Journal of Pharmacognosy and Phytochemistry

Available online at www.phytojournal.com

E-ISSN: 2278-4136
P-ISSN: 2349-8234
JPP 2019; 8(4): 1611-1617
Received: 01-05-2019
Accepted: 03-06-2019

L Jeebit Singh
Directorate of Horticulture and Soil Conservation, Manipur, India

G Khangjarakpam
ICAR - Research Complex for NEH Region, Lamphelpat, Imphal, Manipur, India

R Shadukan
Dept. of Plant Breeding and Genetics, Faculty of Agriculture, BCKV, West Bengal, India

RS Dhua
Dept. of Post Harvest Technology, Faculty of Horticulture, BCKV, West Bengal, India

Correspondence
L Jeebit Singh
Directorate of Horticulture and Soil Conservation, Manipur, India

Quality characterization of new chrysanthemum genotypes

L Jeebit Singh, G Khangjarakpam, R Shadukan and RS Dhua

Abstract
A field experiment was carried out to characterize the performance of new chrysanthemum genotypes to identify suitability for cultivation in different purposes. The experiment was laid out in Randomized Block Design with twenty new genotypes in three replications at Horticultural Research Station, Mandouri, West Bengal during 2013-14 and 2014-15. Based on the evaluation of various vegetative and reproductive parameters, genotypes 'Super', 'Sobha', 'Kumar's White', 'Kumar's Pink', 'Lalima', 'Jayanti', 'Swapna' and 'Antara' were found suitable for cut flower production as the plants were tall with long flower stalk, uniform opening of flowers and longer vase life. Genotypes 'Purna', 'Bloom', 'Rust' and 'Mauve' were observed to be suitable for growing in the garden preferably due to better plant spread together with more number of flowers, synchronous flowering and comparatively longer flowering duration. The genotypes 'Shankar', 'Triumph', 'Rani' and 'Rupanjali' were found suitable for growing in pots due to their dwarf and compact growth habit.

Keywords: Chrysanthemum, cut flower, pot, garden plant, characterisation

Introduction
Chrysanthemum (*Chrysanthemum morifolium* Ramat.) is an important flower crop grown throughout the world for its attractive flowers, which can be used as loose flower, cut flower, garden plant and pot plants. It is commonly known as Guldaudi, Autumn Queen, or Queen of East. It is a popular flower of commercial importance in many parts of the world owing to its unsurpassed beauty and economic values. The wide variation exhibited by large number of genotypes makes it conceivable as a high demand flower crop. It requires long days for vegetative growth and short days for flowering. It is grown under a wide range of climatic conditions, but the performance of a genotype varies with the region, season and other growing conditions. In addition, consumer preference for flower changes over the time and need to introduce and evaluate new varieties/genotypes is required at regular interval. The successful cultivation of chrysanthemum depends on selection of suitable variety to that particular region and purposes. Therefore, evaluation of different genotypes is of paramount importance so that suitable cultivars can be suggested for commercial cultivation. Some earlier works have been reported on evaluation of chrysanthemum genotypes by various workers (Kumar *et al.*, 2007; Swaroop *et al.*, 2008; Reddy *et al.*, 2016) [1, 2, 3].
Therefore, an experiment was undertaken to characterize the performance of twenty genotypes of chrysanthemum in Nadia district of West Bengal and to identify the most suitable genotypes for the particular region.

Materials and Methods
The experiments was conducted at the Horticulture Research Station, Mondouri, Bidhan Chandra Krishi Viswavidyalaya, Nadia, West Bengal during 2013-14 and 2014-15 to evaluate the performance of twenty new chrysanthemum genotypes under new alluvial zone of West Bengal. The experiment was laid out according to Randomized Block Design with three replications. The rooted cuttings were planted on 10-15 cm raised beds. Healthy, well-rooted cuttings of more or less uniform growth were planted in the last week of July, 2013. Thirty two plants per replication of each genotype were planted at spacing of 45 cm x 30 cm. Uniform cultural practices were followed throughout the experiment. The plants were allowed to grow naturally without pinching, de-shooting or disbudding, to study its natural growth and flowering behaviour. Vegetative parameters *viz.* plant height, plant spread and number of branches per plant, reproductive parameters *viz.* number of days to flower bud emergence, number of days to 50 % flowering, flower types, colour of ray florets and disc florets, length of flower stalk, number of flower per spray, number of flower per plant, flower diameter, individual flower weight and vase-life were recorded on five randomly selected plants in each

