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Assessment of different Peageonpea (*Cajanus cajan* L.) genotypes for growth and yield in Prayagraj region (U.P.)

Vijay Dugesar[1], A. K. Chaurasia[2], P. K. Shukla[3] and S. N. Mishra[4]

[1,2&4]Department of Genetics and Plant Breeding,
[3]Department of Biological Sciences, (Naini Agricultural Institute)
Sam Higginbottom University of Agriculture, Technology & Sciences, Prayagraj 211007, U.P, India

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ABSTRACT

The trail was conducted at Field Experimentation Centre, Department of Genetics and Plant Breeding, Naini Agricultural Institute, SHUATS, Prayagraj during *Kharif season* 2019-2021. The experiment was carried out with 17 genotypes (16+1 check variety) of pigeonpea, which were obtained from IIPR, Kanpur (U.P) in Randomized Block Design (RBD) with 3 replications for growth and yield attributes. Observations were made on five plants that were randomly selected for eleven growth and yield traits except field emergence, days to 50% flowering and days to maturity, where the observations were noted on a plot basis. Among the genotypes G-13 recorded early days to maturity (252.17), maximum plant height (268.70 cm), highest emergence on field (84.67%), more No. of branches/plant (29.67), No. of pods/plant (206.90), No. of seeds/ plant (397.93), maximum seed yield/plant (57.00 g.), seed yield/plot (6.45 kg.), 100 seed weight (15.16 g.) and seed yield q/ha (24.90 q.), while genotype G-12 noted less days to 50% flowering (173.83). G-13 and G-7 genotypes taken most down days for flowering and maturity and good yield in comparison to the check variety (MAL-13). Along with many genotypes G-13 was determined to be the most promising and should be considered for commercial cultivation under the agro-climatic conditions of Prayagraj.

Key words : *Pigeonpea genotypes, growth and yield attributing traits.*

Introduction

Pulses are high in protein and are a vegetarian's major source of protein in India. "Poverty meat" is another name for it (Reddy, 2010). Pulses are usually produced under rain fed circumstances and do not require a lot of irrigation, which is why they are planted in the regions that are left over cereal/cash crop demand has been met. Pulses are grown for their ability to fix atmospheric nitrogen in their root nodules, which allows them to satisfy their nitrogen need to a large extent. Pulses also have additional benefits, such as being high in protein, improving soil fertility and physical structure, being adaptable to mixed/ intercropping systems, crop rotation, and dry farming, and providing green pods for vegetables as well as healthy fodder for cattle.

Pigeonpea (*Cajanus cajan* (L.) Mill sp.), also called as Redgram, is a grain legume crop native to india that belongs to *Cajaninae* subtribe of the tribe *Phaseoleae*, sub-family *Papilionoideae*, and family *Leguminosae*. It is the only cultivated food legume crop with a diploid genome (2n = 2x= 22) and 11 pairs of chromosomes (Varshney, 2012). It is a dip-

(Research Scholar[1&4], Associate Professor[2] and Assistant Professor[3])

loid crop is the frequently often cross pollinated. 6.81 million tons of pigeonpea grains were produced globally from 7.02 million ha, with an overall productivity of 0.97 ton per hectare (FAOSTAT, 2017). Pigeonpea output averaged 4.89 million tones globally in 2014 (FAOSTAT, 2015). Pigeonpea is the world's 6^{th} most significant pulse crop and India's second most important pulse crop after chickpea. Nepal, Uganda, Kenya, Malawi, Mozambique, and Tanzania are the worlds other main pigeonpea producers, in addition to India (FAO, 2011). Africa, India and Myanmar are the leading producers (83 %) followed by Malawi, Tanzania, Kenya, and Uganda (14%). Pigeonpea is a minor crop in West Africa, but it is essential for smallholders survival in Benin, Nigeria, and Ghana (Dansi *et al.,* 2012).

Pigeonpea is India's second largest pulse crop, behind chickpea. This crop is grown in 5.6 Mha in India, with yearly production of 3.29 metric tons and a yield of 587 kilograms per hectare, it accounts for 80 percent of the world's pigeonpea area and production. Pigeonpea is mostly farmed in Maharashtra, Uttar Pradesh, Madhya Pradesh, Gujarat, Andhra Pradesh, Karnataka, and Tamil Nadu, Which account for 90% of the country's pigeonpea output. The crop is the most significant pulse crop in Karnataka, with an area of 8.17 lakh ha, an output of 5.07 lakh tones, and predictability of 621 kg/ha (Anonymous, 2017).

