**Studies on mean performance for earliness and growth trait of bottle gourd [*Lagenaria siceraria* (Molina) standl.]. in different environments**

**ABSTRACT**

The experiment was conducted on a vegetable research farm, BAU (Bihar Agricultural University), sabour, Bhagalpur, on nine traits, *viz.,* days to first male and female flower opening and harvest, number of nodes to first male and female flower appearance, vine length, inter-nodal length, number of primary branches, and peduncle length. 30 F1 hybrid were developed by six parents using a 6 x 6 full diallel mating design, namely, Narendra Joyti (NJ), BRBG-23 (BG-23), BRBG-65 (BG-65), Pusa Naveen (PN), BRBG-21-2 (BG-21-2) and Round Bottle Gourd (RBG). Three trials were conducted in February, May, and September 2022, with Randomized Block Design (RBD) design. Among parents RBG exhibited took minimum days in earliness traits and NJ x PN and PN x NJ for male flower, PN x NJ for female flower and first harvest, BG-65 x BG-21-2 for nodes to first male and NJ x BG-23 for female flower appearance took minimum node, while BG-21-2 and PN x BG-65 had maximum vine length, BG-65 and BG-65 x PN had maximum inter-nodal length whereas RBG and RBG x NJ had maximum peduncle length and NJ and NJ x PN had maximum number of primary branches over check in all three environments and pooled.

**Keywords: RBD design, Pooled analysis, Full diallel, Bottle gourd**

**INTRODUCTION**

Bottle gourd [*Lagenaria siceraria* (Molina) standl.] is one of the popular cucurbitaceous vegetables among cucurbits family. It is monoecious & cross-pollinated cucurbits with 2n = 2x = 22. It is native to South Africa. It is most commonly grown in tropical and subtropical regions for its tender fleshy fruits during both the *kharif* & summer seasons in India. The fruits contain 96.3 % moisture, 2.9 % carbohydrate, 0.2 % protein, 0.1 % fat, 0.5 % mineral matter and 11 mg of vitamin C (Ascorbic acid) per 100 g fresh weight (Thamburaj, 2001). Currently, in India, the per capita daily availability of vegetables is 175 grams, falling short of the recommended 280 grams per capita per day (Swarup V, 2022). The pulp possesses antioxidant activity, laxative, cardio-protective, diuretic and used for overcoming constipation, cough, night blindness etc. the fruit of bottle gourd also used as vegetable sweet dishes, rayta and pickle. Bottle gourd is a rich source of essential minerals, including iron, protein, and dietary fibre, which aids in digestion and employed for alleviating issues like constipation, cough, and night blindness. It also acts as an antidote for certain poisons. The seeds are used for treating dropsy and it contains omega-3 oil, which is recognized for its potential to enhance energy levels, support brain function, and contribute to overall human vitality. The fruit pulp is a valuable source of carbohydrate without fibre, while the fruit pericarp is a source of crude fibre. The mature fruit's dried shells, known for their hardness, have multiple uses as containers, floats for fishing nets, utensils, musical instruments, or decorative items. In India, bottle gourd is cultivated in an area of 0.19 mha with a production of 3.17 mt (PIB, Govt. of India 2020-2021). In recent year, demand of bottle gourd is increasing due to its growing ability in all the three seasons and their nutritional importance. However, its productivity in Bihar is significantly lower compared to other tropical countries and the national average. Nowadays, there is a need to developed early-maturing and high-yielding varieties. The lack of high-yielding, early-maturing, and stable varieties could be one of the likely causes of low productivity, offering a good scope for research in bottle gourd. Important characteristics like days to first male and female flower opening and harvest, number of nodes to first male and female flower appearance, vine length, internodal length, number of primary branches, and peduncle length are important in varietal improvement.

**MATERIALS AND METHODS**

The experiment was conducted at the Vegetable Research Farm, Department of Horticulture (Vegetable and Floriculture), Bihar Agricultural College, Bihar Agricultural University, Sabour, Bhagalpur, during 2022 across three different seasons: Summer (February 2022) as Environment-1 (E1), Rainy (May 2022) as Environment-2 (E2), and Winter (September 2022) as Environment-3 (E3). The study aimed to evaluate the mean performance of genotypes using the 6 x 6 full diallel mating design. Geographically, the experimental site falls under a humid subtropical climate and is located between 82.12° and 83.98° E longitude and 24.47° and 26.56° N latitude, at an altitude of 75 meters above mean sea level in the Indo-Gangetic Plains of north-eastern India. The soil of the experimental site was sandy loam. Hybridization program was done in 2021, male and female flowers, which appeared to open during next day were covered in the evening with help of cotton to avoid the contamination and pollination was done next day after noon between 1.30- 4.0 PM after pollination covered with cotton. Six parent namely BRBG-23 (BG-23), BRBG-65 (BG-65), BRBG-21-2 (BG-21-2), Round bottle gourd (RBG), Narendra Joyti (NJ), Pusa Naveen (PN) used for evolution and 30 F1 hybrids obtained through full diallel mating design. The experiment was evaluated using a Randomized Block Design (RBD) with 37 treatments, including six parents, 30 F₁ hybrids, and one check variety (Kashi Ganga) for the assessment of hybrid performance based on traits such as days to first male and female flower opening and harvest, number of nodes to first male and female flower appearance, vine length, internodal length, number of primary branches, and peduncle length. The plot size was 4 m × 3 m, with each plot consisting of eight plants. The statistical analysis of the experimental design was conducted following the methodology of Panse and Sukhatme (1967).

**RESULTS AND DISCUSSION**

**A. For earliness traits**

The analysis of variance indicated that the differences among treatments were highly significant for all earliness traits across Environment-1 (E1), Environment-2 (E2), Environment-3 (E3), and in the pooled analysis, as show in Table-1 to 4.

**Days to first male flower opening**

 Days to first male flower opening in F1 hybrids (Table 5) ranged from 38.33 (NJ x BG-23, NJ x RBG) to 47.33 (NJ x BG-21-2) in E1, 39.00 (NJ x PN) to 47.00 (PN x BG-65) in E2 and 40.67 (NJ x PN) to 53.67 (BG-65 x BG-23) in E3, while in pooled analysis it ranged from 39.67 (NJ x PN, PN x NJ) to 48.67 (BG-65 x BG-23) with their mean values of 43.00, 43.47, 48.18 and 44.88 in E1, E2, E3 and pooled, respectively. On the basis of pooled data, twenty-eight hybrids had lower mean values than the check except BG-65 x BG-23 and BG-65 x BG-21-2, which showed higher mean value than check whereas F1 namely, In pooled analysis, among the 30 F₁ hybrids, the hybrids NJ × PN (39.67), PN × NJ (39.67), NJ × BG-23 (40.56), RBG × NJ (41.44), and RBG × PN (41.56) were found superior to the check variety (Kashi Ganga, 47.89) as they recorded the minimum days to first male flower opening. Similar findings were reported by Sohi et al. (2021), Singh et al. (2023), and Paratpararao et al. (2023).

 Among the parent lines, for days to first male flower opening varied from 44.33 (RBG) to 46.00 (NJ) in E1, 44.33 (RBG) to 48.00 (NJ) in E2, 48.33 (RBG) to 53.00 (BG-65) in E3 and 46.44 (RBG) to 48.78 (BG-65) in pooled with their mean values of 45.72, 47.50, 51.28 and 48.17, respectively, similar result reported by Singh et al., (2023) and sohi et al., (2021).

