International Journal of Chemical Studies

P-ISSN: 2349–8528
E-ISSN: 2321–4902
IJCS 2018; 6(4): 1618-1621

Received: 24-05-2018
Accepted: 28-06-2018

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Evaluation of chrysanthemum (*Dendranthema grandiflora* Tzelev.) genotypes for loose flower production under Coimbatore conditions

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Abstract
An investigation was carried out to study the performance of Chrysanthemum (*Dendranthema grandiflora* Tzelev.) genotypes for loose flower production under Coimbatore conditions during 2017-2018. The experiment was laid out in a completely randomized block design with eighteen treatments and three replications. Significant differences were obtained among the evaluated chrysanthemum genotype for growth and flowering attributes. The maximum plant height of 41.0 cm in Shukla was observed in genotype and maximum number of branches per plant (13.6) was recorded in Mayur. Minimum days taken for first flower bud appearance of 48 days was registered by the genotypes Statesman, Jublee, Vijay Kiran and Rajat. The maximum duration of flowering (92 days) was recorded in Vijay Kiran. While maximum diameter of flower (4.8 cm) was observed in genotype Himanshu. Maximum weight of single flower was observed (1.5 g) in Sunil and maximum vase life (6days) was observed in genotype Coffee. Among all the eighteen genotypes the genotype Sunil produced maximum number of flowers per plant (81.7) followed by Mayur (62.3) which were significantly superior to the remaining genotypes. Considering the flower number per plant these two genotypes are highly suitable for loose flower production under Coimbatore conditions.

Keywords: Chrysanthemum, loose flower, growth and flowering

Introduction
Chrysanthemums are highly prized for its varied color, form, size, shape and use. This diversity is combined with wide variation in growth habit, vase life and amenability to various growth regulatory practices has made this flower popular among flower growers. It is grown both for its aesthetic and commercial value. The major use of chrysanthemum in our country is for making garlands, veni bracelets, flower decoration and religious offerings and bedding purpose. In North India various hues of red, yellow, white and purple chrysanthemums are grown in abundance for decorating the landscape either in the ground or in pots. But, in South India mostly the yellow coloured flowers are highly preferred and grown as loose flowers for trade. Chrysanthemum is very rich in varietal wealth and every year there is an addition of new varieties. The performance of any crop or variety largely depends on interaction between genotype and environment. The genotypes perform differently under varied environmental conditions. Therefore it is necessary to assess the new genotypes for their growth and quality traits under varying climatic conditions. The successful cultivation of chrysanthemum depends on selection of suitable variety. In recent years, several new varieties with ideal range of colors have been developed, but all of them do not perform everywhere especially, under south Indian conditions where the day lengths are more during the most part of year. Hence it is necessary to evaluate the new genotypes for their quality traits under varying climatic conditions.

Materials and Methods
Eighteen chrysanthemum genotypes were selected for the present investigation. Plant materials of the respective genotypes were procured from IIHR at Bangalore, during March 2017 and were multiplied in pots. The experiment was conducted at the Tamil Nadu Agricultural University, Coimbatore. Geographically, it is located at 11 º 02' N latitude and 76º 57' E longitude and at an altitude of 426.72 m above MSL. The media composition of red soil, Sand, Farm Yard Manure and Leaf moulding the ratio of 2:1:1:1. was used for growing in pots.

Vermicompost was added to the media consortium @ 10 kg 100 kg^{-1} of recommended pot mixture. Thirty days old healthy rooted cuttings with 4-5 fresh leaves were planted in the pots of 7" diameter with two cuttings planted equidistantly within the pot. Irrigation was given immediately after transplanting. Subsequent irrigations were given as and when required. Pinching was done 15 and 30 days after planting. Observations on vegetative, flowering, yield and quality characters were recorded in all the treatments at different stages of crop growth i. 30^{th}, 60^{th}, 90^{th} DAT respectively. The observations were recorded on five random competitive plants per replication for each genotype on eight important characters *i.e.* Plant height when first bud appear (cm), number of branches per plant, days taken for first bud appearance, duration of flowering, diameter of flower (cm), number of flowers per plant weight of single flower (g) and vase life in days. The statistical analysis was done by adopting the standard procedures of Panse and Sukhatme (1985) [6] the critical difference was worked out at five per cent (0.05%) probability.

