BL-214 × MR-319, BL-23 × MR-319 and MR-494 × BL-72 (long hybrids) performed better than their respective standard checks. The best-performing hybrids in the present investigation can further be exploited for commercial release.

Keywords: Brinjal, Heterosis, Earliness, Yield, Quality.

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Introduction

Brinjal (*Solanum melongena* L., 2x = 2n = 24) belongs to the non-tuberous family Solanaceae, also known as the nightshade family. It is cultivated for immature fruits used for cooking or as processed products (Talwar *et al*., 2023). It exhibits a great amount of diversity for fruit shape, fruit color, fruit size, plant type and many other quality traits due to its nativeness to India. This provides an opportunity to utilize genetic divergence for the improvement of the crop. This improvement could be the development of new hybrid varieties and new germplasm. There are local preferences for the color and shape of fruits in different parts of India by Ansari & Singh (2014). . Brinjal is mainly a self-pollinated crop. However, it shows heterostyly with four types of style lengths, which are long, medium pseudo-short and short which results in approximately 48% cross-pollination. Therefore, it behaves as an often cross-pollinated crop and can be improved through the breeding methods used for self as well as cross-pollinated crops. Different breeding methods can be used as per the number of genes involved and type of breeding objectives.

Brinjal was one of the first Solanaceous vegetables utilized by farmers as hybrids (Dhaka *et al*., 2017). About 17.8% area under brinjal cultivation is covered by hybrid seeds. Heterosis the exploitation of hybrid vigour that was first observed by Nagai & Kida (1926) in brinjal and is created through heterozygosity. It has become a widely used breeding method for increasing productivity in brinjal (Das *et al*., 2009; Prasad *et al*., 2013; Gill *et al*., 2022). Heterosis is the measure of heterozygosity in different traits produced from a combination of highly diverse parents by Kumar *et al*. (2017). Therefore, before attempting crosses, the selection of diverse and improved inbred lines is necessary. Many scientists reported heterotic effects for different kind of economically important characters in brinjal (Makhani *et al*., 2013). Low cost of hybrid seed production and less seed requirement per unit area for brinjal made heterosis breeding commercially exploitable in this crop (Dhaka *et al*., 2017). New breeding lines were added to the germplasm through different breeding programs in brinjal, which were to be tested for the presence of hybrid vigor in different yield and quality attributes. Therefore, the present investigation was planned to evaluate the heterosis in hybrid combinations of advanced breeding lines.

Materials and Methods

The present investigation involved 47 hybrids from advanced and genetically diverse breeding lines including three checks in brinjal. The developed hybrids were compared group-wise with check hybrids; PBH-3 (small round), PBHR-41 (big round) and PBH-5 (long). During the conduct of the experiment, 50 hybrid combinations along with inbred parents were evaluated in randomized block design with three replications for yield and its contributing traits during the rainy season of 2020. The seed for each combination and check hybrid (PBH-3, PBHR-41 and PBH-5) were sown on nursery beds in the third week of June and seedlings were transplanted in July at a spacing of 45 × 67.5 cm. The observations were recorded on five plants for each combination of each replication for different characteristics like plant height (cm), plant spread (cm), number of primary branches, leaf length (cm), leaf breadth(cm), days to 50% flowering, number of flower per cluster, days to first harvest, number of fruits per cluster, fruit length(cm), fruit diameter(cm), average fruit weight (g) , number of fruits per plant, fruit yield per plant (kg), fruit yield per acre (q), dry matter (%), total phenols (mg/100g) and anthocyanin (mg/100g). The biochemical properties were calculated as per the methods described in AOAC by Latimer (2016).

Data of field observations on five plants was compiled replication-wise for each combination. The statistical analysis was performed in a randomized block design as described by Ariel & Farrington (2010). Then data were statistically analyzed using CPCS1 by Cheema & Singh (1990) program for analysis of variance, for estimating the significance of mean sum of squares, and calculation of standard errors for each trait. Standard error from analysis of variance was used to calculate the critical difference (CD) that was further used to check the significance of heterosis. The magnitude of percent heterosis for F_1's each fruit group was calculated over its respective standard check.