**Days to first female flower opening**

 The hybrid for the trait days to first female flower opening (Table 5) varied from 42.33 (NJ x RBG) to 51.67 (BG-65 x BG-21-2) in E1, 42.00 (NJ x PN) to 51.00 (BG-65 x BG-21-2) in E2 and 42.67 (NJ x PN) to 60.33 (NJ x BG-65) in E3, while in pooled it varied from 42.78 (PN x NJ) to 53.11 (BG-65 x BG-21-2) with the mean value in E1, E2, E3 and pooled was 47.20, 47.52, 52.72 and 49.15, respectively.An examination of the pooled data for days to the first female flower opening the F1, namely PN × NJ (42.78), BG-23 × RBG (43.89), RBG × NJ (44.44), NJ × BG-23 (46.44), and NJ × PN (44.56) were superior to the check (Kashi Ganga, 52.89) as these recorded minimum values for days to first female flower opening similar result reported by Patel, et al., (2023), and Thakur et al., (2013).

 Among the parent lines, for days to first female flower opening varied from 48.00 (RBG) to 53.67 (BG-65) in E1, 51.67 (RBG) to 54.67 (BG-21-2) in E2, 54.67 (RBG) to 60.33 (BG-65) in E3 and 51.44 (RBG) to 55.67 (BG-65) in pooled. And their mean varied in different environments: 51.78, 52.67, 57.9 and 54.13, respectively, in E1, E2, E3 and pooled, similar finding reported by Jain and singh (2016), and Gaddam et al. (2022).

**Days to first harvest:**

 Days to first harvest in F1 hybrid ranged from 51.00 (BG-23 x RBG, RBG x PN) to 61.67 (BG-21-2 x PN) in E1, 49.67 (RBG x NJ) to 63.67 (BG-65 x BG-21-2, BG-21-2 x BG-65) in E2 and 51.00 (NJ x PN) to 68.67 (BG-65 x BG-23) in E3, while in pooled, it ranged from 50.89 (PN x NJ) to 63.33 (BG-65 x BG-21-2) with their mean values of 56.39, 56.66, 61.57 and 58.20 in E1, E2, E3 and pooled respectively. An examination of pooled data for days to first harvesting, the F1, namely PN × NJ (50.87), BG-23 × RBG (52.00), RBG × NJ (53.44), and NJ × PN (52.89) were superior to the check (Kashi Ganga, 62.56) as these took minimum days to first harvest. These findings align with the results reported by Gaonkar et al. (2023), Gaddam et al. (2022), and Harika et al. (2012), as presented in Table 6.

 In parental lines, days to first harvest varied from 60.33 (RBG) to 65.33 (NJ) in E1, 60.67 (RBG) to 63 (BG-21-2) in E2 and 63.33 (RBG) to 69.67 (NJ) in E3, while in pooled, it varied from 61.44 (RBG) to 65.44 (NJ) with their mean values of 62.89, 61.83, 67.11 and 63.94, in E1, E2, E3 and pooled respectively, closed as result reported by Singh et al., 2023 and Gaddam et al. 2022).

**Number of nodes to first male flower appearance**

 Number of nodes to first male flower (Table 6) appearance in F1 hybrids ranged from 4.00 (NJ x PN, BG-23 x RBG, BG-65 x BG-21-2, BG-21-2 x BG-65, RBG x BG-65) to 6.00 (BG-65 x NJ, BG-65 x PN) in E1, 9 (NJ x BG-23, PN x BG-23, PN x BG-21-2, RBG x PN) to 14.00 (NJ x RBG) in E2 and 5.00 (BG-65 x BG-21-2) to 7.67 (BG-23 x BG-21-2, BG-21-2 x BG-65) in E3, while in pooled, it varied from 6.22 (BG-65 x BG-21-2) to 8.56 (BG-23 x BG-21-2) with their mean values of 5.04, 10.62, 6.24 and 7.30 in E1, E2, E3 and pooled respectively. On the basis of pooled estimation for the number of nodes to the first male flower appearance. The F1, namely, BG-65 × BG-21-2 (6.27), NJ × PN (6.56), RBG × PN (6.67), BG-23 × BG-65 (6.37), PN × BG-23 (6.67), and PN × BG-21-2 (6.67) were the best over check (Kashi Ganga) as these recorded minimum nodes to first male flower appearance, similar finding result reported by Harika et al., 2012 and Gaonkar et al. (2023).

 The analysis of data regarding the node number to first male flower appearance among the parents varied from 5.33 (RBG) to 7.00 (PN) in E1, 11.33 (RBG) to 13.33 (NJ) in E2 and 7.00 (RBG) to 8.00 (BG-21-2) in E3, while in pooled it ranged from 7.89 (RBG) to 9.00 (BG-21-2) with their mean values of 6.22, 12.39, 7.39 and 8.67 in E1, E2, E3 and pooled respectively, Bashir et al., (2024) and Singh et al., (2023).

**Number of nodes to first female flower appearance**

 An examination of data for number of nodes to first female flower in F1, ranged from 8.87 (BG-23 x BG-21-2, BG-65 x RBG) to 10.67 (NJ x BG-65, BG-23 x NJ, BG-65 x BG-21-2, RBG  x BG-65) in E1, 12.33 (PN x BG-21-2) to 21.00 (BG-65 x BG-23) in E2 and 9.00 (BG-65 x BG-21-2, RBG x BG-23, RBG x BG-65) to 13.00 (BG-23 x PN) in E3, while in pooled it ranged from 10.56 (PN x BG-21-2) to 14.00 (BG-65 x BG-23) with their mean values of 9.64, 15.41, 10.91 and 11.99 in E1, E2, E3 and pooled, respectively. On the basis of pooled estimation for the number of nodes in the first female flower appearance, the F1, namely NJ × BG-23 (11.11), PN × BG-21-2 (10.56), PN × RBG (10.89), and BG-23 × BG-65 (11.00) were the best over check (Kashi Ganga) as these recorded minimum values for number of nodes first female flower, similar findings align with the results reported by Gaonkar et al. (2023), Gaddam et al. (2022), and Harika et al. (2012), as presented in Table 7.

 A perusal of data for number of nodes to first female flower appearance, among the parents varied from 11.67 (RBG) to 12.67 (BG-65) in E1, 17.00 (RBG) to 19.00 (BG-65) in E2 and 11.67 (RBG) to 13.33 (BG-21-2) in E3, while in pooled, it varied from 13.44 (RBG) to 14.89 (BG-65) with their mean values of 12.06, 17.89, 12.22 and 14.06 in E1, E2, E3 and pooled respectively, Gaonkar et al. (2023) and Harika et al., (2012).

**B. For growth traits**

The variance analysis demonstrated that the treatment differences were highly significant for all earliness characteristics in all growth traits across Environment-1 (E1), Environment-2 (E2), Environment-3 (E3), and in the pooled analysis, as show in Table-1 to 4.

**Vine length at the time of final harvesting (m)**

 Data recorded on account of vine length at the time of final harvesting in F1 hybrids (Table 4.1.7) revealed that the vine length in F1 hybrids ranged from 6.43 (BG-21-2 x PN) to 7.70 (BG-65 x PN) in E1, 7.39 (BG-23 x BG-65) to 10.51 (PN x NJ) in E2, 5.23 (RBG x BG-21-2) to 6.53 (NJ x BG-21-2) in E3 and 6.54 (RBG x NJ) to 7.96 (PN x BG-65) in pooled with their mean values of 6.93, 8.46, 5.92 and 7.10 in E1, E2, E3 and pooled, respectively. On the basis of pooled data for vine length at the time of final harvesting, the F1, namely PN × BG-65 (7.89), BG-65 × PN (7.77), PN × NJ (7.77), BG-21-2 × NJ (7.71), and BG-65 × RBG (7.47) were the best over check (Kashi Ganga) as these recorded maximum values for vine length at the time of final harvesting. These findings align with the results reported by Bhavanasi et al. (2022), Paratpararao et al. (2023), and Gaonkar et al. (2023), as presented in Tables 7.

