



Research Article

EVALUATION OF CHRYSANTHEMUM (*DENDRANTHEMA GRANDIFLORA* TZVELEV) GENOTYPES UNDER BIHAR CONDITION

PRIYA MAYA¹, SINGH DEEPTI², SINGH PARAMVEER³, SINGH MAHESH KUMAR⁴, SAHAY SANJAY⁵, BEHERA SUBRAT KESHORI⁶, SANJEV KUMAR⁷ AND SINHA SWETA⁸

^{1,2,3}Department of Horticulture (Veg. and Flori.), Bihar Agricultural University, Sabour, Bhagalpur, 813210, Bihar, India

⁴Department of Agronomy, Bihar Agricultural University, Sabour, Bhagalpur, 813210, Bihar, India

⁵Department of Horticulture (Fruit and Fruit Technology), Bihar Agricultural University, Sabour, Bhagalpur, 813210, Bihar, India

⁶Department of SMCA, Bihar Agricultural University, Sabour, Bhagalpur, 813210, Bihar, India

⁷Department of Plant Pathology, Bihar Agricultural University, Sabour, Bhagalpur, 813210, Bihar, India

⁸Department of MBGE, Bihar Agricultural University, Sabour, Bhagalpur, 813210, Bihar, India

*Corresponding Author: Email - singh.deepti2008@gmail.com

Received: August 02, 2021; Revised: August 26, 2021; Accepted: August 27, 2021; Published: August 30, 2021

Abstract: Evaluation of twenty chrysanthemum genotypes under was done under Bihar conditions during the year 2020-21 to identify the suitable variety for commercial and quality flower production. Twenty varieties namely Achievement, Alfred Simpson, Beutica Marry, Bolare Deo, Coronation Gold, Coronation Pink, Cassandra, Pompon Rosy Pink, Crimson Pretty Pottey, Crimson Crystal, Crimson Title, Dignity, Dorridge Queen, Duke of Kent, Frosty Whisker, Mahatma Gandhi, Miss India, Red Wine, Royal Prince, S.L. Andre were selected for their evaluation. This experiment was laid out in Completely Randomized Design (CRD) with three replications. Significant differences were recorded among the evaluated chrysanthemum genotype for growth and flowering attributes. The genotype Pompon Rosy Pink was recorded with maximum plant height at first bud appearance (77.90 cm) and number of flowers per plant (88.35) along with second highest values for internodal length (4.05 cm) and flowering duration (40.35 days). Maximum number of primary branches per plant was observed in genotype Coronation Pink (20.35) and third highest number of flowers per plant (78.35). The maximum fresh weight of leaves was studied in genotype Bolare Deo (1.69 g) and internodal length ((4.79 cm) and it was early attained reproductive stage in 64.35 days among all genotype with second highest vase life (15.67 days). The maximum days taken to first flower opening showed the genotype Frosty Whisker (156.00 days) and minimum observed in Coronation pink (122.02 days). The genotype Red Wine reported maximum flower longevity on plant (20.02 days) with second highest flowering duration (40.35 days). The genotype Crimson Pretty Pottey obtained maximum flower duration (41.27 days). The genotype Achievement was recorded maximum flower yield per plant (746.31 g). The genotype Alfred Simpson exhibited significantly maximum vase life (16.33 days).

Keywords: Chrysanthemum, Evaluation, Genotypes, Growth and flowering attributes

Citation: Priya Maya, *et al.*, (2021) Evaluation of Chrysanthemum (*Dendranthema grandiflora* Tzvelev) Genotypes under Bihar Condition. International Journal of Agriculture Sciences, ISSN: 0975-3710 & E-ISSN: 0975-9107, Volume 13, Issue 8, pp.- 10848-10850.

Copyright: Copyright©2021 Priya Maya, *et al.*, This is an open-access article distributed under the terms of the Creative Commons Attribution License, which permits unrestricted use, distribution and reproduction in any medium, provided the original author and source are credited.

