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# Stability Analysis for Fruit Yield and its Components in Bottle Gourd [*Lagenaria siceraria* (Mol.) Standl.]

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**ABSTRACT: The G × E interaction makes it difficult to select the best performing as well as the most stable genotypes and so its efficient interpretation is important issue in plant improvement. The present study was carried out with objectives of to estimate the effect of genotype × environment interaction on the fruit yield and stability and estimate magnitude of genotype × environment interaction in bottle gourd. Forty five bottle gourd genotypes comprising 36 hybrids and 9 parents were evaluated in four different environments for stability parameters for days to opening first female flower, days to opening first male flower, number of node bearing first female flower, number of node bearing first male flower, vine length (cm), days to first picking, fruit length (cm), fruit equatorial diameter (cm), number of fruits per plant, average fruit weight per plant (kg), days to last picking and fruit yield per plant (kg). The analysis of mean squares due to genotypes and environments were found highly significant for all the characters studies when tested against pooled deviation, except for fruit length in environments, revealed that significant variations exist among genotypes and environments. G × E interactions were found significant for number of fruits per plant, average fruit weight per plant and fruit yield per plant when tested against pooled deviation, suggested that genotypes interacted significantly in different environments for these traits. The mean squares due to environments + (genotypes × environments) were found significant for all the characters when tested against their pooled deviation. Mean squares due to environments (linear) differed significantly and were quite diverse with regards to their effect on performance of the genotypes for fruit yield per plant and all the characters studied, thereby indicating that large differences between environments along with the greater part of genotypic response was a linear function of environment. None of the parent was stable for fruit yield per plant, however, parents NDBG 132 and Arka Bahar had more fruit yield per plant and had the least deviation from linear regression, but significant regression coefficient (bi > 1) showed below average response and thus, found to be highly responsive to better environments, while parent ABG 1 had the least deviation from linear regression, but significant regression coefficient (bi < 1) showed above average response and thus, found to be highly responsive to poor environments. Amongst the hybrids, ABG 1 × Arka Bahar, Punjab Long × NDBG 132 and Pusa Naveen × Samrat possessed more fruit yield per plantand had non-significant regression coefficient and deviation from linear regression and thus, were considered as stable hybrids.**

**Keywords**: Bottle gourd, G x E interactions, Stability

## INTRODUCTION

Bottle gourd [*Lagenaria siceraria* (Mol.) Standl. 2n = 2x = 22], is one of humankind's first domesticated plants. It is also known as white flower gourd, Ghiakadoo or Lauki, is an important cucurbitaceous vegetable crop belonging to family *Cucurbitaceae* and subfamily *Cucurbitoidae*. The *Lagenaria siceraria* is the only annual and monoecious cultivated species of bottle gourd, while other species are wild, perennial and dioecious. In India, bottle gourd is cultivated in 157 million hectares during 2017-18 with production of 2683 million tones and productivity of 17.08 tonnes per hectare (Anon., 2018). According to De Candolle (1882), bottle gourd has been found in wild form in South Africa and India. However, Cutler and Whitaker

(1961) are of the view that probably it is indigenous to tropical Africa on the basis of variability in seeds and fruits.

In different parts of the Gujarat state, the local strains of bottle gourd are grown commercially by the farmer which results into low yield. Local strains are generally impure. In spite of its extensive cultivation in Gujarat state, the required attention has not been given on its improvement. Anand Bottle Gourd-1, the only variety released during 2004 and Gujarat Anand Bottle Gourd Hybrid 1 (GABGH 1), the only hybrid released during 2017 is available to growers for commercial cultivation in middle Gujarat and Saurashtra region. Hence, there is a great scope to improve the yield and quality of bottle gourd for Gujarat state.

In plant breeding programme, many potential genotypes are evaluated under different environments (location and years) to test their adaptability before releasing a hybrid/variety for commercial cultivation. It is common observation that the relative performance of different genotypes varies from one environment to another, i.e. a genotype x environment interactions always exists. Such interaction results in change of the relative ranking of the genotypes and also in altering the magnitude of differences in performance among genotypes. The change in ranking makes it difficult for the plant breeder to decide which genotype(s) should be released for general cultivation. Progress from selection is also reduced due to the effects of large G x E interaction, as shown by Comstock and Moll (1963). It may be noted that G x E interactions exists regardless of genetic material with which a breeder is working.

The knowledge of the nature and relative magnitude of the various types of G x E interaction is important in making decisions concerning the choice of breeding methods, selection programmes and testing procedures in crop plants (Baker, 1969). In order to minimize G x E interaction and to increase the precision in selection, the stratification of environments has been employed, however, even with this refinement of technique, the G × E interaction within same year remains very large (Allard and Bradshaw, 1964). The possibility of reducing G x E interaction in field experiments is questionable inspite of knowing the factors responsible or such interaction (Sprague, 1966). The breeders have long been aware of the problems of differential response of a genotype when tested under different environments, however, they were unable to quantify the same and modify their methodology. This was largely due to the problem of their inability to define and measure the adaptability and/or the complexities of environments.

## MATERIALS AND METHODS

The experimental materials comprised of 45 entries includes nine parents (ABG 1, Punjab Long, NDBG 132, Arka Bahar, Pusa Naveen, DBG 5, Samrat, DBG 6 and Santosh), their 36 $F_1$sdeveloped through half diallel mating design excluding reciprocals. Parent ABG 1 was used as a standard check. The materials were evaluated in a Randomized Block Design with three replications over four environments during *kharif* 2018 and *summer* 2019 at Sagdividi Farm, Department of Seed Science and Technology, College of Agriculture, Junagadh Agricultural University, Junagadh. Each entry was sown in a single row plot of 10 m length keeping row-to-row and plant-to-plant distance of 2 m and 1m, respectively. The recommended package of practices and plant protection measures were followed to raise a healthy crop of bottle gourd. Four environments were created by date of sowing in two different seasons.Five competitive plants per genotype in each replication in each environment were selected randomly for recording observations on different characters *viz*., number of node bearing first female flower, number of node bearing first male flower, vine length (cm), days to first picking, fruit length (cm), fruit equatorial diameter (cm), number of fruits per plant, average fruit weight per plant (kg), days to last picking and fruit yield per plant (kg).In the present investigation, the approach of Eberhart and Russell (1966) was used to understand the genotypes x environments interaction of different genotypes and to assess stability of individual genotype.

## RESULTS AND DISCUSSION

The pooled analysis of variance (Table 1) revealed that mean squares due to genotypes were found highly significant for all the characters studied when tested against pooled deviation, while mean squares due to environments were found significant for all the characters studied except for fruit length when tested against pooled deviation, revealed that significant variations exist among genotypes and environments. G x E interactions were found significant for number of fruits per plant, average fruit weight per plant and fruit yield per plant when tested against pooled deviation. This suggested that genotypes interacted significantly in different environments for these traits. The mean squares due to environments + (genotypes x environments) were found significant for all the characters when tested against their pooled deviation. The partitioning of E + (G × E) mean square into three components in to (i) environments (linear), (ii) G × E (linear) and (iii) pooled deviation (G × E; non-linear) indicated that the mean squares due to environments (linear) differed significantly and were quite diverse with regards to their effect on performance of the genotypes for fruit yield per plant and all the characters studied, thereby indicating that large differences between environments along with the greater part of genotypic response was a linear function of environment. This also indicated that environments created by sowing dates and seasons was justified and had linear effects. The coincidence of genotypic

performance with environmental values was observed for number of node bearing first female flower, number of node bearing first male flower, number of fruits per plant, average fruit weight per plant and fruit yield per plant, as evident by significant G x E (linear) mean squares when tested against pooled deviation, indicating that performance of genotypes over environments could be predicted reasonably for these traits. Further, the higher magnitude of mean squares due to environments (linear) as compared to G x E (linear) indicated that linear response of environment accounted for the major part of total variation for all the characters studied. Mean squares due to pooled deviation was non-significant for all the traits studied except number of node bearing first male flower, vine length and fruit equatorial diameter, which suggested that prediction of performance of genotypes over environments based on regression analysis was very reliable for most of the traits studied. The results, in general, are in agreement with those of Samadia (2007) and Singh (2017).

