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## Performance and flower characterization of chrysanthemum (*Dendranthema grandiflora* Tzvelev) genotypes under Agro-climatic region of western Uttar Pradesh

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**Abstract**

In the present study, twenty genotypes of chrysanthemum collected from the IARI were evaluated under irrigated condition at Horticultural Research Centre (HRC) of Sardar Vallabhbhai Patel University of Agriculture & Technology, Meerut (INDIA) research farm during the season (2016-17). A wide range of variation in the performance of the varieties were observed for various characters. The minimum days to flower bud initiation (43.53 days) and minimum days for flowering (69.53 days) was observed in the cultivar of Ajay while cultivar White Star produced larger size flower (9.97 cm). The maximum flowering duration (57.53 days) was observed with the cultivar of Haldighati and maximum plant height at flower bud initiation stage (28.27 cm) and plant height at full bloom (57.53 cm) was observed with the cultivar of Sunny. Cultivar of Basanthi produced maximum number of primary branches (7.93), plant spread (70.73 cm) and maximum number of flowers. On the basis of present studies genotypes namely Ajay, Ajay orange, Sunny, Pusa Centenary, Basanthi, Yellow Charm recommended for commercial production for western Uttar Pradesh.

**Keywords:** chrysanthemum, flower characterization, desirable traits, western Uttar Pradesh

**1. Introduction**

Chrysanthemum (*Dendranthema grandiflora* Tzvelev) belongs to the Asteraceae family (COMPOSITAE) and is one of the most important flower crops in India. The species is suitable for cut flowers with the most important characteristics are due to its attractive colour, long vase life, tough flowers, uniform opening, long erect stem, long inter-notes, normal spray with high centre bloom and easy to open flower buds at the destination. In the trade of global flower market, chrysanthemum is the second largest cut flower after rose. It is being cultivated for both as cut flower and potted plant. Chrysanthemum is originated from Greek word "Chryos" means Gold According to Dwivedi and Banerji, (2009) [5], It is commonly known as Queen of East/ autumn queen/ guldaudi and also known as National Flower of Japan. The basic chromosome number of chrysanthemum is 9, while 2n ranges from 36 to 75 though most of them are hexaploid. In western Uttar Pradesh, it is primarily grown for decoration and landscaping either in the ground or in pots. No data regarding the suitable commercial cultivars for western Uttar Pradesh conditions is available. Thus, it is necessary to identify the most suitable cultivars for the particular region. Keeping in view this lack of information the present study was undertaken to assess the performance of *chrysanthemum* genotypes and to identify superior genotypes for commercial flower yield under western Uttar Pradesh.

**2. Materials and Methods**

The present investigation was conducted at Horticultural Research Centre (HRC) of Sardar Vallabhbhai Patel University of Agriculture & Technology, Meerut INDIA research farm during the season (2016-17). A total of 20 genotypes of chrysanthemum collected from Indian Agricultural Research Institute New Delhi, were used for study. The region has a semi-arid sub-tropical climate with an average annual temperature of 16.80C. The predominant soil at the experimental site is classified as *Typic ustochrept*. Soil samples for 0-20 cm depth at the site were collected and tested prior to applying treatments and the basic properties were non-saline (EC 0.42 dS m<sup>-1</sup>) but mild alkaline in reaction (pH 7.98).

The soil initially had 4.1 g kg<sup>-1</sup> of SOC and 1.29 g kg<sup>-1</sup> of total N (TN), 1.23 g kg<sup>-1</sup> of total phosphorus, 17.63 g kg<sup>-1</sup> of total potassium, 224mg kg<sup>-1</sup> of available N, 4.0 mg kg<sup>-1</sup> of available phosphorus, and 97 mg kg<sup>-1</sup> of available potassium. The experiment was laid down in Randomized Block Design with three replications. Each plot comprised one row of 4.5 m length and rooted plant spaced at 45 cm. All agronomical practices were followed under irrigated conditions as per crop needs. The observations were recorded on five random competitive plants per replication for each genotype on both quantitative traits (viz. days to flower bud initiation, days to flowering, flower size, flowering duration, plant height at flower bud initiation stage, plant height at full bloom, number of primary branches per plant, Plant spread) and qualitative traits (viz. Flower colour, Disc colour, Type of flower). The mean values of the selected plants from each plot were used for statistical analysis. The analysis of variance was carried out as described by Goulden (1959).

