Plant Archives Vol. 26, No. 1, 2026 pp. 302-305 e-ISSN:2581-6063 (online), ISSN:0972-5210

Plant Archives

Journal homepage: http://www.plantarchives.org

DOI Url : https://doi.org/10.51470/PLANTARCHIVES.2026.v26.no.1.042

VARIABILITY IN FLOWERING AND SEED YIELD TRAITS AMONG ONION (*ALLIUM CEPA* L.) GENOTYPES

Naveen Yadav Bairagani[1*], P. Syam Sundar Reddy[2], Syed Sadarunnisa[1], M. Jayaprada[3], K. Lalitha[4], K. Arunodhayam[5], T. Susila[6] and T. V. Surendranath Reddy[7]

[1]Department of Vegetable Science, Dr. YSRHU- College of Horticulture, Anantharajupeta, A.P., India
[2]Principal Scientist, Citrus Research Station, Petluru, A.P., India
[3]Department of Genetic and Plant breeding, Dr. YSRHU- College of Horticulture, Anantharajupeta, A.P., India
[4]Department of Agronomy, Dr. YSRHU- College of Horticulture, Anantharajupeta, A.P., India
[5]Department of Plant Pathology, Dr. YSRHU- College of Horticulture, Anantharajupeta, A.P., India
[6]Principal Scientist and Head, Horticultural Research Station, Vijayrai , A.P., India
[7]Department of English, Dr. YSRHU- College of Horticulture, Anantharajupeta, A.P., India
[*]Corresponding author E-mail: naveenbairaganiyadav@gmail.com
(Date of Receiving-08-11-2025; Date of Revision-12-12-2025; Date of Acceptance-28-01-2026)

ABSTRACT

The present investigation was conducted to evaluate the mean performance of onion (*Allium cepa* L.) genotypes for flowering and seed yield traits in order to identify superior genotypes for seed production. The experiment was carried out during the *rabi* season of 2023 at the Vegetable Block, College of Horticulture, Anantharajupeta, using the bulb-to-seed method. Thirty onion genotypes were evaluated in a Randomized Block Design with two replications at a spacing of 1 m × 1 m. Observations were recorded on days to 50 per cent flowering, number of bolts per plant, maximum bolt length, mature head height and width, number of flowers per umbel, seed test weight and seed yield per plant. Considerable variability was observed among the genotypes for all traits studied. Days to 50 per cent flowering ranged from 72.20 to 98.04 days, while seed yield per plant varied from 3.08 to 5.23 g. The genotype *Bhima Shakti* recorded superior performance for most flowering and seed yield traits, followed by *Bhima Red*, *Bhima Light Red* and *Bhima Dark Red*. The results indicated the presence of substantial genetic variability and identified promising genotypes for efficient onion seed production.

Keywords: Onion (*Allium cepa* L.), flowering and seed yield traits

Introduction

Onion (*Allium cepa* L.) is one of the most important vegetable crops cultivated worldwide and is valued for its culinary, nutritional and medicinal properties. The bulbs are rich in carbohydrates, vitamins, minerals and sulphur-containing compounds with antioxidant and health-promoting effects (Griffiths *et al.*, 2002 and Patil *et al.*, 2016). Onion is a biennial, cross-pollinated crop (2n = 16), grown as an annual for bulb production and as a biennial for seed production. Successful seed production in onion depends largely on flowering behaviour, bolting efficiency and favourable environmental conditions such as temperature and photoperiod, which regulate vernalization and floral initiation (Brewster, 1994 and Khokhar, 2008). Poor flowering synchronization, inadequate bolting and inefficient seed set are major constraints limiting onion seed productivity, particularly under tropical and subtropical conditions.

Seed yield in onion is a complex outcome of several flowering and reproductive traits including days to flowering, number of bolts per plant, flower stalk length, umbel size, number of flowers per umbel and seed weight. Considerable genotypic variation for these traits has been reported in onion germplasm, indicating ample scope for selection of superior genotypes for seed production (Chandel *et al.*, 2024 and Luitel *et al.*, 2024). Recent

studies have highlighted that genotypes with better bolting behaviour, larger umbels and higher flower numbers generally produce higher seed yield due to improved reproductive efficiency (Yadav *et al.*, 2024 and Younas *et al.*, 2025). In India, despite being one of the leading onion-producing countries, the availability of quality seed remains a major limitation affecting crop productivity. Therefore, systematic evaluation of diverse onion genotypes for flowering behaviour and seed yield traits under specific agro-climatic conditions is essential.

