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Varietal evaluation and genetic variability of chrysanthemum (*Dendranthema grandiflora* Tzvelve)

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Abstract

An experiment was conducted to evaluate genetic variability and varietal performance of chrysanthemum varieties under Jhalawar condition during 2019-20. 10 genotypes viz., Marigold, Poornima Pink, Dall White, Calcutta Shantini, Karnool, Poornima Red, Dall Yellow, Poornima White, Poornima Yellow, Dundi were selected for the evaluation. The experiment carried out in randomized block design with three replications. Among these genotypes Poornima Pink recorded maximum plant height (37.70 cm), maximum main stem diameter was observed in Dall White 1.39 cm, maximum number of leaves per plant and number of flowers per plant was recorded in 'Calcutta Shantini' (331.80 and 269.90 respectively), maximum leaf width and maximum number of flower plucking recorded in Karnool (7.37 cm and 3.93 respectively), maximum plant spread in E-W and N-S and number of primary branches per plant recorded in 'Poornima White' (40.83, 40.20 cm and 7.50 respectively), maximum flower yield and estimated flower yield per hectare was recorded in 'Poornima Yellow' (522.86 gm and 326.78 q/ha respectively) and maximum leaf length was showed in 9.42 cm.

Keywords: Chrysanthemum, evaluation, genetic variability, varietal performance

Introduction

Chrysanthemum, (*Dendranthema grandiflora* Tzvelve.) belongs to the family Asteraceae, believed to be the native to the northern hemisphere chiefly Europe and Asia, having basic chromosome number of $n=9$, wide range of ploidy level is found in different cultivars of the species with $2n=36, 45, 47, 71$ and 75 . Chrysanthemum inflorescence is called as capitulum (head consisting of large number of tiny florets closely mounted on a flattened stem end, which gives a false appearance of single bloom). Disc florets are perfect while ray flowers are pistillate and receptacle is naked, flat or convex in shape and involucre scales imbricate and angled or terete. In spite of wide range of variability, very little attention has been paid for chrysanthemum improvement. Hence there is a need for identification of varieties suitable for growing in different agro-climatic conditions for specific purposes, for this the study was conducted with objective to study the variability, yield and yield components in different chrysanthemum varieties.

Materials and Methods

The present experiment was conducted at Department of Floriculture and Landscaping, College of Horticulture & Forestry, Jhalrapatan City, Jhalawar. The experiment laid out in randomized block design, which was replicated thrice with 10 treatments in open field condition in the year 2019-20 with a view to study the performance of chrysanthemum cultivars under Jhalawar condition. Rooted cuttings of chrysanthemum were planted in October at a distance of 40 cm in rows spaced 40 cm apart in plots of size 2×2 m, willing to 26 plants in each plot. Pinching was done to encourage axillary branches a month after transplanting.

Results and Discussion

The results of the present investigation as well as relevant discussion have been presented under following sub heads:

Vegetative parameters

Plant height

Among the genotypes 'Poornima Pink' recorded maximum plant height (37.70 cm) followed by 'Dundi' (36.73 cm), while, the minimum plant height was observed in 'Poornima Red'

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(30.37 cm). The variation in plant height may be accredited primarily to difference in genetic character of the genotypes (Behera *et al.*, 2002)^[5]. 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. (Prabhu *et al.*, 2018). Similar findings were reported by Niki *et al.*, (2016) and Dayal Singh *et al.*, (2017)^[7] in chrysanthemum.

Number of primary branches per plant

A significant difference was recorded for number of primary branches per plant. The mean of number of primary branches per plant recorded was 6.00 and it was ranged from 4.27 to 7.50. The 'Poornima White' recorded maximum number of primary branches (7.50) followed by the 'Poornima Yellow' (7.20), 'Marigold' (7.17). The minimum number of primary branches was recorded in 'Karnool' (4.27). Variation in number of branches may also be attributed to the soil and climatic conditions prevailing in the area that influenced the cultivars of dahlia (Bajaraya *et al.*, 2018)^[3]. Similar findings were also reported by Munikrishnappa *et al.*, (2013)^[12] in china aster and Shaikat *et al.*, (2013)^[22] in gladiolus.