 Among the parents, the vine length at the time of final harvesting varied from 5.67 (RBG, BG-21-2) to 5.90 (BG-23) in E1, 7.34 (RBG) to 7.55 (BG-23) in E2, 5.16 (RBG) to 5.81 (BG-65) in E3 and 5.91 (NJ) to 6.21 (BG-21-2) in pooled with their mean value of 5.85, 7.20, 5.26 and 6.10 in E1, E2, E3 and pooled, respectively,. Sohi et al. (2021), Bhavanasi et al. (2022), and Jamal et al. (2014), as presented in Table 7.

**Inter-nodal length (cm)**

An examined of data presented in Table 8 clearly indicated that the inter nodal length in F1 hybrids ranged from 7.32 (BG-23 x BG-21-2) to 10.20 (BG-65 x NJ) in E1, 7.78 (BG-21-2 x BG-65) to 12.21 (BG-65 x NJ, BG-65 x PN and RBG x BG-21-2) in E2, 7.14 (BG-23 x RBG) to 11.2 (BG-65 x PN) in E3 and 7.63 (BG-21-2 x BG-65) to 11.25 (BG-65 x NJ) in pooled their mean values of 8.44, 10.25, 9.35 and 9.35 in E1, E2, E3 and pooled, respectively. On the basis of pooled data for inter-nodal length, the F1 hybrids namely, BG-65 × PN (8.91), NJ × BG-23 (10.27), BG-23 × NJ (8.60), RBG × BG-21-2 (8.88), and BG-21-2 × BG-23 (8.38) were the best over check (Kashi Ganga), whereas three crosses namely BG-21-2 x BG-65, BG-23 x RBG and BG-65 x BG-21-2 showed the lowest mean values as compare to check, reported by Bhavanasi et al. (2022), Paratpararao et al. (2023),.

An investigation of data among the parents for inter-nodal length varied from 8.91 (BG-21-2) to 10.95 (BG-65) in E1, 11.32 (PN) to 13.24 (BG-65) in E2, 9 (BG-23) to 12 (BG-65) in E3 and 9.85 (BG-23) to 12.06 (BG-65) in pooled with their mean values of 9.79, 11.97, 10.48 and 10.75 in E1, E2, E3 and pooled respectively, similar as Bhavanasi et al. (2022), and Jamal et al. (2014),.

**Peduncle length (cm)**

 The peduncle length in F1 hybrid (Table 9) varied from 9.33 (BG-21-2 x NJ) to 17.00 (RBG x NJ) in E1, 10.09 (NJ x RBG) to 17.26 (BG-65 x RBG) in E2, 10.40 (BG-21-2 x NJ) to 16.72 (BG-23 x PN) in E3 and 10.31 (BG-21-2 x PN) to 15.04 (RBG x BG-21-2), RBG × NJ (14.92), RBG × BG-65 (14.90), BG-23 × PN (14.90), and RBG × BG-23 (14.00) in pooled with their mean value 12.42, 14.08, 13.99 and 13.50 in E1, E2, E3 and pooled, respectively as these recorded maximum values for peduncle length, Patel, et al., (2023) and Bashir et al., (2024).

 Among the parental lines, the peduncle length varied from 9.32 (PN) to 15.04 (RBG) in E1, 12.39 (NJ) to 13.73 (BG-21-2) in E2 and 12.20 (PN) to 14.55 (RBG) in E3, while in pooled it varied from 11.33 (PN) to 14.03 (RBG) with their mean values of 12.48, 13.26, 13.21and 12.98 in E1, E2, E3 and pooled, respectively Bhavanasi et al. (2022), and Gaonkar et al. (2023).

**Number of primary branches per plant**

 An observation of data (Table 9) for the number of primary branches per plant in F1 hybrids indicated that it ranged from 5.34 (NJ x RBG) to 8.35 (BG-23 x RBG) in E1, 4.69 (NJ x BG-65) to 7.35 (BG-23 x RBG) in E2, 4.34 (RBG x BG-21-2) to 6.89 (NJ x BG-21-2) in E3 and 5.15 (NJ x BG-65) to 7.33 (NJ x PN) in pooled with their mean values of 6.85, 6.12, 5.65 and 6.21 in E1, E2, E3 and pooled, respectively. On the basis of pooled data, it was observed that the F1 hybrid namely, NJ × PN (7.33), BG-23 × RBG (7.31), PN × BG-21-2 (7.12), PN × NJ (7.05), and BG-23 × PN (7.71) produced a greater number of primary branches per plant than the check (Kashi Ganga), Paratpararao et al. (2023) and Singh et al., (2023)

 Among parents, the number of primary branches per plant varied from 5.67 (BG-21-2) to 7.23 (NJ) in E1, 5.05 (BG-23) to 6.25 (NJ) in E2 and 5.00 (PN) to 5.46 (BG-21-2) in E3, while in pooled, it ranged from 5.46 (BG-23) to 6.17 (NJ) with their mean value 6.43, 5.49, 5.09 and 5.67 in E1, E2, E3 and pooled, respectively. Similar findings reported by Bhavanasi et al. (2022), Paratpararao et al. (2023), and Gaonkar et al. (2023), as presented in Tables 9.

**CONCLUSION**

Finally, it was concluded that the parent RBG performed well across environments for earliness and growth traits in bottle gourd. Among the F₁ hybrids, NJ × PN and PN × NJ exhibited the minimum days for earliness traits. For growth traits, the hybrid PN × NJ showed a better mean performance than the check variety (Kashi Ganga) for vine length and the number of primary branches, while BG-65 × PN was superior for internodal length, and RBG × NJ had a better mean for peduncle length compared to the check (Kashi Ganga).

 **Table -1. Mean performance, analysis of variance in E1 for bottle gourd.**

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Sources of Variation | D.F. | Days to first male flower opening | Days to first female flower opening | Days to first harvest | No. of nodes to first male flower appearance | No. of nodes to first female flower appearance | Vine length at the time of final harvesting | Inter-nodal length (cm) | Peduncle length (cm) | Number of primary branches per plant |
| Replications | 2 | 5.69 | 13.96 | 10.28 | 0.23 | 1.09 | 0.39 | 0.19 | 0.50 | 0.09 |
| Treatments | 36 | 25.75\*\* | 28.46\*\* | 46.68\*\* | 1.69\*\* | 3.70\*\* | 0.86\*\* | 2.43\*\* | 11.82\*\* | 2.37\*\* |
| Error | 172 | 4.74 | 6.01 | 9.56 | 0.17 | 0.36 | 0.23 | 0.30 | 0.56 | 0.19 |
| Total | 110 | 11.63 | 13.50 | 21.72 | 0.67 | 1.47 | 0.44 | 1.00 | 4.25 | 0.90 |

**Table-2. Mean performance, analysis of variance in E2 for bottle gourd.**

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Sources of Variation | D.F. | Days to first male flower opening | Days to first female flower opening | Days to first harvest | No. of nodes to first male flower appearance | No. of nodes to first female flower appearance | Vine length at the time of final harvesting | Inter-nodal length (cm) | Peduncle length (cm) | Number of primary branches per plant |
| Replications | 2 | 4.98 | 10.28 | 10.66 | 0.66 | 0.66 | 0.12 | 0.21 | 2.73 | 0.02 |
| Treatments | 36 | 20.20\*\* | 33.99\*\* | 51.37\*\* | 5.90\*\* | 12.75\*\* | 2.52\*\* | 5.52\*\* | 8.83\*\* | 1.45\*\* |
| Error | 72 | 4.17 | 6.99 | 9.07 | 0.46 | 0.91 | 0.44 | 0.58 | 0.96 | 0.19 |
| Total | 110 | 9.43 | 15.89 | 22.94 | 2.25 | 4.78 | 1.11 | 2.19 | 3.57 | 0.60 |