A perusal of the results on environmental index for various traits under different environments (Table 2) also suggested variable response of the different environments to the different traits studied. Out of four environments, $E_1$ environment (July 24, 2018) for number of node bearing first female flower, number of node bearing first male flower, vine length, fruit length, fruit equatorial diameter, number of fruits per plant, average fruit weight per plant, days to last picking and fruit yield per plant; $E_2$ environment (August 24, 2018) for number of node bearing first female flower, number of node bearing first male flower, number of fruits per plant, average fruit weight per plant, days to last picking and fruit yield per plant; $E_3$ environment (February 24, 2019) for days to first opening female flower, days to first opening male flower, days to first picking; and $E_4$ environment (March 24, 2019) for days to first opening female flower, days to first opening male flower, days to first picking and fruit length were found favourable and congenial.

**Table 1: Analysis of variance for phenotypic stability for different characters in bottle gourd.**

| Source of variation | df | Days to first opening female flower | Days to first opening male flower | Number of node bearing first female flower | Number of node bearing first male flower | Vine length (m) | Days to first picking |
|---|---|---|---|---|---|---|---|
| **Genotypes** | 44 | 41.47** | 30.12** | 0.80** | 1.02** | 0.71** | 25.69** |
| **Genotype x Environment** | 132 | 1.84 | 1.83 | 0.09 | 0.16 | 0.27 | 2.28 |
| **Environments + (Genotype x Environment)** | 135 | 4.08* | 4.74** | 1.29** | 1.30** | 0.52* | 4.38* |
| **Environments** | 3 | 102.63** | 133.00** | 53.77** | 51.33** | 2.99** | 96.91** |
| **Environments (linear)** | 1 | 307.90** | 399.03** | 161.30** | 154.00** | 8.96** | 290.72** |
| **Genotype x Environment (linear)** | 44 | 1.96 | 1.67 | 0.14* | 0.21* | 0.20 | 2.11 |
| **Pooled deviation** | 90 | 1.75 | 1.87 | 0.07 | 0.13* | 0.30** | 2.32 |
| **Pooled error** | 352 | 2.45 | 2.00 | 0.05 | 0.09 | 0.12 | 3.43 |
| **Source of variation** | **df** | **Fruit length (cm)** | **Fruit equatorial diameter (cm)** | **Number of fruits per plant** | **Average fruit weight per plant (kg)** | **Days to last picking** | **Fruit yield per plant (kg)** |
| **Genotypes** | 44 | 39.94** | 1.61** | 6.55** | 0.018** | 55.83** | 3.51** |
| **Genotype x Environment** | 132 | 3.84 | 0.11 | 0.22** | 0.002** | 2.16 | 0.24** |
| **Environments + (Genotype x Environment)** | 135 | 6.93* | 0.21* | 2.29** | 0.003** | 5.42** | 1.21** |
| **Environments** | 3 | 7.69 | 0.38* | 93.41** | 0.008** | 148.47** | 44.25** |
| **Environments (linear)** | 1 | 23.07** | 1.15** | 280.22** | 0.025** | 445.42** | 132.75** |
| **Genotype x Environment (linear)** | 44 | 2.37 | 0.06 | 0.38** | 0.005** | 2.12 | 0.48** |
| **Pooled deviation** | 90 | 4.48 | 0.13** | 0.14 | 0.001 | 2.14 | 0.11 |
| **Pooled error** | 352 | 5.05 | 0.05 | 0.43 | 0.001 | 9.30 | 0.31 |

***, ** Indicates significance against pooled deviation at P = 0.05 and P = 0.01 levels, respectively**

**Table 2: Estimates of environmental index for various characters under different environments in bottle gourd.**

| Characters | Environmental Index | | | |
|---|---|---|---|---|
| | $E_1$ | $E_2$ | $E_3$ | $E_4$ |
| Days to first opening female flower | 1.17 | 1.43 | -1.16 | -1.44 |
| Days to first opening male flower | 0.74 | 2.07 | -1.57 | -1.24 |
| Number of node bearing first female flower | -0.80 | -1.07 | 1.08 | 0.79 |
| Number of node bearing first male flower | -0.71 | -1.11 | 1.08 | 0.73 |
| Vine length (m) | 0.38 | -1.13 | -0.09 | -0.16 |
| Days to first picking | 1.09 | 1.44 | -1.28 | -1.25 |
| Fruit length (cm) | 0.53 | -0.22 | -0.41 | 0.11 |
| Fruit equatorial diameter (cm) | 0.13 | -0.08 | -0.02 | -0.04 |
| Number of fruits per plant | 1.58 | 0.55 | -0.31 | -1.82 |
| Average fruit weight per plant (kg) | 0.01 | 0.01 | -0.01 | -0.01 |
| Days to last picking | 1.00 | 2.12 | -1.53 | -1.50 |
| Fruit yield per plant (kg) | 1.10 | 0.39 | -0.26 | -1.23 |

Stability in performance is one of the most desirable properties of a genotype for its wide adaptability. The stability parameters *viz.*, mean performance (Xi) across the environments, regression coefficient ($b_i$) and deviation from linear regression ($S^2d_i$) for parents and hybrids were estimated as per Eberhart and Russell (1966) for 12 characters to assess the relative stability of genotypes over environments and are presented in Table 3.1 to 3.4. The perusal of stability parameters for fruit yield per plant and other 11 characters revealed that none of genotype was stable for all the characters which indicated that any generalization pertaining to stability of genotypes for all the traits was not possible.

For fruit yield per plant, none of the parent was stable for fruit yield per plant, however, parents NDBG 132 and Arka Bahar had more fruit yield per plant and had the least deviation from linear regression, but significant regression coefficient (bi > 1) showed below average response and thus, found to be highly responsive to better environments, while parent ABG 1 had the least deviation from linear regression, but significant regression coefficient (bi < 1) showed above average response and thus, found to be highly responsive to poor environments. Amongst the hybrids, ABG 1 × Arka Bahar, Punjab Long × NDBG 132 and Pusa Naveen × Samrat possessed more fruit yield per plant and had non-significant regression coefficient and deviation from linear regression and thus, were considered as stable hybrids. Hybrids NDBG 132 x Arka Bahar, Punjab Long × DBG 5, Arka Bahar × Pusa Naveen, NDBG 132 × Samrat, ABG 1 × NDBG 132, Punjab Long × Pusa Naveen, ABG 1 × Pusa Naveen, NDBG 132 × DBG 5, Arka Bahar × DBG 5, Arka Bahar × Santosh and Pusa Naveen × DBG 6 produced more fruit yield per plant andhad the least deviation from linear regression, but significant regression coefficient ($b_i > 1$) showed below average response and thus, found to be highly responsive to favourable environments, while hybrids ABG 1 × Punjab Long, NDBG 132 × Santosh, Pusa Naveen × DBG 5 and Samrat × DBG 6 produced more fruit yield per plant and had the least deviation from linear regression, but significant regression coefficient ($b_i < 1$) showed above average response and thus, found to be highly responsive to unfavourable environments, The performance of NDBG 132 x Pusa Naveen could not be predicted due to its significant deviation from linear regression.

