

# Studies on heterosis of different yield and its attributing traits in pumpkin (*Cucurbita moschata* Duch ex Poir)

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The investigations were carried out to evaluate the 28 F1 of pumpkin (*Cucurbita moschata* Duch. Ex Poir.) at Department of Vegetable Science, Kalyanpur, CSA, University of Agriculture and Technology, Kanpur (U.P.) during Zaid 2021. The experiments were laid out in randomized complete block design with three replications. The data were recorded for 19 characters traits viz., days to first male flower appearance, days to first female flower appearance, node numbers to first male flower appearance, node numbers to first female flower appearance, vine length, internodal length, branches

plant-1, days to first harvest, average fruit weight, fruits/plant, equatorial circumference of fruit, polar circumference of fruit, flesh thickness, total soluble solids, dry matter content, moisture content, seed/fruit, Specific gravity and fruit yield/plant. Highest fruit yield per plant was recorded in best hybrids viz. Azad Pumpkin-1 × P-40-16, Azad Pumpkin-1 × Punjab Samrat, P-40-16 × Punjab Samrat Azad Pumpkin-1 × P-35-16, Narendra Agrim × Punjab Samrat and Azad Pumpkin-1 × DVRP-2-5) in F1, exhibited significant and desirable heterosis in better parent with days to first male flower appearance, days to first female flower appearance, node number to first female flower appearance and days to first fruit harvest.

**Key Words:** Pumpkin; Heterosis; Better parent; Fruit yield

## INTRODUCTION

Pumpkin (*Cucurbita moschata* Duch ex Poir) is an economically important vegetable crop. It is hardy in nature and rich in carotene content and also have very good keeping quality. It is an herbaceous annual sexually propagated vegetable having an identical genomic structure i.e., AABB which indicates that it is an amphidiploid. It comprises about 27 species of both wild and cultivated having same chromosome number of  $2n=40$ . Among these species only five species viz., *Cucurbita moschata*, *Cucurbita maxima*, *Cucurbita ficifolia*, *Cucurbita pepo* and *Cucurbita mixta* are commonly cultivated. Robinson and Decker-Walters [1] concluded that in genus *Cucurbita* there are 5 cultivated and 10 wild species. Seshadri and More also stated that the recent recognition of synonyms and taxonomic changes have reduced the number of *Cucurbita* species to 15 or even less. The crop improvement can be brought about in pumpkin by assessing the genetic variability and exploitation of heterosis. Because of the monoecious nature of the crop, large flower size, easy of pollination, high proportion of fruit set of pollinated female flowers, large number of seeds per fruit and low seed rate required per unit area, pumpkin is highly amenable for heterosis breeding. It has ample scope for successful exploitation of hybrid vigour. Information on the magnitude of heterosis in different cross combination is a basic requisite for identifying crosses that exhibit high degree of exploitable heterosis. The magnitude of heterosis in different crosses and its confirmation through inbreeding depression in F2 generation and then utilization in future crop improvement programmes [2]. Studies on hybrid vigour and high amount of heterosis in pumpkin has been reported by many research workers [3-7]. Several hybrids have been released by public as well as private sectors for its commercial cultivation. The area under F1 hybrids is growing fast, which has helped to enhance the productivity and production of this crop.

## MATERIALS AND METHODS

The investigations were carried out to evaluate the 64 genotypes (28 F1, 28 F2 and 8 parental lines) of pumpkin viz: Azad Pumpkin-1 (P1), P-35-16 (P2), P-40-16 (P3), Narendra Agrim (P4), NDPK-7-24 (P5), Kashi Harit (P6), DVRP-2-5 (P7), and Punjab Samrat (P8). The 8 parental lines and their 28 F1 were grown in a randomized complete block design with three replications during Zaid 2021 at the Main Experiment Station, Department of Vegetable Science, Kalyanpur, CSA University of Agriculture and Technology, Kanpur (U.P.). Each 28 F1, F2 and parents were grown in rows spaced 3 meters apart with a plant to plant spacing of 0.50 meter. All the recommended agronomic

package of practices and plant protection measures were followed to raise good crop. Observations were recorded on nineteen quantitative traits viz., days to first male flower appearance, days to first female flower appearance, node numbers to first male flower appearance, node numbers to first female flower appearance, vine length, internodal length, branches plant-1, days to first harvest, average fruit weight, fruits/plant, equatorial circumference of fruit, polar circumference of fruit, flesh thickness, total soluble solids, dry matter content, moisture content, seed/fruit, Specific gravity and fruit yield/plant. The data recorded from 28 F1, 28 F2 and 8 parental lines on nineteen characters were subjected to estimate heterosis expressed as per cent increase or decrease in the mean values of F1's (hybrid) over better-parent (heterobeltiosis) and standard variety (standard heterosis) was calculated according to method suggested by Hayes et al., [8].