Introduction

Chrysanthemum (*Dendranthema grandiflora* Tzvelev) is one of the essence floriculture crops use in the potted plant, cut flower and herbaceous perennial markets of the world. The word chrysanthemum is derived from the Greek words 'chrysos' (gold) and 'anthemon' or 'anthos' (flower) it means golden flower. It belongs to family Asteraceae. It is to be of the opinion that native to the Northern hemisphere chiefly Europe and Asia and was considered to have been originated in China by Bose *et al.* [1].

Chrysanthemum is routinely known as Queen of East and Guldaudi in India and Mum in America and commercially grown in different parts of India. It is also known as autumn queen because it blooming in November- December. It is generally known as 'kiku' in Japan and 'liki' in China. It is the national flower of Japan and is regarded as a symbol of royalty by Datta and Bhattacharjee [2]. In United States chrysanthemum is the number one more dollar earning flowers next to rose in other countries. The wide variations exhibited by a large number of cultivars with respect to flower head size, colour, growth habit and shape of bloom make the chrysanthemum flower suitable for various purposes such as borders plants, pot plants, cut flowers, hair decoration, garland making, and for the exhibition purposes. In India chrysanthemum is grown commercially and occupies third rank after rose and gerbera by Janakiram and Rao [3].

Growth and flowering of chrysanthemum are very much influenced by light and temperature. Hence, the performance of genotypes varies with region, season and growing conditions.

Materials and Methods

The present study was conducted at College Garden of Bihar Agricultural University, Sabour, Bhagalpur, Bihar, India during winter season, 2020-21. Bihar Agricultural University is located in Bhagalpur district of Bihar. Latitudinal existence of BAU is on the latitude of 25°15' 40" North and longitudinally the location is of 80°2' 42" east. It is located on the vast Indo-Gangetic plains of north India at an altitude of 46 meter above mean sea level. The experiment was laid out in Completely Randomized Design (CRD) with three replications. The experiment was conducted in pots using soil, sand, FYM, leaf Mould (2:1:1:1) was used for growing in pots. Rooted cutting planted in the pot. Uniform recommended package of practices was followed along with nutritional application and normal irrigation. Pinching was done at 30 days after planting by removing the terminal portion of the plants. The data on plant height at first bud appearance (cm), number of primary branches/ plants, fresh weight of leaves (g), internodal length (cm), days taken to first flower bud appearance, days taken to first flower opening, days taken for full blooming, flower duration (days), flower longevity (days),