Results and Discussion

Growth and flowering parameters

The performance of chrysanthemum genotypes varied significantly for growth and flowering parameters. The data on growth and flowering parameters in chrysanthemum genotypes is presented in Table 1. Among the evaluated genotypes, genotype Shukla has recorded maximum plant height of 41.0 cm. The increase in plant height was associated with rapid cell division and elongation in meristamatic region of plants and this has resulted increased plant height Sharova *et al.* (1977) [7]. This may be due to the attribution of combined factors such as genetic characters of the genotypes, pot mixtures and climatic factors like light, maximum and minimum temperature, nutrition ratio in the media etc. During the study period though all the genotypes were maintained under same climatic conditions, the variation in plant height can be accredited primarily to difference in genetic character of the genotypes Behera *et al.* (2002) [1]. Similar variations for increased plant height in chrysanthemum genotypes were also observed by Niki *et al.* (2016) [5] and Dayal Singh *et al.* (2017) [2].

The genotype Mayur recorded maximum number of branches per plant with 13.6. The production of more number of branches per plant may be the reasons for increasing plant spread and also the genetic characters of the plant. The maximum plant spread is due to increased number of branches in chrysanthemum genotypes was also reported by Dayal Singh *et al.* (2017) [2], and Niki *et al.* (2016) [5].

The minimum days taken for first flower bud appearance of (48 days) was absorbed in genotypes Statesman, Jublee, Vijay Kiran and Rajat. Similar trend was noticed in chrysanthemum genotypes by Heidemans and Stalk (1984) [4], Behera *et al.* (2002) [1] and Vasanthachari (2003) [10]. Maximum duration of flowering was recorded with genotype Vijay Kiran (92 days). Duration of flowering is very important characters, which signifies the availability of the flower in the markets. The variation in flowering duration among the cultivars is attributed to genotype of the plant, environmental influence and other management factors. Similar results for variation in flowering duration among the genotypes have also been reported in chrysanthemum under different environmental conditions by Singh *et al.* (2008) [8], Srilatha *et al.* (2015) [9] and the genotype Sunil produced maximum number of flowers per plant (81.7) followed by Mayur (62.3) (Fig 1). The highest flower number per plant could be attributed to the initiation of more number of branches per plant ultimately resulting in production of more number of flower buds per plant, finally increase yield. The genotype differences for yield potential are attributed to additive gene effect as reported by Behera *et al.* (2002) [1], and Balaji *et al.* (2004).