Material and Methods

A field experiment was conducted to study flowering behaviour, seed yield traits and their association in onion (*Allium cepa* L.) genotypes during the *Rabi* season of October 2023 at the Vegetable Block, College of Horticulture, Anantharajupeta. The experiment was laid out in a Randomized Block Design with thirty genotypes and two replications at a spacing of 1 m × 1 m using the bulb-to-seed method of propagation. Uniform, healthy mother bulbs weighing 50–60 g obtained from the first season crop, were stored for two months under ambient conditions and planted during the cooler period to ensure proper vernalization and synchronized flowering. The experimental material comprised white and red bulb genotypes collected from ICAR-Directorate of Onion and Garlic Research, Pune and ICAR-Indian Institute of Horticultural Research, Bengaluru. Each genotype was grown in a single plot per replication, and all agronomic practices including fertilization, irrigation, weed management, plant protection, earthing up, harvesting, curing and seed storage were uniformly followed as per University recommendations to avoid management-induced variation. Appropriate isolation measures were adopted wherever required to ensure genetic purity and effective seed set. Five representative plants were tagged in each plot at 30 days after planting and all flowering and seed yield observations were recorded on these tagged plants throughout the crop growth period. Days to 50 per cent flowering was recorded as the number of days from bulb planting to the stage when 50 per cent of the tagged plants produced at least one flowering stalk. The number of bolts per plant was counted manually and maximum bolt length was measured from the soil surface to the tip of the fully extended bolt. Mature head height and width were recorded at full umbel expansion, while the number of flowers per umbel was counted manually at full bloom. Seed test weight was determined by weighing a known number of seeds using an analytical balance and seed yield per plant was recorded after harvesting, drying and threshing all umbels from each tagged plant.

Table 1: Details of onion genotypes used in the experiment and source of collection.

S. No	Genotypes	Source
1	W-043	ICAR- DOGR, Pune
2	W-063	ICAR- DOGR, Pune
3	W-085	ICAR- DOGR, Pune
4	W-172	ICAR- DOGR, Pune
5	W-203	ICAR- DOGR, Pune
6	W-208	ICAR- DOGR, Pune
7	W-337	ICAR- DOGR, Pune
8	W-355	ICAR- DOGR, Pune
9	W-364	ICAR- DOGR, Pune
10	W-396	ICAR- DOGR, Pune
11	W-405	ICAR- DOGR, Pune
12	W-448	ICAR- DOGR, Pune
13	R-1672	ICAR- DOGR, Pune
14	R-1739	ICAR- DOGR, Pune
15	R-1740	ICAR- DOGR, Pune
16	R-1772	ICAR- DOGR, Pune
17	R-1773	ICAR- DOGR, Pune
18	R-1774	ICAR- DOGR, Pune
19	R-1807	ICAR- DOGR, Pune
20	Bhima Shweta	ICAR- DOGR, Pune
21	Bhima Shubhra	ICAR- DOGR, Pune
22	Bhima Safed	ICAR- DOGR, Pune
23	Bhima Dark Red	ICAR- DOGR, Pune
24	Bhima Kiran	ICAR- DOGR, Pune
25	Bhima Light Red	ICAR- DOGR, Pune
26	Bhima Raj	ICAR- DOGR, Pune
27	Bhima Red	ICAR- DOGR, Pune
28	Bhima Shakti	ICAR- DOGR, Pune
29	Arka Swadista	IIHR, Bangalore
30	Arka Vishwas	IIHR, Bangalore

Results and Discussion

The mean performance of genotypes in onion is the average expression of important traits and mean performance of genotypes is a key criterion for selecting high-yielding, good quality and widely adapted varieties, forming the foundation for genetic improvement and variety development. The mean performance of 30 genotypes of onion respective of various vegetative, yield and quality are described under below.

