



Screening of Standard Chrysanthemum (*Chrysanthemum morifolium* Ramat) Varieties for Flower Production and Post Harvest Longevity under Sub-tropical conditions of Punjab

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ABSTRACT: Present investigation was carried out to screen ten standard type varieties of chrysanthemum, namely, Purnima, Alfred Wilson, Alfred Simpson, Kikobiory, Valiant, Florence Shoe Smith, Crimson Tide, Denise Oatridge, Thai Ching Queen and Star of India for various flower, leaf and post harvest longevity parameters. The study was carried out at Floricultural Research Farm, Punjab Agricultural University, Ludhiana. The results revealed that variety Star of India recorded maximum plant height at bud appearance (61.55 cm) as well as at commercial harvesting stage (82.78 cm). Variety Crimson Tide produced medium length stems (67.89 cm). Highest chlorophyll content and chlorophyll fluorescence was observed in variety Star of India, 62.4 mg and 0.854 respectively. The same variety showed maximum flower diameter (16.47 cm) and longest duration of flowering (32.30 days). Varieties Alfred Wilson, Denise Oatridge, Alfred Simpson and Thai Ching Queen were early flowering as they needed 93-95 days to reach commercial harvesting stage. Varieties Valiant, Crimson Tide, Florence Shoe Smith and Star of India were late flowering requiring more than 100 days to reach flowering stage. Regarding post harvest longevity of cut stems, variety Star of India and Thai Ching Queen exhibit longer vase life in terms of number of days taken for complete floret senescence (15-18 days) and 50% leaf yellowing (17-20 days).

Keywords: Standard varieties, chrysanthemum, flower production, vase life

INTRODUCTION

Commercial floriculture is seen as a sunrise industry and now it has been given 100% export oriented status by Government of India (APEDA 2016). The important floricultural crops in the international cut flower trade are rose, carnation, chrysanthemum, garbera, marigold, gladiolus, tuberose, jasmine, orchids, anthurium, tulip, and lilies. Chrysanthemum ranks second just next to rose in terms of popularity and production in India as well as globally. Chrysanthemums are commonly called as mums or pompons and widely cultivated for decoration purposes as cut flowers, pot and bedding plants. Chrysanthemum cultivars exhibit enormous variation in terms of size, shape and color of blooms. Standard type varieties possess single large flower atop long sturdy stems which are used for cut flower production or as exhibition plants. Humongous hues of chrysanthemum blooms are major reason for the attraction of flower lovers as well as growers. Increasing demand for such exotic types of flower

varieties has led to their evaluation for flower production in varied climatic conditions.

Due to geographical position of Punjab and prevalent climatic conditions, it provides conducive environment for chrysanthemum cultivation. Therefore present study was undertaken to screen standard type chrysanthemum varieties for their flower production and keeping quality parameters under sub-tropical climate of Punjab.

MATERIAL AND METHODS

The experiment was conducted at the Floriculture Research Farm, Department of Floriculture and Landscaping, PAU, Ludhiana. Ten standard type varieties, namely, Purnima, Alfred Wilson, Alfred Simpson, Kikobiory, Valiant, Florence Shoe Smith, Crimson Tide, Denise Oatridge, Thai Ching Queen and Star of India were used for the studies. The plants were raised through rooting of terminal cuttings. The rooted cuttings were planted in earthen pots of 30 cm diameter. Recommended cultural practices were followed to raise the plants to flowering stage. The stems were harvested when outer two-third florets were half open.

Observations were recorded on plant height at bud appearance and harvesting stage and leaf characteristics such as chlorophyll content and chlorophyll fluorescence. Various floral characters viz. days taken to bud appearance, days taken to commercial harvest stage, flower size and duration of flowering were also recorded. For evaluation of keeping quality, harvested stems were kept in glass jars containing distilled water and placed in an air-conditioned laboratory at 23±2°C; 60-70 per cent R.H. and 16 h illumination (1000 Lux intensity) provided by white fluorescent tubes. Observations were recorded for, days taken to complete floret senescence and days to 50% leaf yellowing. The experiment design was factorial CRD. Each value represent mean of three observations and data was analysed statistically using CPCS1 software developed by PAU, Ludhiana.