## RESULTS AND DISCUSSION

The results of the study reveals that the heterosis was estimated as per cent increase or decrease of F1 values over the Better Parent (BP). The estimates of better parent heterosis for all the traits in twenty-eight F1 are presented in Table 1.

Out of twenty-eight F1 hybrids, five crosses showed significant and negative heterosis over better parent for days to first male flower appearance which were best five crosses, NDPK-7-24 × Punjab Samrat followed by Azad Pumpkin-1 × Punjab Samrat, P-40-16 × DVRP-2-5, P-40-16 × Punjab Samrat and Azad Pumpkin-1 × P-40-16. Nineteen crosses showed significant and negative heterosis over better parent for days to first female flower appearance which were NDPK-7-24 × Kashi Harit followed by Narendra Agrim × NDPK-7-24, Kashi Harit × DVRP-2-5, Narendra Agrim × DVRP-2-5 and Azad Pumpkin-1 × Kashi Harit. Eleven crosses showed significant and negative heterosis over better parent for node to first male flower appearance which were P-40-16 × NDPK-7-24 followed by P-40-16 × Punjab Samrat, P-40-16 × Narendra Agrim, NDPK-7-24 × Punjab Samrat and Kashi Harit × Punjab Samrat. Seven crosses showed significant and negative heterosis over better parent for node to first female flower appearance which were Azad Pumpkin-1 × Punjab Samrat followed by Narendra Agrim × DVRP-2-5, P-40-16 × Punjab Samrat, Narendra Agrim × Punjab Samrat and NDPK-7-24 × Punjab Samrat. Six crosses showed significant and positive over better parent for vine length which are P-40-16 × NDPK-7-24 followed by P-40-16 × Narendra Agrim, P-35-16 × Kashi Harit, P-40-16 × DVRP-2-5 and Azad Pumpkin-1 × DVRP-2-5. Six crosses showed significant and negative heterosis over better parent for

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internodal length which are NDPK-7-24 × DVRP-2-5 followed by NDPK-7-24 × Punjab Samrat and Narendra Agrim × NDPK-7-24, DVRP-2-5 × Punjab Samrat and P-40-16 × DVRP-2-5. Eighteen crosses showed significant positive heterosis over better for number of primary branches per plant which were P-40-16 × Kashi Harit followed by Azad Pumpkin-1 × Kashi Harit, Azad Pumpkin-1 × DVRP-2-5, P-40-16 × NDPK-7-24 and NDPK-7-24 × Kashi Harit. Twelve crosses showed significant and negative heterosis over better parent for days to first fruit harvest which were Azad Pumpkin-1 × Kashi Harit followed by NDPK-7-24 × Kashi Harit, Kashi Harit × Punjab Samrat, Narendra Agrim × NDPK-7-24 and P-40-16 × Narendra Agrim. Similar results were also proposed by Dubey and Maurya et al., [9], Li et al., [5], El-Tahawey et al., [10], Begum et al., [11], Jansi et al., [2], Hatwal et al., [12] and Kumar et al., [13]. Eighteen crosses showed significant and positive heterosis over better parent for average fruit weight which were P-35-16 × DVRP-2-5 followed by NDPK-7-24 × DVRP-2-5, Narendra Agrim × DVRP-2-5, Azad Pumpkin-1 × DVRP-2-5 and Azad Pumpkin-1 × P-35-16. Seventeen crosses showed significant and positive heterosis over better parent for number of fruits per plant which were P-35-16 × P-40-16 followed by Azad Pumpkin-1 × P-35-16, P-35-16 × NDPK-7-24, Kashi Harit × DVRP-2-5 and P-40-16 × Kashi Harit. Fifteen crosses showed significant and positive heterosis over better parent for equatorial circumference of fruit which were P-40-16 × NDPK-7-24 followed by Narendra Agrim × NDPK-7-24, NDPK-7-24 × Kashi Harit, Narendra Agrim × Kashi Harit and Azad Pumpkin-1 × Kashi Harit. Fifteen crosses showed significant and positive heterosis over better parent for polar circumference of fruit which were NDPK-7-24 × DVRP-2-5 followed by P-40-16 × NDPK-7-24, P-40-16 × Punjab Samrat, P-35-16 × P-40-16 and Narendra

