

Evaluation of Dahlia (*Dahlia variabilis* L.) genotypes under *Tarai* conditions of Uttarakhand

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ABSTRACT

The present investigation was conducted to evaluate the performance of sixteen genotypes of Dahlia based on vegetative and floral attributes at the Model Floriculture Centre, G.B. Pant University of Agriculture and Technology, Pantnagar. The experiment was laid out in a randomized complete block design with three replications. Present findings revealed that among all the varieties of Dahlia, maximum plant height (88.18 cm), number of leaves (48.66), number of branches (8.75), plant spread (57.83 cm) and stem girth (1.50 cm) were observed in Mother Teresa, Mangal Pandey, Tufan, Sohire and S. P. Kamla, respectively. While minimum days taken for the first bud appearance (35.26 days) and days taken for the first flower opening (96.46) were recorded in Blackout and Mangal Pandey, respectively. Whereas in terms of flower quality, Jijshu recorded significantly better performance like maximum flower diameter (22.75 cm) and flower weight (68.90 g). Maximum number of flowers (17.66) and vase life (7.67 days) were recorded in S. P. Kamala. It was observed from the experimental results that S.P. Kamala was suitable for cultivation in the *Tarai* regions of Uttarakhand during the winter season period. The overall performance of all the cultivars was influenced by their heritability and environmental conditions.

Key words: Dahlia, genotype, heritability, *Tarai*, S.P. Kamala.

INTRODUCTION

Dahlia (*Dahlia variabilis* L.) is one of the most popular tuberous-rooted perennials, herbaceous flowering plants belonging to the family Asteraceae. It is valued for its gorgeous attractive spectacular flowers and is grown in different parts of the world for its beautiful ornamental blooms of varying shades of colours for the beautification of gardens, cut flowers and as a loose flower. It originated in Mexico and Central America and was domesticated in Mexico before 1575 (Pandey *et al.*, 2015). The genus 'Dahlia' received its name from Abbe Cavanilles in the

year 1971 in the honour of Dr. Andreas Dahl (Manjula *et al.*, 2017). Dahlia was introduced to India as early as 1857 under the auspices of the Agri-Horticultural Society of India (formerly, Royal Agri - Horticultural Society of India) (Malik *et al.*, 2017). The chromosome number of *Dahlia variabilis* L. is $2n = 64$. 12 species of Dahlia are commonly found in Mexico. Among these eight species viz., *Dahlia variabilis*, *D. imperialis*, *D. exelsa*, *D. coronata*, *D. coccinea*, *D. merkii*, *D. zuarezii* and *D. rosea* are generally important (Wararkar *et al.*, 2020). Out of these eight species, *D. variabilis* and *D. rosea* are of

horticultural importance and include showy, fancy, anemone flowered, cactus and semi-cactus, peony, decorative, ball, fimbriated, water lily and star type. These two species are the parents of most of the pompon cultivars.

The height of dahlia plants varies from 30 to 180 cm depending upon the cultivar. Dahlia flower consists of a certain number of outer ray florets in which the male organs are modified into a strap-shaped petal, arranged around a central disk of bisexual florets. Dwarf growing types are suitable for flower beds and borders (pure or mixed borders) whereas, large flowers are suitable for pot culture. Cut flowers of pompon and miniature types stay fresh in flower vases for many days and are better to make moderately good garlands and to use as individual loose flowers (Shukla *et al.*, 2018).

As Dahlia is still an uncut diamond for India, evaluation is the stepping stone to utilize any crop to its full potential. Evaluation is a necessary pre-requisite for crop improvement and it will provide a rapid, reliable and efficient means of information to augment the utilization of germplasm. Since the performance of each genotype varies with region, season and growing environment, therefore testing the performance

of the available genotypes for suitability and adaptability takes prime importance, as the research work on this line is meager in the *Tarai* region of Uttarakhand.

MATERIALS AND METHODS

The experiment was conducted at the Model Floriculture Centre, Govind Ballabh Pant University of Agriculture and Technology, Pantnagar, District Udham Singh Nagar (Uttarakhand) during 2022-23. The area is situated in the *Tarai* region, foothills of the Himalayas at 29° North altitude and 79.3° East longitude. The soil of the experimental plot was sandy loam with adequate drainage and optimum water-holding capacity. The 16 varieties being evaluated under the investigation were V1: Sovra, V2: Sohire, V3: Black Eternity, V4: Sanfi, V5: Terijin Norge, V6: Anurag, V7: Kenya Yellow, V8: S. P. Suparna, V9: Mother Teresa, V10: Oril Kamal, V11: Jijshu, V12: S.P. Kamala, V13: Black out, V14: Priyasona, V1: Tufan and V16: Mangal Pandey. The experiment was laid out in a randomized block design with three replications and each genotype had 10 rooted cuttings per replication. Observations were taken from five plants randomly from each replication. The