Results and Discussion

Heterosis for plant growth and earliness

The heterotic potential of different hybrid combinations of small round and big round hybrids for vegetative traits and earliness is given in Table 1. Among various vegetative growth traits of small round hybrid combinations, plant height (10.14–18.68%) and number of primary branches (3.98–33.14%) displayed significantly positive standard heterosis over the check hybrid PBH-3. None of the hybrids had desirable heterosis in a negative direction for days to first harvest representing earliness. However, SR-5 × SR-9322 unveiled the highest heterosis for the flowers per cluster (109.30%) in the desired direction. Among big round hybrids, heterosis for plant height and number of primary branches ranged between -18.21 to 30.24% and -24.54 to - 3.68, respectively. Among all hybrids, PC-123 × JG had the highest heterosis for plant height (30.24%) over check hybrid PBHR-41 followed by BR-15-2 × SR-9322 (11.25%) and PC-123 × MR-319 (7.23%). All the hybrids displayed negative standard heterosis for a number of primary branches. Two hybrids, BR-324 × SR-9322 and BR-67 × SR-6793 (-17.50%) obtained significantly the highest and negative heterosis for days to the first harvest. BR-15-2 × SR-9322 (222.2%) carried the significantly highest and positive heterosis for the number of flowers per cluster followed by BR-324 × SR-9322(166.67%) and BR-67 × SR-6793 (111.11%) hybrid combinations.

Among long hybrids listed in Table 2, MR-494 × BL-72 achieved the highest heterosis for plant height (16.28%) followed by BL-47 × BR-15-2 (14.96%) and BL-214 × SR-9322 (13.90%). Two hybrid combinations, BR-21-3 × BL-417 (4.49%) and BL-47 × BR-21-6 (4.49%) displayed the desirable positive heterosis for a number of primary branches. BL-47 × SR-9322 (34.50%) established the significantly highest and positive heterosis for flowers per cluster followed by BL-47 × MR-494 (22.81%), MR-431 × BL-417 (22.81%), and MR-431 × BL- 72 (16.96%). However, the hybrid combination BL-214 × MR-319 (-10.80%) carried the significantly highest negative heterosis for days to the first harvest followed by SR-1314 × BL-417 (-9.10%).

The differences accomplished in vegetative and growth traits of hybrid combinations were due to the genotypic divergence in the parental lines and their specific combining abilities for the traits under investigation. In the present investigation, and compact growth habit with less branches in BL-47 and BL-214 resulted in negative heterosis for a number of primary branches and clustered flowering in SR-9322 contributed towards heterosis for more number of flowers per cluster. The early days to first harvest and the number of flowers per cluster are the indicators of

Table 1: Heterosis (%) for the vegetative growth, earliness and yield and quality traits of small and big round fruited hybrids in brinjal