Agrim × NDPK-7-24. Thirteen crosses showed significant and positive heterosis over better parent for flesh thickness which were P-35-16 × Punjab Samrat followed by Azad Pumpkin-1 × P-40-16, Kashi Harit × DVRP-2-5, Azad Pumpkin-1 × DVRP-2-5 and NDPK-7-24 × DVRP-2-5. Twenty-six crosses showed significant and positive heterosis over better parent for for total soluble solids which were NDPK-7-24 × Punjab Samrat followed by P-35-16 × P-40-16, Azad Pumpkin-1 × P-40-16, Azad Pumpkin-1 × Punjab Samrat and Azad Pumpkin-1 × Narendra Agrim. eight crosses showed significant and positive heterosis over better parent for for dry matter content which were Azad Pumpkin-1 × P-40-16 followed by P-35-16 × P-40-16, Azad Pumpkin-1 × P-35-16, P-40-16 × NDPK-7-24 and Azad Pumpkin-1 × NDPK-7-24. Fifteen crosses showed significant and negative heterosis over better parent for moisture content which were Azad Pumpkin-1 × P-40-16 followed by P-35-16 × P-40-16, Azad Pumpkin-1 × Punjab Samrat, Azad Pumpkin-1 × P-35-16 and P-40-16 × Punjab Samrat. Four crosses showed significant and negative heterosis over better parent for number of seeds per fruit which were Azad Pumpkin-1 × Kashi Harit followed by P-35-16 × Kashi Harit, Azad Pumpkin-1 × NDPK-7-24 and P-35-16 × DVRP-2-5. One cross showed significant and positive heterosis over better parent for specific gravity which were Narendra Agrim × Punjab Samrat. Twenty-two crosses showed significant and positive heterosis over better parent for fruit yield per plant which were P-35-16 × DVRP-2-5 followed by P-35-16 × P-40-16, Kashi Harit × DVRP-2-5, Azad Pumpkin-1 × P-35-16 and Narendra Agrim × Punjab. Similar results were also proposed by Sirohi et al., [14], Dubey and Maurya et al., [9], Li et al., [5], El-Tahawey et al., [10], Begum et al., [11], Jansi,[2], Hatwal et al., [12], Kumar et al., [13] and Chandramouli et al., [15] (Tables 1-4).

**TABLE 1**  
**Estimates of heterosis (%) over better parent for vine length character in pumpkin**

S.No.	Crosses	Days to first male flower appear	Days to first female flower appear	Node numbers to first male flower appearance	Node numbers to first female flower appearance	Vine length (cm)
		BP	BP	BP	BP	BP
1	Azad Pumpkin-1 × P-35-16	0.53	-3.37	-2.68	-0.03	-8.15
2	Azad Pumpkin-1 × P-40-16	-4.98*	1.24	-8.37	4.96	-0.59
3	Azad Pumpkin-1 × Narendra Agrim	10.44**	-9.09**	-3.6	-0.27	2.52
4	Azad Pumpkin-1 × NDPK-7-24	1.79	-4.18	-12.06*	-4.89	-11.55*
5	Azad Pumpkin-1 × Kashi Harit	0.66	-18.10**	-5.57	2.82	2.64
6	Azad Pumpkin-1 × DVRP-2-5	1.48	-8.91**	-7.47	-6.84*	12.43*
7	Azad Pumpkin-1 × Punjab Samrat	-6.40**	-10.25**	-7.67	-10.89**	-1.52
8	P-35-16 × P-40-16	15.57**	4.01	-5.63	-5.28	3.17
9	P-35-16 × Narendra Agrim	23.50**	1.74	-8.38	5.47	9.1
10	P-35-16 × NDPK-7-24	-3	8.03**	-4.49	-3.45	-4.93
11	P-35-16 × Kashi Harit	28.24**	6.07**	-14.62*	9.63**	15.80**
12	P-35-16 × DVRP-2-5	10.24**	1.63	-12.27*	-2.81	-5.93
13	P-35-16 × Punjab Samrat	6.15**	6.75**	-5.9	-3.57	1.12
14	P-40-16 × Narendra Agrim	8.08**	-11.38**	-20.57**	7.63*	29.62**
15	P-40-16 × NDPK-7-24	-3.04	-9.44**	-25.46**	-1.41	37.74**
16	P-40-16 × Kashi Harit	13.42**	-7.56**	-13.42*	11.59**	4.32
17	P-40-16 × DVRP-2-5	-5.47**	-16.65**	-15.32**	2.34	15.54**
18	P-40-16 × Punjab Samrat	-5.42**	-14.23**	-24.92**	-9.34**	-7.07
19	Narendra Agrim × NDPK-7-24	0.6	-22.22**	-5.62	-4.48	8.1
20	Narendra Agrim × Kashi Harit	6.04**	-11.53**	0.52	3.57	-7.77