replication of each genotypes. Flower types were classified based on the classification of National Chrysanthemum Society, USA and colour of ray and disc florets were recorded using RHS mini-colour chart. During the experimentation, the average maximum and minimum temperatures 30.1 and 13.1 °C respectively, and relative humidity 70.1% were recorded. All the data were statistically analysed using MSTAT software and the difference of means were compared at 5% level of significance.

Results and Discussion

Vegetative parameters

The various genotypes significantly differ with respect to their vegetative growth characteristics as shown in Table 1. Plant growth is usually a good index of plant vigour, which may contribute towards greater productivity. It also serves as a guide to determine the suitable varieties for obtaining maximum yield. It is apparent from the data that maximum plant height was recorded in 'Sobha' (86.5 cm) at par with 'Super' (83.0 cm) while minimum in 'Triumph' (33.5 cm) at par with 'Shankar' (37.5 cm). This variation in plant height among various cultivars may be due to the hereditary traits as all the plants were given similar cultural practices under same environmental conditions. Similar variation in plant height among varieties was also observed in other evaluation of chrysanthemum by Baskaran *et al.*, (2004) [4]; and Kim *et al.*, (2014) [5]. Maximum plant spread was observed in 'Purna' (54.0 cm) while minimum plant spread was observed in 'Shankar' (26.5 cm). These findings are in conformity with the findings of Kulkarni and Reddy (2004) [6] in chrysanthemum. Number of branches/plant is an important character, which signifies canopy shape and architecture of plant. Genotype 'Rani' (18) produced maximum number of branches/plant while minimum was reported in genotype 'Pradut' (5.5). The result shows increase in plant spread with corresponding increased number of branches. Difference in number of branches among the cultivars could be due to influence of genetical make up of chrysanthemum cultivars (Kumar *et al.*, 2015) [7].

Table 1: Mean performance of twenty chrysanthemum genotypes for vegetative characters

Sl. no.	Genotypes	Plant height (cm)	Plant spread (cm)	Number of branches
1	Bloom	54.0	48.8	13.8
2	Super	83.0	45.8	13.0
3	Purna	73.5	54.8	15.2
4	Sobha	86.5	44.0	9.7
5	Rani	38.0	32.5	18.0
6	Raga	59.5	31.8	12.3
7	Kumar's White	66.0	32.8	16.3
8	Kumar's Pink	72.0	37.8	12.7
9	Rupanjali	39.5	34.3	12.7
10	Mauve	55.5	40.8	13.3
11	Lalima	59.0	34.0	9.2
12	Antara	73.0	32.8	11.2
13	Shankar	37.5	26.5	7.8
14	Triumph	33.5	37.5	7.3
15	Rust	51.5	48.0	8.3
16	Jayanti	66.5	33.0	7.0
17	Swapna	65.0	38.0	7.8
18	Pradut	46.5	37.3	5.5
19	Gold	53.5	38.0	8.5
20	Flame	46.5	39.8	9.5
	C.D. at 5 %	5.25	4.93	2.50
	SE(m)	1.83	1.27	0.87

Reproductive parameters

Significant differences among the genotypes for number of days to bud emergence and 50 % flowering recorded is shown in Figure 1. Number of days taken for flower bud emergence and 50 % flowering are important character that signifies earliness or late flowering which determines the flower availability. Genotypes 'Pradut' (59.0 days) on par with 'Gold' (60.5 days), 'Rust' (60.5 days), 'Mauve' (61.0 days) and 'Kumar's Pink' (61.5 days) took minimum number of days to bud emergence while genotypes 'Rani' (76.5 days) on par with 'Raga' (75.0 days) and 'Antara' (74.5 days) took maximum number of days to bud emergence. Minimum number of days to 50 % flowering was observed in 'Pradut' (95.5 days) on par with 'Kumar's Pink', 'Triumph' (99.0 days) and 'Purna' (99.5 days) while maximum number of days to 50 % flowering was observed in 'Lalima' (111.5 days). Variation for late or early flowering seems to be genetically controlled characters in the genotypes and have also been reported by Rao and Pratap (2006) [8]; and Behera *et al.*, (2002) [9] under different locations.

