Evaluation of dahlia (*Dahlia variabilis* L) cultivars for growth and flowering characteristics under sub-montane, sub-tropical low hill zone of Himachal Pradesh

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ABSTRACT

The investigations were aimed at to evaluate the dahlia genotypes for growth and yield parameters under sub-montane, sub-tropical low hill zone of Himachal Pradesh. Significant differences were found in all the growth and yield parameters among different cultivars of dahlia. Maximum plant height was recorded in cultivar Shanti (118.29 cm), maximum plant spread in cultivar Black Eternity (58.67 cm) and the highest stem girth in cultivar Anadinath (1.56 cm). Maximum internodal length, flower stalk length and flowering duration (24.01 cm, 21.79 cm and 107.56 days respectively) were found in cultivar Red Army. The highest number of side shoots was recorded in cultivars SP Kamla (12.22) and Lokeshwar (12.22). Leaf area was maximum in cultivar Sohini (257.71 cm^2) and maximum number of leaves in Suryadev (132.44). The cultivar Giani Zail Singh took maximum number of days (74.67 days) for the flower bud initiation whereas the minimum number of days for flowering was taken by the cultivar Bada Kachari (102.42 days). Among all the tested cultivars the largest flower size was recorded in Kenya Orange (26.28 cm) and maximum vase life in cultivar Mother Teresa (6.44 days).

Keywords: Dahlia; growth; yield; vegetative characters; floral characters

INTRODUCTION

Dahlia (*Dahlia variabilis*) belongs to the family Asteraceae and occupies a place of pride in any garden at any place. Dahlia is one of the most common perennial tuberous, herbaceous flowering plants valued for its beautiful and spectacular flowers. This plant is cultivated in many parts of the world for its exquisite ornamental bloom of different colour shades to embellish gardens, cut flowers and as a loose flower. Dahlia originated in Mexico and was introduced in India in 1857 under the auspices of the Indian Agri-Horticultural Society (formerly the Royal Agri-Horticultural Society of India). Depending on the cultivar, the height of dahlia plants ranges from 30 to 180 cm. Dahlia flower consists of a number of outer ray florets in which the male organs are transformed into a strap-shaped petal arranged around a central disk of bisexual florets. The ray florets in dahlia actually have all the colours of the flower whereas the disk florets are yellow in particular. Dwarf growing varieties are ideal for flower beds and boundaries (pure or mixed boundaries) whereas broad dahlia is ideal for pot flowering. Cut pompon and miniature varieties of flowers stay fresh for many days in flower vases and are better to make moderately good garlands and use them as individual loose flowers.

Dahlia is India's uncut diamond; evaluation is the stepping stone to make full use of this valuable plant. Since the performance of each genotype varies with region, season and that environment, it is therefore important to check the value of the available cultivars for quality, aesthetic sense and adaptability. In view of all these points investigations were conducted to assess the quality of various cultivars of dahlia for their growth and yield characteristics.

MATERIAL and METHODS

The present investigations were carried out at the experimental farm of Regional Horticultural Research and Training Station, Dhaulakuan, Sirmour, Himachal Pradesh during 2018-2019. The experimental area is located at 30º.4' North latitude and 77º.5' East longitude and lies at an elevation of 468 m amsl under the sub-tropical low hills. The soil structure of the experimental site was gravelly loam to gravelly clay loam with pH ranging from 6.85 to 7.04. Spacing was 60 × 40 cm and the beds of the size 1.2 × 1.2 m were prepared in the field. The rooted plants were planted in field in replicated RBD trial. Observations were made on the vegetative and floral parameters viz plant height, plant spread, stem girth, internodal length, number of side shoots, leaf area, number of leaves/ plant, days taken to bud formation, days taken to flowering, flower size, number of flowers/plant, flower stalk length, duration of flowering and vase life of dahlia cultivars: T_1 (Anadinath), T_2 (Anarkali), T_3 (Bada Kachari), T_4 (Bharti), T_5 (Black Eternity), T_6 (Eternity Sport), T_7 (Gargi), T_8 (Giani Zail Singh), T_9 (Gilody), T_{10} (Hiranmoyee), T_{11} (Jishu), T_{12} (Kenya Orange), T_{13} (Kenya Yellow), T_{14} (Krishna Kalli), T_{15} (Lokeshwar), T_{16} (Matungini), T_{17} (Mother Teresa), T_{18} (Priyadarshini), T_{19} (Red Army), T_{20} (SP Kamla), T_{21} (Shanti), T_{22} (Sohini), T_{23} (Suryadev) and T_{24} (Tenzin).