The parents NDBG 132 and Arka Bahar showed its stability under favourable environments and ABG 1 under unfavourable environments for fruit yield per plant, of which NDBG 132 was found stable for days to first picking and fruit length. It also showed its stability under unfavourable environments for days to first opening female flower, days to first opening male flower and number of node bearing first female flower. Similarly, ABG 1 found stable for fruit length and also showed its stability under favourable environments for days to first opening female flower, vine length and days to last picking, and under unfavourable environments for days to first opening male flower, number of node bearing first female flower and number of node bearing first male flower. Arka Bahar found stable for vine length, fruit equatorial diameter and average fruit weight per plant. It also showed its stability under favourable environment for number of node bearing first male flower and days to last picking, and under unfavourable environments for number of node bearing first female flower.

The three stable hybrids for fruit yield per plant (ABG 1 × Arka Bahar, Punjab Long × NDBG 132 and Pusa Naveen × Samrat) are listed in Table 4 along with their fruit yield per plant and various component traits for which they showed stability. Among these three hybrids, first ranked stable hybrid, ABG 1 × Arka Bahar was also found to be stable for fruit length, fruit equatorial diameter and days to last picking. It also showed stability under favourable condition for number of node bearing first female flower and average fruit weight per plant and under unfavourable condition for number of fruits per plant.

**Table 3.1: Stability parameters of different genotypes for days to first opening female flower, days to first opening male flower and number of node bearing first female flower in bottle gourd.**

| Sr. No. | Genotypes | Days to first opening female flower | | | Days to first opening male flower | | | Number of node bearing first female flower | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Mean | $b_i$ | $S^2d_i$ | Mean | $b_i$ | $S^2d_i$ | Mean | $b_i$ | $S^2d_i$ |
| **Parents** | | | | | | | | | | |
| 1 | ABG 1 | 48.65 | 1.26** | -2.14 | 43.17 | 0.90** | -1.46 | 2.65 | 0.81** | -0.05 |
| 2 | Punjab Long | 52.94 | 1.05** | -1.41 | 45.45 | 0.09 | -0.54 | 2.98 | 0.85** | 0.05* |
| 3 | NDBG 132 | 46.13 | 0.93** | -1.65 | 41.03 | 0.79* | -1.09 | 3.27 | 0.80** | -0.00 |
| 4 | Arka Bahar | 61.12 | 0.06 | -1.83 | 53.40 | 0.83 | 4.72* | 2.99 | 0.88** | 0.02 |
| 5 | Pusa Naveen | 51.72 | 1.70** | -1.94 | 47.57 | 1.14** | -0.83 | 3.78 | 0.95** | -0.03 |
| 6 | DBG 5 | 48.72 | 0.89* | -1.47 | 44.73 | 1.11** | -1.68 | 2.82 | 1.03** | 0.00 |
| 7 | Samrat | 49.32 | 1.16 | 0.47 | 44.31 | 0.46 | -1.00 | 3.19 | 0.80** | 0.04 |
| 8 | DBG 6 | 53.61 | 0.69 | -1.35 | 47.92 | 0.23 | -0.28 | 4.27 | 0.91** | 0.12* |
| 9 | Santosh | 44.93 | 1.03* | -0.80 | 40.00 | 0.98* | 0.16 | 2.89 | 1.35** | 0.12* |
| **Hybrids** | | | | | | | | | | |
| 10 | ABG 1 × Punjab Long | 52.33 | 0.23 | -1.30 | 45.08 | 0.98* | -0.72 | 3.55 | 0.98** | -0.01 |
| 11 | ABG 1 × NDBG 132 | 47.28 | 0.92* | -1.18 | 44.13 | 1.24** | -0.97 | 3.84 | 0.94** | -0.04 |
| 12 | ABG 1 × Arka Bahar | 56.47 | 0.77 | 0.42 | 47.41 | 1.57* | 1.94* | 3.22 | 0.94** | -0.04 |
| 13 | ABG 1 × Pusa Naveen | 50.63 | 0.38 | -0.60 | 44.88 | 0.20 | -0.57 | 3.76 | 1.12** | -0.05 |
| 14 | ABG 1 × DBG 5 | 49.93 | 0.96* | -1.47 | 41.73 | 1.90** | -0.10 | 3.00 | 0.92** | -0.00 |
| 15 | ABG 1 × Samrat | 48.36 | 0.93** | -2.05 | 43.99 | 1.06* | -0.52 | 3.29 | 1.16** | 0.12* |
| 16 | ABG 1 × DBG 6 | 51.73 | 0.28 | -0.14 | 44.20 | 1.09** | -0.59 | 3.46 | 0.60** | -0.00 |
| 17 | ABG 1 × Santosh | 49.68 | 0.61 | -0.88 | 41.61 | 1.31** | -1.38 | 2.89 | 0.97** | -0.01 |
| 18 | Punjab Long × NDBG 132 | 47.53 | 0.63* | -1.88 | 42.94 | 0.87** | -1.04 | 3.63 | 0.50** | 0.02 |
| 19 | Punjab Long × Arka Bahar | 56.72 | 1.25* | 0.26 | 47.68 | 0.46 | 0.35 | 3.26 | 1.01** | -0.02 |
| 20 | Punjab Long × Pusa Naveen | 50.60 | 2.09** | -1.04 | 44.93 | 1.18** | -1.51 | 3.36 | 1.09** | 0.08* |
| 21 | Punjab Long × DBG 5 | 49.10 | 1.02 | -0.35 | 42.54 | 1.83** | -1.42 | 3.08 | 1.07** | 0.08* |
| 22 | Punjab Long × Samrat | 49.13 | 1.05* | -1.26 | 46.88 | 1.71** | 1.80 | 4.08 | 0.99** | 0.00 |
| 23 | Punjab Long × DBG 6 | 53.62 | 0.89 | 0.08 | 47.84 | 0.74 | 0.10 | 3.98 | 0.86** | -0.00 |
| 24 | Punjab Long × Santosh | 46.68 | 2.17** | 1.74 | 41.86 | 1.11** | -1.28 | 3.37 | 1.07** | -0.05 |
| 25 | NDBG 132 × Arka Bahar | 55.16 | 1.10* | -0.58 | 47.27 | 1.76* | 2.41* | 3.32 | 0.86** | -0.04 |
| 26 | NDBG 132 × Pusa Naveen | 50.60 | 1.66** | -1.76 | 47.13 | 0.70 | 1.97* | 3.88 | 1.24** | -0.04 |
| 27 | NDBG 132 × DBG 5 | 47.50 | 1.22* | 0.06 | 43.44 | 1.38** | -0.92 | 3.20 | 1.02** | -0.04 |
| 28 | NDBG 132 × Samrat | 47.69 | 1.18** | -1.60 | 41.99 | 0.79** | -1.49 | 4.06 | 1.31** | -0.04 |
| 29 | NDBG 132 × DBG 6 | 51.71 | -0.05 | -0.75 | 44.92 | 0.75 | 0.81 | 4.31 | 1.24** | 0.07* |
| 30 | NDBG 132 × Santosh | 48.29 | 0.85 | -0.65 | 42.33 | 1.45** | -0.23 | 3.17 | 0.88** | 0.03 |
| 31 | Arka Bahar × Pusa Naveen | 51.68 | 1.35** | -1.04 | 49.92 | 0.67 | 2.56* | 3.72 | 1.10** | 0.01 |
| 32 | Arka Bahar × DBG 5 | 52.56 | 0.66 | -0.85 | 47.48 | 0.69* | -1.22 | 3.05 | 0.86** | -0.05 |
| 33 | Arka Bahar × Samrat | 49.09 | 1.15 | 2.16 | 45.90 | 0.96* | -0.74 | 3.66 | 1.32** | 0.18** |
| 34 | Arka Bahar × DBG 6 | 53.24 | -0.12 | 0.90 | 49.38 | 0.90 | 0.14 | 3.90 | 1.15** | 0.04 |
| 35 | Arka Bahar × Santosh | 47.03 | 1.77** | -1.23 | 43.01 | 1.10** | -1.46 | 3.77 | 1.33** | -0.05 |
| 36 | Pusa Naveen × DBG 5 | 46.43 | 0.99* | -0.80 | 44.24 | 1.77* | 2.52* | 4.12 | 1.11** | 0.03 |
| 37 | Pusa Naveen × Samrat | 48.69 | 1.97** | -0.96 | 44.00 | 1.66** | -0.83 | 3.97 | 0.91** | -0.04 |