Hybrids	*pH*	*NOPB*	*DTFH*	*NFPC*	*FL*	*FB*	*NFRPC*	*FW*	*NFPP*	*FYPP*	*DM*	*TP*	*ANTH*
Small round hybrids													
MR-494 × SR-9322	18.68*	3.98	18.41*	78.29*	-4.08	6.70*	41.41	-5.38*	-15.84*	-20.38*	-11.64*	2.83*	18.66*
BR-21-3 × MR-319	12.64*	8.84	23.32*	70.54*	-15.69	0.64	91.92*	-12.79*	-40.57*	-48.19*	-7.02*	-47.50*	-55.13*
SR-1314× SR-6793	10.14*	31.20*	25.16*	47.29*	-11.23	7.55*	51.52*	-41.54*	-10.77*	-47.84*	-14.48*	-8.26*	1.92
SR-1314× SR-9322	15.79*	33.14*	14.12*	86.05*	-3.02	8.04*	71.72*	-41.49*	73.23*	1.34	2.98	-25.30*	-23.53*
MR-431 × SR-9322	15.98*	5.93	11.66*	55.04*	3.82	9.26*	21.21	4.82*	-2.42	2.31	30.35*	-48.72*	6.67*
SR-5 × SR-9322	13.11*	33.14*	8.60*	109.30*	-11.45	5.91*	122.22*	-34.00*	60.88*	6.17*	40.79*	8.14*	17.74*
CD 5%	1.94	0.41	1.73	0.93	1.10	0.74	1.50	3.37	3.39	0.16	0.38	1.05	2.88
Big round hybrids													
MR-319 × BR -21-6	-1.74	-17.79*	3.13	55.56*	17.40*	16.12*	30.43	-3.40*	-32.36*	-29.46*	-2.48	-21.85*	12.42
BR-15-2 × MR-319	2.12	-24.54*	-4.38*	88.89*	34.13*	35.88*	59.42*	7.93*	-25.09*	-3.87	15.13*	-11.63*	-6.06
BR-15-2 × SR-9322	11.25*	-6.75	5.00*	222.22*	38.45*	30.60*	131.88*	-18.51*	64.67*	53.19*	18.77*	26.27*	11.36
BR-324 × SR-9322	0.32	-24.54*	-17.50*	166.67*	18.53*	28.51*	102.90*	-26.07*	73.80*	38.78*	5.84*	-24.12*	-6.93
BR-67 × SR-6793	-11.61*	-3.68	-17.50*	111.11*	20.17*	22.61*	146.38*	-40.24*	102.25*	30.54*	4.23	-41.07*	-0.81
MR-494 × MR-319	2.36	-12.88*	14.38*	44.44	29.98*	35.06*	88.41*	-31.26*	31.55*	-2.30	-6.07*	-69.35*	13.47
MR-494 × SR-6793	-11.16*	-23.93*	6.87*	55.56*	9.69	11.66	15.94	-24.65*	62.12*	31.94*	-4.65*	-33.48*	-10.91
MR-431 × MR-319	0.27	-17.18*	6.25*	100.00*	17.40*	25.00*	73.91*	-15.24*	15.68*	5.80	3.27	1.26	-0.03
PC-123 × MR-319	7.23*	-31.90*	23.75*	44.44	36.31*	38.11*	15.94	3.35*	-12.88*	-2.70	8.83*	-37.36*	-8.79
BR-1142× SR-6793	-18.21*	-23.31*	1.88	55.56*	-20.75*	-18.44*	-13.04	-36.43*	22.75*	-15.73*	15.32*	-4.72*	15.64
PC-123 × JG	30.24*	-19.02*	-1.25	-33.33	35.77*	35.43*	-27.54	-3.96*	36.86*	42.02*	10.90*	-51.41*	-0.80
CD 5%	2.06	0.44	1.74	1.43	0.89	0.96	1.27	3.77	2.17	0.19	0.34	2.28	3.54

* significant heterosis; Note: PH- plant height, NOPB- number of primary branches, DTFH- days to first harvest, FPC- flowers per cluster, FL- fruit length, FB- fruit breadth, NFRPC- number of fruit per cluster, AFW-average fruit weight, NFPP- number of fruits per plant, FYPP- fruit yield per plant, DM- dry matter, TP-total phenol, ANTH- anthocyanin.

Table 2: Heterosis (%) for the vegetative growth, earliness and yield and quality traits of long fruited hybrids in brinjal