RESULTS and DISCUSSION

Vegetative characteristics

Significant variations were found in various vegetative characters of the available dahlia cultivars. The data presented in Table 1 reveal that maximum plant height (118.29 cm) was recorded in cultivar Shanti whereas the minimum in Hiranmoyee (43.46 cm). The plant spread ranged from 40.50 cm in Hiranmoyee to 58.67 cm in Black Eternity due to the varietal differences. The cultivar Anadinath had significantly highest stem girth (1.56 cm) at all the growth stages whereas Anarkali recorded the lowest stem girth (0.90 cm). The internodal length was more in the cultivar Red Army (24.01 cm) which resulted in increase in height. The cultivar Anarkali (7.27 cm) recorded least internodal length. The number of side shoots was recorded maximum in the cultivars SP Kamla (12.22) and Lokeshwar (12.22) whereas minimum in cultivar Matungini (9.00). Among all the tested cultivars leaf area was maximum in the cultivar Sohini (257.71 cm²/ leaf) and minimum in Anarkali (79.87 cm²/leaf). Significantly maximum number of leaves was recorded in the cultivar Suryadev (132.44) and minimum in Matungini (60.33).

Plant height is a genetically influenced factor; it may differ among the different cultivars due to the environmental conditions, cultural practices and production technology. Major variations in plant height were observed in dahlia by Syamal and Kumar (2002) and Vikas et al (2015). Plant spread and number of primary branches are important growth factors for flower crops. These help to utilize the sunlight to its maximum. There was significant variation among the plant spread and number of primary branches due to the genetic makeup of the cultivars and development of the secondary branches. Gupta et al (2015) recorded similar variations in plant spread and number of primary branches. Stem girth varies among the different cultivars due to the difference in the genetic makeup of the cultivars and influence of the growing environmental conditions. Variation in the stem girth was recorded by Mounika and Saravanan (2019). Significant variation was observed among different genotypes of dahlia for the internodal length. Maximum internodal length was recorded in the cultivar Sourav (18.25 cm) (Manjula and Nataraj 2016). Leaf area and number of leaves per plant varied due to differences in the rate of vegetative growth of the genotypes that could be attributed to genetic makeup and further influenced by agroclimatic conditions. Similar kind of results were reported by Dhane and Nimbalkar (2002).

Floral characteristics

Significant variations were found in various floral characters of dahlia cultivars (Table 2). The days taken for the bud formation were found minimum (74.67 days) in Giani Zail Singh and maximum (95 days) in Tenzin cultivar. Significantly minimum number of days for flowering was taken by the cultivar Bada Kachari (102.42 days) whereas maximum by cultivar Tenzin (126.56 days). Maximum flower size was recorded in the cultivar Kenya Orange (26.28 cm) and minimum in Mother Teresa (16.33 cm). Maximum number of flowers/plant was observed in the cultivar SP Kamla (42.11) and minimum in Matungini (31.33). The longest flower stalk was recorded in cultivar Red Army (21.79 cm) and the smallest (10.12 cm) in Anarkali. Maximum flowering duration was recorded in cultivar Red Army (107.56 days) and minimum in Anadinath (63.44 days). Vase life of flowers significantly differed among different cultivars. Variation in vase life among the genotypes might be attributed to the increased accumulation of carbohydrates. Maximum vase life was