| Sr. No. | Genotypes | Days to first opening female flower | | | Days to first opening male flower | | | Number of node bearing first female flower | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Mean | $b_i$ | $S^2d_i$ | Mean | $b_i$ | $S^2d_i$ | Mean | $b_i$ | $S^2d_i$ |
| **Parents** | | | | | | | | | | |
| 38 | Pusa Naveen × DBG 6 | 49.89 | 1.79* | 1.46 | 47.78 | 1.01 | 3.56* | 3.51 | 1.22** | 0.05 |
| 39 | Pusa Naveen × Santosh | 47.33 | 0.95* | -1.48 | 43.37 | 0.86* | -1.01 | 2.69 | 0.73** | -0.02 |
| 40 | DBG 5 × Samrat | 47.55 | 1.10 | 0.73 | 41.52 | 0.83** | -1.79 | 3.54 | 0.82** | 0.20** |
| 41 | DBG 5 × DBG 6 | 51.63 | 0.88 | -0.64 | 47.55 | 0.73 | 0.31 | 3.74 | 0.78** | -0.02 |
| 42 | DBG 5 × Santosh | 47.73 | 1.77** | -1.15 | 41.80 | 0.80** | -1.23 | 3.08 | 0.98** | 0.06* |
| 43 | Samrat × DBG 6 | 52.58 | 0.38 | -1.23 | 45.99 | 0.57 | -0.01 | 4.31 | 1.17** | 0.03 |
| 44 | Samrat × Santosh | 48.57 | 0.72 | -1.21 | 46.90 | 0.63 | 0.59 | 3.05 | 1.12** | -0.02 |
| 45 | DBG 6 × Santosh | 47.03 | 0.72 | 0.72 | 43.17 | 1.16** | -1.97 | 3.46 | 1.12** | 0.07* |
| | Mean | 50.20 | - | - | 44.98 | - | - | 3.47 | - | - |
| | S. Em± | 0.78 | 0.50 | - | - | 0.46 | - | - | 0.14 | - |
| | C.D. at 5 % | 2.19 | - | - | 1.98 | - | - | 0.43 | - | - |

*, ** Indicates significance at P = 0.05 and P = 0.01 levels, respectively

**Table 3.2: Stability parameters of different genotypes for number of node bearing first male flower, vine length (m) and days to first picking in bottle gourd.**

| Sr. No. | Genotypes | Number of node bearing first male flower | | | Vine length (m) | | | Days to first picking | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Mean | $b_i$ | $S^2d_i$ | Mean | $b_i$ | $S^2d_i$ | Mean | $b_i$ | $S^2d_i$ |
| **Parents** | | | | | | | | | | |
| 1 | ABG 1 | 3.68 | 0.73** | -0.08 | 5.99 | 2.18** | -0.05 | 64.06 | 1.29** | -2.86 |
| 2 | Punjab Long | 5.00 | 1.18** | 0.08 | 5.11 | 0.01 | -0.07 | 60.44 | 1.55** | -2.10 |
| 3 | NDBG 132 | 4.57 | 0.97** | 0.09* | 5.41 | 2.20** | -0.03 | 59.57 | 1.07 | -1.11 |
| 4 | Arka Bahar | 3.72 | 1.09** | -0.06 | 6.46 | 1.81 | 0.09 | 69.15 | 0.48 | -1.77 |
| 5 | Pusa Naveen | 5.29 | 0.75** | -0.09 | 5.78 | -0.49 | 0.48** | 66.40 | 1.14** | -2.99 |
| 6 | DBG 5 | 4.20 | 0.67** | -0.04 | 5.13 | -0.23 | -0.11 | 63.03 | 0.97** | -3.07 |
| 7 | Samrat | 3.27 | 0.68** | -0.01 | 5.84 | 1.78** | -0.07 | 60.33 | 1.55** | -1.88 |
| 8 | DBG 6 | 5.13 | -0.05 | 1.67** | 5.64 | -0.29 | 0.12* | 61.00 | 1.02 | -1.60 |
| 9 | Santosh | 3.98 | 0.90** | 0.01 | 5.04 | -0.86 | -0.05 | 56.35 | 0.96* | -2.21 |
| **Hybrids** | | | | | | | | | | |
| 10 | ABG 1 × Punjab Long | 4.58 | 1.25** | -0.08 | 6.24 | 2.36 | 0.41** | 61.77 | 0.18 | -1.47 |
| 11 | ABG 1 × NDBG 132 | 4.81 | 0.99** | 0.05 | 6.29 | 1.57 | 0.02 | 60.08 | 1.34** | -1.76 |
| 12 | ABG 1 × Arka Bahar | 4.71 | 1.25** | 0.13* | 6.58 | 1.29 | 0.23* | 64.16 | 0.93 | -0.89 |
| 13 | ABG 1 × Pusa Naveen | 5.16 | 0.96** | -0.08 | 5.95 | 1.39 | 0.04 | 62.41 | 0.17 | -0.31 |
| 14 | ABG 1 × DBG 5 | 4.13 | 1.16** | -0.06 | 5.58 | 1.58 | 0.05 | 66.08 | 0.88* | -2.56 |
| 15 | ABG 1 × Samrat | 4.16 | 0.86** | 0.04 | 6.41 | 1.21 | 0.40** | 61.58 | 0.83* | -2.36 |
| 16 | ABG 1 × DBG 6 | 4.17 | 1.10** | 0.13* | 5.83 | 0.14 | 0.22* | 61.58 | 1.14** | -2.25 |
| 17 | ABG 1 × Santosh | 3.96 | 1.26** | -0.07 | 5.61 | -0.96 | 0.12* | 64.33 | 0.79 | -0.20 |
| 18 | Punjab Long × NDBG 132 | 4.11 | 0.84** | -0.03 | 5.84 | 1.54 | 0.68** | 58.87 | 1.50* | -0.08 |

