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Short communication

Evaluation of chrysanthemum (*Chrysanthemum morifolium* Ramat.) genotypes for morphological traits

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ABSTRACT

Thirty small-flowered genotypes of chrysanthemum (*Chrysanthemum morifolium* Ramat.) were evaluated for various morphological and floral characters at Research Farm, Department of Floriculture and Landscaping, PAU, Ludhiana, during 2013-14. All the varieties suitable for different purposes like pot culture, garden decoration, cut flower, loose flower and bedding purposes were evaluated. Results revealed that the genotypes differed significantly with each other with respect to plant growth and flowering parameters like plant height, number of branches per plant, plant spread, days taken to bud appearance, and, floral traits like number of flowers per plant, diameter of flower, flowering duration, flower colour and flower type. On the basis of morphological traits, the varieties were grouped into various categories for different purposes, viz., cut flower, loose flower, bedding/garden decoration and pot culture.

Key words: Chrysanthemum, cultivars, quantitative traits, variability

Chrysanthemum (*Chrysanthemum morifolium* Ramat.) is one of the most widely cultivated herbaceous perennial flowering plants belonging to family Asteraceae. It is commonly known as Autumn Queen or Queen of East, and is extensively grown all over the world for its beautiful, charming flowers having excellent vase life. In India, chrysanthemum cultivation covers 20.14 thousand hectare, with loose flower production of 202.63 million tonnes and cut-flower production of 1415.79 lakh flowers (Anon., 2013). It is one of the most widely cultivated garden flowers with diverse and beautiful range of colours, shades, widely variable flower shapes and range of height (Swaroop *et al*, 2008). These characters make it highly suitable for pot culture, bedding purposes and for production of loose flowers for use in garland making, in worship and for decoration purposes. It also produces long, sturdy stems with good keeping quality, thus making it most suitable for cut-flower and exhibition purposes. Loose flower types are more popular in India for as these are used for making *venis*, garlands, bouquets and for religious offerings.

Though a large number of chrysanthemum varieties are available in the market, novelty in commercial traits like flower colour, shape, size, growth habit, post-harvest life of the flower, etc., are always valued and preferred by the consumer. There is a perpetual demand for superior varieties over the existing ones. It, thus, becomes necessary to evaluate and categorize available chrysanthemum varieties on the basis of their use. With this in view, investigations were undertaken to evaluate chrysanthemum varieties for various uses.

The present study was carried out at Research Farm, Department of Floriculture and Landscaping, Punjab Agricultural University, Ludhiana, in the year 2012-13. Ludhiana is situated between 33º55' North Latitude and 75º54' East Longitude at 247m above mean sea level. The soil at the experimental site was sandy-loam with pH 8.3 and good water-holding capacity besides medium fertility. For evaluation, 30 spray-type chrysanthemum varieties were used: Ajay, Apsara, Autumn Joy, Baggi, Banglori, Birbal Sahni, Chidori, Crystal Fall, Garden Beauty, Kelvin Mandarin, Kotai-Na-Katori, Naintara, Obsession, Olympia, Otome Pink, Purnima, Ratlam Selection, Ravi Kiran, Reagan Emperor, Reagan White, Santi, Punjab Gold, White Bouquet, White Staphour, Winter Queen , Wiron, Yellow Bonsai, Yellow Chram, Yellow Delight and Yukari.

Rooted cuttings were transplanted to the main field during the 4th week of July, at a spacing of 30 x 30cm in beds 1.0m wide. Recommended package of practices was employed to obtain satisfactory plant growth. The varieties were planted in three replications, and five plants were

selected in each variety / replication for making observations. Data were analyzed using Randomized Block Design (RBD).

Pinching operation was performed at two stages – the first at four weeks after transplanting, and the second at seven weeks after transplanting, to encourage emergence of lateral shoots. Adequate measures were taken to prevent lodging by staking the plants. Data on growth and floral parameters, viz., plant height at first bud appearance (cm), number of branches per plant, plant spread (cm), days taken to first bud appearance, number of flowers per plant, flower diameter (cm), flowering duration (days), flower colour and type, were recorded.

Data presented in Table 1 on plant height at appearance of the first bud shows a difference among varieties. Results revealed that Reagan White was the tallest at the time of first-bud appearance (88.1cm), followed by Reagan Emperor (73.13cm), whereas, the variety 'Chidori' was dwarf compared to all other varieties tested, with the lowest plant height (12.7cm). Similar variations among different varieties of chrysanthemum for plant height have

Table 1. Evaluation of chrysanthemum varieties for various morphological and floral attributes