### 3. Results and Discussion

**3.1 Performance of chrysanthemum genotypes:** The mean performance of 20 *chrysanthemum* varieties for 8 characters is presented in Table 1 which showed the significant variation among the different genotypes. Cultivar Ajay initiated early bud (43.53 days) and maximum days taken in the cultivar White Star (82.33 days). Similar trend of findings was reported by Kanamadi and Patil (1993)<sup>[8]</sup>, Mohapatra *et al.*, (2000)<sup>[10]</sup>, and Pal and George (2002)<sup>[12]</sup>. The minimum days to flowering was recorded with cultivar Ajay (69.53 days) followed by Ajay Orange (82.47 days) and maximum days taken to flowering was recorded with the cultivar Liliput (116.33 days). Significant differences with regards to days to flowering in chrysanthemum were also documented by Kanamadi and Patil (1993)<sup>[8]</sup>, Mohapatra *et al.*, (2000)<sup>[10]</sup>, and Deka and Paswan (2001). White Star produced larger size flower (9.97 cm) followed by Pusa Centurary (9.08 cm) and cultivar Liliput gave the smaller flower (2.21 cm). Similar results reported by Raghava *et al.*, (1992)<sup>[13]</sup>, Mishra (1999), Hemlata *et al.*, (1992), Talukdar *et al.*, (2003)<sup>[16]</sup>. Maximum flower duration (57.53 days) was recorded with the cultivar of Haldighati followed by Thai Chin Queen and Ramlal Dada (56.47 days) and minimum flower duration (35.53 days) were observed with the cultivar Pusa Sona. The present findings are in close conformity with earlier findings by Mohapatra *et al.*, (2000)<sup>[10]</sup> in chrysanthemum. Significant variation in plant

height at flower bud initiation was observed among the genotypes and maximum plant height (28.27 cm) was observed in the cultivar of Sunny and minimum height (13.33 cm) was observed with the cultivar of Sadhbhawana. The findings are in agreement with reported by Pal and George (2002)<sup>[12]</sup>. Cultivar Sunny showed maximum plant height (51.53 cm) at plant attained after full bloom while minimum height (18.47 cm) gave by the cultivar of Sadbhawana. Similar findings were recorded by by Shanker and Tewari (1993), Mohapatra *et al.*, (2000)<sup>[10]</sup> and Dilta *et al.* (2005)<sup>[3]</sup>. Variation in number of primary branches per plant was observed among the genotypes and cultivar Basanthi produced maximum number of primary branches per plant (7.930) followed by the cultivar Thai Chin queen (6.27 branches) and minimum number of primary branches (3.27) gave by the cultivar White Star. The findings were quite similar as reported by Shanker and Tewari (1993), Talukdar *et al.*, (2003)<sup>[16]</sup>. Plant spread also showed significant differentiation among the genotypes and cultivar Basanthi gained maximum (70.73 cm) plant spread and minimum plant spread (21.73 cm) attained by the cultivar White Star. Similar findings were recorded by Kanamadi and Patil (1993)<sup>[8]</sup>, Shanker and Tewari (1993), and Talukdar *et al.*, (2003)<sup>[16]</sup>. Cultivar Basanthi produced maximum number of flowers (218.67) followed by, Yellow Charm (199.67 flowers) and minimum number of flowers (31.41) gave by White Star. Similar results were also closely related by Negi and Raghava, (1985)<sup>[11]</sup>, Hemalata *et al.*, (1992)<sup>[7]</sup>, Talukdar *et al* (2003)<sup>[16]</sup>, and Baskaran *et al.*, (2004)<sup>[1]</sup>. Differences in vegetative and flowering characters of different cultivars may be due to varied growth rate and their genetic makeup of plant. Similar observation was reported by Swaroop, K., (2010) in gladiolus. Cultivar identification and cultivar morphological characterization are important issues for horticultural breeders. Genetic variation among *Dendranthema* species, related to the cultivated chrysanthemum, is extremely high, with a very low similarity among species. Besides that, genetic variation within species is also very high. To obtain new desirable recombinants in chrysanthemum, studies on gene actions and interactions are possible in the expression of quantitative traits and it is advisable to make crosses between genotypes selected with high mean performance to get desirable transgressive segregates. Dwivedi A.K. and Mitra S.K., (1996)<sup>[4]</sup>.

**Table 1:** Mean performance of 20 genotypes for different quantitative characters in chrysanthemum

S. No.	Genotypes	Days to flower bud initiation	Days to flowering	Flower size (cm)	Flowering duration (days)	Plant height at flower bud initiation stage (cm)	Plant height after full bloom (cm)	Number of primary branches per plant <sup>-1</sup>	Plant spread (cm)	Number of flowers per plant <sup>-1</sup>
1	Thai Chin Queen	59.53	85.53	6.75	56.47	21.47	34.47	6.27	38.47	138.47
2	Pusa Arunoday	60.47	90.27	7.25	52.67	26.33	45.53	5.67	46.47	154.73
3	Yellow Charm	72.27	109.47	3.79	35.67	15.67	23.53	3.67	41.73	199.67
4	Pusa Sona	60.53	90.33	3.63	35.53	15.33	22.73	3.53	37.33	46.07
5	Pusa Centenary	71.73	105.47	9.08	53.67	27.73	42.47	4.47	62.53	61.53
6	Pusa Aditya	71.47	104.33	5.64	38.47	27.53	40.33	3.73	43.73	66.53
7	Sunny	64.73	106.73	5.75	42.27	28.27	51.53	4.47	36.27	102.47
8	Pusa Kesari	57.47	97.53	8.75	50.47	24.27	42.27	5.67	44.33	141.73
9	Sadbhawana	64.13	95.47	3.56	41.47	13.33	18.47	5.47	46.67	80.67
10	Lalith	64.47	95.53	5.16	39.47	25.67	39.73	3.73	40.53	94.53
11	Ajay	43.53	69.53	4.77	50.53	21.43	41.53	3.67	42.73	64.47
12	Pusa Chitraksha	78.53	107.53	5.76	41.53	21.27	40.47	3.47	58.73	77.33
13	Basanthi	60.27	96.67	4.14	49.33	26.67	48.47	7.93	70.73	218.67
14	Ramlal Dada	59.47	91.53	4.18	56.47	22.33	37.27	4.33	47.53	100.47
15	Haldighati	55.53	88.47	3.86	57.53	26.47	41.67	4.27	35.53	115.47