Main stem diameter

The data observed for main stem diameter showed a significant difference. The mean of main stem diameter recorded was 1.04 cm and it was ranged from 0.81 cm to 1.39 cm. Superior main stem diameter was recorded in 'Dall White' (1.39 cm) followed by 'Karnool' (1.20cm), 'Dundi' (1.16 cm) and 'Marigold' (1.13 cm). Minimum main stem diameter was recorded in 'Dall yellow' (0.81 cm). The production of strong and sturdy stem or thin and weak stem might due to genetic makeup of varieties which could have also been further affected by environmental conditions (Rajiv *et al.*, 2007)^[19]. The variation in main stem diameter was due to genetic makeup of genotypes. Due to the increased vegetative growth like number of branches, chlorophyll content as well as root growth there is an increase in stem diameter (Kazemi, 2014 and Awang *et al.*, 2015)^[9,21].

Number of leaves per plant

'Calcutta Shantini' recorded maximum number of leaves (331.83) followed by 'Poornima Red' (273.52), 'Poornima Yellow' (253.33) and 'Poornima White' (251.67). Minimum number of leaves recorded in 'Marigold' (95.33). Increasing the number of leaves per plant may be due to the mutual coordination of nutrients absorption and photo assimilates in the presence of optimum temperature and relative humidity during the vegetative growth, Bajaraya *et al.*, (2018)^[3]. These results coincide with the findings of Ali *et al.*, (2015)^[11] in chrysanthemum.

Leaf length and width (cm)

A keen observation of the data revealed significant difference in the leaf length. 'Dundi' recorded maximum leaf length (9.42 cm) which was statistically at par with the 'Marigold' (9.13 cm) followed by the 'Karnool' (8.44 cm) while the minimum leaf length was recorded in 'Poornima Red' (5.62 cm). Significant difference in leaf width was observed in different varieties of chrysanthemum. It was ranged from 3.77 cm to 7.54 cm with mean of 5.63 cm. Among them 'Karnool' recorded maximum leaf width (7.54 cm) which was statistically at par with 'Marigold' (7.25 cm) followed by the

'Dundi' (7.18 cm) while minimum leaf width was recorded in 'Calcutta Shantini' (3.77 cm). The differences in the leaf length as well as leaf width of the different varieties were mainly due to varietal character (Laskar and Yadav. 1991)^[11]. Variation in leaf length and width may be due to the increased number of leaves and their size as reported by (Punetha *et al.*, 2011)^[18] in chrysanthemum. Variation in leaf area indicates additive gene effects as showed by Nair and Shiva (2003)^[15] in gerbera.

Plant spread (E-W, N-S)

Among the varieties, 'Poornima White' recorded maximum plant spread (40.83 cm) in East-West direction which was statistically at par with 'Karnool' (40.23 cm) followed by 'Poornima Red' (36.75 cm) 'Calcutta Shantini' (36.50 cm). Minimum spreading was recorded in 'Dall Yellow' (30.63 cm). Significant difference in plant spread (N-S) observed in different varieties of chrysanthemum. It was ranged from 33.33 cm to 40.20 cm with mean of 37.19 cm. Among them 'Poornima White' recorded maximum plant spread (40.20 cm) in north south direction and which was statically at par with 'Poornima Yellow' (39.80 cm) followed by 'Dundi' (39.36 cm), 'Poornima Red' (38.90 cm), 'Karnool' (38.67 cm). Minimum spreading was recorded in 'Poornima pink' (33.33 cm). Greater plant spread shows better vegetative growth of plant (Singh *et al.*, 2017). 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 (Prabhu *et al.*, 2018). Similar finding was also reported by Niki *et al.*, (2016) suvija *et al.*, (2016)^[25] and Dayal Singh *et al.*, (2017)^[7] in chrysanthemum.

