A study on the heterosis in cashew (*Anacardium occidentale* L)

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ABSTRACT

An experiment was conducted at Cashew Research Station, All India Coordinated Research Project on Cashew under Odisha University of Agriculture and Technology, Bhubaneswar, Odisha to study the extent of heterosis exhibited by five F_1 progenies of 4 years old cashew. The experiment was laid out during 2014 following statistical design RBD replicated twice. Heterosis for different parameters was studied for the fruiting season 2016-17. The magnitude of heterosis for nut yield/tree, nut weight and shelling percentage in terms of relative heterosis, heterobeltiosis and standard heterosis recorded variations among the genotypes. Relative heterosis, heterobeltiosis and standard heterosis for nut yield ranged from 37.41 (BH-27) to 157.86 (BH-26) per cent , 33.33 (BH-19) to 47.48 (BH-26) per cent and 1.42 (BH-105) to 46.42 (BH-26) per cent respectively. Among the five tested genotypes, BH-26 recorded maximum extent of relative heterosis, heterobeltiosis and standard heterosis for nut yield. For nut weight, four genotypes viz BH-27 (9.24%), BH-19 (5.45%), BH-26 (17.72%) and BH-105 (11.71%) showed relative heterosis while only two hybrids (BH-19 and BH-26) exhibited heterosis over the standard variety with a range of 1.79 to 8.89 per cent. Relative heterosis for shelling ranged from 5.16 (BH-105) to 15.99 (BH-30) per cent. Genotypes BH-27 (1.83%), BH-30 (3.57%), BH-19 (10.18%) and BH-105 (5.16%) exhibited heterosis over their respective better parents for shelling percentage. However all the five varieties recorded heterosis over the standard variety with values ranging from 3.88 (BH-26) to 11.49 (BH-30) per cent. It may be concluded that the genotypes which showed heterosis for the studied characters can be utilised in hybridisation programme for cashew crop improvement. The hybrid BH-26 may be recommended for commercial cultivation in the state of Odisha because of yield advantage over the standard check.

Keywords: Cashew; nut weight; shelling percentage; nut yield; heterosis

INTRODUCTION

Cashew (*Anacardium occidentale* L) is an important export earning crop of the country. India is the leading country in the world in cashew production area (9,23,000 ha) and production (6,13,000 MT) (Ponnuswami et al 2015). But the average productivity of the crop in the country is only 753 kg/ha that is quite low as compared to other cashew growing countries of the world. The primary factor for low productivity of Indian cashew is cultivation of seedling progenies of poor genetic stock. This low productivity of Indian cashew can be addressed by developing superior progenies with desirable traits through crop breeding programme preferably by exploitation of heterosis thereby development of F_1 progeny. Exploitation of heterosis and estimation of different aspects of heterosis play a very crucial role in the development of potential progenies and subsequent popularization among the growers will make considerable headway in enhancing not only the production but also productivity of the crop to a satisfactory level. The said experiment was formulated with the objective to estimate the extent of heterosis exhibited by five F_1 genotypes for yield attributing traits and nut yield of cashew.

MATERIAL and METHODS

Five F_1 genotypes of cashew were planted along with their parents at Cashew Research Station, Odisha University of Agriculture and Technology,

Bhubaneswar, Odisha during the year 2014. The experiment was laid out following statistical design RBD replicated twice. The selected hybrids were evaluated based on heterosis over mid-parent (reletaive heterosis), better parent (heterobeltiosis) and standard variety (standard heterosis) for the yield attributing characters like nut weight, shelling percentage and nut yield/tree using the following formulae suggested by Briggle (1963) and Hayes et al (1965):

$$\text{Relative heterosis} = \frac{F_1 - MP}{MP} \times 100$$

$$\text{Heterobeltiosis} = \frac{F_1 - BP}{BP} \times 100$$

$$\text{Standard heterosis} = \frac{F_1 - CV}{CV} \times 100$$

where F_1, BP and CV denote average performance of F_1 genotype, better parent and check/standard variety (BPP-8) respectively while MP denotes mid-parent value

RESULTS and DISCUSSION

Magnitude of heterosis for nut weight, shelling percentage and nut yield/tree in terms of relative heterosis, heterobeltiosis and standard heterosis are presented in Table 1.

