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RESEARCH ARTICLE

# Assessment of standard heterosis for crop advancement in bottle gourd [*Lagenaria siceraria* (Molina) Standl]

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## SUMMARY

Thirty six $F_1$ hybrids of bottle gourd and fifteen parental lines were carried out to assess the extent of standard heterosis over standard variety *i.e.* Pusa Meghdoot. The observations were recorded on twelve characters *viz.,* days to fifty per cent germination, days to first male flower anthesis, days to first male flower anthesis, node number to first male flower, node number to first female flower, vine length (m), number of nodes per vine, number of primary branches per plant, length of fruit (cm), weight per fruit (kg), number of fruits per plant and fruit yield per plant. The positive and significant heterosis is desirable for vine length, number of nodes per vine, number of primary branches per plant, length of fruit, weight per fruit, number of fruits per plant and fruit yield per plant. The negative and significant heterosis is desirable for days to fifty per cent germination, days to first male flower anthesis, days to first female flower anthesis, node number to first male flower, node number to first female flower. Most of the crosses showed positive and significant heterosis over standard variety. The cross combinations DK x NDBG-104 and PBOG-22 x Pusa Naveen for days to fifty per cent germination, VRBG-18 x NDBG-104 for days to first male flower anthesis, VRBG-105 x PSPL and VRBG-18 x NDBG-104 for days to first female flower anthesis and DK x PSPL for node number to first male flower, PBOG-22 x NDBG-104 for node number to first female flower, AD-1 x NDBG-104 showed negative and significant heterosis over standard variety. As negative heterosis is desirable for these characters. The cross combinations AD-1 x NDBG-104 for vine length, VRBG-1 x PSPL and DK x PSPL for number of nodes per vine, VRBG-1 x PSPL and AD-1 x Pusa Naveen for number of primary branches per plant, VRBG-44 x NDBG-104 and VRBG-112 x PSPL for length of fruit, VRBG-148 x NDBG-104 for weight per fruit, DK x Pusa Naveen for number of fruits yield per plant and VRBG-44 x Pusa Naveen for fruit yield per plant showed highly positive and significant heterosis over standard variety.

***Key Words*** **:** Heterosis, Studies, Bottle gourd

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Bottle gourd is monoecious, annual having vine with long ribbed stem and strong tendrils. Flower open at night being a monoecious crop bottle gourd is strictly cross pollinated. The time of anthesis in bottle gourd is in between 5.00 and 8.00 pm both the male and female flower open at the same time. The shape of bottle gourd fruits are cylindrical, round, oval and oblong. The bottle gourd fruit in the green stage are used as vegetable, which is available throughout the year and also preparation of some delicious sweets impregnated with sugar solutions. It is highly digestive and reduces cough. Its oil extracted from mature seeds are used to remove headache. Its continuous use gradually cures eye trouble. The fruits at maturity are hard shelled, smooth surfaced and green to whitish green or tan in colour and variously striped or mottled.

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Exploitation of hybrid vigour approach was utilized as an ideal tool for boost the bottle gourd production in different parts of the world. Hays and Jones (1916) were first to report hybrid vigour in cucumber and the first commercial $F_1$ hybrid was made available by Japan in 1935. In India, there have been a number of reports on the prospects of hybrid vigour in bottle gourd but development of hybrid varieties for commercial purposes suitable for all or specific agro-climatic regions are not available.

Heterosis refers to the superiority of $F_1$ hybrid in one or more characters over its parents. In other words, heterosis refers to increase of $F_1$ in fitness and vigour over the parental values. Heterosis leads to superiority in adaptation, yield, quality, disease resistance, maturity and general vigour over its parents. Generally, positive heterosis is considered as desirable, but in some cases negative heterosis is also desirable for example, negative heterosis for plant height, maturity duration and toxic substances is desirable in many cases because it shows superiority over the parents.

The ultimate goal of any plant breeding programme is to evolve or improve genotypes which are better than the existing ones. This requires genetic amelioration through maximum utilization of allelic resources to develop ideal genotypes.

## MATERIALS AND METHODS

Fifteen parental lines of bottle gourd including 12 lines and 3 testers namely AD-1, DK, PBOG-22, VRBG-1, VRBG-18, VRBG-40, VRBG-44, VRBG-88, VRBG-105, VRBG-107, VRBG-112, VRBG-148, Pusa Naveen, PSPL and NDBG-104 were used to made crosses in line x tester fashion design to produce 36 crosses. Crosses and their parents were grown with plant to plant 1.0 m and row to row 2.0 m at Horticulture Research Farm, Department of Applied Plant Science (Horticulture), Babasaheb Bhimrao Ambedkar University, Lucknow - 226025(U.P.) during the year of 2009-2010. The trial was conducted in Randomized Block Design with three replications. The observations were recorded on twelve characters of bottle gourd *viz.* days to fifty per cent germination, days to first male flower anthesis, days to first female flower anthesis, node number to first male flower, node number to first female flower, vine length (m), number of nodes per vine, number of primary branches per plant, length of fruit (cm), weight per fruit (kg), number of fruits per plant and fruit yield per plant (kg). The data was analyzed statistically for all the characters. Magnitude of heterosis was calculated as percentage of $F_1$ performance in favourable direction over standard variety. The significant was tested by 't' test.

## RESULTS AND DISCUSSION

Heterosis was estimated as parent increases or decreases of $F_1$ value over standard variety and presented in Table 1 for the twelve characters of bottle gourd.