Hybrids	*pH*	*NOPB*	*DTFH*	*NFPC*	*FL*	*FB*	*NFRPC*	*AFW*	*FPP*	*FYPP*	*DM*	*TP*	*ANTH*
BL-214 × BL-5121	1.48	1.92	3.97*	11.11	38.68*	-42.06*	14.20	-17.99*	19.10*	-2.15	-3.89	108.13*	12.92*
BL-72 × P-219	-19.55*	-17.31*	2.27	5.26	-1.59	8.78	7.07	-47.93*	41.48*	-26.33*	13.60*	269.30*	26.00*
MR-319× P-219	-21.10*	-21.15*	7.95*	-18.13*	-9.84*	17.51*	-21.48*	-44.23*	59.56*	-10.90*	12.61*	175.04*	69.70*
BR-67 × BL-72	-6.84*	-7.69*	-5.12*	-12.28	-7.33*	-6.08	-7.21*	-32.44*	65.28*	11.77*	18.98*	170.20*	-3.90
BR-67 × BL-417	-6.25*	-37.18	7.38*	-35.67*	-1.87	18.59*	-64.31*	-34.15*	-35.15*	-57.29*	24.81*	73.20*	-4.84
BL-5121 × BL-417	-5.18*	3.21*	8.52*	-29.82*	59.41*	-31.47*	-42.90*	-11.74*	-8.10	-18.83*	27.85*	126.83*	58.35*
BL-214 × SR-9322	13.90*	-28.21*	3.97*	-23.98*	-8.48*	19.37*	-21.48*	-33.26*	45.80*	-2.32	1.30	140.99*	-0.69
BL-214 × BL-72	-7.33*	-12.82*	-2.28*	-18.13*	48.04*	-30.39*	-28.62*	-27.46*	5.90	-23.10*	-12.61*	22.87	76.80*
BL-214 × BL-417	3.98*	-25.00*	5.11	-29.82*	55.60*	-25.33*	-28.62	1.45	-44.98*	-44.14*	-4.09	242.53*	32.61*
BL-214 × SN 6793	4.96*	-26.28*	6.24*	-0.58	-9.04*	-8.00	7.07	-26.42*	1.07	-25.58*	14.40*	88.08*	-56.32*
BL-214 × MR-319	-10.65*	-25.64*	-10.80*	-23.98*	-15.93*	12.27	14.20*	26.61*	-32.52*	-14.61*	32.93*	148.24*	-6.08
BL-23 × MR-319	2.51*	-19.87*	27.27*	-18.13*	-7.56*	27.80*	-21.48*	-3.63	-12.07*	-15.26*	27.25*	179.59*	27.81*
MR-494 × BL-72	16.28*	-32.69*	9.65*	-6.43	0.12	8.72	-28.62*	16.80*	-32.99*	-21.70*	2.09	147.28*	81.00*
MR-494 × BL-417	-10.63*	-12.18	9.08*	11.11	-14.43*	16.49*	-21.48	26.48*	-52.66*	-40.05*	-6.83*	-1.82	-1.49
BR-21-3 × BL-417	-5.73*	4.49*	3.40*	5.26	-5.03	-1.74	-14.35	-10.21*	-33.01*	-39.84*	0.60	71.10*	15.89*
BR-21-3 × BL-72	-6.95*	-17.31*	-7.96*	-12.28	-8.18*	5.96	-14.35*	-30.98*	-36.19*	-55.81*	-26.66*	60.35*	-2.41
SR-1314× BL-417	6.39	-32.05	-9.10*	-6.43	28.56*	-3.79	-21.48*	36.44*	-22.18*	6.11	10.91*	64.48*	68.48*
BR-9991 × BL-417	0.82*	-5.77	-6.26*	-23.98*	-15.49*	6.08	-42.90*	28.63*	-68.17*	-59.04*	15.05*	35.57	57.96*
MR-431 × BL-417	4.23*	-11.54	11.93*	22.81*	-12.26*	-3.79	21.34*	53.63*	-65.50*	-47.04*	26.01*	115.79*	-14.24*
BL-72 × BR-21-6	12.71*	2.56*	2.27*	-18.13*	-2.21	-0.72	-21.48*	92.49*	-46.52*	2.98	8.12*	66.96*	58.00*
BL-47 × BR-15-2	14.96*	-19.87	6.24*	-41.52*	-1.50	11.79	-50.04*	124.35*	-52.14*	7.39	27.80*	-94.36*	54.81*
BL-47 × MR-431	8.71	-2.56	5.11*	-23.98*	-4.47	1.26	-35.76*	71.54*	-33.79*	13.67*	21.03*	120.55*	27.45*
BL-47 × BR-21-6	2.33*	4.49*	5.68*	-29.82*	-11.48*	1.44	-28.62*	74.72*	-32.93*	17.17*	32.54*	100.48*	11.09*
BL-47 × BR-9991	12.77*	-32.05*	6.81*	-18.13*	-10.88*	8.30	-28.62*	40.28*	-33.74*	-6.79	16.09*	66.02*	32.30*
BL-47 × BR-1142	12.09	-13.46*	7.95*	-35.67*	-3.71	11.31	-42.90*	102.34*	-44.23*	12.93*	25.56*	102.50*	-1.99
MR-431 × BL-72	1.33*	-20.51*	-3.41*	16.96*	-8.14*	5.48	7.07	-36.53*	13.97*	-27.63.*	24.61*	75.74*	48.15*
BL-215 × SR-6793	-29.92*	-32.69*	-2.85*	-41.52*	-16.41*	-18.53*	-28.62*	-56.11*	8.80*	-52.10*	11.11*	27.12	-10.23*
BL-47 × SR-9322	-10.24*	-16.67	-4.55*	34.50*	-14.32*	-12.2	35.62*	-49.72*	70.31*	-14.36*	27.06*	125.67*	-43.74*
BL-47 × MR-319	8.31*	1.28*	-0.01*	-23.98*	-8.37*	21.12*	28.48*	-20.46*	33.80*	6.43	5.78*	55.82*	-20.33*
BL-47 × MR-494	9.71	-8.33	0.01	22.81*	-7.93*	9.75	-42.90	72.67*	-31.21*	18.78*	9.32*	56.86*	24.32*
CD 5%	1.99	0.53	1.7	0.96	1.03	0.76	0.93	5.89	3.14	0.29	0.34	11.43	8.34