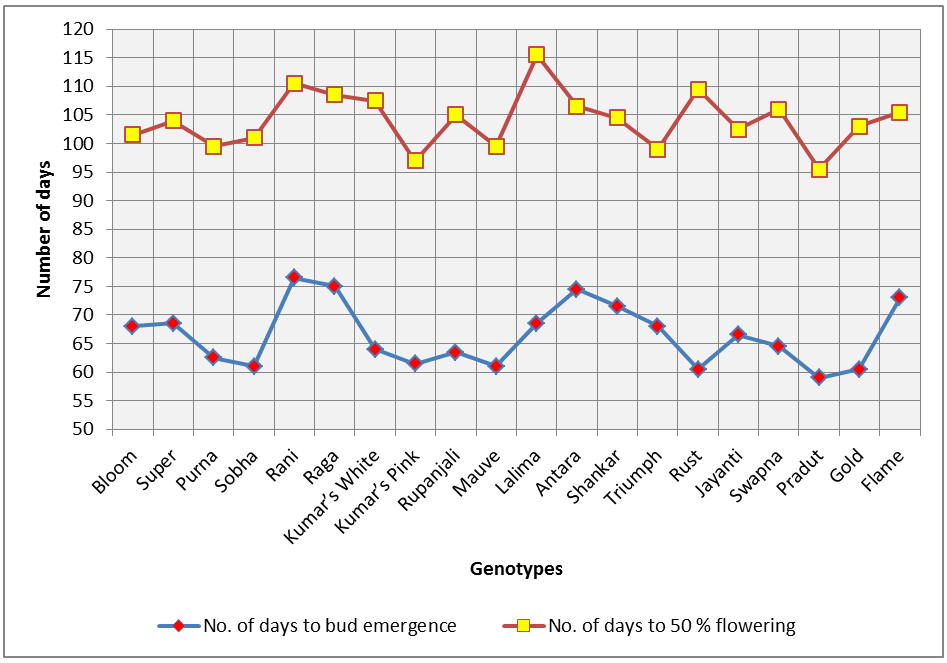

Fig 1: Mean performance of twenty chrysanthemum genotypes for number of days to bud emergence and days to 50 % flowering

The different flower types and colour of disc and ray florets recorded for the twenty new chrysanthemum genotypes is recorded in Table 2. Flower colour and flower types are very important quality characteristics which are used as main criteria for determining its acceptability and aesthetic appeal by the consumers. Dilta *et al.*, (2005) [10] also observed different flower colours in different cultivars.

Table 2: Colour of ray florets, colour of disc florets and flower type of twenty chrysanthemum genotypes