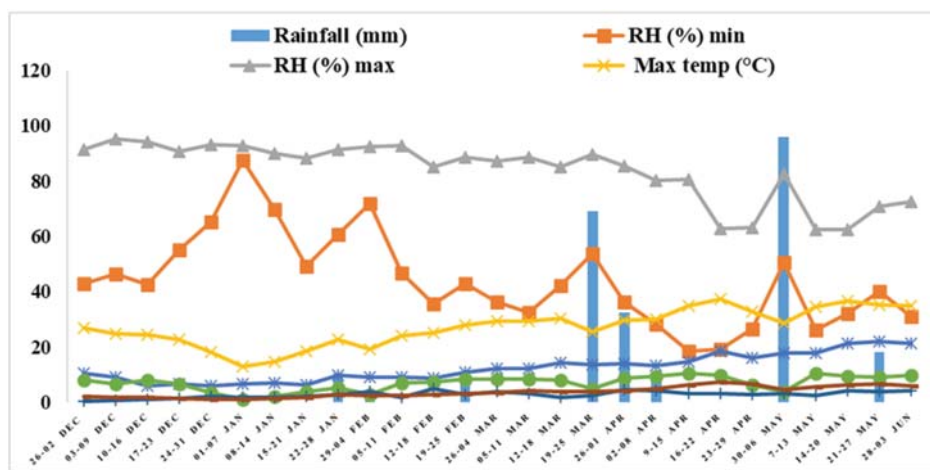


Fig. 1: Meteorological data of 2022-2023.

rooted cuttings were well-moistened and kept in a greenhouse condition in sand for better growth. The rooted cuttings were planted on the second week of December at the spacing of 90 cm × 70 cm. The data on different studied parameters were statistically analysed by using analysis of variance technique for the randomized block design with help of OPSTAT software developed by O.P. Sheoran Programmer, Computer Section, Chaudhry Charan Singh Haryana Agriculture University, Hisar.

RESULT AND DISCUSSION

The results of the present investigation indicated that all the dahlia genotypes exhibited significant variation for the studied parameters.

Vegetative parameters

Plant height : A significant difference was seen in the plant height at different stages of plant growth. The variation in plant height is

represented in Table 1.

Plant height at 30 DAT was recorded significantly higher in the variety Mother Teresa (33.26 cm) as compared to other varieties whereas, the lowest plant height was recorded in Kenya Yellow (10.50 cm).

A significant difference was also observed in the interval of 60 DAT in terms of plant height. The plant height at 60 DAT was found highest in variety Mother Teresa (62.26 cm) whereas, genotype Kenya Yellow recorded the minimum plant height (19.30 cm).

Plant height at 90 DAT was recorded significantly highest in Mother Teresa (85.73 cm) as compared to other genotypes whereas, variety S. P. Kamala recorded the lowest plant height (44.76 cm).

Maximum plant height at 120 DAT was found in the variety Mother Teresa (88.18 cm) whereas the minimum plant height was found in the variety S. P. Kamala (51.19 cm). Due to genetic

Table 1: Plant height (cm) at different growth stages of Dahlia genotypes.

Varieties	Plant height (cm)			
	30 DAT	60 DAT	90 DAT	120 DAT
Sovra	19.76	37.13	56.30	62.72
Sohire	22.76	44.00	63.60	75.26
Black Eternity	15.04	25.20	45.06	51.73
Sanfi	21.40	36.06	65.96	69.74
Terijin Norge	28.10	56.40	75.66	79.18
Anurag	15.60	31.43	49.63	52.06
Kenya Yellow	10.50	19.30	47.73	53.56
S.P. Suparna	19.03	37.60	58.20	64.67
Mother Teresa	33.26	62.26	85.73	88.18
Oril Kamal	21.10	47.30	67.26	71.28
Jijshu	20.16	36.30	71.26	75.68
S. P. Kamala	11.80	23.33	44.76	51.19
Black out	16.80	22.76	56.47	61.00
Priyasona	14.60	27.13	67.48	70.87
Tufan	15.63	30.36	58.16	63.28
Mangal Pandey	22.26	35.06	60.08	64.84
C.D.	11.85	18.72	18.11	2.39
SE(m)	4.08	6.45	6.24	0.78

control, plant height varied among cultivars and was also impacted by a number of biotic and environmental factors. Kumar (2017) observed a similar kind of variation in plant height among dahlia cultivars.