Table 1. Performance of dahlia cultivars for different vegetative characters

Treatment	Plant height (cm)	Plant spread (cm)	Stem girth (cm)	Internodal length (cm)	Number of side shoots	Leaf area (cm^2)	Number of leaves/plant
T_1	83.76	46.97	1.56	8.97	9.78	123.28	89.00
T_2	51.59	40.65	0.90	7.27	10.00	79.87	93.11
T_3	103.81	47.04	0.92	14.87	10.78	112.66	84.67
T_4	81.19	49.60	1.11	13.52	9.78	212.15	85.22
T_5	69.10	58.67	1.36	9.83	11.89	95.16	107.44
T_6	62.92	45.03	1.38	10.32	11.22	132.59	98.55
T_7	54.69	48.27	1.21	8.70	10.11	166.35	82.00
T_8	71.01	46.70	1.43	9.91	9.67	129.85	84.55
T_9	60.78	44.39	1.07	11.69	11.89	188.03	97.22
T_{10}	43.46	40.50	1.02	11.87	11.33	130.33	84.11
T_{11}	70.31	48.15	1.39	13.06	10.11	173.65	63.44
T_{12}	71.87	47.73	1.24	9.46	11.66	98.86	98.22
T_{13}	73.77	43.51	1.35	9.13	11.11	96.25	70.89
T_{14}	109.15	45.56	1.43	15.49	10.56	124.35	89.78
T_{15}	77.58	49.11	1.03	10.67	12.22	185.93	115.67
T_{16}	62.88	48.05	1.10	11.42	9.00	227.13	60.33
T_{17}	63.37	46.88	1.13	14.02	10.22	166.51	95.67
T_{18}	85.54	53.99	1.39	11.04	10.67	81.80	109.33
T_{19}	112.58	51.58	0.94	24.01	11.89	128.10	100.34
T_{20}	84.71	51.36	1.16	10.07	12.22	231.81	125.33
T_{21}	118.29	55.41	1.37	12.34	10.56	189.75	93.45
T_{22}	82.51	48.13	1.39	13.98	10.00	257.71	61.11
T_{23}	64.68	45.73	1.19	12.55	11.33	95.61	132.44
T_{24}	103.50	48.01	1.15	16.16	9.55	164.50	86.11
$CD_{0.05}$	4.95	3.34	0.19	1.62	1.34	20.80	6.02
Mean ± SE	77.63 ± 1.73	47.96 ± 1.17	1.22 ± 0.07	12.10 ± 0.57	10.73 ± 0.47	149.68 ± 7.28	92.00 ± 2.11

T_1: Anadinath, T_2: Anarkali, T_3: Bada Kachari, T_4: Bharti, T_5: Black Eternity, T_6: Eternity Sport, T_7: Gargi, T_8: Giani Zail Singh, T_9: Gilody, T_{10}: Hiranmoyee, T_{11}: Jishu, T_{12}: Kenya Orange, T_{13}: Kenya Yellow, T_{14}: Krishna Kalli, T_{15}: Lokeshwar, T_{16}: Matungini, T_{17}: Mother Teresa, T_{18}: Priyadarshini, T_{19}: Red Army, T_{20}: SP Kamla, T_{21}: Shanti, T_{22}: Sohini, T_{23}: Suryadev, T_{24}: Tenzin

recorded in cultivar Mother Teresa (6.44 days) and minimum in Red Army (3.22 days).

Thus there were significant variations among cultivars for the characteristics like days taken to bud formation and flowering, flower size, flowers/plant and flower stalk length.

The varieties showed significant differences for the number of days taken for bud formation which may be due to better growth and development in terms of maximum number of leaves, branches and plant spread which led to higher production and accumulation of sugar leading to switching of vegetative phase into reproductive phase.

Similar results were also reported by Dhane and Nimbalkar (2002) and Kumar et al (2010) in dahlia. The variation among the varieties for number of days taken to flowering and flower size could be mainly because of genetic factors or cultural operations like disbudding and pinching. Similar results were also reported by Mahawer et al (2010) in dahlia. The variation in the number of flowers per plant may be directly related to the genetic makeup and climatic conditions prevailing in Sirmour region. Similar results were also reported by Baburao et al (2018).

For garden display, flower longevity is important factor. Duration of flowering is a genetically influenced factor and it differed among the different cultivars due to cultural and production technology. These findings are closely related with the work of Dhane and Nimbalkar (2002) and Kumar et al (2010) in dahlia.