16	Star White	82.33	112.47	9.97	54.33	27.53	47.33	3.27	21.73	31.47
17	Lal Pari	77.47	102.53	3.96	42.47	20.53	38.47	3.53	28.27	167.47
18	Jaya	67.53	94.33	5.94	40.73	24.47	43.27	3.87	56.27	118.73
19	Ajay Oranage	52.47	82.47	4.84	37.33	23.53	41.47	3.27	47.67	78.47
20	Lilyput	73.67	116.33	2.21	46.53	20.33	34.47	4.13	50.47	42.33
	Mean	64.88	97.13	5.45	46.15	23.01	38.77	4.42	44.89	105.06
	C.V.	1.49	1.13	1.56	2.41	3.73	1.07	2.64	1.76	0.65
	S.E	0.79	0.90	0.07	0.91	0.70	0.34	0.10	0.64	0.56
	C.D. 5%	1.61	1.82	0.14	1.84	1.43	0.69	0.19	1.31	1.13

**Table 2:** Qualitative characters of 20 genotypes of chrysanthemum

S. No.	Genotypes	Flower colour	Disc colour	Type of flower
1.	Thai Chin Queen	Orange	*	Double
2.	Pusa arunoday	Pink	Yellow	Double
3.	Yellow charm	Yellow	Yellow	Semi-double
4.	Pusa sona	Yellow	Yellow	Semi-double
5.	Pusa centenary	Yellow	*	Double
6.	Pusa aditya	Yellow with orange centre	Orange	Semi-double
7.	Sunny	Blood red	*	Double
8.	Pusa kesari	Saffron	*	Double
9.	Sadbhavana	Dark orange	Yellow	Semi-double
10.	Lalith	White	*	Double
11.	Ajay	Pink	*	Double
12.	Pusa Chitraksha	Deep magenta	Yellow	Semi-double
13.	Basanthi	Yellow	Yellow	Semi-double
14.	Ramlal dada	Yellow	*	Single
15.	Haldighati	Dark yellow	*	Double
16.	Star white	White	*	Double
17.	Lal pari	Red	Yellow	Semi-double
18.	Jaya	White	*	Double
19.	Ajay oranage	Orange	*	Double
20.	Lilyput	Yellow	*	Double

\* Disk not available

**Variability in Chrysanthemum genotypes**

**3.2 Flower Characterization:** Qualitative characters of 20 genotypes presented in Table 2. Eleven types of flower colours were found in *chrysanthemum* genotypes. Thai Chin Queen and Ajay Orange showed orange coloured flowers. Pusa Arunoday and Ajay showed pink colour. Yellow Charm, Pusa Sona, Pusa Centenary, Basanthi, Ramlal Dada, Lilyput presented yellow colour. Pusa Aditya showed yellow with orange centre colour. Star White, Lalith and Jaya showed white colour. Sunny, Pusa Kesari, Sadbhavana, Pusa Chitraksha, Haldighati and Lal Pari, presented blood red, saffron, dark orange, deep magenta, dark yellow and red colour, respectively. Out of 20 genotypes disk are present in 8 genotypes (genotypes Pusa Arunoday, Yellow Charm, Pusa Sona, Sadbhavana, Pusa Chitraksha, Basanthi and Lal Pari showed yellow colour of disk. Pusa Aditya showed orange colour of disk). Thai Chin Queen, Pusa Arunoday, Pusa Centenary, Sunny, Pusa Kesari, Lalith, Ajay, Haldighati, Star White, Jaya, Ajay Orange and Lilyput presented Double type of flowers. Yellow Charm, Pusa Sona, Pusa Aditya, Sadbhavana, Pusa Chitraksha, Basanthi and Lal Pari showed semi-double type of flower. Genotype Ramlal Dada showed single type flower. These variations could be due to genotypic variation. The data have also been supported by Kher M.A (1976) [9], Simrat *et al* (2008) [15]. Which reported different flower colours like mauve, yellow, pinkish white, and white etc. in *chrysanthemum*.

#### 4. Conclusion

On the basis of present studies genotypes namely Ajay, Ajay orange, Sunny, Pusa Centenary, Basanthi, Yellow Charm recommended for commercial production for western Uttar Pradesh as they performed better over others in terms of days to flower bud initiation, plant height after full bloom, number of flowers per plant.

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