Sl. no.	Genotypes	Colour of ray floret	Colour of disc floret	Flower type
1	Bloom	Light red pink (RHS 49D)	Light yellow orange (RHS 23C)	Decorative
2	Super	Purple (RHS 67A)	Purple (RHS 71A)	Decorative
3	Purna	Orange yellow (RHS 14A) with orange (RHS 28B)	Orange yellow (RHS 23A)	Single
4	Sobha	White (RHS N155B)	Orange yellow (RHS 14A)	Single
5	Rani	Purple (RHS 67A)	Orange yellow (RHS 15B)	Decorative
6	Raga	Dark purple red (RHS 53C)	Light yellow (RHS 13B)	Decorative
7	Kumar's White	White (RHS N155B)	Light yellow (RHS 8C)	Pompon
8	Kumar's Pink	Red pink (RHS 52B)	Light yellow (RHS 8C)	Pompon
9	Rupanjali	Red (RHS 41A) tip with orange yellow (RHS 13B) base	Red (RHS 41A) tip with orange yellow (RHS 13B) base	Decorative
10	Mauve	Light red pink (RHS 38D)	Yellow (RHS 6A)	Decorative
11	Lalima	Red (RHS 45A)	Orange yellow (RHS 14A)	Decorative
12	Antara	Red (RHS 44A)	Orange (RHS 24A)	Decorative
13	Shankar	Orange (RHS 28B)	Orange yellow (RHS 14A)	Semi double
14	Triumph	Red pink (RHS 49A)	Orange yellow (RHS 14A)	Semi double
15	Rust	Brown orange (RHS 33C)	Brown orange (RHS171B)	Spoon
16	Jayanti	Yellow (RHS 12A)	Orange (RHS 32A)	Decorative
17	Swapna	Pink (RHS 68C)	Pink purple (RHS N74A)	Decorative
18	Pradut	Orange yellow (RHS 23A)	Red (RHS 45A)	Decorative
19	Gold	Orange yellow (RHS 14A)	Orange (RHS 32A)	Decorative
20	Flame	Orange (RHS 28B)	Orange (RHS 32A)	Decorative

Perusal of data in Table 3 shows significant variation among the genotypes with regard to various reproductive parameters observed. Length of flower stalk is an important characteristic for suitability of flower as cut flower. Longest length of flower stalk was recorded in 'Jayanti' (38.5 cm) on par with 'Super' (37.2 cm) and 'Kumar's White' (37.0) while shortest in 'Shankar' (15.0 cm) on par with 'Triumph' (15.3 cm) and 'Rani' (17.5 cm). It was observed that the genotypes with higher plant height produced the longer flower stalk as compared to cultivars with smaller plant heights. Similar findings were reported in rose by Mantur *et al.*, (2005) [11] and Fascella and Zizzo (2005) [12]. Flower yield per plant is an excellent indicator for characterization of plant for various purposes. It is obvious from the data that significantly maximum number of flower per plant were observed in 'Flame' (384.5) followed by 'Purna' (325.5), 'Super' (308.8) and 'Sobha' (300.2) while minimum number of flower per plant was observed in 'Triumph' (83.2) on par with 'Pradut' (91.8). Higher yield might be due to increase in morphological parameters like plant height, plant spread and number of branches which might have contributed in production of more photosynthates resulting in production of more number of flowers per plant. Variation in number of flowers per plant was observed in chrysanthemum by Palai *et*

al., (2018) [13]. Maximum numbers of flower per spray was observed in 'Rupanjali' (8.3) on par with 'Purna' (7.7) while minimum in 'Triumph' (3.5) on par with 'Pradut' (4.0), 'Shankar' (4.2) and 'Flame' (4.3). A wide range of variability for number of flower per spray is mainly due to genetic nature of the plant. The results obtained in the present study are in agreement with that of Prabhu *et al.*, (2018) [14] and Reddy *et al.*, (20016) [15] in chrysanthemum. Flower diameter is very important character for deciding the quality of flowers. Significantly maximum flower diameter was observed in 'Sobha' (9.7 cm) while minimum in 'Kumar's Pink' (3.8 cm). Variation in flower diameter might be due to the genetic makeup of the varieties and their interaction with prevailing genotype and environment (Baskaran *et al.*, 2016) [16]. Significantly maximum individual flower weight was observed in 'Bloom' (4.3 g) on par with 'Jayanti' (4.3 g) while minimum in 'Flame' (1.3 g). Variation in flower diameter and weight among the varieties was also reported by Uddin *et al.*, (2015) [17].