*significant heterosis; Note: PH- plant height, NOPB- number of primary branches, DTFH- days to first harvest, FPC- flowers per cluster, FL- fruit length, FB- fruit breadth, NFRPC- number of fruit per cluster, AFW-average fruit weight, FPP- fruits per plant, FYPP- fruit yield per plant, FYPA-fruit yield per acre, DM- dry matter, TP-total phenol, ANTH- anthocyanin.

earliness and high yield in brinjal. The results of heterosis for vegetative growth traits and earliness were substantiated with the findings of (Makani *et al*., 2013; Reddy *et al*., 2020).

Heterosis for fruit and yield traits

Standard heterosis for fruit and yield contributing traits of different hybrid combinations is shown in Table 1. Among small round hybrids, only MR-431 × SR-9322 had shown significantly positive heterosis for fruit length (3.82%), and fruit breadth (9.26%). SR-5 × SR-9322 showed the significantly highest and positive heterosis for the number of fruits per cluster (122.22%), fruits per plant (60.88%) and fruit yield per plant (6.17%). Among big round hybrids in Table 1, most of the combinations showed significantly positive and desirable heterosis for both fruit length and breadth. However, BR-67 × SR-6793 carried significantly the highest and positive heterosis for the number of fruits per cluster (146.38%) and per plant (102.25%) followed by BR-324 × SR-9322 with 102.90 and 73.8% heterosis, respectively. Among big round hybrids, BR-15-2 × SR-9322 had the significantly positive and the highest heterosis for fruit yield per plant (53.19%) followed by PC-123 × JG (42.02%) and BR-324 × SR-9322 (38.78%). Among long hybrids in Table 2, BL-5121 × BL-417 and BL-23 × MR-319 had displayed significantly highest and positive heterosis in the desirable direction for fruit length (59.41%) and fruit breadth (27.80%), respectively. For the number of fruits per cluster, BL-47 × SR-9322 (35.62%) carried the significantly highest positive heterosis followed by BL-47 × MR-319 (28.48%). BL-47 × MR-494 (18.78%) showed the significantly highest positive heterosis for fruit yield per plant followed by BL-47 × BR-21-6 (17.17%) and BL-47 × MR-431 (13.67%).

The hybrid vigour of contributing traits such as the number of fruits per plant and average fruit weight resulted in high heterosis for yield potential of best hybrid combinations over check hybrids PBH-3 (small round), PBHR-41 (big round) and PBH-5 (long hybrid). In the present investigation, cluster-bearing parental genotypes have contributed to the increase in number of fruits per plant. The cross combinations between clustered small round genotypes and solitary big round genotypes improved both the number and fruit weight and augmented the yield potential of the resulting hybrids. The combinations between big round and long clustered genotypes again improved both fruit weight and number. Thus, the variation revealed for fruit and yield traits in these hybrids combinations was due to the genotypic dissimilarity in the parental lines and their specific combining abilities. The results were substantiated by the findings of (Makani *et al*., 2013).

