Studies on Growth and Flowering Behavior of Newly Evolved Genotypes of Chrysanthemum (Dendranthema grandiflora Tzvelev) for Loose Flower Production

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A B S T R A C T

An experiment was conducted to study the growth and flowering behavior of newly evolved nineteen genotypes of chrysanthemum (Dendranthema grandiflora Tzvelev) including cultivar ‘Surf’ as standard check for loose flower production at the Experimental Farm of Department of Floriculture and Landscape Architecture, Dr. Yashwant Singh Parmar University of Horticulture and Forestry, Nauni, Solan, Himachal Pradesh during the year 2016-17. Among different genotypes, maximum plant height was recorded in genotype ‘UHFSChr128’ (120.33 cm). The number of stems per plant were observed maximum in “UHFSChr 131” (6.67) followed by “UHFSChr118” (6.33). The cultivar ‘Surf’ took minimum number of days for visible flower bud formation (76.07 days) followed by genotypes ‘UHFSChr 111’ (95.80 days), ‘UHFSChr 123’ (96.33 days) and ‘UHFSChr 115’ (96.93 days). In contrast, genotype ‘UHFSChr129’ took maximum number of days for visible flower bud formation (123 days). Significantly lesser number of days taken for flowering was recorded in cultivar ‘Surf’ (109.13 days) whereas, genotype ‘UHFSChr129’ (154 days) took maximum days for flowering. Maximum number of flowers per plant were observed in cultivar ‘UHFSChr128’ (474.93) followed by ‘UHFSChr132’ (435.93) and ‘UHFSChr117’ (408.33) whereas minimum number of flowers were observed in genotype ‘UHFSChr124’ (29.59). The duration of flowering was found maximum in genotype ‘UHFSChr111’ (34.00 days).

Keywords
Chrysanthemum, Genotypes, Flowering, Production Technology, Germplasm

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Introduction

Chrysanthemum (Dendranthema grandiflora Tzvelev) belongs to family Asteraceae (Andreson, 1987) and native to Northern hemisphere chiefly Europe and Asia. It is the national flower of Japan and commonly called as “Queen of the East,” Guldaudi in India and mum in America. The number of species in the genus chrysanthemum varies from 100 to 200. It ranks second after rose in spray type while seventh in standard type in term of consumption (Anonymous, 2017). It is most popular due to its wide range of flower colour,
growth habit, size and shape. It is used for cut flower and loose flower as well as making garlands, venis, gajras and religious offering.

The extra large-bloomed cultivars are prized for their exhibition value. The utility and popularity of chrysanthemum have increased immensely with the introduction of the techniques for year round blooming based on scientific research in the field of photoperiodism and genetics.

Chrysanthemum is a short day plant and cannot normally form flower buds when the day length exceeds 14.5 hours and developed them when it exceeds 13.5 hours (Machin and Scopes, 1978). Due to nature of flowering under short-day conditions, availability of chrysanthemum flower is restricted to short span of not more than three months. As, it requires long days for vegetative growth and short days for flowering. It is grown under wide range of climatic conditions but the performance of the genotype varies with the region, season and other growing conditions. Due to of intensive research done by scientists and practical experience of many growers, its flowers can be produced throughout the year to precise schedules at any time by environmental manipulation, fertilization and using growth regulating chemical. However, ability to produce chrysanthemum year round depends on an understanding the complex interaction between the plant and its environment. A sound knowledge of its physiology and management practices can ensure the continued success of chrysanthemum crop despite increasing production cost.

Somehow, the available germplasm could not fulfill the requirements in terms of new colors, forms, types and various characteristics. Therefore, urgent need is felt to develop new cultivars having wide genetic adaptability and easily availability to the growers at cheapest rate, the genotypes were evolved at the deptt. of Floriculture and landscape Architecture, College of Horticulture, Dr. Yashwant Singh Parmar University of Horticulture and Forestry, Nauni, Solan (Himachal Pradesh). An investigation was carried out with the objective to study the growth and flowering behavior of newly evolved genotype of chrysanthemum (*Dendranthema grandiflora* Tzvelev) for loose flower production.

### Materials and Methods

#### Study Area and experimental design

The experiment was conducted at Experimental Farm of Department of Floriculture and Landscape Architecture, College of Horticulture, Dr. Yashwant Singh Parmar University of Horticulture and Forestry, Nauni- Solan (Himachal Pradesh), India during 2016-17.