Yield parameters

Number of flowers per plant

Maximum number of flowers was recorded in 'Calcutta Shantini' (269.90) followed by 'Poornima Red' (213.20), 'Poornima Yellow' (141.47), 'Dundi' (139.63) 'Poornima White' (117.58). Minimum number of flowers per plant was observed in cultivar 'Poornima Pink' (51.02). The genotype differences for yield potential were attributed to additive gene effect as reported by Behera *et al.*, (2002)^[5], and Balaji *et al.*, (2004)^[4]. Number of flower per plant was varied due to 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 (Prabhu *et al.*, 2018). Variation of number of flowers per plant was due to varietal differences for number of floret spike may be due to the fact that a gene exerts influence on physiological processes by controlling the synthesis of amino acid and proteins responsible for growth and development (Bajaraya *et al.*, 2018)^[3]. Similar finding for varietal differences for floret size has been reported by Nagaraju and Parthasarathy, (2001)^[13] in gladiolus.

Number of flower plucking

The perusal of the data related to number of flower plucking explicate that variety 'Karnool' (3.93) showed the maximum number of flowers plucking which was statistically at par with 'Poornima Pink' (3.87) followed by 'Dundi' (3.73) 'Marigold' (3.32) and 'Dall Yellow' (3.27). Minimum number of plucking was found in 'Calcutta shantini' (2.10). Increasing in number of flower plucking may be due to genetic makeup of varieties and increasing number of primary branches and environmental factor and their interaction.

Similar results were also recorded by Girangeet *et al.*, (2016) ^[8] and Byadwal *et al.*, (2018) ^[6] in gaillardia.

Flower yield per plant (gm)

The flower yield per plant recorded in different cultivars was subjected to statistical analysis showed significant variation among the varieties. Maximum flower yield was recorded in 'Poornima Yellow' (522.86 gm) followed by 'Poornima White' (444.40 gm), 'Calcutta Shantini' (419.88gm). Minimum flower yield was recorded in 'Poornima Pink' (144.17 gm). The variation in the flower yield among the varieties is also may be due to the higher rate of water absorption than the transpiration rate (Baskaran *et al.*, 2010). Variation in flower yield per plant may be due to weight of flowers per plant directly correlated with number of flowers per plant (Sharma, 2014) ^[21]. Variation in yield might be due to increase in morphological parameters like plant height, number of leaves and leaf area which might have contributed in production of more photosynthates resulting in greater accumulation of dry matter in rose (Ramzan *et al.*, 2014) ^[20]. Higher yields were due to the more number of flowers and heavier flowers per plant as reported by Srilatha *et al.*, (2015)

^[24] in chrysanthemum.

Flower yield per hectare (q/ha)

Maximum estimated flower yield per hectare was observed in 'Poornima Yellow' (326.78 q/ha) followed by 'Poornima White' (277.75 q/ha), 'Calcutta Shantini' (277.75 q/ha) and 'Dundi' (232.00 q/ha). Minimum flower yield per hectare was observed in 'Poornima Pink' (90.10 q/ha). The increased flower yield was due to increased flower size and flower weight and due to more number of flowers per plant in and varieties had high dry matter accumulation, which might have contributed for the increased flower yield (Munikrishnappa *et al.*, 2013) ^[12]. Higher yields were due to the more number of flowers and heavier flowers (Srilatha *et al.*, 2015) ^[24]. The increased flower yield might be attributed to more number of leaves resulted in production and accumulation of maximum photosynthetic material which ultimately resulted in production of more number of flowers with bigger sized flowers (Kumar *et al.*, 2017) ^[10]. Similar findings reported by Patil (2001) ^[16] in carnation and (Naik *et al.*, 2005) ^[14] in marigold.

Table 1: Evaluation of chrysanthemum genotypes for vegetative and yield parameters