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21	Narendra Agrim × DVRP-2-5	-2.75	-20.36**	3	-10.70**	2.89
22	Narendra Agrim × Punjab Samrat	4	-8.12**	-9.03	-7.96*	-16.96**
23	NDPK-7-24 × Kashi Harit	-2.29	-23.46**	-8.88	7.84*	5.12
24	NDPK-7-24 × DVRP-2-5	4.14*	-5.97**	-14.36*	-6.74*	-7.36
25	NDPK-7-24 × Punjab Samrat	-10.95**	-8.91**	-17.23**	-7.68**	-15.00**
26	Kashi Harit × DVRP-2-5	-1.98	-21.63**	-5.38	2.14	11.33*
27	Kashi Harit × Punjab Samrat	0.39	-17.89**	-15.94**	-2.32	0.43
28	DVRP-2-5 × Punjab Samrat	-0.68	-9.27**	-6.25	0.55	2.03
No. of crosses with significant positive heterosis		10	3	0	4	6
No. of crosses with significant negative heterosis		5	19	11	7	3
Range of heterosis		-10.95 to 28.24	-23.46 to 8.03	-25.46 to 3.00	-10.89 to 11.59	-16.96 to 37.74

Note: \*, \*\*Significant at 5 per cent and 1 per cent probability levels, respectively.

**TABLE 2**  
Estimates of heterosis (%) over better parent for average fruit weight character in pumpkin

S.No.	Crosses	Internodal length (cm)	Number of primary branches/plant	Days to first harvest	Average fruit weight (kg)
		BP	BP	BP	BP
1	Azad Pumpkin-1 × P-35-16	3.04	5.72	0.27	32.93**
2	Azad Pumpkin-1 × P-40-16	8.85**	20.26**	5.75**	10.33*
3	Azad Pumpkin-1 × Narendra Agrim	-5.32	14.33**	-9.23**	6.29
4	Azad Pumpkin-1 × NDPK-7-24	8.75**	10.88*	-0.81	6.59
5	Azad Pumpkin-1 × Kashi Harit	2.37	27.29**	-12.07**	-6.74
6	Azad Pumpkin-1 × DVRP-2-5	13.31**	25.46**	-1.54	35.33**
7	Azad Pumpkin-1 × Punjab Samrat	6.84*	20.73**	-8.37**	1.53
8	P-35-16 × P-40-16	1.54	20.88**	16.52**	12.11*
9	P-35-16 × Narendra Agrim	6.82*	-7.12	1.18	24.71**
10	P-35-16 × NDPK-7-24	-2.65	12.54*	3.88*	10.80*
11	P-35-16 × Kashi Harit	6.32	-1.74	14.07**	9.33
12	P-35-16 × DVRP-2-5	4.55	4.79	3.81*	53.68**
13	P-35-16 × Punjab Samrat	-7.20*	12.20*	-4.67**	2.08
14	P-40-16 × Narendra Agrim	3.85	-0.04	-9.92**	18.74**
15	P-40-16 × NDPK-7-24	5.38	24.24**	-2.12	19.34**
16	P-40-16 × Kashi Harit	1.19	35.22**	3.03	26.49**
17	P-40-16 × DVRP-2-5	-9.23**	17.13**	-6.95**	31.35**
18	P-40-16 × Punjab Samrat	-1.15	-3.33	-4.17*	7.21
19	Narendra Agrim × NDPK-7-24	-13.48**	10.05*	-10.41**	15.70**
20	Narendra Agrim × Kashi Harit	9.49**	7.57	-2.87	28.97**
21	Narendra Agrim × DVRP-2-5	-5.41	13.86**	-9.11**	39.71**
22	Narendra Agrim × Punjab Samrat	-0.33	-2.78	6.37**	27.46**
23	NDPK-7-24 × Kashi Harit	11.46**	21.33**	-11.72**	12.73*
24	NDPK-7-24 × DVRP-2-5	-18.47**	-2.15	1.96	49.75**
25	NDPK-7-24 × Punjab Samrat	-13.48**	-1.75	-7.41**	-2.77
26	Kashi Harit × DVRP-2-5	2.77	18.01**	0.52	31.07**
27	Kashi Harit × Punjab Samrat	10.28**	19.49**	-10.79**	-6.24