Variety	Plant height at first-bud appearance (cm)	Number of branches per plant	Plant spread (cm)	Days taken to first-bud appearance	Number of flowers per plant	Flower diameter (cm)	Flowering duration (days)	Flower colour	Flower Type
Ajay	45.06	3.33	39.86	67.33	54.00	4.73	32.00	Yellow	Pompom
Apsara	55.50	7.66	44.10	71.76	75.33	4.80	30.00	Creamish, with purple margins	Decorative
Autumn Joy	45.93	6.00	40.53	74.80	128.33	9.67	30.00	Pink	Decorative
Baggi	72.40	10.66	57.10	72.46	123.33	6.40	26.00	White	Pompom
Banglori	59.23	6.66	45.60	73.70	82.33	5.40	30.00	Yellow	Pompom
Birbal Sahni	58.20	3.66	36.60	70.49	27.33	5.53	23.00	White	Pompom
Chidori	12.70	7.00	20.26	73.36	75.66	2.36	36.67	White and Yellow	Single Korean
Crystal Fall	17.13	4.66	14.23	58.34	21.66	3.83	32.00	Red	Decorative
Garden Beauty	65.20	4.33	40.10	70.07	85.00	10.36	32.67	Maroon	Spoon type
Kelvin Mandarin	49.13	5.66	39.53	70.03	54.00	4.60	28.80	Deep orange	Pompom
Kotoi-Na-Kaori	16.23	4.66	30.33	61.32	159.33	3.30	41.00	Golden-bronze	Anemone
Naintara	66.26	6.00	46.96	65.19	187.33	4.46	37.00	Yellow	Decorative
Obsession	38.86	5.33	24.83	66.67	14.33	7.26	35.80	Pink	Decorative
Olympia	54.00	5.00	42.10	74.67	61.33	4.70	37.40	Orange	Pompom
Otome Pink	63.10	4.66	39.80	63.73	36.33	8.26	33.40	Pink, with deep pink centre	Double Korean
Punjab Gold	37.66	5.00	35.90	69.69	164.33	4.50	36.00	Yellow	Double Korean
Purnima	46.80	5.66	40.70	72.24	46.00	7.60	34.00	White	Decorative
Ratlam Selection	70.66	11.33	61.20	75.41	150.00	8.83	24.40	Creamish-white	Decorative
Ravi Kiran	58.37	5.33	49.76	65.42	45.33	9.63	30.00	Maroon	Decorative
Reagan White	88.10	6.66	53.73	55.18	51.66	7.50	36.33	White	Single Korean
Reagan Emperor	73.13	6.33	48.93	75.74	54.66	7.40	29.33	Purple-pink	Single Korean
Santi	46.23	4.66	36.73	72.93	33.66	6.40	39.00	Cream	Decorative
White Bouquet	38.83	6.33	33.23	62.40	62.66	4.66	38.00	White	Pompom
White Staphour	57.00	5.66	45.13	69.93	66.66	8.70	34.00	White	Anemone
Winter Queen	59.00	5.00	50.90	76.88	78.00	9.76	35.67	Pink	Spoon type
Wiron	58.03	5.33	40.60	67.34	42.33	5.23	30.00	Yellow, with chocolate center	Single Korean
Yellow Bonsai	32.66	5.66	45.33	76.82	319.33	4.33	38.60	Yellow	Single Korean
Yellow Chram	15.16	8.00	32.66	59.01	290.00	3.30	25.33	Yellow	Anemone
Yellow Delight	53.16	4.00	37.16	51.68	61.33	4.96	32.20	Yellow	Pompom
Yukari	16.33	6.33	23.13	65.34	179.33	2.70	34.00	Pink	Single Korean
CD *(P=0.05)*	1.84	1.04	4.21	10.69	11.92	0.35	1.49	—	—
C.V. (%)	2.31	11.00	6.46	9.57	7.73	3.72	2.78	—	—
SEM±	0.79	0.44	1.82	4.62	5.15	0.48	0.64	—	—

been recorded earlier by various workers (Gaikwad and Dumbre Patil, 2001; Chahal, 2011).

Highest number of branches per plant (11.33) was recorded in 'Ratlam Selection', followed by Baggi (10.66). Least number of branches per plant (3.33) was obseved in 'Ajay' (Kumar and Chattopadhyay, 2002). Swaroop *et al* (2008) also reported variation among varieties of chrysanthemum for number of branches.

Maximum plant spread (61.2cm) was observed in 'Ratlam Selection', followed by Baggi (57.1cm). Minimum plant spread (14.23cm) was recorded in the variety 'Crystal Fall'. Seventeen *Chrysanthemum* genotypes were also evaluated for vegetative growth, flowering and yield parameters by Kulkarni and Reddy (2004) who concluded that among the various accessions, Harvest Home, Mutant No. 9, Selection-5, Kurnool, Saraval and Chandrika were superior in terms of having fairly good plant-spread, number of branches, leaf area and good flower-yield, compared to the other genotypes.

Days taken for appearance of the first bud is an important character signifying early or late flowering habit. Both these traits are helpful in ascertaining availability of flowers for a longer period. Maximum days taken to first bud appearance (76.82) was recorded in 'Yellow Bonsai'. 'Yellow Delight' recorded minimum number of days (51.68) to first bud appearance. Variation for early and late flowering appears to be a genetically controlled trait in the varieties. Similar observations were made by Kanamadi & Patil (1993) in chrysanthemum.

Number of flowers per plant was recorded as highest (319) in 'Yellow Bonsai', followed by 'Yellow Charm' (290), while, minimum number of flowers (14.33) were recorded in 'Obsession'. As for flower diameter, 'Garden Beauty' recorded maximum flower diameter (10.36cm), while, 'Chidori' recorded minimum flower diameter (2.36cm). Longest flowering-duration was observed in 'Kotoi-na-Kaori' (41.00 days), while the shortest duration of flowering (23 days) was observed in the variety 'Birbal Sahni'. Flowers of varied hues and shades, along with various flower-type, were observed among the varieties. Dilta *et al* (2005) also reported a wide range of diversity in the number of flowers, flower size and flowering duration in different varieties of chrysanthemum. Differences among chrysanthemum varieties have also been reported for several morphological and floral characters by Anuradha *et al* (2000) and Rao and Pratap (2006).

Cultivars studied by us can be grouped as per morphological variation in plant height, flower size, and other characters. These varieties can also be categorized for different uses, like, cut-flower, (Reagan Emperor, Reagan White, Yellow Delight and Kelvin Mandarin); garden decoration and bedding purpose (Garden Beauty and Winter Queen); for loose flower production (Birbal Sahni, Baggi and Ratlam Selection) and the varieties Chidori, Yellow Charm and Punjab Gold for pot culture.

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