| Genotypes | Plant Height (cm) | No. of primary branches | No. of leaves per plant | Main stem diameter (cm) | Leaf length (cm) | Leaf width (cm) | Plant spread (E-W) in cm | Plant spread (N- S) in cm | Number of flowers per plant | Flower yield per plant(gm) | Number of flower plucking | Flower yield per ha (q/ha) |
|-------------------|-------------------|-------------------------|-------------------------|-------------------------|------------------|-----------------|--------------------------|---------------------------|-----------------------------|----------------------------|---------------------------|----------------------------|
| Marigold | 30.63 | 7.17 | 93.53 | 1.13 | 9.13 | 7.25 | 35.07 | 35.90 | 52.20 | 205.30 | 3.32 | 128.31 |
| Poornima Pink | 37.70 | 4.77 | 115.17 | 0.81 | 6.08 | 3.95 | 34.07 | 33.33 | 51.02 | 144.17 | 3.87 | 90.10 |
| Dall White | 30.76 | 4.97 | 243.53 | 1.39 | 7.58 | 5.79 | 36.23 | 34.83 | 98.05 | 324.59 | 3.07 | 202.87 |
| Calcutta Shantini | 33.30 | 5.57 | 331.83 | 0.92 | 5.87 | 3.77 | 36.50 | 35.70 | 269.90 | 419.88 | 2.10 | 262.42 |
| Karnool | 35.70 | 4.27 | 186.45 | 1.20 | 8.44 | 7.54 | 40.23 | 38.67 | 101.50 | 232.16 | 3.93 | 145.09 |
| Poornima Red | 30.37 | 6.03 | 273.52 | 0.92 | 5.62 | 4.13 | 36.75 | 38.90 | 213.20 | 264.38 | 3.17 | 165.24 |
| Dall Yellow | 34.57 | 6.30 | 197.17 | 0.94 | 7.13 | 5.33 | 30.63 | 35.30 | 120.02 | 291.48 | 3.27 | 182.17 |
| Poornima White | 35.43 | 7.50 | 251.67 | 1.01 | 7.25 | 5.55 | 40.83 | 40.20 | 117.58 | 444.40 | 2.99 | 277.75 |
| Poornima Yellow | 33.97 | 7.20 | 253.53 | 1.01 | 7.68 | 5.87 | 33.10 | 39.80 | 141.47 | 522.86 | 2.95 | 326.78 |
| Dundi | 36.73 | 6.30 | 182.50 | 1.16 | 9.42 | 7.18 | 34.92 | 39.30 | 139.63 | 372.31 | 3.73 | 232.69 |
| Mean | 33.61 | 6.00 | 212.89 | 1.04 | 7.42 | 5.63 | 35.83 | 37.19 | 130.45 | 322.15 | 3.23 | 201.34 |
| S.Em± | 0.43 | 0.50 | 3.56 | 0.48 | 0.16 | 0.53 | 0.61 | 0.50 | 8.74 | 16.84 | 0.153 | 10.53 |
| CD 5% | 1.30 | 1.46 | 10.58 | 0.21 | 1.43 | 0.49 | 1.54 | 1.75 | 25.97 | 50.058 | 0.456 | 31.28 |

Conclusion

From this study it was concluded that Poornima Yellow recorded maximum yield per plant and estimated flower yield per hectare. However, in the local market Poornima White, Dall White and Marigold having good acceptance due to their color and flower appearance.

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References

1. Ali M, Khattak AM, Ullah K, Ibrahim M. Performance of Exotic Tulip Cultivars under Agro-Climatic Conditions of Peshawar, Journal of Bioresource Management 2015;2(3).
2. Awang NA, Ismail MR, Omar D, Islam MR. Comparative study of the application of Jasmonic acid and pesticide in chili: effects on physiological activities,

yield and viruses control. Bioscience Journal Uberlandia 2015;31(3):672-681.

3. Bajaraya B, Kanawjia A, Jaysawal N, Dubey A, Parveen S, Pawaiya S. Performance of different cultivars of Dahlia (*Dahlia variabilis* L.) under agro-climatic conditions of Gwalior. Journal of Pharmacognosy and Phytochemistry 2018;7(6):98-102.
4. Balaji S, Kulkarni, Reddy BS. Vegetative growth, flower yield and quality of different chrysanthemum cultivars. Journal of Ornamental Horticulture 2004;7(3, 4):3236.
5. Behera TK, Sirohi PS, Anand Pal. Assessment of chrysanthemum germplasm for commercial cultivation under Delhi condition. Journal of Ornamental Horticulture 2002;5(2):11-14.
6. Byadwal RK, Meena MK, Chauhan S, Rundla SK. Performance of different genotypes of gaillardia (*Gaillardia pulchella* Foug.) in respect to flowering, quality and yield parameter. Journal of Pharmacognosy and Phytochemistry 2018;7(6):2697-2700.
7. Dayal Singh D, Tyagi S, Singh S, Kumar P. Studies on the Performance and Flower Characterization of Chrysanthemum (*Dendranthema grandiflora* L.) Genotypes under Uttar Pradesh Conditions 2017.