Heterosis for biochemical traits

Heterosis for biochemical traits of different hybrid combinations is also presented in Table 1 and Table 2. Among small round hybrid combinations, SR-5 × SR-9322 showed significant maximum and positive heterosis for dry matter (40.79%), total phenol (8.14%) and anthocyanin (17.74%). Among big round hybrids, the hybrid combination BR-15-2 × SR-9322 presented the significant maximum and positive heterosis for dry matter (18.77%) and total phenols (26.27%), whereas MR-494 × MR-319 significantly the highest and positive heterosis for anthocyanin content (13.47%). Among long hybrids, BL-214 × MR-319 (32.93%), BL-72 × P-219 (269.30%), and MR-494 × BL-72 (81.00%) showed significant maximum and positive heterosis for dry matter, total phenols and anthocyanin, respectively.

Among biochemical traits, anthocyanin and phenols have been reported as major antioxidants carrying the ability to scavenge free radicals. Anthocyanin is responsible for providing color to the fruit peel (Cao *et al*. 1996). Because of its antioxidant properties, it has been found effective in reducing the risk of cancer and cardiovascular diseases. High dry matter improves the post-harvest storage life of a genotype. Therefore, the high level of these biochemical compounds improved the nutritional value of studied hybrids. In the present investigation, the differential heterotic effects for these biochemical parameters of the hybrids might be due to the diverse genetic backgrounds of their parental lines. Similar heterotic effects for biochemical traits were earlier reported in many studies (Kumar *et al*., 2017; Panchbhaiya *et al*., 2020; Rameshkumar & Vethamonai, 2020).

***Per se* performance**

Per se performance for yield contributing and fruit quality traits of the best hybrid combinations is given in Table 3. Based on heterosis for fruit yield per acre, 10 hybrid combinations were shortlisted including one from small round and five each from big round and long hybrid groups. Per se performance of small round hybrid, SR-5 × SR-9322 in comparison to check PBH-3 indicated the increase in yield potential (411.15q/ acre) mainly due to the number of fruits per plant (85.00). Additionally, it carried 9.76% dry matter, 94.95 mg/100g total phenols, and 148.60 mg/100 g anthocyanin content. Among big round hybrids, five hybrids *viz;* BL -47 × MR-494, BL- 47 × BR-21-6, BL -47 × MR-431, BL -47 × BR-1142, BR-67 × BL-72 indicated better per se performance for yield potential (396.52-465.30 q/acre) in comparison to their check hybrid PBHR-41. All these hybrids had a substantial increase in the number of fruits per plant that mainly contributed towards higher yields. These hybrids also have good content for different quality traits. Among long hybrids, BL- 47 × MR-494, BL-47 × BR-21-6, BL-47 × BL-2013-4, BL-47 × BR-1142 and BR-67 × BL-72 comparatively better performance for yield potential (496.06-466.79q/ acre) than their check hybrid PBH-5. All these hybrids were a combination of round and long inbred lines that enhanced the hybrid vigor for fruit weight and increased the yield

Table 3: Per se performance for yield contributing and biochemical traits of top hybrids in small, big round and long hybrids.

Hybrids	*Heterosis*	*Per se performance for yield and contributing traits*			*Per se performance of biochemical traits*		
	FYPA	*FYPA (q)*	*AFW (g)*	*NFPP*	*Dry matter (%)*	*Total phenol (mg/100g)*	*Anthocynin (mg/100g)*
Small round hybrids							
SR-5 × SR-9322	6.17*	411.15	56.87	85.00	9.76	94.95	108.60
PBH-3 (check)	-	387.24	86.17	52.83	6.93	87.80	92.24
Big round hybrids							
BR-15-2 × SR-9322	53.19*	465.30	178.18	29.05	8.61	92.71	105.60
PC-123 × JG	45.62*	442.31	210.00	24.15	8.04	35.68	94.07
BR -324 × SR-9322	42.98*	434.29	161.67	30.66	7.67	55.71	88.26
MR-494 × SR-6793	31.94*	400.77	164.77	28.60	6.91	48.84	84.48
BR- 67 × SR-6793	30.54*	396.52	130.67	35.68	7.55	43.26	94.06
PBHR-41(check)	-	303.75	218.67	17.64	7.25	73.42	94.83
Long hybrids							
BL -47 × MR-494	18.78*	496.06	222.17	26.26	7.31	40.06	102.12
BL- 47 × BR-21-6	17.17*	489.35	224.81	25.60	8.87	51.19	91.25
BL -47 × MR-431	13.67*	474.72	220.72	25.27	8.10	56.32	104.69
BL -47 × BR-1142	12.93*	471.62	260.35	21.29	8.40	51.71	80.51
BR-67 × BL-72	11.77*	466.79	86.93	63.08	7.96	69.00	78.94
PBH-5(check)	-	417.62	128.67	38.17	6.69	25.54	82.14