**Table-3. Mean performance, analysis of variance in E3 for bottle gourd.**

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Sources of Variation | D.F. | Days to first male flower opening | Days to first female flower opening | Days to first harvest | No. of nodes to first male flower appearance | No. of nodes to first female flower appearance | Vine length at the time of final harvesting | Inter-nodal length (cm) | Peduncle length (cm) | Number of primary branches per plant |
| Replications | 2 | 0.11 | 6.77 | 3.28 | 0.55 | 1.32 | 0.03 | 0.20 | 0.11 | 0.27 |
| Treatments | 36 | 37.53\*\* | 63.59\*\* | 82.45\*\* | 1.54\*\* | 3.47\*\* | 0.62\*\* | 5.25\*\* | 8.27\*\* | 1.04\*\* |
| Error | 72 | 6.04 | 9.21 | 13.82 | 0.21 | 0.49 | 0.19 | 0.33 | 0.77 | 0.20 |
| Total | 110 | 16.24 | 26.96 | 36.09 | 0.65 | 1.48 | 0.33 | 1.94 | 3.22 | 0.48 |

**Table-4. Mean performance, analysis of variance in pooled for bottle gourd.**

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Sources of Variation | D.F. | Days to first male flower opening | Days to first female flower opening | Days to first harvest | No. of nodes to first male flower appearance | No. of nodes to first female flower appearance | Vine length at the time of final harvesting | Inter-nodal length (cm) | Peduncle length (cm) | Number of primary branches per plant |
| Replicate | 2 | 0.71 | 22.98 | 8.71 | 0.33 | 0.82 | 0.29 | 0.25 | 1.86 | 0.19 |
| Environments | 2 | 899.85\*\* | 1067.50\*\* | 905.19\*\* | 984.35\*\* | 1047.49\*\* | 167.20\*\* | 96.18\*\* | 83.69\*\* | 42.88\*\* |
| Interactions | 4 | 5.03 | 4.01 | 7.75 | 0.55 | 1.13 | 0.12 | 0.17 | 0.74 | 0.09 |
| Overall Sum | 8 | 227.65\*\* | 274.62\*\* | 232.35\*\* | 246.45\*\* | 262.64\*\* | 41.93\*\* | 24.19\*\* | 21.76\*\* | 10.81\*\* |
| Treatments | 36 | 63.67\*\* | 89.072\*\* | 120.10\*\* | 4.96\*\* | 10.11\*\* | 2.36\*\* | 8.69\*\* | 15.02\*\* | 3.38\*\* |
| Error | 288 | 6.21 | 10.17 | 15.66 | 0.73 | 1.67 | 0.42 | 0.87 | 2.31 | 0.33 |

**Table-5. Mean performance of hybrid and parents and check in pooled over environments for days to first male flower and days to first female flower.**

|  |  |  |  |
| --- | --- | --- | --- |
| Treatment  | F1 Hybrid  | Days to first male flower opening | Days to first female flower opening |
| E1 | E2 | E3 | Pooled | E1 | E2 | E3 | Pooled |
| T1 | NJ x BG-23 | 38.33 | 40.67 | 42.67 | 40.56 | 48.00 | 43.33 | 48.00 | 46.44 |
| T2 | NJ x BG-65 | 46.33 | 44.00 | 53.00 | 47.78 | 48.67 | 49.00 | 60.33 | 52.67 |
| T3 | NJ x PN | 39.33 | 39.00 | 40.67 | 39.67 | 49.00 | 42.00 | 42.67 | 44.56 |
| T4 | NJ x BG-21-2 | 47.33 | 44.00 | 48.67 | 46.67 | 49.67 | 49.00 | 54.67 | 51.11 |
| T5 | NJ x RBG | 38.33 | 45.67 | 46.33 | 43.44 | 42.33 | 50.33 | 52.00 | 48.22 |
| T6 | BG-23 x NJ | 46.33 | 46.67 | 49.67 | 47.56 | 48.67 | 50.33 | 52.33 | 50.44 |
| T7 | BG -23 x BG-65 | 44.67 | 40.67 | 46.67 | 44.00 | 49.67 | 43.67 | 51.33 | 48.22 |
| T8 | BG-23 x PN | 46.67 | 44.00 | 53.00 | 47.89 | 49.67 | 47.67 | 58.00 | 51.78 |
| T9 | BG-23 x BG-21-2 | 42.67 | 43.67 | 49.67 | 45.33 | 48.00 | 49.67 | 56.33 | 51.33 |
| T10 | BG-23 x RBG | 39.33 | 40.33 | 42.33 | 40.67 | 43.33 | 44.00 | 44.33 | 43.89 |
| T11 | BG-65 x NJ | 45.00 | 43.67 | 48.33 | 45.67 | 48.67 | 49.00 | 54.67 | 50.78 |
| T12 | BG-65 x BG-23 | 46.67 | 45.67 | 53.67 | 48.67 | 48.67 | 49.33 | 58.67 | 52.22 |
| T13 | BG-65 x PN | 45.33 | 43.67 | 48.67 | 45.89 | 48.00 | 45.67 | 52.00 | 48.56 |
| T14 | BG-65 x BG-21-2 | 46.67 | 45.33 | 53.00 | 48.33 | 51.67 | 51.00 | 56.67 | 53.11 |
| T15 | BG-65 x RBG | 44.33 | 44.00 | 49.00 | 45.78 | 48.00 | 49.33 | 53.33 | 50.22 |
| T16 | PN x NJ | 38.67 | 39.33 | 41.00 | 39.67 | 42.67 | 42.33 | 43.33 | 42.78 |
| T17 | PN x BG-23 | 44.33 | 44.33 | 50.33 | 46.33 | 51.33 | 50.33 | 53.33 | 51.67 |
| T18 | PN x BG-65 | 46.67 | 47.00 | 48.33 | 47.33 | 48.33 | 50.67 | 52.33 | 50.44 |
| T19 | PN x BG-21-2 | 40.00 | 43.67 | 47.33 | 43.67 | 44.67 | 47.33 | 52.33 | 48.11 |
| T20 | PN x RBG | 46.33 | 43.67 | 48.33 | 46.11 | 48.00 | 48.33 | 53.33 | 49.89 |
| T21 | BG-21-2 x NJ | 43.33 | 45.00 | 50.67 | 46.33 | 46.33 | 48.33 | 54.67 | 49.78 |
| T22 | BG-21-2 x BG-23 | 42.67 | 40.33 | 51.33 | 44.78 | 44.00 | 43.67 | 57.33 | 48.33 |
| T23 | BG-21-2 x BG-65 | 43.33 | 45.33 | 49.33 | 46.00 | 45.33 | 50.67 | 56.33 | 50.78 |
| T24 | BG -21-2 x PN | 40.67 | 45.33 | 49.67 | 45.22 | 48.00 | 49.00 | 55.67 | 50.89 |
| T25 | BG-21-2 x RBG | 42.33 | 45.67 | 48.67 | 45.56 | 47.67 | 49.67 | 55.33 | 50.89 |
| T26 | RBG x NJ | 39.33 | 39.67 | 45.33 | 41.44 | 44.33 | 41.67 | 47.33 | 44.44 |
| T27 | RBG x BG-23 | 43.33 | 44.33 | 50.33 | 46.00 | 48.67 | 47.33 | 54.67 | 50.22 |
| T28 | RBG x BG-65 | 40.67 | 43.67 | 47.00 | 43.78 | 43.33 | 48.33 | 51.33 | 47.67 |
| T29 | RBG x PN | 38.67 | 45.00 | 41.00 | 41.56 | 42.67 | 50.67 | 44.33 | 45.89 |
| T30 | RBG x BG21-2 | 42.33 | 40.67 | 51.33 | 44.78 | 48.67 | 44.00 | 54.67 | 49.11 |
|  | **Cross mean** | **43.00** | **43.47** | **48.18** | **44.88** | **47.20** | **47.52** | **52.72** | **49.15** |
|  | **Parent**  |  |
| T31 | NJ | 46.00 | 48.00 | 52.00 | 48.67 | 53.00 | 52.33 | 59.00 | 54.78 |
| T32 | BG-23 | 45.33 | 47.33 | 51.00 | 47.89 | 51.33 | 52.00 | 57.67 | 53.67 |
| T33 | BG-65 | 45.33 | 48.00 | 53.00 | 48.78 | 53.67 | 53.00 | 60.33 | 55.67 |
| T34 | PN | 46.67 | 47.67 | 51.67 | 48.67 | 52.67 | 52.33 | 57.33 | 54.11 |
| T35 | BG-21-2 | 46.67 | 47.33 | 51.67 | 48.56 | 52.00 | 54.67 | 58.67 | 55.11 |
| T36 | RBG | 44.33 | 46.67 | 48.33 | 46.44 | 48.00 | 51.67 | 54.67 | 51.44 |
|  | **Parent mean** | **45.72** | **47.50** | **51.28** | **48.17** | **51.78** | **52.67** | **57.94** | **54.13** |
| T37 | Kashi Ganga (Check) | 45.33 | 47.33 | 51.00 | 47.89 | 52.00 | 51.67 | 55.00 | 52.89 |
|  | Common Mean | 43.50 | 44.23 | 48.76 | 45.50 | 48.07 | 48.47 | 53.63 | 50.06 |
|  | C.V. (%) | 5.00 | 4.62 | 5.04 | 5.48 | 5.10 | 5.46 | 5.66 | 6.37 |
|  | S.E. (±) | 1.26 | 1.18 | 1.42 | 0.83 | 1.42 | 1.53 | 1.75 | 1.06 |
|  | C.D. 5% | 3.54 | 3.32 | 4.00 | 2.31 | 3.99 | 4.30 | 4.94 | 2.96 |
|  | C.D. 1% | 4.70 | 4.41 | 5.31 | 3.05 | 5.30 | 5.71 | 6.56 | 3.90 |