Table-1 Performance of chrysanthemum genotypes for growth and flowering traits

Treatment	PHB	PB/P	FWL	IL	FBA	FO	FD	FL	F/P	FWF	FY/P	VL/SL
Achievement	45.99	4.08	1.14	1.45	95.33	125.00	33.00	17.33	52.67	14.17	746.31	6.67
Alfred Simpson	68.45	5.00	0.83	4.05	105.00	155.35	31.02	15.33	15.68	1.17	18.44	16.33
Beutica Marry	65.35	5.33	1.37	3.21	82.67	125.33	33.67	17.00	26.67	3.83	102.01	6.67
Bolare Deo	71.70	2.92	1.69	4.79	64.35	122.02	25.02	18.35	26.37	12.21	321.95	15.67
Cassandra	62.37	4.35	0.99	3.28	85.37	133.33	35.33	16.33	78.68	3.16	248.67	8.67
Pompon Rosy Pink	77.90	5.33	0.49	4.05	89.33	128.33	40.35	15.00	88.35	2.95	260.90	8.33
Crimson Crystal	54.98	5.35	1.00	2.05	95.67	136.00	35.67	14.67	18.00	0.96	17.34	3.67
Crimson Title	60.62	3.67	1.13	4.03	90.67	137.00	38.33	16.33	28.00	7.90	220.26	14.33
Crimson Pretty Pottey	63.52	4.28	0.93	3.24	86.72	121.33	41.27	18.58	39.49	3.09	122.11	7.33
Coronation Pink	68.02	20.35	1.66	2.91	87.35	122.02	31.68	15.02	78.35	0.88	68.96	7.33
Coronation Gold	47.67	8.01	0.89	3.85	91.35	134.67	29.68	13.02	21.33	3.35	71.31	7.33
Dignity	52.58	3.02	1.02	2.09	71.03	126.33	29.02	12.35	16.37	9.34	153.11	7.67
Dorridge Queen	37.36	2.90	1.16	2.05	72.68	128.35	27.33	15.35	13.02	13.84	180.20	7.33
Duke of Kent	67.38	4.33	0.63	2.05	108.02	142.68	35.67	18.67	65.32	1.80	116.15	15.67
Frosty Whisker	66.03	4.02	1.12	2.08	118.33	156.00	36.02	15.00	27.35	4.67	127.55	8.33
Mahatma Gandhi	45.87	2.35	0.93	1.13	98.67	146.33	26.00	18.00	1.33	7.15	9.54	6.67
Miss India	63.06	3.72	1.18	2.09	103.37	145.35	33.35	13.70	38.35	8.02	307.72	10.67
Red Wine	59.54	5.35	1.59	3.05	134.35	146.00	40.35	20.02	39.00	5.96	232.48	7.33
Royal Prince	57.68	4.33	0.85	2.06	91.67	142.00	24.67	14.67	64.33	6.97	447.93	4.33
S.L. Andre	49.37	4.68	0.62	3.06	74.67	133.35	26.67	19.00	6.68	16.86	112.66	8.67
C.D.	7.101	0.838	0.116	0.253	9.115	12.890	4.472	1.668	2.917	0.407	25.196	0.956
SE(m)	2.475	0.292	0.041	0.088	3.177	4.493	1.559	0.581	1.017	0.142	8.783	0.333
C.V.	7.234	9.816	6.556	5.408	5.960	5.750	8.256	6.221	4.725	3.832	7.830	6.451

flower diameter (cm), number of flowers/ plants, average fresh weight of flower (g), flower yield/ plant (g), vase/shelf life of flowers (days) were recorded. The observations were statistically analyzed as per by Panse and Sukhatme [4].

Results and Discussion

Growth and flowering parameters

Significant differences were obtained in vegetative and floral quality characters among twenty different chrysanthemum genotypes. The data on growth and flowering attributes in chrysanthemum genotypes depicted in [Table-1]. The genotype Pompon Rosy Pink was recorded maximum plant height at first bud appearance (77.90 cm) followed by Bolare Deo (71.70 cm) whereas, genotype Dorridge Queen was recorded minimum plant height at first bud appearance (37.36 cm) followed by Mahatma Gandhi (45.87 cm) and Achievement (45.99 cm). The variation in plant height is mainly due to their genetic makeup of individual genotype. These results are supported by Prabhu *et al.* [5], Bala [6], Prakash *et al.* [7] and Thakur *et al.* [8] in chrysanthemum flower.

Significant variation among the genotypes was observed for number of primary branches per plant. Maximum number of primary branches per plant was observed in genotype Coronation Pink (20.35) followed by Coronation Gold (8.01), whereas minimum number of primary branches per plant was observed in Mahatma Gandhi (2.35) and is statistically at par with Dorridge Queen (2.90) and Bolare Deo (2.92). The production of a greater number of branches per plant may be the reason for increasing plant spread and also the genetic characters of the plant by Prabhu *et al.* [5]. Similar trend was noticed in chrysanthemum genotypes by Kumar *et al.* [9], Parmar *et al.* [10], Bala [6] and Dewan *et al.* [12].

Maximum fresh weight of leaves was studied in genotype Bolare Deo (1.69 g) followed by Coronation Pink (1.66), however minimum average fresh weight of leaf studied in genotype Pompon Rosy Pink (0.49 g) followed by S.L.Andre (0.62 g). Genotype Bolare Deo observed maximum internodal length (4.79 cm) followed by Alfred Simpson (4.05 cm), whereas Mahatma Gandhi (1.13 cm) had minimum internodal length followed by Achievement (1.45 cm). Similar observation were concluded by Rathore *et al.* [12], Thakur *et al.* [8] and Dewan *et al.* [11] in chrysanthemum.

