



Evaluation of different chrysanthemum (*Chrysanthemum morifolium*) genotypes under mid hill conditions of Garhwal Himalaya

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ABSTRACT

Fifteen chrysanthemum (*Chrysanthemum morifolium* Ramat.) genotypes were assessed for their performance under mid hill conditions of Garhwal Himalaya during 2009–10. Uniform healthy suckers were planted at a spacing of 30 cm×20 cm in randomized block design with three replications. Significant differences were obtained among the genotypes for all morphological and floral characters studied. Genotype Saifali recorded maximum (149.71 cm) plant height, followed by Terry (132.92 cm) but plant spread was maximum in genotype Paris White (45.04 cm), followed by Suneel (44.50 cm), however it was minimum in Saifali (25.96 cm). Genotype Paris White produced maximum number of primary (15.16) and secondary branches (19.16)/plant while minimum, i.e. 4.41 and 8.16 was recorded in genotype Saifali, respectively. Earliest bud burst (9.33 days) was observed in genotype Red Queen, whereas genotype Charming was late (30.00 days). The highest number of flowers/branch (10.43) was produced by genotype White Anemone followed by Gauri (9.08) and Appu (7.66), but number of flowers/plant was higher (301.00) in Paris White and minimum (66.33) was recorded with genotype Suneel. Extended period of vase life was recorded in Gauri (24.66 days), followed by Shanti (22.00 days), while it was low with Red Queen (5.33 days). Keeping these characters in view, genotypes White Anemone, Shanti and Charming were found to be highly suitable to grow under these conditions for cut and loose flowers.

Key words: Chrysanthemum, Evaluation, Germplasm

Chrysanthemum (*Chrysanthemum morifolium* Ramat.) presently known as *Dendrathera grandiflora* Tzvelev. (Anderson 1987) is an important flower crop grown throughout the world for its attractive coloured flowers, which are used as loose and cut flowers. It is commonly known as Guldaudi, Autumn Queen, or Queen of East belonging to family Asteraceae. Chrysanthemum is gaining popularity in the Uttarakhand mostly as potted plant at house hold level. The climate of the state is also congenial for its production which can fetch high prices in big cities, especially during the off-season. It is a popular flower of commercial importance in many parts of the world owing to its unsurpassed beauty and economic values. The wide variation exhibited by large number of genotypes makes it conceivable for a flower crop. It requires long days for vegetative growth and short days for flowering. It is grown under a wide range of climatic conditions, but the performance of a genotype

varies with the region, season and other growing conditions. Therefore, evaluation of different cultivars is of paramount importance so that suitable cultivars can be suggested for commercial cultivation in the state. Some works have been reported in other regions by various workers (Kumar *et al.* 2007, Singh *et al.* 2008, Swaroop *et al.* 2008). Keeping the importance of such a study in view, the present investigation was under taken to evaluate different genotypes for different growth and flowering attributes under mid hill conditions of Garhwal Himalaya.

MATERIALS AND METHODS

The present investigation was conducted at Department of Horticulture, G B Pant University of Agriculture and Technology, Hill Campus, Ranichauri, Tehri Garhwal, Uttarakhand which is situated at an altitude of 2 000 m at MSL, involving 15 genotypes during 2009–10. Suckers of 15 genotypes of chrysanthemum namely Appu, Charming, Dainty Maid, Gauri, Indian, Jabra, Kargil, Paris White, Red Queen, Shanti, Saifali, Sonoton, Suneel, Terry and White Anemone were collected from Model Floriculture Centre, G B Pant University of Agriculture and Technology, Pantnagar,

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Udham Singh Nagar, Uttarakhand. The suckers were planted in open field conditions at spacing of 30 cm × 20 cm in randomized block design with three replications consisting 16 plants in each replication. Five plants were selected from each replication for recording observation. The observations were recorded after the bud-initiation stage. Uniform package of practices were followed throughout the cropping season to grow a successful crop. Data were recorded for several growth and flowering characters, viz plant height, plant spread, number of branches, duration of flowering, days for 1st bud appearance, number of flower, average weight of flowers and vase life using the standard methods. The collected data was subjected to statistical analysis as suggested by Cochran and Cox (1992).