Pigeonpea seeds are a nutrient dense food. Protein, carbohydrates, fat, crude fiber, and minerals are all found in ripe seeds (Saxena and Kumar, 2012). Pigeonpea has several benefits over annual legumes as a perennial shrub, including the ability to produce many harvests and a far larger capacity to contributor to soil fertility enhancement. 100 g of pigeonpea contains approximately 62.78 g of carbohydrates, 21.70 gm of protein, 1.49 g of total fats, 15 g of dietary fibers, 456 micrograms foliates, 2.965 mg niacin, 17 mg sodium, 13.92 mg potassium, 130 mg calcium, 1.057 micro g copper, 5.23 mg iron, 183 mg magnesium, and 1.791 mg other micronutrients (USDA, 2016).

Pigeonpea genotypes are more susceptible to waterlogging than wild *Cajanus* cultivars, which have a high level of tolerance to waterlogging. As a result, wild species genotypes are an excellent source for generating waterlogging-tolerant pigeonpea cultivars. Pigeonpea cultivars have a limited genetic background, since just 57 parental lines have been utilized to generate variants through hybridization (Kumar *et al.,* 2004). Furthermore, roughly 20% of the pigeonpea types have the poor harvest index. As a result, there has been no quantum leap in pigeonpea production. Extra-early cultivars (90 to 120), early cultivars (120 to 150), medium cultivars (150 to 200), and late cultivars (200 to 300 days) are the maturity groups that have direct bearing on the crops, survive and fit in various agroecological circumstances (Choudhary *et al.,* 2011). Early maturing varieties are better adapted to the places with minimum rainfall and soil with poor moisture retention. Because of the lengthy humid and overcast weather, these cultivars are susceptible to pests and illness when cultivated in high rainfall areas. Each maturity level has its own adaptation region. In places with moderate rainfall, medium maturing genotypes regularly outperform both early and late mature genotypes in terms of production (Dasbak *et al.,* 2012).

Farmers have been restricted in their production operations by a number of limitations, which they have responded to by implementing mitigation measures. One of the biggest restrictions limiting the pigeonpea output is a lack of better varieties to fulfill farmers' demands. Furthermore, even in areas where better varieties are available, there is no working seed supply infrastructure since seed companies and governments are hesitant to invest in anything other than cash ones (Mutegi and Zingore, 2008). As a consequence, this study can help farmers reduce yield gaps by assessing various Peageonpea (*Cajanus cajan* L.) genotypes for growth and yield in the Prayagraj region (U.P.).

Materials and Methods

The experiment was carried out at Field Experimentation Centre, Department of Genetics and Plant Breeding, Naini Agricultural Institute, SHUATS, Prayagraj, Uttar Pradesh. The material of experiment was consists of 16 genotypes with one check variety of pigeonpea (encoded with G1 to G17). The genotypes were taken from I.I.P.R, Kanpur (U.P.) and the research conducted in Field Experimentation Center, Dept. of GPB, SHUATS, NAI, Prayagraj (U.P.) with 3 replications in Randomized Block Design (RBD).

Results and Discussion

The results obtained from the experiment are discussed here under

The experimental work was conducted and analyzed statically; the result is presented below in the table. The data collected from field for growth and yieldattributes *viz*. field emergence percentage, days to 50% flowering, plant height (cm), No. of branches/plant, No. of pods/plant, No. of seeds/plant, days to maturity, seed yield/plant (g.), seed yield/plot (kg.), seed yield (q/ha) and weight of 100 seeds (g.).

Analysis of variance for various characters is accessible in the (ANOVA) table. The mean sum of square due to various genotypes showed consequential differences for all growth and yield attributes under this study at 1 % level and 5 % level of significance.

Among all the genotypes, the highest field emergence percentage, plant height, No. of branches/plant, No. of seeds/plant, seed yield/plant, seed yield/hectare, 100 seed weight and lowest days to the maturity were achieved in genotype G-13. While, genotype G-12 had fewer days to 50% flowering.

The percentage of field emergence in G-13 was significantly higher (84.67%), followed by G-7 (83.67%), and found to be lower in G-10 (76.50%), when compared with check variety (MAL-13) among all the genotypes. Fig. 1 indicated that the similar results of Field emergence percentage was observed by Mohar *et al.*, (2014); Varshney *et al.*, (2010); Pawar *et al.*, (2015); Egbe and Venge, (2008); Rani *et al.*, (2015) and Upadhyaya *et al.*, (2011).