| Sr. No. | Genotypes | Number of node bearing first male flower | | | Vine length (m) | | | Days to first picking | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Mean | $b_i$ | $S^2d_i$ | Mean | $b_i$ | $S^2d_i$ | Mean | $b_i$ | $S^2d_i$ |
| **Parents** | | | | | | | | | | |
| 19 | Punjab Long × Arka Bahar | 4.32 | 1.15** | -0.09 | 6.34 | 1.61* | -0.04 | 64.20 | -0.12 | -0.17 |
| 20 | Punjab Long × Pusa Naveen | 5.27 | 1.06** | 0.06 | 5.81 | 0.31 | 0.17* | 63.05 | 1.14** | -2.25 |
| 21 | Punjab Long × DBG 5 | 4.51 | 1.08** | 0.15* | 5.22 | 1.06 | -0.04 | 63.46 | 0.32 | 5.38* |
| 22 | Punjab Long × Samrat | 4.44 | 1.11** | 0.03 | 5.80 | 0.62 | 0.32** | 58.83 | 1.27 | -0.41 |
| 23 | Punjab Long × DBG 6 | 4.48 | 0.72** | -0.01 | 5.05 | 1.80** | -0.04 | 62.71 | 0.90 | -0.11 |
| 24 | Punjab Long × Santosh | 4.66 | 0.97** | -0.07 | 5.28 | 0.29 | 0.19* | 58.38 | 0.69 | -2.21 |
| 25 | NDBG 132 × Arka Bahar | 4.78 | 0.83** | -0.00 | 6.67 | 0.84 | 0.10 | 60.65 | 1.32 | 0.08 |
| 26 | NDBG 132 × Pusa Naveen | 5.46 | 1.19** | -0.09 | 5.48 | 1.82 | 0.83** | 64.85 | 0.78 | -1.56 |
| 27 | NDBG 132 × DBG 5 | 4.06 | 0.91** | 0.07 | 5.63 | 2.31 | 0.33** | 59.39 | 1.91** | -0.93 |
| 28 | NDBG 132 × Samrat | 4.07 | 1.17** | -0.09 | 5.83 | 2.72** | 0.00 | 59.94 | 1.39** | -1.74 |
| 29 | NDBG 132 × DBG 6 | 4.33 | 1.18** | 0.14* | 5.74 | 0.29 | 0.29* | 60.54 | 0.083 | -2.04 |
| 30 | NDBG 132 × Santosh | 4.60 | 1.01** | -0.04 | 5.32 | 1.24 | -0.01 | 62.35 | 0.84 | -1.53 |
| 31 | Arka Bahar × Pusa Naveen | 4.93 | 0.96** | -0.05 | 5.86 | 2.11* | 0.06 | 65.95 | 1.01* | -1.80 |
| 32 | Arka Bahar × DBG 5 | 3.77 | 0.99** | -0.05 | 5.76 | 1.07 | -0.00 | 63.97 | 1.51** | -1.56 |
| 33 | Arka Bahar × Samrat | 3.89 | 0.96** | 0.07 | 6.03 | 2.37* | 0.15* | 62.27 | 0.74 | -0.60 |
| 34 | Arka Bahar × DBG 6 | 4.22 | 1.11** | -0.06 | 5.89 | 0.70 | 0.04 | 61.31 | -0.14 | 0.68 |
| 35 | Arka Bahar × Santosh | 4.71 | 1.30** | -0.09 | 6.12 | -0.54 | 0.94** | 62.62 | 0.54 | -0.47 |
| 36 | Pusa Naveen × DBG 5 | 4.27 | 0.73** | 0.03 | 5.90 | -0.07 | 0.29* | 59.86 | 2.26** | 0.89 |
| 37 | Pusa Naveen × Samrat | 4.21 | 0.95** | -0.06 | 5.68 | 1.10 | -0.01 | 60.65 | 2.09** | -0.76 |
| 38 | Pusa Naveen × DBG 6 | 4.81 | 0.94** | 0.02 | 6.08 | 0.10 | 0.49** | 61.68 | 1.08* | -1.74 |
| 39 | Pusa Naveen × Santosh | 5.19 | 0.93** | -0.06 | 5.32 | 1.04 | 0.02 | 58.62 | 0.83* | -2.39 |
| 40 | DBG 5 × Samrat | 4.95 | 1.29** | 0.14* | 5.84 | 1.75* | 0.02 | 60.01 | 1.17* | -1.92 |
| 41 | DBG 5 × DBG 6 | 3.99 | 0.82** | -0.01 | 4.90 | 1.47* | -0.06 | 62.29 | -0.10 | -0.30 |
| 42 | DBG 5 × Santosh | 5.07 | 0.99** | 0.11* | 5.49 | 0.14 | 0.40** | 63.39 | 1.62** | -2.24 |
| 43 | Samrat × DBG 6 | 4.82 | 1.31** | -0.03 | 6.13 | 1.93* | 0.03 | 61.75 | 0.57 | -0.99 |
| 44 | Samrat × Santosh | 3.90 | 1.38** | -0.05 | 5.57 | -1.15 | 1.13** | 59.42 | 1.54 | 2.30 |
| 45 | DBG 6 × Santosh | 4.98 | 1.34** | 0.20* | 5.49 | 1.79* | -0.02 | 57.79 | 1.93** | -0.16 |
| | Mean | 4.47 | - | - | 5.75 | - | - | 61.80 | - | - |
| | S. Em± | 0.20 | 0.20 | - | 0.26 | 1.24 | - | 0.93 | 0.60 | - |
| | C.D. at 5 % | 0.56 | - | - | 0.73 | - | - | 2.59 | - | - |

*, ** Indicates significance at P = 0.05 and P = 0.01 levels, respectively

**Table 3.3: Stability parameters of different genotypes for fruit length (cm), fruit equatorial diameter (cm) and number of fruits per plant in bottle gourd.**

