

HETEROSIS IN BOTTLE GOURD (*LAGENARIA SICERARIA* (MOLINA) STANDL) USING L X T

K. G. JANARANJANI¹, B. MURALIDHARAN² & V. KANTHASWAMY³

^{1,2}Research Scholar, Department of Horticulture, Pandit Jawaharlal Nehru College of
Agriculture and Research Institute, Karaikal, Puducherry India

³Research Scholar, Professor, Department of Horticulture, Pandit Jawaharlal Nehru College of
Agriculture and Research Institute, Karaikal, Puducherry, India

ABSTRACT

Nine lines and four testers and 36 F₁ hybrids of bottle gourd, obtained from L x T mating, were studied to investigate the extent of heterosis for yield and its contributing characters, during 2011 and 2012, in the Department of Horticulture, Pandit Jawaharlal Nehru College of Agriculture and Research Institute, Karaikal, U.T. of Puducherry. The variety NDBG – 164 (T₂) was used as the standard check variable to estimate the standard heterosis. Negative heterosis was considered to be better for some of the eight characters studied viz., Node at first male flower appears, node at first female flower appears, days to first male flower opening, days to first female flower opening, days to first fruit harvest, fruit cavity, 100 seed weight and number of seeds per fruit with respect to the yield while positive heterosis was considered to be desirable for the remaining 10 traits viz., vine length, number of primary branches, sex ratio, fruit length, fruit width, fruit flesh thickness, number of fruits per vine, number of pickings, fruit weight and yield per vine. The heterobeltiosis for yield per vine was positive and significant in 36 hybrids. The maximum positive and high significant heterotic expression of 133.61 per cent for fruit yield per vine, number of fruit pickings and fruit length was observed in Pusa Naveen x NDBG - 164 (L₇ x T₂) followed by Pusa Naveen x Punjab Komal (L₇ x T₁) with heterotic expression of 132.31 per cent for fruit yield per vine. Therefore, it is concluded that Pusa Naveen x NDBG-164 and Pusa Naveen x Punjab Komal, could be considered for commercial cultivation as F₁ hybrids after conducting confirmatory trials (MLT and ART) in farmer's holdings.

KEYWORDS: F₁ Hybrids, Heterosis, Bottle Gourd, L X T

INTRODUCTION

The bottle gourd is extensively grown in India in different states viz., Uttar Pradesh, Punjab, Gujarat, Assam, Rajasthan, Kerala, TamilNadu and Karnataka. It is cultivated almost throughout the year in India in an area of 1.17 lakh ha, with a production of 14.28 lakh tones and a productivity of 12.21 tonnes per ha (Suchitra and Haribabu, 2007). It is grown in the summer season as well, during the rainy season. Under the genus *LaGuardia*, six species are reported in the world. Among them, *Lagenaria siceraria* is generally cultivated in all tropical parts of the world, including India and in a few African countries. The cooked vegetable has cooled diuretic, sedative and anti-bilious effect. The bottle gourd fruit juice can be used in the treatment of insanity, epilepsy and other nervous diseases. The juice can also be used in the treatment of stomach acidity, indigestion and ulcers. The bottle gourd fruit also helps in relieving constipation. The relative power and the potency of heterosis breeding in increasing the productivity of crop plants in general and allogamous crop like cucurbit in particular

are more prospective. Based on the comparison used, heterosis has been obtained as improvement of F_1 over the mid parental value, better parent and best parent. When the F_1 performance is poorer than the mid parent or the worst parent, it is referred to as “negative heterosis”. Various theories have been postulated to explain the genetic basis of heterosis. One such is the dominance hypothesis viz., Favorable expressions of heterozygosity, by making deleterious recessive genes by their dominant counterpart alleles. Another explanation is the over dominance viz., Cumulative support and complementation between the alleles in the F_1 , contributed by both the male and female parents. Heterosis is more pronounced in cross pollinated species (Hayes and Foster, 1976).

MATERIALS AND METHODS

Thirteen promising lines/varieties of bottle gourd were crossed 9 x 4 (Line x Tester) fashion (Kempthorne,) to obtain 36 F_1 hybrids. The F_1 hybrids along with their parents were evaluated by the Department of Horticulture, Pandit Jawaharlal Nehru College of Agriculture and Research Institute, Karaikal during 2011-2012 in randomized block design with three replications. An inter-row spacing of 2.0 m and intra-row spacing of 1.5 m was adopted. Five plants were tagged in each hybrids and parents in each replication and biomedical observations were recorded from the tagged plants in each replication. The variety NDBG – 164 (T_2) was used as the standard check variable to estimate the standard heterosis. Negative heterosis was considered to be better for some of the eight characters studied viz., Node at first male flower appears, node at first female flower appears, days to first male flower opening, days to first female flower opening, days to first fruit harvest, fruit cavity, 100 seed weight and number of seeds per fruit with respect to the yield while positive heterosis was considered to be desirable for the remaining 10 traits viz., Vine length, number of primary branches, sex ratio, fruit length, fruit with, fruit flesh thickness, number of fruits per vine, number of pickings, fruit weight and yield per vine.