Uniform healthy rooted plants were planted at a spacing of 30×30 cm in randomized block design with three replications consisting nine plants in each replication under open field conditions. Using FYM and NPK @ 5 kg /m² and 22.5 g P (Single Super Phosphate-140.62 g /m²) and K (Muriate of Potash-37.5 g / m²) and 11.25 g of N (Urea-24.46g /m²) should be applied after 30 days of planting respectively. Five plants were selected from each replication for getting observation. The observations were recorded after bud initiation stage and uniform package and practices were followed throughout the cropping season. Data were recorded for both vegetative and flowering attributes like number of flower per plant, days taken for bud initiation, days taken to flowering, flowering duration (days), plant height (cm), plant spread (cm²), flower diameter (cm) and flower weight(kg/m²), using the standard method. The collected data were analysed statistically as per standard methods of Gomez and Gomez (1984).
Genotypes used

In total, following nineteen newly evolved genotypes were used in the present investigation in order to assess their growth and flowering along with ‘Surf’ (standard check) under open field conditions:

Results and Discussion

Among different genotypes, maximum plant height was recorded in genotype ‘UHFSChr128’ (120.33cm) whereas minimum in cultivar ‘Surf’ (39.27cm) as depicted in Table 1. The variation in plant height of different cultivars of chrysanthemum has also been reported by Barigidad and Patil (1997), Laxmi et al., (2008), Sawaroop et al., (2008), Palai (2009), Banerji et al., (2012) and Kumar et al., (2012) and Punetha et al., (2011).

The number of stems per plant were observed maximum in “UHFSChr125” and ‘UHFSChr125’ (6.67) in contrast, minimum number of stems were noted in genotype ‘Surf’ (4.37). The number of stem varied with the genotypes which resulted best after pinching. Swaroop et al., (2008) evaluated different genotypes of chrysanthemum recorded maximum number of branches per plant. The cultivar ‘Surf’ took minimum number of days for visible flower bud formation (76.07 days). In contrast, genotype ‘UHFSChr129’ took maximum number of days for visible flower bud formation (123 days). Significantly lesser number of days taken for flowering by genotype ‘Surf’ (109.13 days) whereas, ‘UHFSChr129’ (154 days) took maximum days for flowering. In similar study Negi et al., (2015) also reported the variation for days taken to flowering different cultivars of chrysanthemum. The largest flowers were found in genotype ‘UHFSChr124’ (10.17cm). In contrast, smallest sized flowers were observed in ‘UHFSChr128’ (3.07cm).

The variation in flower size in the genotypes may be attributed due to inherent genetic characters of the individual cultivars and environmental factors reported by Biradur and Khan (1996); Singh and Ramchandran (2002). The increase in flower size may be due to disbudding also. It was however, found to be statistically at par with genotype ‘UHFSChr118’ (3.3cm). The perusal of data from Table 2 envisages that maximum numbers of flowers per plant were observed in genotype ‘UHFSChr128’ (447.49) followed by ‘UHFSChr132’ (435.93) and ‘UHFSChr117’ (408.33). On the other hand, minimum numbers of flowers were observed in genotype ‘UHFSChr124’ (29.59).The number of flowers per plant determines the better growth and flower yield of chrysanthemum. Poonam and Ashok Kumar (2007) and Kumar et al., (2015) reported that vegetative growth significantly contribute towards the flower yield of chrysanthemum. Variation in number of flowers was observed by Yadav et al., (2014).

Maximum flower yield per meter square was observed in genotype ‘Surf’ (6316.8gm/m²), ‘UHFSChr132’(6192.00/m²) and minimum was in genotype ‘UHFSChr124’ (1253.52/m²). The difference in yield may be due to the additive gene effect (Behera et al., (2002). The increase in yield may be due to the increased flower size, flower weight and number of branches per plant (Suvija et al., 2016). The duration of flowering was found maximum in genotype ‘UHFSChr111’ (34.00 days). Variation among different cultivars for duration of flowering was also been observed by Talukdar et al., (2006), Kumar et al., (2014).
Table 1

<table>
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<tr>
<th>Sr. no.</th>
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<th>Sr. no.</th>
<th>Genotype</th>
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<td>Surf (Standard check)</td>
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Table 2 Variation in different growth and flowering parameters of newly evolved genotypes of Chrysanthemum under Nauni (Solan) conditions during 2016-17 for loose flower production

<table>
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<tr>
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<th>Bud formation (Days)</th>
<th>Days taken to flowering</th>
<th>Plant height (cm)</th>
<th>Number of Stems/Plant</th>
<th>Plant spread (cm)</th>
<th>Flower size (cm)</th>
<th>Duration of flowering (days)</th>
<th>Number of flower/Plant</th>
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<th>Weight of flower gm/m²</th>
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It was concluded that ‘UHFSChr 132’, ‘UHFSChr 117’, ‘UHFSChr 122’, ‘UHFSChr 111’, including ‘Surf’ performed comparatively better w.r.t. flower yield so these genotypes are suitable for cultivation as loose flower production.

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