Table 3: Mean performance of twenty chrysanthemum genotypes for reproductive characters

Sl. no.	Genotypes	Length of flower stalk (cm)	Number of flowers/ spray	Number of flower per plant	Flower diameter (cm)	Individual flower weight (g)
1	Bloom	27.8	5.0	204.8	7.1	4.3
2	Super	37.2	5.2	308.8	6.7	2.8
3	Purna	34.8	7.7	325.5	7.9	1.8
4	Sobha	33.3	6.5	300.2	9.7	2.3
5	Rani	17.5	4.7	222.3	7.8	3.0
6	Raga	30.8	6.3	289.3	6.7	2.8
7	Kumar's White	37.0	5.7	182.0	4.3	2.3
8	Kumar's Pink	33.0	7.3	202.5	3.8	2.9
9	Rupanjali	20.2	8.3	193.0	4.8	1.7
10	Mauve	25.3	5.5	272.0	6.5	1.8
11	Lalima	29.0	4.7	154.5	6.4	2.4
12	Antara	32.2	7.5	161.3	4.2	2.0
13	Shankar	15.0	4.2	181.5	6.5	1.9
14	Triumph	15.2	3.5	83.2	6.9	2.5
15	Rust	26.5	4.7	119.0	6.1	3.1
16	Jayanti	38.5	5.2	132.3	7.8	4.3
17	Swapna	32.2	5.4	171.5	6.5	3.4
18	Pradut	23.0	4.0	91.8	5.8	3.0
19	Gold	26.3	4.7	207.8	6.5	3.6
20	Flame	19.3	4.3	384.5	4.2	1.3
	C.D. at 5 %	3.40	1.08	35.69	0.26	0.34
	SE(m)	1.18	0.38	12.42	0.09	0.11

Vase life

Vase life of the genotypes under the study showed significant variation and is depicted in Figure 2. Vase life or keeping quality of flowers is of greater value in determining the safe marketing of flowers to the distant markets and is a prerequisite character of cut flower. At room temperature, significantly extended period of vase life was recorded in 'Kumar's Pink' (11.39 days) followed by 'Kumar' White' (10.69 days), 'Jayanti' (10.69 days) and 'Swapna' (10.69 days). The minimum vase life was observed in 'Rani' (6.19 days) on par with 'Rupanajali' (6.39 days) and 'Triumph' (6.39 days). The variation in vase life of flowers must be due to the differences in senescencing behaviour of the cultivars by producing higher amount of ethylene forming enzymes. The finding has similarity with the results observed in chrysanthemum given by Gaikwad and Patil (2001) [18]; Jayanthi and Vasanthachari (2002) [19]; and Suvija *et al.*, (2016) [20].

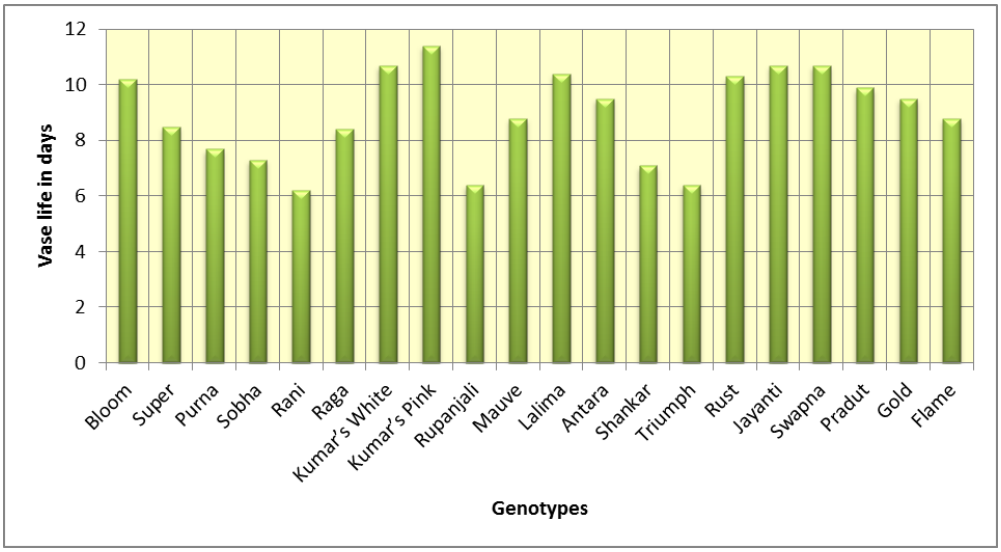

Fig 2: Vase life of twenty chrysanthemum genotypes

Conclusion

Based on the various morphological and floral characters, genotypes 'Super', 'Sobha', 'Kumar's White', 'Kumar's Pink', 'Lalima', 'Jayanti', 'Swapna' and 'Antara' were found to be suitable for cut flower purpose (Plate 1). Genotypes 'Purna', 'Bloom', 'Rust' and 'Mauve' were suitable for growing in the garden (Plate 2) and genotypes 'Shankar', 'Triumph', 'Rani' and 'Rupanjali' were suitable for growing in pots (Plate 3).