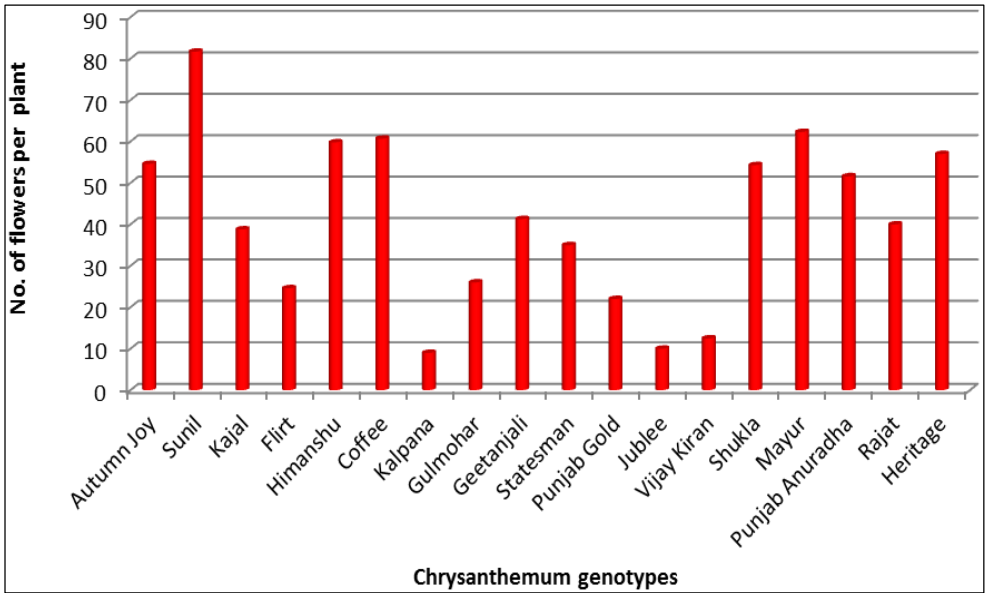

Fig 1: Number of flowers per plant on different chrysanthemum genotypes

Flower Quality Parameters

The data on flower quality parameters in chrysanthemum genotypes is presented in Table 1. The quality of flower is other important parameters which desired the market value of flowers. The maximum diameter of flower (4.8 cm) was observed in the genotype Himanshu. Significant differences were observed in all the genotypes for flower diameter which is in agreement with the findings of Deka and Paswan (2002) [3]. The maximum weight of single flower (1.5 g) was recorded in the genotype Sunil and maximum vase life flower was observed in genotype Coffee (7 days). Vase life of flowers after harvest is depends on the vigour of the plant,

number of days taken for opening of the flowers or it might be due to genetic makeup of the genotype Wang and Lee (1994) [11] opined that the genetic constitution of the variety is an important factor which decides the longevity of flowers on the plant.

Table 1: Growth, flowering and quality performance of chrysanthemum genotypes for loose flower production

Treatments	Name of the genotypes	Plant height when first bud appear (cm)	No of branches per plant	Days taken for first bud appearance	Duration of flowering (days)	Diameter of flower (cm)	Wt. of single flower (g)	Vase life (days)	Flower colour (as per RHS colour chart)
T_1	Autumn Joy	28.0	7.4	79	37	4.3	0.5	2.5	Red purple group 72-C
T_2	Sunil	20.4	4.0	54	28	4	1.5	5	Red group 53-B
T_3	Kajal	28.4	7.4	49	67	3.5	0.9	1.5	Orange red group N34-A
T_4	Flirt	26.8	5.0	50	22	3	1.2	3.0	Red purple 71-A
T_5	Himanshu	17.4	8.4	52	39	4.8	0.9	2.0	White group NN155-C
T_6	Coffee	24.4	7.0	75	33	3.3	1.2	6	Orange group N25-A
T_7	Kalpana	20.4	5.4	57	81	3.4	0.7	1.5	Yellow group 12-A
T_8	Gulmohar	33.0	3.0	58	9	3.5	0.4	2.5	Red purple N74-B
T_9	Geetanjali	28.6	7.2	50	68	5	1.3	3.0	Yellow group 3-A
T_{10}	Statesman	33.4	7.4	48	34	3.8	1.0	2.0	Yellow group 5C
T_{11}	Punjab Gold	12.5	8.0	50	8	2	0.5	1.5	Yellow group 9-B
T_{12}	Jublee	18.8	3.8	48	41	3	1.1	3.5	Yellow group 9-A
T_{13}	Vijay Kiran	15.5	4.4	48	92	4	0.6	2.5	Yellow group 9-A
T_{14}	Shukla	41.0	4.8	52	42	3.9	0.8	4	White group NN155-D
T_{15}	Mayur	24.8	13.6	51	59	3.1	0.6	3	Yellow group 9-A
T_{16}	Punjab Anuradha	16.8	6.2	50	67	3.5	1.2	2	Yellow group 9-A
T_{17}	Rajat	24.6	7.2	48	40	4.5	0.9	3.5	White group NN155-D
T_{18}	Heritage	40.0	6.6	70	33	4.1	1.2	6	Purple group N 78-A
Mean		25.27	6.49	54.96	44.48	3.70	0.91	3.06	
S. Ed		0.46	0.13	1.10	1.17	0.08	0.02	0.07	
C.D. 0.05%		0.93	0.26	2.23	2.36	0.16	0.03	0.15	

Conclusion

From the present investigation, it could be concluded that the performance chrysanthemum genotypes Sunil and Mayur was superior with improved growth, flowering and quality characters under Coimbatore conditions.

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