28	DVRP-2-5 × Punjab Samrat	-9.45**	13.72**	3.19	-10.68*
	No. of crosses with significant positive heterosis	8	18	6	18
	No. of crosses with significant negative heterosis	6	0	12	1
	Range of heterosis	-18.47 to 13.31	-1.75 to 35.22	-12.07 to 16.52	-10.68 to 53.68

Note: \*, \*\*Significant at 5 per cent and 1 per cent probability levels, respectively.

**TABLE 3**  
Estimates of heterosis (%) over better parent for dry matter content character in pumpkin

S.No.	Crosses	Equatorial circumference of fruit (cm)	Polar circumference of fruit (cm)	Flesh thickness (cm)	Total soluble solids (°Brix)	Dry matter content (%)
		BP	BP	BP	BP	BP
1	Azad Pumpkin-1 × P-35-16	5.44**	10.45**	7.29	BP	20.49**
2	Azad Pumpkin-1 × P-40-16	-1.37	6.00*	19.39**	6.83**	37.18**
3	Azad Pumpkin-1 × Narendra Agrim	-5.66**	3.17	3.58	17.40**	14.69*
4	Azad Pumpkin-1 × NDPK-7-24	-9.50**	-4.6	7.29	16.12**	17.22*
5	Azad Pumpkin-1 × Kashi Harit	9.45**	5.86*	2.03	6.32**	14.97*
6	Azad Pumpkin-1 × DVRP-2-5	-7.90**	-4.06	18.02**	3.92	11.94
7	Azad Pumpkin-1 × Punjab Samrat	7.46**	5.45*	3.44	6.66**	12.75
8	P-35-16 × P-40-16	6.47**	10.74**	12.89**	17.12**	26.57**
9	P-35-16 × Narendra Agrim	4.11*	4.15	6.43	20.76**	14.65*
10	P-35-16 × NDPK-7-24	1.48	2.58	10.53**	11.11**	-11.3
11	P-35-16 × Kashi Harit	-3.16	-1.57	1.49	8.12**	8.62
12	P-35-16 × DVRP-2-5	4.54**	10.20**	7.93	4.4	-13.99*
13	P-35-16 × Punjab Samrat	3.79*	3.19	20.45**	9.64**	3.51
14	P-40-16 × Narendra Agrim	6.74**	9.55**	6.29	5.25*	11.68
15	P-40-16 × NDPK-7-24	17.99**	17.91**	6.12	13.66**	19.03*
16	P-40-16 × Kashi Harit	0.07	-0.68	0.81	17.36**	11.38
17	P-40-16 × DVRP-2-5	1.45	1.13	11.33**	13.66**	7.64
18	P-40-16 × Punjab Samrat	4.65**	11.26**	10.22**	12.90**	6.73
19	Narendra Agrim × NDPK-7-24	14.81**	10.50**	12.09**	9.43**	-11.83
20	Narendra Agrim × Kashi Harit	9.51**	3.93	4.74	17.31**	9.55
21	Narendra Agrim × DVRP-2-5	1.89	7.63**	6.37	14.43**	-12.4
22	Narendra Agrim × Punjab Samrat	-1.63	10.97**	9.80*	11.69**	3.17
23	NDPK-7-24 × Kashi Harit	10.61**	5.76	5.82	14.84**	-12.3
24	NDPK-7-24 × DVRP-2-5	-3.59*	24.75**	13.17**	13.22**	6.36
25	NDPK-7-24 × Punjab Samrat	8.81**	7.39**	13.03**	9.33**	-21.79**
26	Kashi Harit × DVRP-2-5	-17.13**	-7.19**	18.81**	25.58**	-6.97
27	Kashi Harit × Punjab Samrat	-13.91**	-12.06**	8.39*	7.31**	-11.83
28	DVRP-2-5 × Punjab Samrat	4.92**	9.72**	4.2	11.10**	-5.34
	No. of crosses with significant positive heterosis	15	15	13	11.05**	8
	No. of crosses with significant negative heterosis	6	2	0	26	2
	Range of heterosis	-17.13 to 17.99	-12.06 to 24.75	0.81 to 20.45	0	-21.79 to 37.18

Note: \*, \*\*Significant at 5 per cent and 1 per cent probability levels, respectively.