A perusal of the data reveals that all the hybrids exhibited positive relative heterosis for nut weight except the F_1 genotype BH-30 (-5.56%). Maximum positive relative heterosis was observed in F_1 genotype BH-26 (17.72%) followed by BH-105 (11.71%) and BH-27 (9.24%). Regarding the results of heterobeltiosis estimated on the basis of better parent value, the present study revealed negative heterosis among all the tested F_1 genotypes. Similarly the standard heterosis estimated over the standard check variety BPP-8 revealed wide variations for nut weight which ranged from minimum (-12.57%) in genotype BH-30 to maximum of 8.98 per cent in genotype BH-26.

The results on expression of heterosis (relative heterosis, heterobeltiosis and standard heterosis) reveal wide variations among tested F_1 genotypes for shelling percentage. The relative heterosis for shelling percentage ranged from minimum 5.16 in BH-105 to maximum 15.99 in BH-30. Similarly positive heterobeltiosis was recorded for all the tested F_1 genotypes except BH-26 (-3.48%). Regarding standard heterosis, shelling percentage was recorded maximum (11.49%) in F_1 genotype BH-30 while genotype BH-26 recorded the least value (3.88%) among the tested genotypes. However all the tested genotypes recorded positive standard heterosis for shelling percentage. The positive heterosis was also observed for nut yield and number of nuts in cashew by Manivannan et al *(*1989) and Manoj et al (1993). The higher magnitude of heterosis for nut weight and kernel weight has also been suggested for cashew improvement programme by Chipojola et al (2009).

Relative heterosis for nut yield (kg/tree) ranged from minimum -0.35 per cent in BH-105 to 157.86 per cent in genotype BH-26. Relative heterosis exhibited by genotypes BH-27, BH-30 and BH-19 was in the magnitude of 37.41, 62.26 and 112.24 per cent respectively. Regarding heterobeltiosis for nut yield, the data indicated wide variations which ranged from minimum of -2.06 per cent in genotype BH-105 to maximum (47.48%) in BH-26. The standard heterosis for nut yield was recorded maximum for genotype BH-26 (46.42%) followed by BH-19 (11.42%) and BH-105 (1.42%). The overall results on expression of heterosis for nut yield revealed that genotypes namely BH-26 and BH-19 recorded better relative heterosis (157.86 to 112.24%), heterobeltiosis (47.48 to 33.33%) as well as standard heterosis (46.42 to 11.42%) among the tested genotypes. The results are in conformity with the findings of Manoj et al (1993) and Sethi et al (2016) in cashew .

CONCLUSION

The results from the present study indicated that the genotypes namely BH-26 and BH-19 exhibited better heterosis with respect to total nut yield/tree as compared to the other tested genotypes of cashew. Hence the genotypes BH-19 and BH-26 may be recommended for cultivation to increase the production and productivity of cashew in the state of Odisha.

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Table 1. Heterosis for nut weight, shelling percentage and nut yield/tree of five F_1 cashew genotypes

Genotype	F_1 genotype	Parent-1	Parent-2	Mid-parent	Check variety	Relative heterosis	Heterobeltiosis	Standard heterosis
Nut weight (g)								
BH-27	8.15	4.5	10.42	7.46	8.35	9.24	-50.44	-2.39
BH-30	7.3	4.7	10.76	7.73	8.35	-5.56	-73.61	-12.57
BH-19	8.5	5.7	10.42	8.06	8.35	5.45	-33.68	1.79
BH-26	9.1	4.7	10.76	7.73	8.35	17.72	-35.31	8.98
BH-105	8.25	6.42	8.35	7.385	8.35	11.71	-1.55	-1.19
Shelling (%)								
BH-27	32.26	31.68	27.25	29.47	30.37	9.48	1.83	6.22
BH-30	33.86	32.69	25.69	29.19	30.37	15.99	3.57	11.49
BH-19	32.23	29.25	27.25	28.25	30.37	14.08	10.18	6.12
BH-26	31.55	32.69	25.69	29.19	30.37	8.084	-3.48	3.88
BH-105	31.94	30.37	30.37	30.37	30.37	5.16	5.16	5.16
Nut yield (kg/plant)								
BH-27	1.01	1.17	0.3	0.735	1.4	37.41	-13.67	-27.85
BH-30	1.29	1.39	0.2	0.795	1.4	62.26	-7.19	-7.85
BH-19	1.56	1.17	0.3	0.735	1.4	112.24	33.33	11.42
BH-26	2.05	1.39	0.2	0.795	1.4	157.86	47.48	46.42
BH-105	1.42	1.45	1.4	1.425	1.4	-0.35	-2.06	1.42

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