Days to 50% flowering were significantly shorter in G-12 (173.83), followed by G-10 (174.33), and found to be longer in G-1 (183.83),when compared with check variety (MAL-13) among all the genotypes. Fig. 2 indicated that the similar results of Days to 50% flowering was observed by Rani *et al.*, (2015); Antarvalli *et al.*, (2001); Mishra *et al.*, (2008); Saxena, (2009) and Narula *et al.*, (1997).

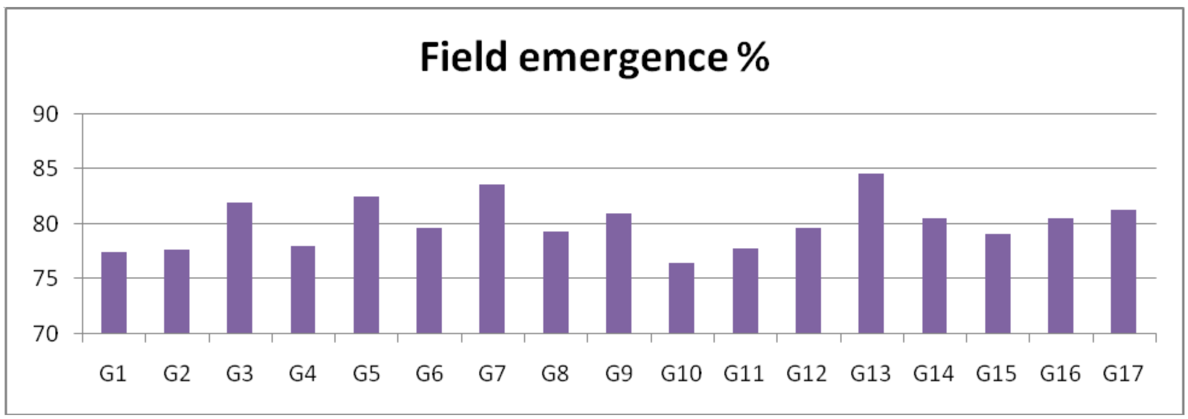

Fig. 1. Field emergence percentage of various pigeonpea genotypes.

Table 1. Analysis of variance for growth and yield attributes of different pigeonpea genotypes.

S. No.	Characteristic	M.S.S		
		Replication (d.f. =2)	Treatment (d.f. =16)	Error (d.f. =32)
1	Field emergence percentage	2.88	15.49*	1.30
2	Days to 50% flowering	6.01	15.62*	2.31
3	Plant height (cm)	26.84	504.95*	9.75
4	No. of branches/plant	1.85	42.03*	0.19
5	No. of pods/plant	1714.31	2502.44*	80.33
6	Days to maturity	0.98	24.57*	0.67
7	No. of seeds/plant	226.48	3105.98*	91.76
8	Seed yield/plant (g.)	0.27	103.02*	0.84
9	Seed yield/plot (kg.)	0.02	1.39*	0.03
10	100 seed weight (g.)	1.02	0.89*	0.09
11	Seed yield (q/ha)	0.28	20.67*	0.39

* Significant at 1% and 5% level of significance

Plant height was found to be more prevalent in G-13 (268.70 cm), followed by G-7 (266.49 cm), and lowest in G-1 (220.92 cm), when compared with check variety (MAL-13) among all the genotypes. Fig. 3 indicated that the similar results of Plant height was observed by Puste and Jana, (2016); Prabhakar and Anand, (2005); Hariram *et al.,* (2011); Varshney *et al.,* (2010) and Hemavathy *et al.,* (2017).

No. of branches/plant was found to be significantly higher in G-13 (29.27) followed by G-7 (28.83) and lower in G-1 (14.43), when compared with check variety (MAL-13) among all the genotypes. Fig. 4 indicated that the similar results of No. of branches/plant was observed by Lohithaswa and Dharamraj, (2003); Saxena, (2009); Ojwang *et al.,* (2016); Birendra *et al.,* (2017); Vijay *et al.,* (2016) and Mahjabin *et al.,* (2015).