RESULTS AND DISCUSSION

Data presented in Table 1 reveal that there is a significant variation among all the genotypes studied. Plant growth is usually a good index of plant vigour, which may contribute towards greater productivity. It also serves as a guide to determine the suitable varieties for obtaining maximum yield. Maximum plant height at the time of 1st bud appearance was recorded for genotype Saifali (149.71 cm), followed by Terry (132.92 cm), while genotype Appu attained the lowest (37.81 cm) height. The variation in plant height can be attributed to genetic constitution (Singh *et al.*, 2008). Plant spread at grand growth stage was observed maximum in Paris White (45.04 cm), followed by Suneel (44.50 cm), whereas minimum in Saifali (25.96 cm). The increase in plant spread was might be due to the production of increased number of branches. Number of branches/plant is an important characters, which signifies canopy shape and architecture of plant and among the evaluated genotypes,

genotype Paris White produced maximum (15.16 and 19.16) number of primary and secondary branches/plant while least minimum (4.41 and 8.16) was reported in genotype Saifali, respectively. Considerable variations in leaf area were also observed in the present study. Further, Shanti registered maximum (9054.59 cm²/plant) leaf area and minimum (2125.02 cm²/plant) in Appu. Higher leaf area in these genotypes was due to increased number of leaves and their size.

Time taken for 1st bud appearance and days to bud burst by different genotypes was significantly altered (Table 2). Genotype Jabra and Charming were earliest to flower followed by Dainty Maid, Terry, Indian, Appu, Sonoton, Paris White, White Anemone, Gauri, Kargil, Shanti and Suneel whereas Red Queen and Saifali took the maximum days to produce flower. Variation for late or early flowering seems to be genetically controlled characters in the genotypes and have also been reported by Kanamadi and Patil 1993. It is clearly revealed from the data presented in Table 2 that days taken to bud burst was minimum (9.33 days) with genotype Red Queen, whereas it was maximum (30 days) with genotype Charming. Duration of flowering is very important which signifies the availability of flowers in the market. Among the evaluated cultivars duration of flowering was found to be maximum in Charming (55 days), followed by Jabra (45.66 days) while it was shorter in (17.00 days) in Red Queen. The variation for the blooming among the genotypes can be attributed to the differences in the genetic makeup of genotype. Peduncle length is an important character as the genotype having more peduncle length is generally preferred for preparation of bouquets. Peduncle length was found to vary significantly and the minimum (1.21 cm) was found in Terry and six genotypes, viz Saifali, Charming, Dainty Maid,

Table 1 Performance of chrysanthemum genotypes for floral characters under Garhwal conditions

Genotype	Plant height (cm)	Plant spread (cm)	No. of primary branches/plant	No. of secondary branches/plant	Leaf area (cm ² /plant)
Appu	37.81	28.00	11.08	15.08	2125.02
Charming	93.00	39.95	6.66	14.00	5261.90
Dainty Maid	84.25	42.25	5.08	9.08	4344.20
Gauri	95.66	39.38	6.42	13.42	3896.86
Indian	76.08	32.64	6.75	8.42	6591.65
Jabra	96.92	32.16	6.58	13.58	5494.45
Kargil	66.08	36.53	6.50	13.50	2787.87
Paris White	77.58	45.04	15.16	19.16	5674.34
Red Queen	76.00	42.19	7.98	11.98	5665.51
Shanti	55.66	34.65	10.25	13.25	9054.59
Saifali	149.71	25.96	4.41	8.16	4605.95
Sonoton	84.83	42.12	9.84	13.85	7169.68
Suneel	105.16	44.50	11.33	15.23	5356.56
Terry	132.92	38.71	6.80	12.46	6350.29
White Anemone	55.16	37.17	7.75	11.75	2829.66
CD (<i>P</i> =0.05)	1.94	1.60	0.67	0.66	67.43

Table 2 Floral characters performance of chrysanthemum genotypes under Garhwal conditions