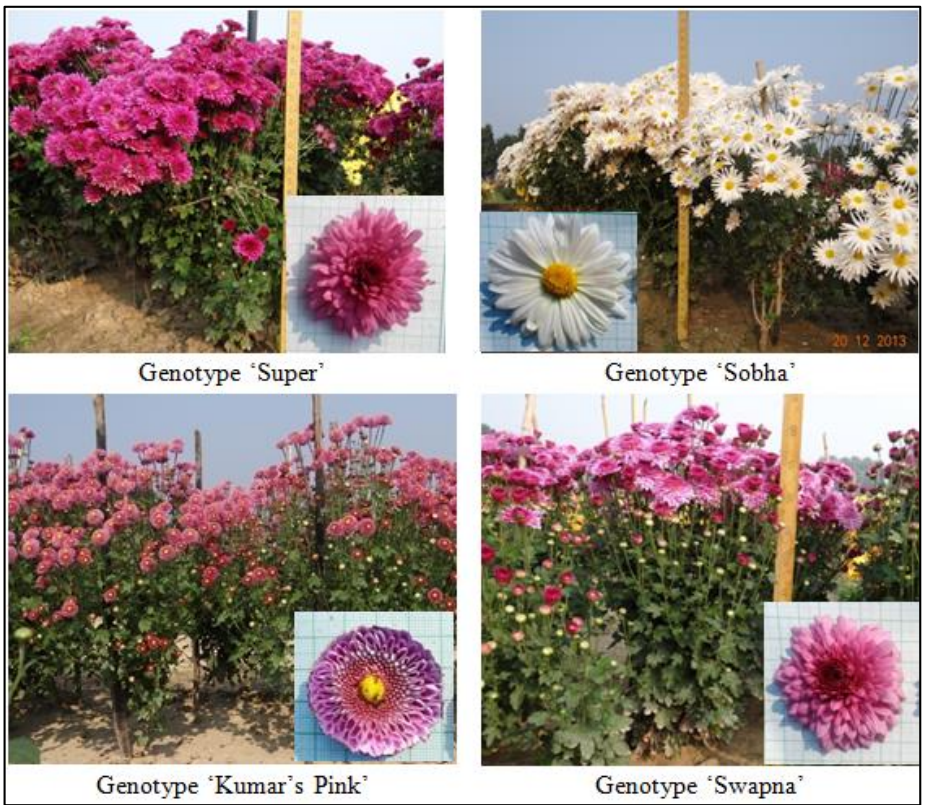

Plate 1: Some photographs of chrysanthemum genotypes found suitable for cut flower production taken at study at flowering stage and flower head (inset)

Plate 2: Photographs of chrysanthemum genotypes found suitable for growing in garden taken at study at flowering stage and flower head (inset)

Plate 3: Photographs of chrysanthemum genotypes found suitable for growing in pots taken at study at flowering stage and flower head (inset)