Where NJ= (Narendra Joyti), BG-23= (BRBG-23), BG-65= (BRBG-65), PN= (Pusa Naveen), BG-21-2= (BRBG-21-2) and RBG= (Round bottle gourd).

**Table 6. Mean performance of hybrid and parents and check in pooled over environments for days to first harvest and no. of nodes to first male flower.**

|  |  |  |  |
| --- | --- | --- | --- |
| Treatment  | F1 Hybrid | Days to first harvest | No. of nodes to first male flower appearance |
| E1 | E2 | E3 | Pooled  | E1 | E2 | E3 | Pooled |
| T1 | NJ x BG-23 | 56.67 | 53.00 | 55.33 | 55.00 | 5.67 | 9.00 | 6.33 | 7.00 |
| T2 | NJ x BG-65 | 53.67 | 57.00 | 70.00 | 60.22 | 5.33 | 11.00 | 6.00 | 7.44 |
| T3 | NJ x PN | 57.67 | 50.00 | 51.00 | 52.89 | 4.00 | 10.00 | 5.67 | 6.56 |
| T4 | NJ x BG-21-2 | 59.00 | 56.00 | 64.00 | 59.67 | 5.00 | 11.00 | 6.00 | 7.33 |
| T5 | NJ x RBG | 51.67 | 61.00 | 62.33 | 58.33 | 5.00 | 14.00 | 6.33 | 8.44 |
| T6 | BG-23 x NJ | 58.00 | 61.00 | 62.67 | 60.56 | 4.67 | 10.00 | 6.33 | 7.00 |
| T7 | BG -23 x BG-65 | 60.33 | 52.33 | 60.33 | 57.67 | 5.00 | 9.33 | 5.67 | 6.67 |
| T8 | BG-23 x PN | 58.33 | 57.00 | 67.67 | 61.00 | 5.33 | 9.67 | 6.67 | 7.22 |
| T9 | BG-23 x BG-21-2 | 58.33 | 58.00 | 68.33 | 61.56 | 5.00 | 13.00 | 7.67 | 8.56 |
| T10 | BG-23 x RBG | 51.00 | 52.00 | 53.00 | 52.00 | 4.00 | 10.00 | 6.67 | 6.89 |
| T11 | BG-65 x NJ | 58.00 | 57.00 | 62.33 | 59.11 | 6.00 | 13.00 | 6.00 | 8.33 |
| T12 | BG-65 x BG-23 | 57.33 | 58.67 | 68.67 | 61.56 | 5.00 | 12.00 | 5.67 | 7.56 |
| T13 | BG-65 x PN | 56.67 | 53.67 | 59.67 | 56.67 | 6.00 | 11.00 | 6.67 | 7.89 |
| T14 | BG-65 x BG-21-2 | 60.00 | 63.67 | 66.33 | 63.33 | 4.00 | 9.67 | 5.00 | 6.22 |
| T15 | BG-65 x RBG | 57.33 | 58.00 | 60.67 | 58.67 | 5.67 | 11.67 | 6.00 | 7.78 |
| T16 | PN x NJ | 50.67 | 50.33 | 51.67 | 50.89 | 5.33 | 10.00 | 6.67 | 7.33 |
| T17 | PN x BG-23 | 60.33 | 62.00 | 62.67 | 61.67 | 4.67 | 9.00 | 6.33 | 6.67 |
| T18 | PN x BG-65 | 58.67 | 61.33 | 62.33 | 60.78 | 4.33 | 12.33 | 7.00 | 7.89 |
| T19 | PN x BG-21-2 | 53.00 | 56.00 | 60.33 | 56.44 | 5.67 | 9.00 | 5.33 | 6.67 |
| T20 | PN x RBG | 56.00 | 56.33 | 61.33 | 57.89 | 5.33 | 10.00 | 5.67 | 7.00 |
| T21 | BG-21-2 x NJ | 54.33 | 58.00 | 63.33 | 58.56 | 5.67 | 12.33 | 6.00 | 8.00 |
| T22 | BG-21-2 x BG-23 | 52.67 | 52.00 | 68.00 | 57.56 | 5.67 | 10.00 | 6.00 | 7.22 |
| T23 | BG-21-2 x BG-65 | 53.00 | 63.67 | 65.33 | 60.67 | 4.00 | 9.67 | 7.67 | 7.11 |
| T24 | BG -21-2 x PN | 61.67 | 58.33 | 65.33 | 61.78 | 5.67 | 10.00 | 6.00 | 7.22 |
| T25 | BG-21-2 x RBG | 60.00 | 58.67 | 63.67 | 60.78 | 5.67 | 11.00 | 6.00 | 7.56 |
| T26 | RBG x NJ | 56.33 | 49.67 | 54.33 | 53.44 | 5.00 | 9.33 | 6.67 | 7.00 |
| T27 | RBG x BG-23 | 58.33 | 56.00 | 62.33 | 58.89 | 4.00 | 11.33 | 7.00 | 7.44 |
| T28 | RBG x BG-65 | 51.67 | 57.67 | 60.00 | 56.44 | 5.00 | 11.33 | 5.67 | 7.33 |
| T29 | RBG x PN | 51.00 | 60.00 | 51.33 | 54.11 | 4.67 | 9.00 | 6.00 | 6.56 |
| T30 | RBG x BG21-2 | 60.00 | 51.33 | 62.67 | 58.00 | 5.00 | 10.00 | 6.67 | 7.22 |
|  | **Cross mean** | **56.39** | **56.66** | **61.57** | **58.20** | **5.04** | **10.62** | **6.24** | **7.30** |
|  | **Parent**  |  |
| T31 | NJ | 65.33 | 61.33 | 69.67 | 65.44 | 6.33 | 13.33 | 7.00 | 8.89 |
| T32 | BG-23 | 61.67 | 62.00 | 66.00 | 63.22 | 6.33 | 12.33 | 7.33 | 8.67 |
| T33 | BG-65 | 65.00 | 62.00 | 69.00 | 65.33 | 6.00 | 12.67 | 7.33 | 8.67 |
| T34 | PN | 63.33 | 62.00 | 67.33 | 64.22 | 7.00 | 12.00 | 7.67 | 8.89 |
| T35 | BG-21-2 | 61.67 | 63.00 | 67.33 | 64.00 | 6.33 | 12.67 | 8.00 | 9.00 |
| T36 | RBG | 60.33 | 60.67 | 63.33 | 61.44 | 5.33 | 11.33 | 7.00 | 7.89 |
|  | **Parent mean** | **62.89** | **61.83** | **67.11** | **63.94** | **6.22** | **12.39** | **7.39** | **8.67** |
| T37 | Kashi Ganga (Check) | 61.33 | 61.67 | 64.67 | 62.56 | 6.00 | 10.67 | 7.00 | 7.89 |
|  | Common Mean | 57.58 | 57.63 | 62.55 | 59.25 | 5.26 | 10.91 | 6.45 | 7.54 |
|  | C.V. (%) | 5.37 | 5.23 | 5.94 | 6.68 | 7.83 | 6.24 | 7.05 | 11.34 |
|  | S.E. (±) | 1.78 | 1.74 | 2.15 | 1.32 | 0.24 | 0.39 | 0.26 | 0.29 |
|  | C.D. 5% | 5.03 | 4.90 | 6.05 | 3.67 | 0.67 | 1.11 | 0.74 | 0.79 |
|  | C.D. 1% | 6.68 | 6.51 | 8.03 | 4.84 | 0.89 | 1.47 | 0.98 | 1.05 |