Flowering traits

Days to 50 per cent flowering among the onion genotypes ranged from 72.20 to 98.04 days, with a general mean of 87.22 days. The genotype Arka Swadista (72.20 days) recorded the earliest flowering, which was statistically on par with W-396 (73.01 days), W-043 (74.00 days), W-085 (74.60 days), Arka Vishwas (76.41 days), R-1739 (76.75 days), Bhima Dark Red (76.84 days), W-364 (79.04 days) and W-063 (79.50). The maximum days to 50 per cent flowering were recorded by R-1772 (98.04 days). The mean number of bolts per plant ranged from

Table 2: Mean performance of flowering and seed yield traits in thirty genotypes of onion.

Genotypes	DF	NBP	MBL	MHH	MHW
White genotypes					
W-043	74.00	2.10	59.90	7.20	8.12
W-063	79.50	1.80	56.70	7.15	8.23
W-085	74.60	1.59	50.10	7.13	7.70
W-172	88.40	1.29	56.00	5.66	6.70
W-203	89.98	1.50	58.10	7.19	8.16
W-208	87.20	1.20	48.80	5.30	7.66
W-337	94.83	1.60	49.00	5.23	6.47
W-355	96.73	1.89	53.40	7.34	8.11
W-364	79.03	1.80	55.60	7.41	8.06
W-396	73.01	2.20	57.10	7.38	8.17
W-405	91.51	2.20	56.20	5.71	7.61
W-448	92.48	1.40	49.30	7.29	8.35
Bhima Shweta	92.05	1.70	58.40	7.88	7.95
Bhima Shubra	91.92	1.80	59.40	7.92	8.52
Bhima Safed	85.55	3.00	56.60	7.61	8.63
Arka Swadista	72.20	1.60	52.20	6.58	7.64
Red genotypes					
R-1672	93.45	2.20	65.90	7.58	8.60
R-1739	76.75	1.30	56.80	7.45	7.67
R-1740	94.07	1.80	47.40	7.17	7.62
R-1772	98.04	1.40	52.00	7.73	8.16
R-1773	92.11	1.20	57.40	7.64	8.22
R-1774	90.57	1.50	54.00	7.62	8.43
R-1807	93.27	1.70	56.20	8.01	8.67
Bhima Dark Red	76.84	1.80	71.60	7.39	10.03
Bhima Kiran	97.40	2.29	57.20	7.67	9.66
Bhima Light Red	94.45	1.59	67.50	7.65	8.65
Bhima Raj	90.00	1.90	63.78	7.72	9.13
Bhima Red	85.35	2.09	62.10	7.87	9.71
Bhima Shakti	95.01	3.80	69.21	8.19	10.15
Arka Vishwas	76.41	1.90	51.50	6.46	7.78
Grand Mean	87.22	1.84	56.98	7.20	8.29
SE(m)±	2.97	0.06	0.89	0.15	0.28
CD (P=0.05)	8.59	0.17	2.58	0.42	0.81

DF: Days to 50% flowering; NBP: Number of bolts per plant; MBL: Maximum bolt length (cm); MHH: Mature head height (cm); MHW: Mature head width (cm)

Table 3: Mean performance of flowering and seed yield traits in thirty genotypes of onion.

Genotypes	NFU	STW	SYP
White genotypes			
W-043	202.50	1.69	3.37
W-063	203.60	1.75	3.16
W-085	223.98	1.98	3.45
W-172	207.59	1.71	3.17
W-203	242.53	2.51	4.13
W-208	212.36	2.09	4.00
W-337	202.68	1.87	3.44
W-355	203.00	1.73	3.33
W-364	187.80	1.50	3.08
W-396	221.36	2.32	4.29
W-405	225.27	2.48	4.18
W-448	200.68	**1.75**	**3.23**
Bhima Shweta	327.63	3.09	5.01
Bhima Shubra	313.15	2.97	4.26
Bhima Safed	303.01	2.86	4.02
Arka Swadista	213.15	2.17	3.70
Red genotypes			
R-1672	266.32	2.84	4.38
R-1739	205.00	1.97	3.60
R-1740	203.09	1.82	3.34
R-1772	284.07	2.87	4.19
R-1773	223.11	2.27	4.13
R-1774	206.81	1.75	3.15
R-1807	208.17	1.84	3.23
Bhima Dark Red	307.83	3.16	5.12
Bhima Kiran	331.68	3.12	4.09
Bhima Light Red	308.91	2.91	5.16
Bhima Raj	303.51	3.02	5.02
Bhima Red	315.26	3.10	5.19
Bhima Shakti	322.92	3.23	5.23
Arka Vishwas	198.75	2.11	3.63
Grand Mean	245.86	2.35	3.97
SE(m)±	15.09	0.17	0.23
CD (P=0.05)	43.65	0.50	0.66