| Sr. No. | Genotypes | Fruit length (cm) | | | Fruit equatorial diameter (cm) | | | Number of fruits per plant | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Mean | $b_i$ | $S^2d_i$ | Mean | $b_i$ | $S^2d_i$ | Mean | $b_i$ | $S^2d_i$ |
| **Parents** | | | | | | | | | | |
| 1 | ABG 1 | 41.46 | 0.37 | -4.59 | 5.06 | 1.21 | -0.02 | 9.75 | 1.25** | -0.41 |
| 2 | Punjab Long | 29.28 | 0.59 | -4.32 | 4.84 | 0.41 | 0.11* | 8.44 | 1.39** | 0.03 |
| 3 | NDBG 132 | 40.66 | -0.55 | -2.49 | 6.13 | -0.35 | 0.04 | 9.40 | 1.32** | -0.31 |
| 4 | Arka Bahar | 34.19 | 0.21 | 0.08 | 7.63 | 2.74 | 0.04 | 6.67 | 1.03** | -0.41 |
| 5 | Pusa Naveen | 29.92 | 0.61 | -4.16 | 6.86 | 1.00 | 0.01 | 7.58 | 0.94** | -0.29 |
| 6 | DBG 5 | 33.19 | 2.14** | -4.84 | 6.16 | -0.08 | 0.03 | 6.54 | 0.82** | -0.33 |
| 7 | Samrat | 30.81 | -1.06 | -3.14 | 5.63 | -1.77 | 0.09* | 6.88 | 0.78** | -0.37 |
| 8 | DBG 6 | 35.00 | 3.08 | 5.32* | 6.32 | 2.69 | 0.17** | 6.06 | 0.75** | -0.31 |
| 9 | Santosh | 32.89 | -2.37 | -4.19 | 6.59 | 2.18 | 0.07* | 7.35 | 0.62** | -0.31 |
| **Hybrids** | | | | | | | | | | |
| 10 | ABG 1 × Punjab Long | 36.32 | 0.52 | 6.01* | 5.40 | -0.73 | -0.00 | 10.08 | 1.21** | -0.42 |
| 11 | ABG 1 × NDBG 132 | 41.13 | 1.56** | -4.91 | 5.74 | 1.21 | 0.05 | 10.57 | 1.20** | -0.38 |
| 12 | ABG 1 × Arka Bahar | 38.88 | 1.43 | 2.90 | 7.13 | 0.91 | -0.00 | 9.39 | 0.87** | -0.11 |
| 13 | ABG 1 × Pusa Naveen | 41.08 | 0.73 | -3.96 | 6.02 | 2.18 | 0.01 | 9.85 | 1.27** | -0.17 |
| 14 | ABG 1 × DBG 5 | 34.77 | 2.58 | 12.17** | 5.80 | 1.56 | 0.30** | 7.49 | 1.01** | -0.34 |
| 15 | ABG 1 × Samrat | 32.74 | 2.39 | 0.34 | 5.53 | -0.86 | 0.16** | 7.95 | 1.09** | -0.40 |
| 16 | ABG 1 × DBG 6 | 41.73 | 0.81 | -2.63 | 6.29 | 1.74 | 0.04 | 6.95 | 1.24** | -0.43 |
| 17 | ABG 1 × Santosh | 37.98 | -1.19 | -1.21 | 6.49 | -0.53 | 0.02 | 8.06 | 1.05** | -0.41 |
| 18 | Punjab Long × NDBG 132 | 38.04 | 3.85** | -4.30 | 6.14 | 1.01 | 0.08* | 10.50 | 1.20** | -0.38 |
| 19 | Punjab Long × Arka Bahar | 36.45 | 1.37 | -3.22 | 6.66 | 1.77 | 0.02 | 7.10 | 1.12** | -0.43 |
| 20 | Punjab Long × Pusa Naveen | 38.11 | -1.80 | -1.55 | 6.15 | -0.07 | 0.31** | 9.97 | 1.26** | -0.40 |
| 21 | Punjab Long × DBG 5 | 31.58 | 3.12* | -4.19 | 5.90 | 0.66 | 0.04 | 9.73 | 1.26** | -0.28 |
| 22 | Punjab Long × Samrat | 36.07 | 1.71 | 6.03* | 5.71 | -0.42 | 0.24** | 8.40 | 0.74** | -0.38 |
| 23 | Punjab Long × DBG 6 | 34.66 | 4.31** | -3.78 | 6.31 | -2.34 | 0.16** | 6.28 | 0.68** | -0.37 |
| 24 | Punjab Long × Santosh | 32.90 | -2.69 | -3.11 | 5.96 | 1.91 | 0.03 | 7.25 | 0.65** | -0.28 |
| 25 | NDBG 132 × Arka Bahar | 36.46 | 2.70** | -4.78 | 6.77 | 2.72 | 0.23** | 8.99 | 0.78* | 0.24 |
| 26 | NDBG 132 × Pusa Naveen | 32.21 | -1.11 | -1.23 | 6.66 | 2.48* | -0.03 | 9.96 | 1.08** | 0.23 |
| 27 | NDBG 132 × DBG 5 | 35.16 | 2.87** | -5.01 | 6.29 | 0.17 | 0.02 | 8.11 | 0.54 | 0.18 |
| 28 | NDBG 132 × Samrat | 32.02 | 2.90 | -3.76 | 6.05 | -0.93 | 0.28** | 10.07 | 1.16** | -0.00 |
| 29 | NDBG 132 × DBG 6 | 35.19 | -0.50 | -1.21 | 6.29 | 1.32* | -0.05 | 8.20 | 0.99** | -0.42 |
| 30 | NDBG 132 × Santosh | 33.22 | 1.33 | 2.71 | 6.32 | 1.68 | 0.02 | 9.18 | 0.98** | -0.28 |
| 31 | Arka Bahar × Pusa Naveen | 35.24 | 3.75** | -4.07 | 7.46 | 4.62** | -0.02 | 8.38 | 0.93** | -0.41 |
| 32 | Arka Bahar × DBG 5 | 33.85 | 2.45 | -2.75 | 6.48 | 1.61 | 0.02 | 7.43 | 1.02** | -0.37 |
| 33 | Arka Bahar × Samrat | 32.03 | -1.31 | -1.69 | 6.23 | -1.02 | -0.02 | 6.93 | 1.20** | -0.31 |
| 34 | Arka Bahar × DBG 6 | 38.09 | 0.20 | 5.36* | 7.54 | 2.47** | -0.03 | 6.51 | 0.78** | -0.36 |
| 35 | Arka Bahar × Santosh | 31.93 | 4.04** | -4.20 | 7.96 | 2.15 | 0.09* | 7.41 | 0.84** | -0.43 |
| 36 | Pusa Naveen × DBG 5 | 37.35 | -2.50 | -4.07 | 6.12 | 1.90 | 0.02 | 8.40 | 0.66** | -0.21 |
| 37 | Pusa Naveen × Samrat | 33.21 | -4.04** | -4.24 | 5.57 | 2.84 | 0.14** | 9.01 | 0.69** | -0.41 |
| 38 | Pusa Naveen × DBG 6 | 34.63 | 4.19* | -3.31 | 6.26 | 3.04 | 0.07* | 7.98 | 0.92** | -0.43 |

| Sr. No. | Genotypes | Fruit length (cm) | | | Fruit equatorial diameter (cm) | | | Number of fruits per plant | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Mean | $b_i$ | $S^2d_i$ | Mean | $b_i$ | $S^2d_i$ | Mean | $b_i$ | $S^2d_i$ |
| **Parents** | | | | | | | | | | |
| 39 | Pusa Naveen × Santosh | 32.56 | 2.18 | 0.16 | 7.02 | 0.27 | 0.28** | 7.61 | 0.95** | -0.42 |
| 40 | DBG 5 × Samrat | 34.78 | 2.78 | -1.44 | 6.37 | 0.77 | 0.16** | 6.84 | 1.05** | -0.38 |
| 41 | DBG 5 × DBG 6 | 33.85 | 2.71 | 8.11* | 6.11 | -0.74 | 0.02 | 6.12 | 1.13** | -0.30 |
| 42 | DBG 5 × Santosh | 37.27 | -2.12 | 5.38* | 6.58 | -0.87 | 0.05* | 7.34 | 0.94** | -0.42 |
| 43 | Samrat × DBG 6 | 31.51 | 2.62 | 6.85* | 6.26 | 4.13 | 0.16** | 7.81 | 0.57** | -0.41 |
| 44 | Samrat × Santosh | 35.82 | -2.34 | 9.16* | 6.63 | -0.62 | 0.01 | 7.26 | 1.62** | -0.27 |
| 45 | DBG 6 × Santosh | 32.39 | 2.48 | 5.96* | 6.98 | 0.99 | 0.02 | 7.21 | 1.39** | -0.32 |
| | Mean | 35.08 | - | - | 6.32 | - | - | 8.11 | - | - |
| | S. Em± | 1.12 | 2.95 | - | 0.16 | 2.25 | - | 0.33 | 0.15 | - |
| | C.D. at 5 % | 3.15 | - | - | 0.46 | - | - | 0.92 | - | - |