No. of pods/plant was found to be significantly higher in G-13 (206.90) followed by G-7 (203.10) and lower in G-1 (120.70), when compared with check variety (MAL-13) among all the genotypes. Fig. 4 indicated that the similar results of No. of pod/plant was observed by Prabhakar and Anand, (2005); Egbe and Venge, (2008); Rama and Rajamani, (2018); Ramesh *et al.*, (2006); and Sandeep *et al.,* (2019).

Days to maturity were significantly shorter in G-13 (252.17), followed by G-10 (252.83), and found to be longer in G-1 (263.00), when compared with check variety (MAL-13) among all the genotypes. Fig. 2 indicated that the similar results of Days to maturity was observed by Ramesh *et al.,* (2006), Hariram *et al.,* (2011); Parameshwarappa, (2002), Saxena, (2009) and Vijay *et al.,* (2016).

No. of seeds/plant was found to be significantly higher in G-13 (397.93) followed by G-7 (364.07) and lower in G-1 (274.97), when compared with check variety (MAL-13) among all the genotypes. Fig. 4 indicated that the similar results of No. of seed/plant was observed by Ojwang *et al.,* (2016), Birendra *et al.,* (2017); Rani *et al.,* (2015); Rama and Rajamani, (2018); Prabhakar and Anand, (2005) and Esnart *et al.,* (2020).

Seed yield/plant was found to be significantly higher in G-13 (57.00 g.) followed by G-7 (52.18 g.) and lower in G-2 (34.90 g.), when compared with check variety (MAL-13) among all the genotypes. Fig. 5 indicated that the similar results of Seed yield/plant was observed by Ezeaku *et al.,* (2015), Ramesh *et al.*, (2006), Tembhume *et al.,* (2009), Vijay Bhaskar, (2016), Egbe and Venge, (2008) and Prabhakar and Anand, (2005).

Seed yield/plot was found to be significantly

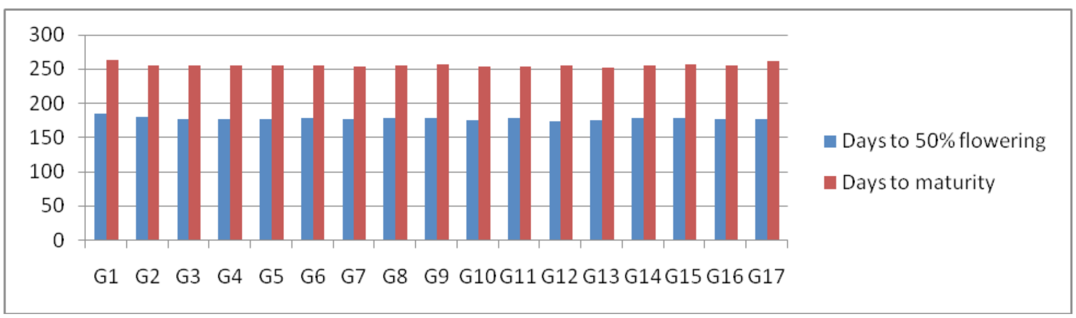

Fig. 2. Days to 50% flowering and maturity of various pigeonpea genotypes.

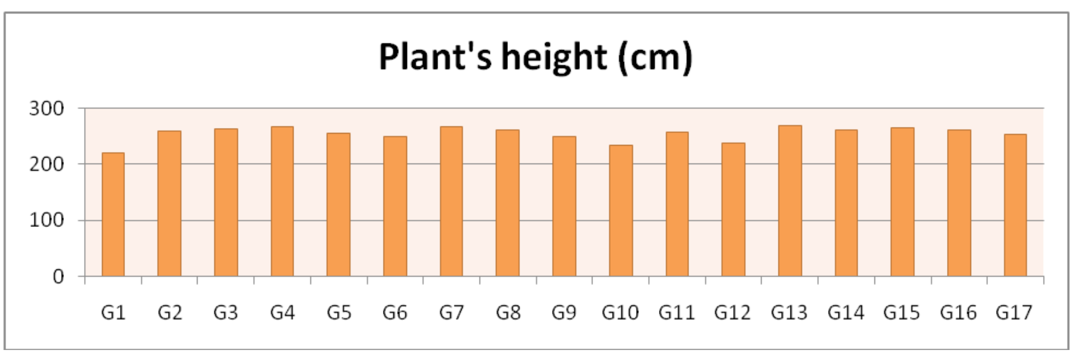

Fig. 3. Plant height of various pigeonpea genotypes.

higher in G-13 (6.45 kg) followed by G-7 (6.15 kg) and lower in G-1 (4.21 kg), when compared with check variety (MAL-13) among all the genotypes. Fig. 5 indicated that the similar results of Seed yield/plot were observed by Aloyce *et al.*, (2015); Mahjabin *et al.*, (2015); Tembhume *et al.*, (2009); Pawar *et al.*, (2015) and Upadhaya *et al.*, (2011).