RESULTS AND DISCUSSION

All the ten varieties selected for evaluation showed wide variations in terms of height gained at bud

appearance and at commercial harvesting stage. The minimum plant height at bud appearance stage was observed in variety Alfred Simpson (33.67 cm) while Crimson Tide (57.78) and Star of India (61.55 cm) exhibited more plant height at this stage (Table 1). Observations recorded for the plant height at commercial harvesting stage showed that some varieties gained significant increase in height between bud appearance and commercial harvesting stage. Alfred Wilson recorded 51.22 cm height at harvesting stage while height was 38.44 cm at bud appearance stage. The maximum increase was observed in variety Star of India (20 cm) which stood at 82.78 cm tall at commercial harvesting stage and was the tallest among all the varieties. Low chlorophyll content (as given by SPAD values) was observed in varieties Purnima (43.1), Alfred Simpson (45.3) and Kikobiory (49.4). The maximum chlorophyll content was observed in variety Star of India (62.4).

Table 1: Morpho-physiological characters in ten standard type varieties.

Variety	Plant height at first bud appearance (cm)	Plant height at harvesting stage (cm)	SPAD values	Chlorophyll fluorescence (F _v /F _m)
Purnima	41.11	47.22	43.1	0.611
Alfred Wilson	38.44	51.22	52.6	0.650
Alfred Simpson	33.67	44.78	45.3	0.631
Kikobiory	45.67	54.22	49.4	0.634
Valiant	38.66	48.78	54.2	0.792
Florence Shoe Smith	37.78	50.89	52.3	0.662
Crimson Tide	57.78	67.89	59.7	0.826
Denise Oatridge	41.89	51.78	51.6	0.720
Thai Ching Queen	38.33	46.45	54.2	0.783
Star of India	61.55	82.78	62.4	0.854
C.D. at p=0.05	3.51	4.09	6.79	0.23

Minimum F_v/F_m ratio was obtained in variety Purnima (0.611) and maximum in variety Star of India (0.854). F_v/F_m ratio is related to efficiency of PS-II and it can be inferred that varieties recording high F_v/F_m ratio are photosynthetically more efficient than those showing low ratio.

Results presented in Table 2 show that variety Alfred Simpson recorded the minimum number of days taken for bud appearance (46.89 days) followed by varieties Alfred Wilson (52.00 days), Thai Ching Queen (56.44 days) and Denise Oatridge (58.88 days). Varieties Purnima (62.78 days), Valiant (63.00 days), Crimson Tide (63.56 days) and Florence Shoe Smith (64.11 days) showed the delayed production of flower buds.

Variety Star of India took the maximum number of days (65.42 days) to reach reproductive stage. Data recorded for number of days taken to reach commercial harvesting stage showed similar trends. After the appearance of the flower bud, all the varieties took more or less same time to reach the commercial flower harvesting stage. Variety Alfred Simpson although showed early bud formation (46.89 days), took 95.00 days to reach commercial harvesting stage. Likewise, varieties showing late bud appearance took more number of days to reach the commercial harvesting stage *i.e.*, 100.67 days in varieties Valiant and Crimson Tide, 102.33 days in variety Florence Shoe Smith and 104.00 days in variety Star of India.

Table 2: Floral characters and keeping quality parameters in ten standard chrysanthemum varieties.

Variety	Days taken for bud appearance	Days taken to reach commercial harvesting stage	Flower size (cm)	Flowering duration (days)	Days taken to complete floret senescence	Days taken to 50% leaf yellowing
Purnima	62.78	98.00	10.85	27.33	16.67	17.33
Alfred Wilson	52.00	93.00	14.25	24.40	13.33	16.33
Alfred Simpson	46.89	95.00	13.62	25.18	14.33	16.00
Kikobiory	60.55	97.67	14.92	27.39	13.33	15.33
Valiant	63.00	100.67	14.43	25.33	15.67	19.33
Florence Shoe Smith	64.11	102.33	15.72	26.46	17.00	19.67
Crimson Tide	63.56	100.67	13.20	30.42	17.67	20.00
Denise Oatridge	58.88	94.67	13.12	25.42	15.67	17.00
Thai Ching Queen	56.44	95.67	13.33	24.46	15.67	17.67
Star of India	65.42	104.00	16.47	32.30	18.67	20.67
C.D. at p=0.05	2.37	4.40	1.09	3.45	1.61	2.30