NFU: Number of flowers per umbel; STW: Seed test weight (g) ; SYP: Seed yield per plant (g)

1.20 to 3.80, with a grand mean of 1.84 bolts per plant. The highest number of bolts per plant was recorded in Bhima Shakti (3.80), followed by Bhima Safed (3.00) and Bhima Kiran (2.30). These genotypes exhibited a strong tendency towards multiple scape formation. The genotypes W-208, R-1773 (1.20 each) recorded lowest number of bolts followed by W-172 and R-1739 (1.30 each). Among the genotypes, the average maximum bolt length values ranged from 47.40 to 71.60 cm resulting in an average of 56.98 cm. Genotypes such as Bhima Dark Red (71.60 cm) recorded maximum bolt length and Bhima Shakti (69.21 cm) was statistically on par with Bhima Dark Red indicating their superior scape elongation ability. Minimum bolt length was observed in R-1740 (47.40 cm), W-208 (48.80 cm) and W-337 (49.00 cm) reflecting genotypic differences in floral stalk growth. Mature head height exhibited considerable variation among the onion genotypes, indicating differential umbel development under seed production conditions. The mature head height values ranged from 5.23 to 8.19 cm, with a grand mean of 7.20 cm. The maximum mature head height was recorded in Bhima Shakti (8.19 cm) and R-1807 (8.01 cm), Bhima Shubhra (7.92 cm), Bhima Shweta (7.88 cm)

and Bhima Red (7.87 cm) were statistically on par with Bhima Shakti reflecting superior umbel growth. In contrast, W-337 (5.23 cm) and W-208 (5.30 cm) registered the lowest mature head height. For mature head width, the mean values ranged from 6.47 cm to 10.15 cm, with an average of 8.29 cm. The maximum mature head width was observed in Bhima Shakti (10.15 cm) and Bhima Dark Red (10.03 cm), Bhima Red (9.71 cm) and Bhima Kiran (9.66 cm) were statistically on par with Bhima Shakti indicating their ability to produce broader umbels. The minimum mature head width was recorded in W-337 (6.47 cm). The mean values for number of flowers per umbel ranged from 187.80 to 331.68 with an average of 245.86. The number of flowers per umbel exhibited substantial variation among the 30 onion genotypes, reflecting marked genotypic differences in floral productivity under seed production conditions. The highest number of flowers per umbel was recorded in Bhima Kiran (331.68) and Bhima Shweta (327.63), Bhima Shakti (322.92), Bhima Red (315.26), Bhima Shubhra (313.15), Bhima Light Red (308.91), Bhima Dark Red (307.83), Bhima Raj (303.51) and Bhima Safed (303.01) were statistically on par with Bhima Kiran indicating their superior floral bearing capacity. Genotypes W-364 (187.80) and Arka Vishwas (198.75) produced the lowest number of flowers per umbel. The present findings are in agreement with Aklilu *et al.,* (2001); Sultana *et al.,* (2007); Akter *et al.,* (2011) and Haile *et al.,* (2017).