References

1. Kumar R, Yadav DS, Roy AR. Performance of chrysanthemum (*Dendranthema grandiflora* Tzvelev.) cultivars under sub-tropical mid-hills altitude of Meghalaya. Environment and Ecology. 2007; 25(3A):941-45.
2. Swaroop K, Prasad KV, Raju DVS. Evaluation of chrysanthemum (*Dendranthema grandiflora* Tzvelev.) germplasm in winter season under Delhi conditions. Journal of Ornamental Horticulture. 2008; 11(1):58-61.
3. Reddy AM, Jyothi UK, Vani SV, Reddy AR. Evaluation of chrysanthemum (*Dendranthema grandiflora* Tzvelev) cultivars for flower and post harvest quality in alfisols of coastal Andhra Pradesh. Annals of Horticulture. 2016; 9(1):4-8.
4. Baskaran V, Janakiram T, Jayanthi R. Varietal evaluation in chrysanthemum. Karnataka Journal of Horticulture Sciences. 2004; 1(1):23-27.
5. Kim SJ, Lee CH, Kim J, Kim KS. Phylogenetic analysis of Korean native chrysanthemum species based on morphological characteristics. Scientia Horticulturae. 2014; 175:278-89.
6. Kulkarni BS, Reddy BS. Vegetative growth, flower yield and quality of different chrysanthemum cultivars. Journal of Ornamental Horticulture. 2004; 7(3-4):32-36.
7. Kumar A, Dubey P, Patanwar M, Sharma R. Evaluation of chrysanthemum varieties for loose flower production in Chhattisgarh plains. Trends in Bioscience. 2015; 8(1):175-77.
8. Rao AM, Pratap M. Evaluation of varieties and variability studies in chrysanthemum (*Dendranthema grandiflora* Tzvelev.). Journal of Ornamental Horticulture. 2006; 9(3):221-23.
9. Behera TK, Sirohi PS, Pal A. Assessment of chrysanthemum germplasm for commercial cultivation under Delhi condition. Journal of Ornamental Horticulture. 2002; 5(2):11-14.
10. Dilta BS, Sharma YD, Verma VK. Evaluation of chrysanthemum cultivars under sub-tropical region of Himachal Pradesh. Journal of Ornamental Horticulture. 2005; 8(2):149-51.
11. Mantur SM, Bagali AN, Patil SR. Influence of bending and pruning on different varieties of roses under naturally ventilated polyhouse. Karnataka Journal of Agricultural Sciences. 2005; 18(2):474-77.
12. Fascella G, Zizzo GV. Effect of growing media on yield and quality of soilless cultivated rose. Acta Horticulturae. 2005; 697:43-47.
13. Palai SK, Madhuri G, Nath MR, Bhuyan S. Effect of planting dates and photoperiod on growth and flowering of chrysanthemum (*Chrysanthemum morifolium* Ramat) cv. yellow Reagan. The Pharma Innovation. 2018; 17(5):106-108.
14. Prabhu G, Thamaraiselvi SP, Aruna P, Sudhakar R. Evaluation of chrysanthemum (*Dendranthema grandiflora* Tzelev.) genotypes for loose flower production under Coimbatore conditions. International Journal of Chemical Studies. 2018; 6(4):1618-21.
15. Reddy AM, Jyothi UK, Vani SV, Reddy AR. Evaluation of Chrysanthemum (*Dendranthema grandiflora* Tzvelev) cultivars for flower and post harvest quality in alfisols of coastal Andhra Pradesh. Annals of Horticulture. 2016; 9(1):4-8.
16. Baskaran V, Jayanthi R, Janakiram T, Abirami K. Studies on genetic variability, heritability and genetic advance in chrysanthemum. Journal of Horticultural Science. 2016; 4(2):174-6.
17. Uddin AF, Taufique T, Ona AF, Shahrin S, Mehraj H. Growth and flowering performance evaluation of thirty two chrysanthemum cultivars. Journal of Bioscience and Agriculture Research. 2015; 4(01):40-51.
18. Gaikwad AM, Dumbre-Patil SS. Evaluation of chrysanthemum varieties under open and polyhouse

conditions. Journal of Ornamental Horticulture. 2001; 4(2):95-7.
19. Jayanthi R, Vasanthachari LH. Varietal evaluation of chrysanthemum. Journal of Ornamental Horticulture. 2002; 5(2):273-76.
20. Suvija NV, Suresh J, Kumar RS, Kannan M. Evaluation of chrysanthemum (*Chrysanthemum morifolium* Ramat.) genotypes for loose flower, cut flower and pot mums. International Journal of Innovation Research and Advanced Studies. 2016; 3(4):100-104.