8. Girahge RR, Charjan SU, Jadhav GN, Bhaskarwar AC, Ghube NN, Lambat AP. Evaluation of different genotypes of gaillardia for growth, flowering and yield parameters. *International Journal of Agricultural Science and Research* 2016;6(6):301-306.
9. Kazemi M. Effect of foliar application with salicylic acid and Methyl Jasmonate on growth, flowering, yield and fruit quality of Tomato. *Bulletin of Environment, Pharmacology and Life Sciences* 2014;3(2):154-158.
10. Kumar S, Polara D. Evaluation of Chrysanthemum Varieties on Growth and Quality under South Saurashtra Region. *International Journal of Pure and applied Bioscience* 2017;5(4):1989-1997.
11. Lascar MA, Yadav LP. Varietal performance with chrysanthemum in the plains of West Bengal. *Environment and Ecology* 1991;(9):979-982.
12. Munikrishnappa PM, Patil AA, Patil VS, Patil BN, Channappagoudar BB, Alloli TB. Studies on the growth and yield parameters of different genotypes of China aster (*Callistephus chinensis* Nees.). *Karnataka Journal of Agriculture Science*, 26(1):107-110.
13. Nagaraju V, Parthasarathy VA. Evaluation of gladiolus germplasm at midhills of Meghalaya. *Indian Journal of Horticulture* 2001;58(3):269-75.
14. Naik Hemla B, Patil AA, Basavaraj N, Patil VS. Stability analysis for growth, yield and flower colour (xanthophylls) in African marigold (*Tagetes erecta* L.). *Karnataka Journal of Horticulture* 2005;1(3):28-36.
15. Nair SA, Shiva KN. Genetic variability, correlation and path coefficient analysis in gerbera. *Journal of Ornamental Horticulture* 2003;6(3):180-187.
16. Patil RT. Evaluation of standard carnation (*Dianthus caryophyllus*) cultivars under protected cultivation M. Sc. Thesis, University of Agriculture Sciences, Dharwad 2001.
17. Prabhu G, Thamaraiselvi SP, Aruna P, Sudhakar R. Evaluation of chrysanthemum (*Dendranthema grandiflora* Tzvelev.) genotypes for loose flower production under Coimbatore conditions. *International Journal of Chemical studies* 2013;6(4):1628-1621.
18. Punetha P, Roa VK, Sharma SK. Evaluation of different chrysanthemum (*Chrysanthemum morifolium*) genotypes under mid hill conditions of Garhwal Himalaya. *Indian Journal of Agricultural Sciences* 2011;81(9):830-3.
19. Rajiv K, Yadav S, Roy R. Performance of chrysanthemum (*Dendranthema grandiflora* Tzvelev) cultivars under subtropical midhills altitude of Meghalaya. *Environment and Ecology* 2007;255(34):941-944.
20. Ramzan A, Hanif M, Tariq S. Performance of *Rosa hybrida* cultivars under agro climatic condition of Islamabad, Pakistan. *Journal of Agricultural. Research* 2014;52(1).
21. Sharma P. Evaluation of genotypes of French marigold (*Tagetes patula* L.) under Nauni, Solan conditions M. Sc thesis, Dr Y S Parmar University of Horticulture and Forestry, Nauni, Solan 2014.
22. Shaukat SA, Shah SZA, Shaukat SK, Shaukat SW. Performance of gladiolus (*Gladiolus grandiflora* L.) cultivars under the climatic conditions of Bagh Azad. *Journal of Central European Agriculture* 2013;14(2):636-645.
23. Singh DD, Tyagi S, Singh S, Ray KP. Studies on the performance and flower characterization of chrysanthemum (*Dendranthema grandiflora* L.) genotypes under Uttar Pradesh conditions 2017;9(1):1-7.
24. Srilatha V, Kumar KS, Kiran YD. Evaluation of chrysanthemum (*Dendranthema grandiflora* Tzvelev) varieties in southern zone of Andhra Pradesh. *Agricultural Science Digest-A Research Journal* 2015;35(2):155-157.
25. 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 Advanced and Innovative Research* 2016;3(4):100-103.