Number of leaves per plant : Observation on number of leaves per plant has been presented in Table 2. A glance over the data indicates that the variety Mangal Pandey showed the highest number of leaves (48.66) whereas, the variety Oril Kamal showed the lowest number of leaves (21.66) among all the other varieties. The variation in leaf number between cultivars can be attributed to plant genetic characteristics as well as a variety of other environmental factors. A higher number of leaves indicates a higher-quality plant. Similar findings have been reported by Gupta *et al.* (2015).

Number of primary branches per plant : On perusal of data tabulated in Table 2. It was depicted from the study that significant difference

was observed in the Dahlia cultivars in terms of number of primary branches per plant. The variety having the highest number of primary branches was Tufan (8.75) whereas, the least number of primary branches were found in Terijin Norge (2.50). The genetic composition of the plant and biotic and abiotic factors may be responsible for the variation in the number of primary branches. Munikrishnappa (2013) in China aster and Gupta *et al.* (2015) in Dahlia reported a similar type of variation.

Plant spread (cm) : In Dahlia cultivation, one of the most crucial factors is plant spread. It facilitates the optimal use of sunlight and the proper spacing of plants. The data on plant spread was depicted in Table 2. The cultivar Sohire showed a maximum plant spread of 57.83 cm whereas the cultivar Oril Kamal showed a minimum plant spread of 26.18 cm after 120 days of transplanting. The greatest plant spread was primarily due to the presence of more

Table 2: Number of leaves, number of branches and plant spread (cm), stem girth (cm) at 120 days after transplanting of Dahlia genotypes.

Varieties	Number of leaves/ plants	Number of primary branches/plants	Plant spread (cm)	Stem girth (cm)
Sovra	34.00	7.50	27.43	1.43
Sohire	44.66	3.50	57.83	1.03
Black Eternity	28.66	5.50	41.24	1.37
Sanfi	33.33	5.00	45.26	0.97
Terijin Norge	30.33	2.50	41.57	1.13
Anurag	31.66	3.00	27.90	0.77
Kenya Yellow	33.33	5.00	39.78	1.37
S.P. Suparna	36.33	6.50	37.04	0.80
Mother Teresa	32.00	6.00	46.31	1.13
Oril Kamal	21.66	6.75	26.18	1.17
Jijshu	37.33	4.50	45.87	1.40
S. P. Kamala	27.66	3.70	43.39	1.50
Black Out	42.66	6.75	37.95	0.67
Priyasona	37.00	7.00	55.77	0.98
Tufan	38.66	8.75	35.13	0.87
Mangal Pandey	48.66	7.95	34.51	1.39
C.D.	10.29	2.45	11.48	0.45
SE(m)	3.54	0.80	3.95	0.16

branches and broad-leaved plants. Verma *et al.* (2017) reported similar results.

Stem girth (cm) : Stem girth contributes to the plant's stability. Otherwise, weak and thin stems may cause plant lodging in windy conditions. The data regarding stem girth depicted in Table 2 showed that maximum stem girth (1.50 cm) was recorded in cultivar S. P. Kamala, whereas, minimum stem girth (0.67 cm) was recorded in cultivar Black Out. These findings were confirmed by the work of Vikas *et al.* (2015) in dahlia and Yadav *et al.* (2007) in chrysanthemum cultivars.

Flowering parameters

Days taken for first bud appearance : Data recorded on days taken to the first bud appearance was depicted in Table 3. Among all cultivars, the earliest flower bud appearance (35.26 days) was recorded in the cultivar Black Out. However, there was a significant difference among the cultivars. Whereas, the delayed number of days

taken for the first bud appearance (49.33 days) was recorded in the cultivar Terijin Norge. The results were in accordance with the findings of Kanamadi and Patil (2002) in dahlia.

Days taken for first flower opening : The perusal of data tabulated in Table 3. revealed that the minimum days taken for the first flower opening (93.46 days) was recorded in the cultivar Mangal Pandey. However, the maximum number of days taken for the first flower opening (115.76 days) was recorded in the cultivar Terijin Norge. Similar findings were reported by Kumar *et al.* (2009) in dahlia.

Number of flowers per plant : Table 3 illustrates the variations in the number of flowers each plant produces. During the peak flowering period, the total number of flowers was counted. Among Dahlia cultivars, there were significant variations in the total number of flowers per plant. The cultivar S. P. Kamala recorded the maximum number of flowers per plant (17.66), while Sanfi

Table 3: Days taken for first bud appearance, Days taken for first flower opening and number of flowers per plant of Dahlia genotype.