Genotype	Days taken for first bud appearance	Days taken to bud burst	Flowering duration (days)	Peduncle length (cm)	No. of flower/branch	No. of flowers/plant	Flower diameter (cm)	Weight flower (g)	100-flower weight	No. of ray florets	Vase life (days)
Appu	122.33	21.00	25.00	5.22	7.66	115.42	2.08	1.19	186.08	150.33	16.66
Charming	119.66	30.00	55.00	9.89	3.91	106.25	3.39	3.32	252.52	220.00	12.33
Dainty Maid	121.33	27.00	28.33	9.62	3.00	114.00	4.68	3.14	215.00	165.00	8.33
Gauri	124.66	25.66	24.00	6.40	9.08	108.16	3.28	1.30	125.80	241.94	24.66
Indian	121.66	25.33	28.66	8.77	5.00	213.83	3.11	1.22	113.00	52.50	14.33
Jabra	118.33	27.00	20.66	5.99	4.25	144.36	4.04	1.22	134.79	217.16	11.66
Kargil	124.66	23.66	45.66	7.45	5.83	177.68	4.19	0.42	39.83	22.33	14.00
Paris White	123.33	22.66	20.66	5.53	4.75	301.00	2.35	1.04	100.95	164.83	6.66
Red Queen	152.33	9.33	17.00	9.21	3.83	144.48	7.51	2.13	176.35	168.78	5.33
Sonoton	122.33	26.66	17.33	7.69	4.58	190.75	3.29	1.09	89.93	31.50	11.33
Saifali	158.33	17.66	37.00	9.48	3.08	113.50	7.77	3.52	350.29	245.50	5.66
Shanti	128.33	24.00	26.33	7.80	5.08	190.75	3.35	1.95	190.66	113.00	22.00
Suneel	129.66	23.66	39.00	9.34	3.66	66.33	5.29	1.97	165.13	246.50	8.33
Terry	121.33	24.66	21.00	1.21	3.92	99.78	4.62	1.04	97.55	43.83	8.33
White Anemone	123.33	28.00	20.66	4.16	10.43	288.08	1.97	0.36	30.43	30.50	7.66
CD ($P=0.05$)	0.88	1.87	1.96	0.69	1.06	2.41	0.28	0.238	0.951	2.37	0.84

Suneel, Red Queen and Indian have a Peduncle length between 8 and 10 cm, while rest of the eight genotypes attain a moderate peduncle length which vary from 4–7 cm. Genotype White Anemone produced maximum number of flowers/branch (10.43), followed by Gauri (9.08) and Appu (7.66). Significantly maximum number of flowers/plant was produced by genotype Paris White (301.00), followed by White Anemone (288.08), whereas Suneel produced least flowers (66.33)/plant. Similar variation among the varieties with regard to number of flower/plant had also reported by Dahiya *et al.* (2007). Flower diameter is very important character for deciding the quality of flowers. Largest flower was recorded in genotype Saifali (7.77 cm), followed by Red Queen (7.51 cm) while smallest (1.97 cm) was recorded in White Anemone. Variation in flower diameter might be due to the genetic makeup of the varieties and their interaction with prevailing genotype and environment. Present findings are in agreement with the finding of Rao and Pratap (2006). Heaviest flower at harvest was produced in Saifali, (3.52 g), followed by Charming (3.32 g), while White Anemone produced lightest flower (0.36 g). Due to heaviest flower Saifali recorded maximum 100 flower weight of 350.29 g, followed by Charming 252.52 g. Similar variation among the different chrysanthemum genotypes has also been observed by Laxmi *et al.* (2008). Maximum number of ray florets/flower was recorded in Suneel (246.50), followed Saifali (245.00). Similarly different genotypes showed significant variation in ray floret length and the longest was noted in Saifali (4.60 cm) and shortest in Appu (1.31 cm). This variation may be due to the genetic makeup of the genotypes and similar results were also reported by Gupta and Datta (2005). Vase life or keeping quality of flowers is

of greater value in determining the safe marketing of flowers to the distant markets. At room temperature significantly extended period of vase life was recorded in Gauri (24.66 days), followed by Shanti (22.00 days), while the keeping quality was low with Red Queen (5.33 days). The variation in vase life of flowers must be due to the differences in senescencing behavior of the cultivars by producing higher amount of ethylene forming enzymes. This fact was also in agreement with Kandpal *et al.* (2003) in Gerbera.

On the basis flower yield and quality it can be concluded that out of seventeen genotypes evaluated White Anemone, Shanti and Charming were found to be promising for growing as cut and loose flowers under agro-climatic conditions of Garhwal Himalayas.

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