100 seed weight was found to be significantly higher in G-13 (15.16 g.) followed by G-7 (14.99 g.) and lower in G-6 (13.32 g.), when compared with check variety (MAL-13) among all the genotypes. Fig. 5 indicated that the similar results of 100 seed weight was observed by Tej *et al.*, (2003), Pawar *et al.*, (2015), Vijay Bhaskar, (2016), Parameshwarappa,

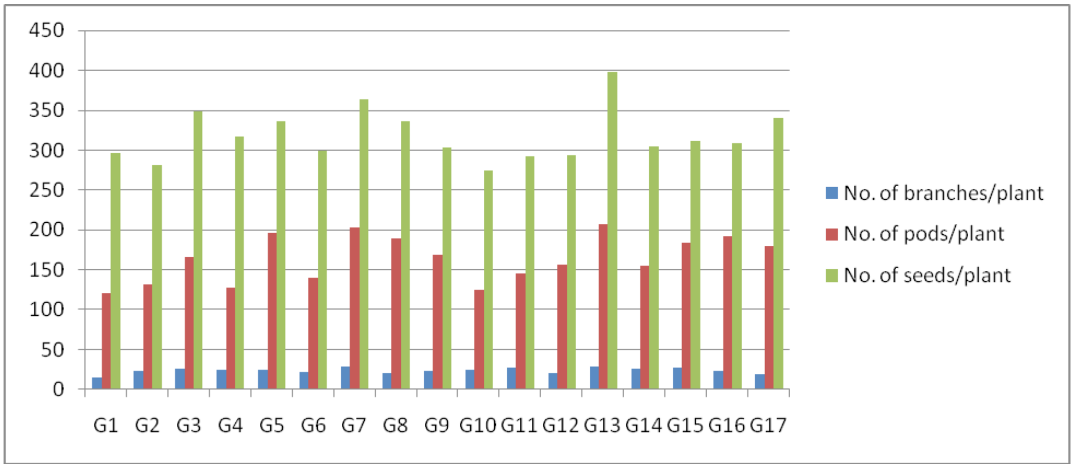

Fig. 4. Number of branches/plant, pods/plant and seeds/plant of various pigeonpea genotypes.

Table 2. Mean performance for growth and yield attributes of different pigeonpea genotypes.

S.No.	Genotypes	Field Emergence %	Days to 50% flowering	Plant height (cm)	Number of branches/ plant	Number of pods/Plant	Days to maturity	Number of Seeds/plant	Seed yield/ plant (g)	Seed yield/ plot (kg)	100 seed weight (g.)	Seed yield (q/ha.)
1	G1	77.50	183.83	220.92	14.43	120.70	263.00	296.10	39.34	4.21	13.81	16.24
2	G2	77.67	179.50	259.06	23.70	131.47	254.33	280.60	34.90	4.35	13.62	16.78
3	G3	82.00	176.67	262.30	25.67	165.87	255.50	349.00	49.08	5.74	14.78	22.16
4	G4	78.00	176.17	265.99	25.03	127.70	254.33	316.90	40.01	4.44	13.56	17.11
5	G5	82.50	176.50	255.41	24.67	196.17	254.67	336.53	46.80	5.41	14.90	20.88
6	G6	79.67	177.83	248.72	21.47	140.00	255.50	298.60	38.82	4.44	13.32	17.13
7	G7	83.67	175.83	266.49	28.83	203.10	253.67	364.07	52.18	6.15	14.99	23.74
8	G8	79.33	178.50	262.01	20.83	189.50	255.17	335.57	44.44	5.10	14.30	19.69
9	G9	81.00	177.67	249.60	24.00	168.30	256.00	302.90	43.42	4.96	14.67	19.14
10	G10	76.50	174.33	233.42	24.60	124.33	252.83	274.97	37.21	4.31	13.71	16.65
11	G11	77.83	178.67	256.76	27.90	145.10	253.00	292.03	36.87	4.45	13.93	17.17
12	G12	79.67	173.83	238.53	20.67	157.00	255.67	293.40	39.94	4.63	14.10	17.85
13	G13	84.67	175.17	268.70	29.27	206.90	252.17	397.93	57.00	6.45	15.16	24.90
14	G14	80.50	178.33	260.40	26.00	154.87	254.33	304.43	42.64	4.87	14.20	18.78
15	G15	79.17	178.00	264.75	27.00	183.53	256.50	311.03	41.64	4.59	14.31	17.71
16	G16	80.50	176.50	261.30	23.23	191.60	254.67	308.83	38.50	4.38	14.16	16.88
17	G17	81.33	177.17	253.46	19.47	179.40	261.83	340.57	45.82	5.38	14.59	20.77
G. M		80.09	177.32	254.58	23.93	163.85	255.48	317.85	42.86	4.93	14.24	19.03
C.D. (5%)		1.90	2.53	5.19	0.72	14.91	1.36	15.93	1.53	0.28	0.50	1.03
SE(m)		0.66	0.88	1.80	0.25	5.17	0.47	5.53	0.53	0.10	0.17	0.36
SE(d)		0.93	1.24	2.55	0.36	7.32	0.67	7.82	0.75	0.14	0.24	0.51
C.V.		1.43	0.86	1.23	1.82	5.47	0.32	3.01	2.14	3.27	2.10	3.27