Varieties	Days taken for first bud appearance	Days taken for first flower opening	Number of flowers per plant
Sovra	48.87	108.03	10.00
Sohire	46.68	112.73	13.33
Black Eternity	47.31	111.71	12.33
Sanfi	49.17	110.23	8.33
Terijin Norge	49.33	115.76	11.33
Anurag	48.21	104.92	13.00
Kenya Yellow	46.07	112.67	14.66
S.P. Suparna	39.17	99.19	12.33
Mother Teresa	45.73	106.85	13.66
Oril Kamal	40.10	103.33	12.00
Jijshu	46.17	105.30	12.66
S. P. Kamala	48.33	102.87	17.66
Black out	35.26	99.53	14.00
Priyasona	45.30	103.08	9.66
Tufan	40.70	100.33	12.33
Mangal Pandey	38.40	93.46	9.67
C.D.	2.26	4.74	3.37
SE(m)	0.78	1.63	1.16

recorded the least (8.33). Environmental and genetic factors of the Tarai region also contributed to the variation in flower count. The above results corroborated the findings of Baburao *et al.* (2018) in dahlia.

Flower diameter (cm) : As far as flower diameter is concerned, it varied significantly concerning different Dahlia cultivars and data is represented in Table 4. Data showed that the maximum flower diameter was recorded in the cultivar Jijshu (22.75 cm) whereas, the minimum flower diameter was recorded in the cultivar S.P. Suparna (15.05 cm). The flower diameter was measured from east to west, then north to south and the mean was estimated. The variation in flower diameter could be attributed to genotypic expression. Kumar *et al.* (2010) found similar results in the flower diameter of dahlia plants.

Flower weight (g) : Data recorded on flower weight is depicted in Table 4. When flowers reached their full size and were in full bloom,

the fresh weight of each cultivar's flowers was calculated. The maximum flower weight (68.90 g) was found in the cultivar Jijshu, whereas, the minimum flower weight (18.00 g) was found in the cultivar Tufan. Various biotic and abiotic factors influenced the flower weight. Higher amounts of water and carbohydrates in the flower could be the cause of this variation. The findings aligned with the observations made by Dhane and Nimbalkar (2002) regarding dahlia cultivars.

Vase life (days) : The time taken from the first day to the wilting or falling of petals on cut stems of Dahlia flowers was recorded. The data presented in Table 4 summarizes the vase life of different cultivars of Dahlia. Maximum vase life was observed in the cultivar S.P. Kamala (7.67 days) whereas, minimum vase life was recorded in the cultivar Oril Kamal (3.33 days). The increased accumulation of carbohydrates may also be responsible for the flower's vase life. Mahawer *et al.* (2010) and Dhane and Nimbalkar (2002) also present similar findings in dahlia.

Table 4: Vase life (days), flower weight (gm) and flower diameter (cm) of Dahlia genotypes.

Varieties	Flower diameter (cm)	Flower weight (g)	Vase life (days)
Sovra	18.30	41.55	4.67
Sohire	19.35	45.35	5.67
Black Eternity	19.65	38.75	6.67
Sanfi	18.10	59.65	6.33
Terijin Norge	18.10	28.85	5.33
Anurag	17.05	65.35	5.67
Kenya Yellow	17.65	46.45	5.00
S.P. Suparna	15.05	33.10	4.33
Mother Teresa	13.50	26.45	6.00
Oril Kamal	19.90	42.40	3.33
Jijshu	22.75	68.90	4.00
S. P. Kamala	16.30	38.90	7.67
Black out	19.95	51.20	6.00
Priyasona	17.55	39.95	4.67
Tufan	15.15	18.00	5.33
Mangal Pandey	18.25	39.90	6.00
C.D.	3.66	26.66	1.40
SE(m)	1.20	8.76	0.48



Mangal Pandey



Priyasona



Tufan



Blackout



Jijshu



S. P. Kamla



Mother Teresa



Kenya



S. P. Suparna



Anurag



Terijin Norge



Sanfi



Sovra



Sohire



Black Eternity



Oril Kamal

CONCLUSION

The dahlia genotypes under the study showed significant difference in among number of vegetative and floral traits. In current study S.P. Kamala genotype was superior in terms of numbers of flower per plant and other quality trait such as vase life, stem girth. Heritability and environmental conditions had an impact on each cultivar's overall performance. It can be concluded that S.P. Kamala genotype is suitable for cultivation in tarai region of Uttarakhand in winter season.

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