*, ** Indicates significance at P = 0.05 and P = 0.01 levels, respectively

**Table 3.4: Stability parameters of different genotypes for average fruit weight per plant (kg), days to last picking and fruit yield per plant (kg) in bottle gourd.**

| Sr. No. | Genotypes | Average fruit weight per plant (kg) | | | Days to last picking | | | Fruit yield per plant (kg) | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Mean | $b_i$ | $S^2d_i$ | Mean | $b_i$ | $S^2d_i$ | Mean | $b_i$ | $S^2d_i$ |
| **Parents** | | | | | | | | | | |
| 1 | ABG 1 | 0.52 | 0.30 | -0.001 | 107.59 | 1.12** | -8.60 | 5.02 | 0.96** | -0.28 |
| 2 | Punjab Long | 0.49 | -3.02** | -0.001 | 97.19 | 0.40 | -8.44 | 4.07 | 0.67* | -0.08 |
| 3 | NDBG 132 | 0.58 | 2.69** | -0.001 | 95.33 | 1.15** | -7.92 | 5.49 | 1.44** | -0.19 |
| 4 | Arka Bahar | 0.76 | 2.85 | 0.000 | 107.43 | 1.62** | -6.50 | 5.14 | 1.37** | -0.26 |
| 5 | Pusa Naveen | 0.50 | 4.55** | -0.001 | 103.78 | 1.42* | -6.06 | 3.78 | 1.12** | -0.29 |
| 6 | DBG 5 | 0.63 | 0.01 | 0.000 | 104.38 | 1.29** | -8.29 | 4.05 | 0.75** | -0.11 |
| 7 | Samrat | 0.52 | 0.52 | 0.000 | 98.93 | 0.65 | -8.14 | 3.52 | 0.62** | -0.27 |
| 8 | DBG 6 | 0.59 | 5.62** | -0.001 | 101.15 | 0.48 | -8.68 | 3.58 | 1.06** | -0.27 |
| 9 | Santosh | 0.58 | -1.34 | 0.000 | 94.65 | 1.55** | -7.83 | 4.21 | 0.41 | -0.11 |
| **Hybrids** | | | | | | | | | | |
| 10 | ABG 1 × Punjab Long | 0.58 | -3.78** | -0.001 | 99.18 | 0.99** | -8.39 | 5.83 | 0.57** | -0.22 |
| 11 | ABG 1 × NDBG 132 | 0.58 | 4.01** | -0.001 | 100.81 | 1.02** | -8.15 | 6.17 | 1.56** | -0.22 |
| 12 | ABG 1 × Arka Bahar | 0.76 | 3.95** | -0.001 | 109.75 | 0.48 | -6.46 | 7.22 | 0.31 | -0.25 |
| 13 | ABG 1 × Pusa Naveen | 0.53 | 3.82** | 0.000 | 105.06 | 1.65** | -8.53 | 5.38 | 1.52** | -0.22 |
| 14 | ABG 1 × DBG 5 | 0.61 | -4.86** | -0.001 | 107.93 | 1.43* | -5.76 | 4.53 | 0.45* | -0.16 |
| 15 | ABG 1 × Samrat | 0.49 | 1.42 | 0.000 | 98.16 | 0.90** | -8.64 | 4.00 | 0.92** | -0.27 |
| 16 | ABG 1 × DBG 6 | 0.56 | 6.21** | -0.001 | 101.28 | 1.69** | -8.05 | 3.91 | 1.55** | -0.27 |
| 17 | ABG 1 × Santosh | 0.58 | -3.87** | -0.001 | 104.39 | 1.87* | -4.06 | 4.53 | 0.49** | -0.30 |
| 18 | Punjab Long × NDBG 132 | 0.62 | 2.46** | -0.001 | 98.70 | 0.04 | -5.58 | 6.54 | 0.30 | -0.24 |
| 19 | Punjab Long × Arka Bahar | 0.59 | 4.59** | -0.001 | 104.35 | 0.74 | -5.00 | 4.27 | 1.37** | -0.29 |
| 20 | Punjab Long × Pusa Naveen | 0.58 | 1.11 | 0.001 | 104.10 | 1.17** | -8.29 | 5.79 | 1.24** | -0.00 |

| Sr. No. | Genotypes | Average fruit weight per plant (kg) | | | Days to last picking | | | Fruit yield per plant (kg) | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Mean | $b_i$ | $S^2d_i$ | Mean | $b_i$ | $S^2d_i$ | Mean | $b_i$ | $S^2d_i$ |
| Parents | | | | | | | | | | |
| 21 | Punjab Long × DBG 5 | 0.64 | 0.61 | -0.001 | 99.71 | 0.75 | -6.61 | 6.28 | 1.25** | -0.08 |
| 22 | Punjab Long × Samrat | 0.56 | -2.54 | 0.000 | 98.85 | 0.80** | -8.61 | 4.60 | 0.35* | -0.22 |
| 23 | Punjab Long × DBG 6 | 0.55 | 1.83 | 0.000 | 106.58 | 1.58** | -6.61 | 3.50 | 0.71** | -0.17 |
| 24 | Punjab Long × Santosh | 0.50 | -0.42 | -0.001 | 97.38 | 0.14 | -6.80 | 3.62 | 0.45** | -0.28 |
| 25 | NDBG 132 × Arka Bahar | 0.70 | 2.90 | 0.000 | 103.23 | 0.84 | -5.69 | 6.41 | 1.15* | 0.33 |
| 26 | NDBG 132 × Pusa Naveen | 0.62 | 0.77 | 0.000 | 104.68 | 1.69** | -5.75 | 6.17 | 1.08* | 0.39* |
| 27 | NDBG 132 × DBG 5 | 0.67 | 4.57** | -0.001 | 99.58 | 0.77* | -8.01 | 5.36 | 1.06** | -0.16 |
| 28 | NDBG 132 × Samrat | 0.61 | 2.49 | 0.001 | 98.39 | 1.11 | -4.90 | 6.23 | 1.33** | -0.28 |
| 29 | NDBG 132 × DBG 6 | 0.60 | 2.657 | 0.001 | 98.23 | 1.28** | -8.29 | 4.95 | 1.14** | -0.09 |
| 30 | NDBG 132 × Santosh | 0.62 | -3.70* | 0.000 | 99.10 | 1.31** | -7.15 | 5.64 | 0.45* | -0.19 |
| 31 | Arka Bahar × Pusa Naveen | 0.73 | 6.55** | -0.001 | 110.88 | 0.24 | -6.05 | 6.26 | 1.70** | -0.18 |
| 32 | Arka Bahar × DBG 5 | 0.69 | 4.44** | -0.001 | 105.24 | 0.97** | -8.46 | 5.24 | 1.44** | -0.30 |
| 33 | Arka Bahar × Samrat | 0.68 | 3.21** | -0.001 | 103.69 | 1.55** | -6.04 | 4.68 | 1.45** | -0.22 |
| 34 | Arka Bahar × DBG 6 | 0.68 | -1.05 | -0.001 | 102.43 | 0.76 | -7.47 | 4.42 | 0.70** | -0.31 |
| 35 | Arka Bahar × Santosh | 0.70 | 2.87* | 0.000 | 106.07 | 1.05** | -8.05 | 5.24 | 1.14** | -0.28 |
| 36 | Pusa Naveen × DBG 5 | 0.65 | -0.24 | -0.001 | 101.06 | 1.07** | -7.88 | 5.42 | 0.63** | -0.25 |
| 37 | Pusa Naveen × Samrat | 0.65 | -3.79** | 0.000 | 101.89 | 1.05** | -8.38 | 5.86 | 0.22 | -0.22 |
| 38 | Pusa Naveen × DBG 6 | 0.64 | 2.68** | -0.001 | 102.92 | 0.42 | -8.46 | 5.15 | 1.13** | -0.30 |
| 39 | Pusa Naveen × Santosh | 0.63 | -4.22* | 0.000 | 100.41 | 1.44** | -8.28 | 4.81 | 0.45** | -0.29 |
| 40 | DBG 5 × Samrat | 0.64 | 0.37 | 0.000 | 103.36 | 0.98 | -5.53 | 4.37 | 1.02** | -0.16 |
| 41 | DBG 5 × DBG 6 | 0.61 | -3.11** | -0.001 | 100.20 | 0.78 | -6.25 | 3.71 | 0.78** | -0.29 |
| 42 | DBG 5 × Santosh | 0.60 | 3.25** | -0.001 | 105.14 | 0.91 | -4.34 | 4.38 | 1.12** | -0.29 |
| 43 | Samrat × DBG 6 | 0.66 | 0.70 | -0.001 | 101.84 | 0.21 | -5.45 | 5.17 | 0.60** | -0.27 |
| 44 | Samrat × Santosh | 0.65 | -0.00 | -0.001 | 101.31 | 1.29** | -7.56 | 4.75 | 1.54** | -0.2 |
| 45 | DBG 6 × Santosh | 0.69 | -3.05** | -0.001 | 97.42 | 0.38 | -8.59 | 4.93 | 1.16** | -0.27 |
| | Mean | 0.61 | - | - | 102.08 | - | - | 4.98 | - | - |
| | S. Em± | 0.02 | 1.24 | - | 1.53 | 0.46 | - | 0.28 | 0.20 | - |
| | C.D. at 5 % | 0.07 | - | - | 4.27 | - | - | 0.78 | - | - |