Other varieties viz. Denise Oatridge, Thai Ching Queen, Alfred Simpson and Purnima took lesser number of days *i.e.* 94.67, 95.67, 95.00 and 98.00 days, respectively, to reach commercial harvesting stage. The varieties showed significant variations in terms of flower diameter. The smallest flower size was observed in variety Purnima (10.85 cm). Varieties Denise Oatridge (13.12 cm), Crimson Tide (13.20 cm), Thai Ching Queen (13.33 cm), Alfred Simpson (13.62 cm) and Alfred Wilson (14.25 cm) recorded slightly larger flower diameter. The maximum flower diameter was observed in variety Star of India (16.47 cm) followed closely by variety Florence Shoe Smith (15.72 cm). Standard chrysanthemum varieties exhibited longer flowering duration ranging from 24.40 days to 32.30 days. The duration of flowering recorded for different varieties was 24.46 days for Thai Ching queen, 25.42 days for Denise Oatridge, 24.46 days for Florence Shoe Smith, 27.33 days for Purnima and 27.39 days for Kikobiory. The maximum flowering duration was observed in variety Star of India (32.30 days) closely followed by Crimson Tide (30.42 days).

Results presented in Table 2 show that after harvest, the stems started to show signs of floret wilting after about 5-9 days in vase. Slight variations were observed in all the varieties in terms of number of days taken to complete floret senescence. Varieties Alfred Wilson, Kikobiory and Alfred Simpson showed complete floret withering in 13.33, 13.33 and 14.33 days, respectively. Varieties Valiant, Denise Oatridge

and Thai Ching Queen showed complete floret senescence after 15.67 days. Flowers of varieties Purnima, Florence Show Smith and Crimson Tide lasted little longer, taking 16.67, 17.00 and 17.67 days, respectively for the complete floret senescence. Variety Star of India exhibited the maximum post harvest longevity of florets *i.e.* 18.67 days in vase.

All the varieties showed minor variations in leaf senescence process as evident from data recorded for days taken to 50% yellowing of leaves (Table 2). Variety Alfred Wilson showed the earliest leaf senescence symptoms as discoloration in the form of yellow spots. Most of the varieties started to show signs of leaf wilting and yellowing after 9 days in vase. Leaves of varieties Kikobiory, Alfred Simpson and Alfred Wilson showed 50 % leaf yellowing after 15.33, 16.00 and 16.33 days, respectively. Number of days taken to 50 % leaf yellowing was slightly delayed in varieties Denise Oatridge (17.00 days), Purnima (17.33 days), Thai Ching Queen (17.67 days) and Valiant (19.33 days). Variety Star of India took the maximum number of days (20.67 days) for 50% leaf yellowing followed by variety Crimson Tide (20.00 days).

Studies of varietal evaluation for morpho-physiological, leaf, flower and vase life characters has been undertaken by various workers under different geographical regions. Dhiman (2003) observed significant diversity among chrysanthemum cultivars which he suggested could be exploited commercially for cut flower production or growing in pots.

He reported that cultivars Ajay, Fiji and Flirt showed higher flower yield in terms of number and weight basis with medium-sized flowers which were suitable for loose flower while cultivars Pink Prince, Tata Century, Thai Ching Queen and Snow Ball produced large flowers which were more suited for garden decoration and/or exhibition purposes. Swaroop *et al.*, (2008) evaluated twenty genotypes of chrysanthemum at the Indian Agricultural Research Institute (IARI), New Delhi, for different characters suitable for production of cut flower. They concluded that varieties Thai Ching Queen, Tata Centenary, Snow Ball and Snow Don were suitable for cut flower production. Banerji *et al.*, (2012) evaluated ten large-flowered *Chrysanthemum* cultivars, for vegetative and floral characters and found considerable variations in the vegetative and floral characters. Vetrivel and Jawaharlal (2014) evaluated twenty varieties of chrysanthemum for flower yield and vase life under subtropical hilly region in Tamil Nadu and found that var. Almalfi, Calmiro Sunny, Cindrella Yellow and Punch White were better suited for growth in pots as well as cut flowers. In another study carried out by Kumar *et al* (2015), eleven varieties of chrysanthemum were investigated for loose flower production in Chhattisgarh plains. It was found that variety Decorative White had maximum plant height (60.9 cm), variety Pompon Rosy Pink showed early appearance of buds (43 days), variety Suneel had

largest flower size (7.6 cm) while highest yield was observed in variety Decorative White.

CONCLUSION

It can be concluded that varieties with large flower size and long stems are better suited for flower production in pots for exhibition and decoration purposes while those with medium sized flowers exhibit better post harvest keeping qualities.

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