Chrysanthemum genotypes significantly varied for flowering attributes. The genotype Bolare Deo was recorded to be early in attaining bud appearance stage (64.35 days after transplanting) followed by Dignity (71.03 days) and Dorridge Queen (72.68 days), whereas genotype Red Wine (134.35 days) took maximum days to flower bud appearance followed by Frosty Whisker (118.33 days) and Duke of Kent (108.02 days). The maximum days taken to first flower opening showed the genotype Frosty Whisker (156.00 days) followed by Alfred Simpson (155.35 days) and Mahatma Gandhi (146.33 days), whereas the genotype

CrimsonPrettyPottey (121.33 days) showed minimum days followed by Coronation Pink (122.02 days) and Achievement (125.00 days). These results were in accordance with the finding of Suvija *et al.* [13], Prabhu *et al.* [5], Archana *et al.* [14], Thakur *et al.* [8]. The variation in time to flowering might be due to the genotype or the influence of genotype and environment by Dewan *et al.* [11].

The genotype CrimsonPrettyPottey obtained maximum flower duration (41.27 days) followed by Pompon Rosy Pink (40.35 days) and Frosty Whisker (36.02 days), whereas Royal Prince obtained minimum flower duration (24.67 days) followed by Bolare Deo (25.02 days) and Mahatma Gandhi (26.00 days). The genotype Red Wine took maximum flower longevity (20.02 days) on plant followed by S.L.Andre (19 days) and Duke of Kent (18.67 days), whereas the minimum flower longevity was observed by the genotype Dignity (12.35 days) followed by Coronation Gold (13.02 days). The variation in flowering duration among the varieties was attributed to genotype of the plant, environmental influence and other management factors. The results obtained by Thakur *et al.* [8], Dewan *et al.* [11], Suvija *et al.* [13], Kumar [15], Kumarn *et al.* [9], Archana *et al.* [14], Bala [6] and Prabhu *et al.* [5] in chrysanthemum.

The genotype Pompon Rosy Pink resulted in maximum number of flowers per plant (88.35) followed by Cassandra (78.68) whereas, minimum number of flowers per plant resulted in Mahatma Gandhi (1.33) followed by S.L.Andre (6.68). The genotype S.L.Andre significantly increased fresh weight of individual flower (16.86 g) followed by Achievement (14.17 g) and Dorridge Queen (13.84 g), whereas Coronation Pink resulted in minimum weight of individual flower (0.88 g) followed by Crimson Crystal (0.96 g). The genotype Achievement recorded maximum flower yield per plant (746.31 g) followed by Royal Prince (447.93 g) whereas Mahatma Gandhi was recorded minimum flower yield per plant (9.54 g) followed by Crimson Crystal (17.34 g). The genotype Alfred Simpson exhibited significantly maximum vase life (16.33 days) followed by Bolare Deo (15.67 days), whereas minimum vase life exhibited in Crimson Crystal (3.67 days). These findings are also in accordance with results of Kumar [15], Kumar *et al.* [9], Archana *et al.* [14], Suvija *et al.* [13] and Parmar *et al.* [10] in chrysanthemum.

Conclusion

The present investigation for evaluation of different genotypes of chrysanthemum, varieties Royal Prince, Miss India, Duke of Kent and Bolare Deo gave better performance for vegetative and flowering characters under climatic condition of Bihar Agricultural University, Sabour, Bhagalpur, Bihar and recommended for its commercial cultivation. Also, considerable morphological variations were recorded among vegetative and flowering characters that could be considered as useful selection criteria for further improvement in chrysanthemum.

Application of Research: With the research findings of the present study, good performing genotypes under Bihar conditions can be further evaluated in multi-locations and can be recommended for further commercial cultivation.