*, ** Indicates significance at P = 0.05 and P = 0.01 levels, respectively

The stability parameters for component traits revealed that none of the parent and hybrid (genotype) showed its stability for all the traits studied. The stability parameters for component traits revealed that 8, 3 and 10 genotypes turned out to be stable each for days to first opening female flower, days to first opening female flower and days to first picking, respectively with low mean values (negative values were considered desirable for these traits), non-significant regression coefficient and deviation from linear regression.

Out of 45 genotypes (9 parents + 36 hybrids), 6, 10, 8, 10 and 8 genotypes were found to be stable for vine length, fruit length, fruit equatorial diameter, average fruit weight per plant and days to last picking with high mean, non-significant regression coefficient and deviation from linear regression. None of the genotype was found stable for number of node bearing first female flower, number of node bearing first male flower and number of fruits per plant.

**Table 4: Stable hybrids for fruit yield per plant along with their *per se* performance and showing stability for other component traits in bottle gourd.**

| Sr. No. | Hybrids | Fruit yield per plant (kg) | Stable for component traits |
|---|---|---|---|
| 1 | ABG 1 × Arka Bahar | 7.22 | $NFF^{+}$, FL, FEW, $NFP^{++}$, $AFP^{+}$, DLP |
| 2 | Punjab Long × NDBG 132 | 6.54 | $DOF^{++}$, $DOM^{++}$, $NFM^{++}$, $DFP^{+}$, $NFP^{+}$, $AFW^{+}$ |
| 3 | Pusa Naveen × Samrat | 5.86 | $DOM^{+}$, $NFM^{++}$, $DFP^{+}$, $NFP^{++}$, $AFW^{++}$ |

Where, +, ++, indicates better for favourable and unfavourable environments, respectively
NFF = Number of node bearing first female flower, FL = Fruit length, FEW = Fruit equatorial diameter, NFP = Number of fruits per plant, AFW = Average fruit weight per plant, DLP = Days to last picking, DOF = Days to first opening female flower, DOM = Days to first opening male flower, NFM = Number of node bearisng first male flower, DFP = days to first picking

Traits wise result of genotypes showing specific adaptation to favourable (better management condition) and unfavourable (poor management condition) environments revealed that 10 and 8 genotypes for days to first opening female flower, 14 and 8 genotypes for days to first opening female flower, 5 and 12 genotypes for number of node bearing first female flower, 8 and 12 genotypes for number of node bearing first female flower, 7 and 0 genotypes for vine length, 12 and 3 genotypes for days to first picking, 5 and 0 genotypes for fruit length, 3 and 0 genotypes for fruit equatorial diameter, 11 and 8 genotypes for number of fruits per plant, 8 and 4 genotypes for average fruit weight per plant, 12 and 1 genotypes for days to last picking and 13 and 5 genotypes for fruit yield per plant were found to be highly responsive to favourable and unfavourable environments, respectively.

## CONCLUSION

None of the parent was stable for fruit yield per plant, however, parents NDBG 132 and Arka Bahar were found to be highly responsive to better environments, while ABG 1 was found to be highly responsive to poor environments. Amongst the hybrids, ABG 1 × Arka Bahar, Punjab Long × NDBG 132 and Pusa Naveen × Samrat possessed more fruit yield per plant and had non-significant $b_i$ and $S^2d_i$ and thus, were considered as stable hybrids, needs to be evaluated at more locations before released as a hybrids for commercial cultivation.

## REFERENCES


Allard, R. W. and Bradshaw, A. D. (1964). Implications of genotype x environment interactions in applied plant breeding. *Crop Science*, **4**(5): 503-508.

Anonymous. (2018). Horticulture Statistics at a Glance 2018. Horticulture Statistics Division, Department of Agriculture, Cooperation & Farmers Welfare, Ministry of Agriculture & Farmers Welfare, Government of India. (http://agricoop.nic.in/sites/default/files/Horticulture%20Statistics%20at%20a%20Glance-2018.pdf) accessed on November 25, 2019.

Baker, R. J. (1969). Genotype-environment interactions in yield of wheat. *Canadian Journal of Plant Science*, **49**: 743-791.

Comstock, R. E. and Moll, R. H. (1963). Genotype-environment interactions. In: "Statistical Genetics and Plant Breeding". (Ed. W. D. Hanson and H. F. Robinson), NAS-NRC Publication, Washington, D. C., pp. 164-196.

Cutler, H. C. and Whitaker, T. W. (1961). History and distribution of the cultivated cucurbits in the Americas. *American Antiquity*, **26**(4): 469-485.

De Candolle, A. (1882). *Origin of Cultivated Species*. Hafner Publishing Co., London (Reprint 1967).

Eberhart, S. A. and Russell, W. A. (1966). Stability parameters for comparing varieties. *Crop Science*, **6**(1): 36-40.

Samadia, D. K. (2007). Stability parameters in bottle gourd. *Indian Journal of Arid Horticulture*, **2**(2): 20-23.

Singh, H. K. (2017). Stability analysis in bottle gourd [*Lagenaria siceraria* (Mol.) Standl.]. Ph. D. (Agri.) Thesis (Unpublished) Submitted to Bihar Agricultural University, Sabour.

Sprague, G. F. (1966). *Quantitative Genetics in Plant Breeding*. In: Plant Breeding. Frey, K. J. (Ed.). Iowa State University Press. Amer. Iowa. Pp. 315-354.



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