As earliness is a desirable trait in bottle gourd, negative and significant heterosis is desirable. The heterosis value ranged from -8.23 per cent (DK x NDBG-104) to 32.47 per cent(VRBG -112 x PSPL) over standard variety. Only three crosses were showed negative and significant heterosis, whereas, thirty three crosses showed positive and significant heterosis over standard variety. Cross combinations DK x NDBG-104, VRBG-1 x Pusa Naveen, and VRBG-18 x NDBG-104 over standard variety showed early germination. Earliness is to be considered as a desirable trait in bottle gourd and hence, three crosses showed negative and significant heterosis over standard variety. Cross combinations VRBG-18 x NDBG-104, VRBG-40 x Pusa Naveen and VRBG-44 x Pusa Naveen showed early days to first male flower anthesis over standard variety. The crosses with negative heterosis were considered as desirable for days to first female flower anthesis. Heterosis ranged from -17.51 per cent(VRBG-105 x PSPL) to 22.04 per cent(VRBG-148 x PSPL) over standard variety. Cross combinations VRBG-105 x PSPL and VRBG-105 x NDBG-104 and VRBG-40 x Pusa Naveen over standard variety showed early days to first female flower anthesis because these cross combinations exhibited negative and significant heterosis over standard variety. The negative and significant heterosis is desirable for early node number to first male flower. Heterosis ranged from -33.08 per cent(VRBG-18 x NDBG-104) to 33.23 per cent (AD-1 x PSPL) over standard variety. Cross combinations VRBG-18 x NDBG-104, PBOG-22 x NDBG-104, AD-1 x NDBG-104 and VRBG-18 x Pusa Naveen over standard variety noticed early node number to first male flower. The crosses with negative and significant heterosis were considered as desirable earliness for node number to first female flower. Heterosis ranged from -29.37 per cent (PBOG-22 x NDBG-104) to 55.17 per cent (AD-1 x PSPL) over standard variety. Cross combinations PBOG-22 x NDBG-104, VRBG-44 x NDBG-104 and VRBG-18 x NDBG-104 over standard variety showed earliness for node number to first female flower. The positive and significant heterosis for vine length is desirable because it is directly associated with increase of fruit yield. The heterosis value ranged from -34.60 per cent (VRBG-1 x PSPL) to 29.36 per cent (AD-1 x NDBG-104) over standard variety. Cross combinations AD-1 x NDBG-104, VRBG-44 x Pusa Naveen and VRBG-18 x NDBG-104 showed positive and significant heterosis over standard variety for highest length of vine.

The positive and significant heterosis is desirable for number of male and female flowers because larger number of nodes hold more number of male and female flowers. Heterosis ranged from -28.22 per cent (DK x Pusa Naveen) to 20.33 per cent (VRBG-1 x PSPL) over standard variety. Cross combinations VRBG-1 x PSPL, AD-1 x NDBG-104 and VRBG-44 x Pusa Naveen showed positive and significant heterosis over standard variety. The positive and significant heterosis for number of primary branches per plant is desirable because

it is directly associated with increase fruit yield per plant. The heterosis value ranged from -38.07 per cent (DK x Pusa Naveen) to 49.03 per cent (VRBG-1 x PSPL) over standard variety. Cross combination VRBG-1 x PSPL, VRBG-107 x PSPL, VRBG-88 x PSPL and AD-1 x Pusa Naveen showed positive and significant heterosis over standard variety for number of primary branches per plant.

Heterosis ranged from -31.04 (DK x Pusa Naveen) to 31.78 per cent (VRBG-44 x PSPL) over standard variety for the length of fruit. Cross combinations VRBG-44 x PSPL, VRBG-44 x Pusa Naveen and VRBG-1 x PSPL over standard variety showed positive and significant heterosis for maximum length of fruit. Weight per fruit is one of the most important yield contributing traits which influences the yield decisively. The hybrids with positive and significant heterosis are desirable for this vital trait. The heterosis value ranged from -16.66 per cent (AD-1 x Pusa Naveen) to 37.61 per cent(VRBG-148 x NDBG-104) over standard variety for this trait. The cross combination VRBG-148 x NDBG-104 followed by DK x Pusa Naveen and AD-1 x NDBG-104 over standard variety showed maximum positive and significant heterosis for maximum weight per fruit. Number of fruits per plant is an important trait and contributes to the yield enhancement, hence, positive and significant heterosis effects would be highly desirable. The heterosis value ranged from -40.19 per cent (VRBG-18 x Pusa Naveen) to 46.06 per cent (DK x Pusa Naveen) over standard variety for this trait. The cross combinations DK x Pusa Naveen, AD-1 x NDBG-104 and VRBG-40 x Pusa Naveen over standard variety showed maximum positive and significant heterosis for number of fruits per plant.

The positive and significant value for fruit yield per plant is desirable for exploitation of hybrid vigour. Such high heterosis for fruit yield per plant was due to additive heterotic effect of one or more components traits. The heterosis value ranged from -43.44 per cent (VRBG-148 x NDBG-104) to 24.08 per cent (VRBG-44 x Pusa Naveen) over standard variety for this trait. The cross combinations VRBG-44 x Pusa Naveen, VRBG-105 x Pusa Naveen and VRBG-44 x PSPL over standard variety showed highest positive and significant heterosis for fruit yield per plant.

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