Research Category: Horticulture

Abbreviations: PHB- Plant height at first bud appearance (cm), PB/P- Number of primary branches per plant, IL- Internodal length (cm), FWL- Average fresh weight of leaf (g), FBA- Days taken to first flower bud appearance, FO- Days taken to first flower opening, FD- Flower duration (days), FL- Flower longevity (days), F/P- Number of flowers per plant, FWF- Average fresh weight of flower(g), VL/SL- Vase life/ Shelf life, FY/P- Flower yield per plant (g)

Acknowledgement / Funding: Authors are thankful to Department of Horticulture, Bihar Agricultural University, Sabour, Bhagalpur, 813210, Bihar, India

****Principal Investigator or Chairperson of research: Dr Deepti Singh**

University: Bihar Agricultural University, Sabour, Bhagalpur, 813210, Bihar, India
Research project name or number: Research station study (Natural Resource Management)

Author Contributions: All authors equally contributed

Author statement: All authors read, reviewed, agreed and approved the final manuscript. Note-All authors agreed that- Written informed consent was obtained from all participants prior to publish / enrolment

Study area / Sample Collection: Department of Horticulture, Bihar Agricultural University, Sabour, Bhagalpur, 813210, Bihar, India

Cultivar / Variety / Breed name: *Dendranthema grandiflora* Tzvelev

Conflict of Interest: None declared

Ethical approval: This article does not contain any studies with human participants or animals performed by any of the authors.
Ethical Committee Approval Number: Nil

References

- [1] Bose T.K., Yadav L.P. and Pal P. (2002) 2nd ed. Kolkata, Naya Prakash, 463-602.
- [2] Datta S.K. and Bhattacharjee S.K. (2001) *All India Coordinated Research Project on Floriculture*. Indian Council of Agricultural Research Institute.
- [3] Janakiram T. and Rao T.M. (2001) *Indian institute of horticulture research, Bangalore*, 36.
- [4] Panse V.G. and Sukhatme P.V. (1985) *Indian Council of Agricultural Research Publication*, 87-89.
- [5] Prabhu G., Thamaraiselvi S.P., Aruna P. and Sudhakar R. (2018) *International Journal of Chemical Studies*, 6(4), 1618-21.
- [6] Bala M. (2015) *Journal of Horticultural Sciences*, 10(2), 242-44.
- [7] Prakash A., Kumar M., Naresh R.K., Malik S., Singh M.K., Kumar V. and Kumar A. (2017) *International Journal of Pure & Applied Bioscience*, 5(3), 982-988.
- [8] Thakur N., Nair S.A., Kumar R., Bharathi T.U., Dhananjaya M.V. and Venugopalan R. (2018) *International Journal of Current Microbiology and Applied Sciences*, 7(8), 565-57.
- [9] Kumar S., Kumar M., Malik S., Singh M.K. and Kumar S. (2014) *Annals of Horticulture*, 7(2), 162-65.
- [10] Parmar R., Kanawjia A., Chaurasiya R., Dubey A., Parveen S.K. and Pawaiya S. (2019) *International Journal of Current Microbiology Applied Sciences*, 8, 38-44.
- [11] Dewan N., Kumar S., Sharma S. and Chakraborty S. (2016) *Hort Flora*

Research Spectrum, 5(3), 189-194.

- [12] Rathore I., Kaushik R.A., Upadhyay B. and Mahawer L.N. (2016) *Progressive Research an International Journal*, 11(1), 283-89.
- [13] Suvija N.V., Suresh J., Kumar S.R. and Kannan M. (2016) *International Journal of Innovative Research and Advanced Studies*, 3(4), 101-04.
- [14] Archana D., Prasanth P., Seenivasan N. and Joshi V. (2019) *Journal of Pharmacognosy and Phytochemistry*, 8(6), 1522-1525.
- [15] Kumar R. (2014) *Hort Flora Research Spectrum*, 3(4), 388-89.