RESULT AND DISCUSSIONS

In the present investigation, the heterosis of cross combinations derived from the nine lines and four testers were of genetically divergent parents through L x T mating design was estimated over mid parent, better parent and standard check variety. Hence the productive hybrids were not assessed merely by the expression of heterocyst, over the parents, but also in relation to the standard check variety. Hence, the standard heterosis was taken as an important criterion for evaluation of the hybrids. Top three hybrids are mentioned in the table 1 for all the eighteen traits.

The hybrid Pusa Naveen x Punjab Komal (L_7 x T_1) and Punjab Long x Samrat (L_5 x T_4) were 28.54 & 21.46 found to exhibit significant standard heterosis for vine length. For the trait, number of primary branches were shown significant standard heterosis and it was maximum in Pusa Naveen x Samrat (L_7 x T_4) 102.28 and Kashi Ganga x NDBG-164 (L_3 x T_2) 99.54. The hybrids Pusa Naveen x Punjab Komal (L_7 x T_1) -58.01 and Pusa Naveen x Narendra Dharward (L_7 x T_3) -54.98, were found to exhibit significant standard heterosis for node, at first male flower appears, highest standard heterosis recorded in NDBG-121 x Punjab Komal (L_1 x T_1) -72.08 and Pusa Naveen x NDBG-164 (L_7 x T_2) -71.80. The hybrid Pusa Naveen x NDBG-164 (L_7 x T_2) -39.81 and NarendraJothi x NDBG-164 (L_2 x T_2) -39.21 were found to exhibit significant standard heterosis for days to first male flower opening. Four days to first female flower opening highest standard heterosis, recorded in Narendra Jothi x NDBG-164 (L_2 x T_2) -35.66 and Pusan Naveen x NDBG -164 (L_7 x T_2) -28.80. The cross combination Punjab Long x Narendra Dharward (L_5 x T_3) -33.93 were found to be exhibiting significant standard heterosis, for the trait sex ratio. The crosses DBG-6 x Punjab Komal (L_8 x T_1) -9.16 and Arka Bahar x Punjab

Komal ($L_9 \times T_1$) -9.23 recorded maximum significant standard heterosis, for the character days to first fruit harvest. For the fruit length, the standard heterosis were recorded maximum in Pusa Naveen x NDBG-164 ($L_7 \times T_2$) 4.54. The hybrids Kalyanpur Long Green x Narendra Dharward ($L_6 \times T_3$) 8.46 and DBG-6 x Samrat ($L_8 \times T_4$) 8.36 were recorded maximum, significant standard heterosis for the character fruit width. The hybrids DBG-6 x Punjab Komal ($L_8 \times T_1$) -53.73 and Narendra Jothi x Narendra Dharward ($L_2 \times T_3$) -51.23 were recorded maximum significant heterosis, for the character fruit cavity. For the trait fruit flesh thickness were found to exhibit significant standard heterosis and it was maximum in NDBG - 121 x Samrat ($L_1 \times T_4$) 43.85 and Pusa Naveen x NDBG-164 ($L_7 \times T_2$) 42.56. For fruit weight found to exhibit significant standard heterosis and it was maximum in Narendra Jothi x NDBG-164 ($L_2 \times T_2$) 14.59 and Kashi Ganga x NDBG-164 ($L_3 \times T_2$) 9.46.

The hybrid Kalyanpur Long Green x Samrat ($L_6 \times T_4$) 381.13 and Punjab Long x NarendraDharward ($L_5 \times T_3$) 381.13 were recorded maximum significant standard heterosis for the character number of fruits per vine. For the character, number of pickings Pusa Naveen x NDBG- 164 ($L_7 \times T_2$) 304.17 and Pusa Naveen x Punjab Komal ($L_7 \times T_1$) 293.75 cross combination shown the highly significant standard heterosis in a desirable direction. The crosses NarendraJothixSamrat ($L_2 \times T_4$) -75.71 and Punjab Long x Samrat ($L_5 \times T_4$) -73.01 recorded maximum significant standard heterosis for the character number of seeds per fruit. The crosses Kalyanpur Long Green x Punjab Komal ($L_6 \times T_1$) 82.38 and Kashi Ganga x NarendraDharward ($L_3 \times T_3$) 82.38 recorded maximum significant standard heterosis for the character 100 seed weight. The hybrids Pusa Naveen x NDBG-164 ($L_7 \times T_2$) 133.61 and Pusa Naveen x Punjab Komal ($L_7 \times T_1$) 132.31 were recorded maximum significant standard heterosis for the yield per vine. Similar results were obtained by Veerendraet al. (2007) for node at first female flower appearance, sex ratio and yield per vine in ash gourd; Munshiet al. (2005) for fruit length, flesh thickness and yield per plant in cucumber; Jadhav et al. (2009) for days to appearance of first female flower, node number at which first female flower and fruit yield per plant in bitter gourd; Maurya et al. (2009) for number of fruits per vine and fruit yield in bottle gourd; Veerendraet al. (2010) for number of female flowers per plant, individual fruit weight and yield per plant in ash gourd; Jagesh Kumar et al. (2010) for earliness, number of fruits per plant and yield in slicing cucumber.

The hybrids Pusa Naveen x NDBG-164 ($L_7 \times T_2$) 133.61 manifested had high heterotic effects for yield and its important attributes like days to first male flower opening, fruit length, number of pickings and yield per vine in the present investigation were found to be the best performing hybrids and may be could be considered for commercial cultivation as F_1 hybrids after conducting confirmatory trails (MLT and ART) in farmers holdings.

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