Where NJ= (Narendra Joyti), BG-23= (BRBG-23), BG-65= (BRBG-65), PN= (Pusa Naveen), BG-21-2= (BRBG-21-2) and RBG= (Round bottle gourd).

**Table 7. Mean performance of hybrid and parents and check in pooled over environments for no. of nodes to first female flower appearance and vine length at the time of final harvesting.**

|  |  |  |  |
| --- | --- | --- | --- |
| Treatment  | F1 Hybrid  | No. of nodes to first female flower appearance  | Vine length at the time final harvesting (m) |
| E1 | E2 | E3 | Pooled | E1 | E2 | E3 | Pooled |
| T1 | NJ x BG-23 | 9.00 | 14.67 | 9.67 | 11.11 | 6.50 | 7.81 | 6.25 | 6.85 |
| T2 | NJ x BG-65 | 10.67 | 15.33 | 10.67 | 12.22 | 6.45 | 9.20 | 5.81 | 7.16 |
| T3 | NJ x PN | 9.67 | 14.33 | 10.33 | 11.44 | 7.34 | 7.53 | 5.46 | 6.77 |
| T4 | NJ x BG-21-2 | 10.33 | 15.00 | 11.00 | 12.11 | 6.70 | 9.66 | 6.53 | 7.63 |
| T5 | NJ x RBG | 10.33 | 19.00 | 10.00 | 13.11 | 6.87 | 8.73 | 5.87 | 7.15 |
| T6 | BG-23 x NJ | 10.67 | 16.00 | 11.00 | 12.56 | 6.56 | 8.36 | 6.28 | 7.07 |
| T7 | BG -23 x BG-65 | 10.00 | 13.00 | 10.00 | 11.00 | 6.78 | 7.39 | 6.31 | 6.83 |
| T8 | BG-23 x PN | 9.67 | 14.33 | 13.00 | 12.33 | 7.10 | 8.02 | 5.50 | 6.87 |
| T9 | BG-23 x BG-21-2 | 8.67 | 19.33 | 11.67 | 13.22 | 7.34 | 8.46 | 5.60 | 7.13 |
| T10 | BG-23 x RBG | 9.00 | 15.67 | 11.00 | 11.89 | 6.68 | 7.41 | 6.33 | 6.81 |
| T11 | BG-65 x NJ | 9.33 | 16.00 | 12.00 | 12.44 | 7.23 | 7.72 | 5.88 | 6.94 |
| T12 | BG-65 x BG-23 | 9.00 | 21.00 | 12.00 | 14.00 | 6.87 | 8.22 | 5.30 | 6.80 |
| T13 | BG-65 x PN | 9.33 | 15.33 | 11.67 | 12.11 | 7.70 | 9.26 | 6.36 | 7.77 |
| T14 | BG-65 x BG-21-2 | 10.67 | 16.33 | 9.00 | 12.00 | 6.90 | 8.12 | 5.93 | 6.99 |
| T15 | BG-65 x RBG | 8.67 | 20.00 | 11.67 | 13.44 | 7.27 | 9.49 | 5.67 | 7.47 |
| T16 | PN x NJ | 10.33 | 14.67 | 11.00 | 12.00 | 7.33 | 10.51 | 5.47 | 7.77 |
| T17 | PN x BG-23 | 9.67 | 14.67 | 10.67 | 11.67 | 6.81 | 8.12 | 5.87 | 6.93 |
| T18 | PN x BG-65 | 9.33 | 16.00 | 11.00 | 12.11 | 7.30 | 10.26 | 6.32 | 7.96 |
| T19 | PN x BG-21-2 | 9.67 | 12.33 | 9.67 | 10.56 | 6.65 | 7.46 | 5.53 | 6.55 |
| T20 | PN x RBG | 9.00 | 12.67 | 11.00 | 10.89 | 7.32 | 8.02 | 5.53 | 6.96 |
| T21 | BG-21-2 x NJ | 9.00 | 14.33 | 12.33 | 11.89 | 7.27 | 9.87 | 6.00 | 7.71 |
| T22 | BG-21-2 x BG-23 | 9.33 | 15.67 | 11.00 | 12.00 | 7.33 | 8.26 | 6.40 | 7.33 |
| T23 | BG-21-2 x BG-65 | 9.67 | 15.00 | 12.00 | 12.22 | 6.63 | 7.69 | 6.37 | 6.90 |
| T24 | BG -21-2 x PN | 10.33 | 14.00 | 12.33 | 12.22 | 6.43 | 8.22 | 6.00 | 6.88 |
| T25 | BG-21-2 x RBG | 9.00 | 14.67 | 11.00 | 11.56 | 6.77 | 7.72 | 5.87 | 6.79 |
| T26 | RBG x NJ | 10.33 | 14.33 | 10.67 | 11.78 | 6.45 | 7.52 | 5.63 | 6.54 |
| T27 | RBG x BG-23 | 9.33 | 15.67 | 9.00 | 11.33 | 6.60 | 8.79 | 6.40 | 7.26 |
| T28 | RBG x BG-65 | 10.67 | 14.67 | 9.00 | 11.44 | 6.80 | 8.46 | 6.37 | 7.21 |
| T29 | RBG x PN | 9.00 | 14.33 | 11.00 | 11.44 | 7.56 | 8.86 | 5.40 | 7.27 |
| T30 | RBG x BG21-2 | 9.67 | 14.00 | 11.00 | 11.56 | 6.45 | 8.52 | 5.23 | 6.74 |
|  | **Cross mean** | **9.64** | **15.41** | **10.91** | **11.99** | **6.93** | **8.46** | **5.92** | **7.10** |
|  | **Parent**  |  |
| T31 | NJ | 11.67 | 18.00 | 11.33 | 13.67 | 5.87 | 6.82 | 5.04 | 5.91 |
| T32 | BG-23 | 12.00 | 18.33 | 12.00 | 14.11 | 5.90 | 7.55 | 4.99 | 6.15 |
| T33 | BG-65 | 12.67 | 19.00 | 13.00 | 14.89 | 5.81 | 6.79 | 5.81 | 6.13 |
| T34 | PN | 12.00 | 17.33 | 12.00 | 13.78 | 6.18 | 7.21 | 5.09 | 6.16 |
| T35 | BG-21-2 | 12.33 | 17.67 | 13.33 | 14.44 | 5.67 | 7.50 | 5.47 | 6.21 |
| T36 | RBG | 11.67 | 17.00 | 11.67 | 13.44 | 5.67 | 7.34 | 5.16 | 6.06 |
|  | **Parent mean** | **12.06** | **17.89** | **12.22** | **14.06** | **5.85** | **7.20** | **5.26** | **6.10** |
| T37 | Kashi Ganga (Check) | 11.67 | 17.00 | 11.33 | 13.33 | 6.26 | 7.50 | 5.27 | 6.34 |
|  | Common Mean | 10.09 | 15.86 | 11.14 | 12.36 | 6.74 | 8.23 | 5.79 | 6.92 |
|  | C.V. (%) | 5.93 | 6.01 | 6.29 | 10.44 | 7.15 | 8.03 | 7.58 | 9.37 |
|  | S.E. (±) | 0.35 | 0.55 | 0.40 | 0.43 | 0.28 | 0.38 | 0.25 | 0.22 |
|  | C.D. 5% | 0.97 | 1.55 | 1.14 | 1.20 | 0.78 | 1.08 | 0.71 | 0.60 |
|  | C.D. 1% | 1.29 | 2.06 | 1.51 | 1.58 | 1.04 | 1.43 | 0.95 | 0.79 |