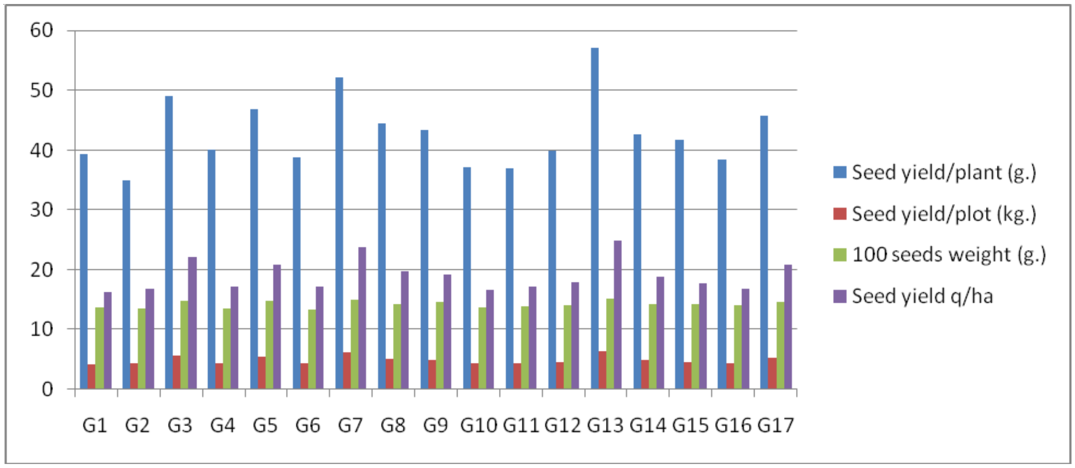

Fig. 5. Yield attributes of various pigeonpea genotypes.

(2002) and Akaazua *et al.,* (2017).

Seed yield q/ha was found to be significantly higher in G-13 (24.90 q.) followed by G-7 (23.74 q.) and lower in G-1 (16.24 q.), when compared with check variety (MAL-13) among all the genotypes. Fig. 5 indicated that the similar results of Seed yield/hectare was observed by Zote *et al.,* (2002), Mahjabin *et al.,*(2015); Ramesh *et al.,* (2006); Varshney *et al.,* (2010); Mishra *et al.,* (2008) and Arjun *et al.,* (2010).

Conclusion

From present investigation it was concluded that the genotype G-13 and G-7 had performed well for growth and yield attributes. The genotype G-13 showed fewer days to 50% flowering, days to maturity, and maximum No. of branches per/plant, plant height (cm), No. of seeds/plant, field emergence percentage, seed yield/plant (g.), seed yield/hectare (q/ha.), weight of 100 seeds (g.) among all the genotypes with respect to check variety in the Prayagraj region.

In comparison to the check variety (MAL-13), the G-13 and G-7 genotypes took the most down days for flowering and maturity and had a good yield under Prayagraj's agro-climatic conditions. Along with many genotypes G-13 was determined to be the most promising and should be considered for commercial cultivationunder the agro-climatic conditions of Prayagraj.

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