Seed yield traits

Seed test weight showed significant variation among the 30 onion genotypes, indicating differences in seed size and density under seed production conditions. The seed test weight ranged from 1.50 to 3.23 g, with a grand mean of 2.35 g. The highest seed test weight was recorded in Bhima Shakti (3.23 g) and Bhima Dark Red (3.16 g), Bhima Kiran (3.12 g), Bhima Red (3.10 g) and Bhima Shweta (3.09 g), Bhima Raj (3.02 g), Bhima Shubhra (2.97 g), Bhima Light Red (2.91 g), Bhima Safed (2.87 g), R-1772 (2.87 g) and R-1672 (2.84 g) were found statistically on par with Bhima Shakti indicating superior seed boldness and better seed filling capacity. In contrast, the lowest seed test weight was observed in W-364 (1.50 g). Seed yield per plant varied widely among the 30 onion genotypes, indicating pronounced differences in seed production potential under the experimental conditions. The seed yield per plant ranged from 3.08 g to 5.23 g, with an overall mean value of 3.97 g per plant. The maximum seed yield was obtained from Bhima Shakti (5.23 g), and Bhima Red (5.19 g), Bhima Light Red (5.16 g), Bhima Dark Red (5.12 g), Bhima Raj (5.02 g) and Bhima Shweta (5.01 g) were statistically on par with Bhima Shakti reflecting their superior reproductive efficiency. In contrast, W-364 (3.08 g) registered the lowest seed yield per plant. Similar findings are reported by Aklilu *et al.,* (2001); Sultana *et al.,* (2007) and Luitel *et al.,* (2024).

Conclusion

The study revealed wide variability among onion genotypes for flowering, bolting, umbel traits, seed quality, and seed yield per plant. Early flowering genotypes with higher bolting capacity and superior umbel development exhibited enhanced reproductive efficiency. Greater floral density and higher seed test weight contributed to improved seed formation and seed quality. Seed yield per plant varied markedly and reflected the combined influence of favourable flowering and reproductive traits. Genotypes such as Bhima Shakti showed superior performance and are promising for onion seed production.

References

Aklilu, S., Dessalegne L. and Currah L. (2001). Association of characters and path coefficient analysis of seed yield and yield components in onion (*Allium cepa* L.). *Acta Agronomica Hungarica*, **49(2)**, 175-181.

Akter, M.S., Ivy N.A., Mian M.A.K. and Hoque M.M. (2011). Variability and character association for reproductive traits in onion (*Allium cepa* L). *Bangladesh Journal of Plant Breeding and Genetics*, **24(1)**, 27-32.

Brewster, J.L. (1994). *Onions and other vegetable alliums*. CAB International.

Chandel, R., Singh S., Kumar A., Taak Y. and Khar A. (2024). Genetic diversity of morphological and yield traits in onion. *Indian J. of Agri. Sciences*, **94(6)**, 632–637.

Griffiths, G., Trueman L., Crowther T., Thomas B. and Smith B. (2002). Onions—A global benefit to health. *Phytotherapy Research*, **16**, 603–615.

Haile, A., Tesfaye B. and Worku W. (2017). Seed yield of onion (*Allium cepa* L.) as affected by bulb size and intra-row spacing. *African J. of Agri. Research*, **12(12)**, 987-996.

Khokhar, K.M. (2008). Flowering and seed development in onion. *J. of Horti. Sci. and Biotechnology*, **83**, 447–454.

Luitel, B.P., Han J., Kang S., Cho M.C. and Choi M.S. (2024). Variations in seed yield and related traits in onion germplasm collections. *Horticultural Science and Technology*, **42(1)**, 68–79.

Patil, B.S., Jayaprakasha G.K., Murthy K.N.C. and Vikram, A. (2016). Bioactive compounds in onion. *Journal of Agricultural and Food Chemistry*, **64**, 6355–6362.

Sultana, M., Islam A.K.M.A., Rasul M.G., Mian M.A.K. and Hossain T. (2007). Estimation of correlation and path coefficients of seed yield contributing traits in onion (*Allium cepa* L.). *Indian J.* of *Horticulture*, **57**, 329-333.

Yadav, A., Singh R.K., Kumar R. and Tiwari C.P. (2024). Evaluation of onion genotypes for yield and related traits. *J. of Advances in Biology & Biotechnology*, **27(5)**, 32–40.

Younas, O., Ahmad H. and Rasheed S.M. (2025). Evaluation of exotic onion germplasm for yield and agronomic traits. *Journal of Soil, Plant and Environment*, **4(1)**, 61–71.