, significant at 5% and 1% levels, respectively ; Note:FYPA-fruit yield per acre, AFW-average fruit weight, NFPP- number of fruits per plant, , DM-dry matter, TPH- total phenol, ANTH- anthocyanin .

potential. These hybrids also had better quality traits than their check hybrid.

Conclusion

It is concluded from the present investigation that one hybrid of small round (SR-5 × SR-9322), and five each of big round (BL -47 × MR-494, BL- 47 × BR-21-6, BL -47 × MR-431, BL -47 × BR-1142, BR-67 × BL-72) and long group (BL- 47 × MR-494, BL-47 × BR-21-6, BL-47 × BL-2013-4, BL-47 × BR-1142 and BR-67 × BL-72) performed significantly better than their respective commercial checks. Therefore, new hybrid combinations of the three groups can be further evaluated in yield trails for commercial exploitation.

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सारांश

वर्तमान अध्ययन का उद्देष्य बैंगन में उन्नत प्रजनन लाइनों से विकसित हाइब्रिड के प्रदर्षन की जांच करना है। विभिन्न फल समूहों की तीन जांचों सहित पचास एफ1 हाइब्रिड का उपज और गुणवत्ता विषेषताओं के लिए मूल्यांकन किया गया है। भिन्नता के विष्लेषण से छोटे गोल, बड़े गोल और लंबे हाइब्रिड में फलों की लंबाई को छोड़कर विभिन्न लक्षणों के लिए महत्वपूर्ण अंतर का संकेत मिला। छोटे गोल संकरों में, एसआर-5 × एसआर-9322 ने मानक जांच पीबीएच-3 की तुलना में प्रति पौधे फलों की संख्या (60.80 प्रतिषत) और प्रति पौधे फल की उपज (6.17 प्रतिषत) के मामले में उच्चतम ओज प्राप्त हुआ है। बड़े गोल संकरों में, बीआर-15-2 × एसआर-9322, पीसी-123 × जेजी, बीआर-324 × एसआर-9322 और एमआर-494 × एसआर-6793 ने प्रति पौधे फलों की संख्या और प्रति पौधे फल की उपज के लिए महत्वपूर्ण ओज मिला है। मानक प्रजाति पीबीएचआर-41 की तुलना में, लंबे संकरों में, संकर संयोजन, बीएल-47 × एमआर-494, बीएल-47 × बीआर-21-6, बीएल-47 × एमआर-431, बीएल-47 × बीआर-1142 ने प्रति पौधा फल उपज के लिए सबसे अच्छा प्रदर्षन किया। शुष्क पदार्थ प्रतिषत, कुल फिनोल और एंथोसायनिन जैसे गुणवत्ता लक्षणों के लिए, एसआर-5 × एसआर-9322 और एमआर-494 × एसआर-9322 (छोटे गोल संकर), बीआर-15-2 × एसआर-9322 और बीआर बीआर-1142 × एसआर-6793 (बड़े गोल संकर) और बीएल-214 × एमआर-319, बीएल-23 × एमआर-319 और एमआर-494 × बीएल-72 (लंबे संकर) ने अपने संबंधित मानक प्रजाति से बेहतर प्रदर्षन किया। वर्तमान जांच में सबसे अच्छा प्रदर्षन करने वाले संकर संयोजनों का व्यावसायिक रिलीज के लिए उपयोग किया जा सकता है।