Vase life of flower is influenced by water relations and carbohydrate status of flowers. Similar effect on vase life was also reported by Dhane and Nimbalkar (2002) and Mahawer et al (2010) in dahlia in their studies.

Table 2. Performance of dahlia cultivars for different floral characters

Treatment	Days taken to bud formation (days)	Days taken to flowering (days)	Flower size (cm)	Number of flowers/plant	Flower stalk length (cm)	Duration of flowering (days)	Vase life (days)
T_1	77.56	109.15	16.60	32.45	15.92	63.44	4.67
T_2	77.89	110.55	17.01	36.55	10.12	106.89	5.00
T_3	80.83	102.42	16.75	36.56	19.58	77.78	6.22
T_4	77.42	112.67	19.30	38.22	18.81	100.56	5.33
T_5	87.67	111.33	18.13	38.00	15.46	92.55	5.78
T_6	89.89	115.11	19.11	38.00	17.26	100.78	5.00
T_7	78.33	104.33	19.70	32.11	15.17	100.44	4.44
T_8	74.67	104.33	16.99	35.11	16.71	91.44	4.89
T_9	84.22	103.45	16.79	35.44	16.31	95.22	4.89
T_{10}	78.11	105.11	17.90	35.44	16.63	90.33	5.45
T_{11}	78.00	105.89	18.45	34.22	18.17	82.33	3.33
T_{12}	77.78	104.00	26.28	32.00	17.56	102.56	5.00
T_{13}	84.11	112.00	21.41	32.78	16.61	92.44	4.89
T_{14}	94.00	124.33	17.00	34.89	20.04	84.22	5.22
T_{15}	83.44	105.78	16.62	38.22	16.08	102.44	3.33
T_{16}	76.33	104.33	19.75	31.33	12.67	106.00	3.56
T_{17}	86.11	106.11	16.33	35.33	16.11	106.33	6.44
T_{18}	84.00	113.00	17.51	39.89	16.99	64.00	6.22
T_{19}	80.55	102.44	16.67	40.22	21.79	107.56	3.22
T_{20}	82.56	105.56	17.16	42.11	17.24	106.78	5.22
T_{21}	76.11	103.22	18.68	41.00	18.86	106.34	6.22
T_{22}	76.89	104.56	17.41	34.44	15.74	98.00	4.67
T_{23}	84.99	107.00	18.46	39.22	17.11	97.00	6.11
T_{24}	95.00	126.56	22.12	33.11	17.34	89.89	6.33
$CD_{0.05}$	2.67	3.87	1.36	4.69	1.70	2.48	0.61
Mean ± SE	81.92 ± 0.93	108.47 ± 1.36	18.42 ± 0.48	36.11 ± 1.64	16.85 ± 0.60	94.39 ± 0.87	5.06 ± 0.21

TT_1: Anadinath, T_2: Anarkali, T_3: Bada Kachari, T_4: Bharti, T_5: Black Eternity, T_6: Eternity Sport, T_7: Gargi, T_8: Giani Zail Singh, T_9: Gilody, T_{10}: Hiranmoyee, T_{11}: Jishu, T_{12}: Kenya Orange, T_{13}: Kenya Yellow, T_{14}: Krishna Kalli, T_{15}: Lokeshwar, T_{16}: Matungini, T_{17}: Mother Teresa, T_{18}: Priyadarshini, T_{19}: Red Army, T_{20}: SP Kamla, T_{21}: Shanti, T_{22}: Sohini, T_{23}: Suryadev, T_{24}: Tenzin

CONCLUSION

Significant variations were found in various vegetative and floral characteristics of tested dahlia cultivars. In the present study SP Kamla was found superior in terms of yield and other qualitative traits among all the tested cultivars. Among the cultivars evaluated the cultivar Bada Kachari can be grown for early crop whereas Red Army was found suitable for longer flower duration; Kenya Orange had the maximum flower size; Lokeshwar and SP Kamla had maximum number of side shoots and cultivar Anadinath had maximum stem girth.

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