**TABLE 4**  
Estimates of heterosis (%) over better parent for fruit yield per plant character in pumpkin

S. No.	Crosses	Moisture content (%)	Number of seeds per fruit	Specific gravity (g/cm <sup>3</sup> )	Fruit yield per plant (kg)
		BP	BP	BP	BP
1	Azad Pumpkin-1 × P-35-16	-1.67**	17.00**	10.62	65.88**
2	Azad Pumpkin-1 × P-40-16	-2.71**	-0.55	-1.37	27.89**
3	Azad Pumpkin-1 × Narendra Agrim	-1.23*	30.35**	9.25	17.61*
4	Azad Pumpkin-1 × NDPK-7-24	-1.26**	-16.64**	-9.97*	22.31**
5	Azad Pumpkin-1 × Kashi Harit	-1.41**	-21.02**	-5.45	-0.35
6	Azad Pumpkin-1 × DVRP-2-5	-1.14*	-6.4	-1.37	57.18**
7	Azad Pumpkin-1 × Punjab Samrat	-1.71**	15.17**	7.19	15.17*
8	P-35-16 × P-40-16	-2.34**	32.19**	-2.08	80.34**
9	P-35-16 × Narendra Agrim	-1.05*	3.42	0.69	34.83**
10	P-35-16 × NDPK-7-24	0.39	1.01	-8.26	36.35**
11	P-35-16 × Kashi Harit	-1.28**	-18.31**	-8.97	55.86**
12	P-35-16 × DVRP-2-5	0.93	-13.28*	-2.07	93.84**
13	P-35-16 × Punjab Samrat	-0.76	18.31**	-3.82	18.02**
14	P-40-16 × Narendra Agrim	-1.28**	21.48**	0.35	18.35*
15	P-40-16 × NDPK-7-24	-1.36**	9.12	-13.96**	4.77
16	P-40-16 × Kashi Harit	-0.89	28.27**	-8.65	50.41**
17	P-40-16 × DVRP-2-5	-1.09*	12.4	-2.07	41.23**
18	P-40-16 × Punjab Samrat	-1.51**	18.12**	-3.89	28.28**
19	Narendra Agrim × NDPK-7-24	0.46	6.91	-19.09**	36.84**
20	Narendra Agrim × Kashi Harit	-1.30**	2.96	-9.29	10.38
21	Narendra Agrim × DVRP-2-5	0.78	22.22**	2.07	50.45**
22	Narendra Agrim × Punjab Samrat	-0.78	-5.5	23.59**	60.73**
23	NDPK-7-24 × Kashi Harit	0.5	6.13	-18.52**	45.62**
24	NDPK-7-24 × DVRP-2-5	-0.87	26.36**	-17.66**	55.17**
25	NDPK-7-24 × Punjab Samrat	0.72	19.27**	-11.11*	11.2
26	Kashi Harit × DVRP-2-5	-0.25	-0.26	-4.81	66.65**
27	Kashi Harit × Punjab Samrat	-0.31	-0.23	-8.01	9.55
28	DVRP-2-5 × Punjab Samrat	-0.06	13.53*	0.34	-1.03
No. of crosses with significant positive heterosis		0	12	1	10.62
No. of crosses with significant negative heterosis		15	4	6	-1.37
Range of heterosis		-2.71 to 0.93	-21.02 to 32.19	-19.09 to 23.59	9.25

Note: \*, \*\*Significant at 5 per cent and 1 per cent probability levels, respectively.

**CONCLUSION**

Based on the above findings it may be concluded that Based on the above findings it may be concluded that for fruit yield per plant crosses Azad Pumpkin-1 × P-35-16, Azad Pumpkin-1 × DVRP-2-5, Narendra Agrim × Punjab Samrat showed high heterosis over parents better in F1 may be exploited as commercial hybrid in future. Parents Azad Pumpkin-1, Punjab Samrat, DVRP-2-5 and P-35-16 may be used in future crossing programme.

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