Where NJ= (Narendra Joyti), BG-23= (BRBG-23), BG-65= (BRBG-65), PN= (Pusa Naveen), BG-21-2= (BRBG-21-2) and RBG= (Round bottle gourd).

**Table 8. Mean performance of hybrid and parents and check in pooled over environments for inter-nodal length (cm)**

|  |  |  |
| --- | --- | --- |
| Treatment  | F1 Hybrid  | Inter-nodal length (cm) |
| E1 | E2 | E3 | Pooled |
| T1 | NJ x BG-23 | 8.72 | 11.21 | 10.87 | 10.27 |
| T2 | NJ x BG-65 | 9.23 | 10.23 | 9.02 | 9.49 |
| T3 | NJ x PN | 9.21 | 9.12 | 8.10 | 8.81 |
| T4 | NJ x BG-21-2 | 7.85 | 11.32 | 10.60 | 9.92 |
| T5 | NJ x RBG | 8.25 | 9.32 | 8.23 | 8.60 |
| T6 | BG-23 x NJ | 9.09 | 11.24 | 10.34 | 10.22 |
| T7 | BG -23 x BG-65 | 9.12 | 10.21 | 9.10 | 9.48 |
| T8 | BG-23 x PN | 8.35 | 9.32 | 8.23 | 8.63 |
| T9 | BG-23 x BG-21-2 | 7.32 | 10.21 | 9.21 | 8.91 |
| T10 | BG-23 x RBG | 8.34 | 8.35 | 7.14 | 7.94 |
| T11 | BG-65 x NJ | 10.20 | 12.21 | 11.34 | 11.25 |
| T12 | BG-65 x BG-23 | 9.10 | 9.32 | 8.32 | 8.91 |
| T13 | BG-65 x PN | 7.68 | 12.21 | 11.21 | 10.37 |
| T14 | BG-65 x BG-21-2 | 8.12 | 8.36 | 7.56 | 8.01 |
| T15 | BG-65 x RBG | 8.25 | 11.26 | 10.56 | 10.02 |
| T16 | PN x NJ | 9.12 | 9.31 | 8.10 | 8.84 |
| T17 | PN x BG-23 | 8.21 | 10.89 | 9.76 | 9.62 |
| T18 | PN x BG-65 | 7.64 | 11.21 | 10.65 | 9.83 |
| T19 | PN x BG-21-2 | 8.28 | 9.78 | 8.57 | 8.88 |
| T20 | PN x RBG | 9.31 | 11.34 | 10.23 | 10.29 |
| T21 | BG-21-2 x NJ | 7.45 | 9.36 | 8.34 | 8.38 |
| T22 | BG-21-2 x BG-23 | 8.12 | 11.34 | 10.62 | 10.03 |
| T23 | BG-21-2 x BG-65 | 7.65 | 7.78 | 7.45 | 7.63 |
| T24 | BG -21-2 x PN | 8.12 | 8.55 | 10.00 | 8.89 |
| T25 | BG-21-2 x RBG | 7.67 | 11.26 | 10.67 | 9.87 |
| T26 | RBG x NJ | 8.21 | 10.00 | 7.45 | 8.55 |
| T27 | RBG x BG-23 | 9.05 | 10.21 | 10.00 | 9.75 |
| T28 | RBG x BG-65 | 7.34 | 11.34 | 10.32 | 9.67 |
| T29 | RBG x PN | 9.97 | 9.01 | 7.65 | 8.88 |
| T30 | RBG x BG21-2 | 8.34 | 12.21 | 11.00 | 10.52 |
|  | **Cross mean** | **8.44** | **10.25** | **9.35** | **9.35** |
|  | **Parent**  |  |
| T31 | NJ | 9.01 | 12.60 | 10.32 | 10.64 |
| T32 | BG-23 | 10.25 | 10.30 | 9.00 | 9.85 |
| T33 | BG-65 | 10.95 | 13.24 | 12.00 | 12.06 |
| T34 | PN | 9.36 | 11.32 | 10.10 | 10.26 |
| T35 | BG-21-2 | 8.91 | 12.34 | 11.23 | 10.83 |
| T36 | RBG | 10.23 | 12.04 | 10.23 | 10.83 |
|  | **Parent mean** | **9.79** | **11.97** | **10.48** | **10.75** |
| T37 | Kashi Ganga (Check) | 7.98 | 9.52 | 8.85 | 8.78 |
|  | Common Mean | 8.65 | 10.51 | 9.52 | 9.56 |
|  | C.V. (%) | 6.33 | 7.21 | 6.03 | 9.73 |
|  | S.E. (±) | 0.32 | 0.44 | 0.33 | 0.31 |
|  | C.D. 5% | 0.89 | 1.23 | 0.93 | 0.86 |
|  | C.D. 1% | 1.18 | 1.64 | 1.24 | 1.14 |

Where NJ= (Narendra Joyti), BG-23= (BRBG-23), BG-65= (BRBG-65), PN= (Pusa Naveen), BG-21-2= (BRBG-21-2) and RBG= (Round bottle gourd).

**Table 9. Mean performance of hybrid and parents and check in pooled over environments for peduncle length (cm) and number of primary branches.**

|  |  |  |  |
| --- | --- | --- | --- |
| Treatment  | F1 Hybrid  | Peduncle length (cm) | Number of primary branches |
| E1 | E2 | E3 | Pooled | E1 | E2 | E3 | Pooled |
| T1 | NJ x BG-23 | 12.67 | 14.11 | 13.89 | 13.56 | 6.54 | 5.56 | 5.43 | 5.84 |
| T2 | NJ x BG-65 | 13.67 | 12.89 | 12.77 | 13.11 | 5.56 | 4.69 | 5.21 | 5.15 |
| T3 | NJ x PN | 13.33 | 14.63 | 16.04 | 14.67 | 8.32 | 7.34 | 6.34 | 7.33 |
| T4 | NJ x BG-21-2 | 16.00 | 11.67 | 13.06 | 13.58 | 6.53 | 6.12 | 5.65 | 6.10 |
| T5 | NJ x RBG | 15.00 | 10.09 | 11.94 | 12.34 | 5.34 | 5.21 | 5.00 | 5.18 |
| T6 | BG-23 x NJ | 15.00 | 13.83 | 14.92 | 14.58 | 7.82 | 6.10 | 5.67 | 6.53 |
| T7 | BG -23 x BG-65 | 11.67 | 14.38 | 15.90 | 13.98 | 5.73 | 5.21 | 6.21 | 5.72 |
| T8 | BG-23 x PN | 12.00 | 15.99 | 16.72 | 14.90 | 8.10 | 7.12 | 6.12 | 7.11 |
| T9 | BG-23 x BG-21-2 | 14.00 | 14.29 | 15.79 | 14.69 | 7.78 | 6.12 | 5.67 | 6.52 |
| T10 | BG-23 x RBG | 14.00 | 14.75 | 14.78 | 14.51 | 8.35 | 7.37 | 6.21 | 7.31 |
| T11 | BG-65 x NJ | 11.67 | 14.46 | 12.90 | 13.01 | 5.97 | 6.21 | 5.87 | 6.02 |
| T12 | BG-65 x BG-23 | 11.67 | 16.98 | 15.35 | 14.66 | 5.74 | 5.23 | 5.78 | 5.58 |
| T13 | BG-65 x PN | 10.00 | 16.13 | 15.35 | 13.83 | 7.32 | 6.34 | 5.32 | 6.33 |
| T14 | BG-65 x BG-21-2 | 10.18 | 16.53 | 15.86 | 14.19 | 7.96 | 6.80 | 4.98 | 6.58 |
| T15 | BG-65 x RBG | 9.67 | 17.26 | 16.37 | 14.43 | 6.21 | 6.25 | 6.23 | 6.23 |
| T16 | PN x NJ | 13.00 | 13.83 | 13.03 | 13.29 | 8.12 | 7.14 | 5.89 | 7.05 |
| T17 | PN x BG-23 | 11.67 | 15.26 | 13.26 | 13.40 | 5.67 | 5.34 | 5.12 | 5.38 |
| T18 | PN x BG-65 | 11.00 | 14.55 | 12.09 | 12.55 | 6.45 | 6.23 | 6.32 | 6.33 |
| T19 | PN x BG-21-2 | 13.33 | 12.60 | 11.86 | 12.60 | 7.34 | 7.13 | 6.89 | 7.12 |
| T20 | PN x RBG | 10.33 | 13.11 | 12.53 | 11.99 | 5.56 | 6.21 | 5.67 | 5.81 |
| T21 | BG-21-2 x NJ | 9.33 | 11.19 | 10.40 | 10.31 | 6.67 | 6.14 | 6.00 | 6.27 |
| T22 | BG-21-2 x BG-23 | 10.00 | 12.16 | 11.35 | 11.17 | 7.76 | 6.47 | 6.34 | 6.86 |
| T23 | BG-21-2 x BG-65 | 12.00 | 12.78 | 14.13 | 12.97 | 6.78 | 5.80 | 5.23 | 5.94 |
| T24 | BG -21-2 x PN | 10.33 | 11.29 | 12.63 | 11.42 | 6.34 | 5.67 | 4.78 | 5.60 |
| T25 | BG-21-2 x RBG | 9.67 | 12.24 | 11.72 | 11.21 | 6.85 | 5.87 | 5.67 | 6.13 |
| T26 | RBG x NJ | 17.00 | 14.44 | 13.31 | 14.92 | 7.45 | 6.47 | 5.32 | 6.41 |
| T27 | RBG x BG-23 | 14.00 | 15.23 | 14.89 | 14.71 | 5.89 | 5.23 | 5.54 | 5.55 |
| T28 | RBG x BG-65 | 13.67 | 15.86 | 15.18 | 14.90 | 7.82 | 6.34 | 6.32 | 6.83 |
| T29 | RBG x PN | 12.67 | 14.45 | 16.15 | 14.42 | 7.34 | 6.21 | 4.45 | 6.00 |
| T30 | RBG x BG21-2 | 14.00 | 15.48 | 15.63 | 15.04 | 6.10 | 5.74 | 4.34 | 5.39 |
|  | **Cross mean** | **12.42** | **14.08** | **13.99** | **13.50** | **6.85** | **6.12** | **5.65** | **6.21** |
|  | **Parent**  |  |
| T31 | NJ | 13.23 | 12.39 | 13.00 | 12.87 | 7.23 | 6.25 | 5.04 | 6.17 |
| T32 | BG-23 | 13.11 | 13.15 | 13.20 | 13.15 | 6.21 | 5.05 | 5.12 | 5.46 |
| T33 | BG-65 | 12.33 | 15.32 | 14.03 | 13.89 | 6.34 | 5.18 | 4.90 | 5.47 |
| T34 | PN | 9.32 | 12.48 | 12.20 | 11.33 | 6.58 | 5.22 | 5.00 | 5.60 |
| T35 | BG-21-2 | 11.83 | 13.73 | 12.30 | 12.62 | 5.67 | 5.41 | 5.46 | 5.51 |
| T36 | RBG | 15.04 | 12.51 | 14.55 | 14.03 | 6.54 | 5.80 | 5.01 | 5.78 |
|  | **Parent mean** | **12.48** | **13.26** | **13.21** | **12.98** | **6.43** | **5.49** | **5.09** | **5.67** |
| T37 | Kashi Ganga (Check) | 9.78 | 12.15 | 12.23 | 11.39 | 6.66 | 5.22 | 5.12 | 5.67 |
|  | Common Mean | 12.36 | 13.90 | 13.82 | 13.36 | 6.77 | 5.99 | 5.55 | 6.11 |
|  | C.V. (%) | 6.05 | 7.05 | 6.36 | 11.38 | 6.40 | 7.22 | 8.04 | 9.40 |
|  | S.E. (±) | 0.43 | 0.57 | 0.51 | 0.51 | 0.25 | 0.25 | 0.26 | 0.19 |
|  | C.D. 5% | 1.22 | 1.59 | 1.43 | 1.41 | 0.71 | 0.70 | 0.73 | 0.53 |
|  | C.D. 1% | 1.62 | 2.12 | 1.90 | 1.86 | 0.94 | 0.94 | 0.96 | 0.70 |

Where NJ= (Narendra Joyti), BG-23= (BRBG-23), BG-65= (BRBG-65), PN= (Pusa Naveen), BG-21-2= (BRBG-21-2) and RBG= (Round bottle gourd).

**COMPETING INTERESTS DISCLAIMER:**

Authors have declared that they have no known competing financial interests OR non-financial interests OR personal relationships that could have appeared to influence the work reported in this paper.

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1. Not used any AI tool

2.

3.

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