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Assessment of Qualitative and Quantitative Parameters of Leaf and Flower of Different Spray Chrysanthemum Genotypes

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ABSTRACT: Chrysanthemum (Chrysanthemum morifolium Ramat) which belongs to the Asteraceae family and find their place in the market as cut flowers, loose blooms, and potted plants. An experiment was carried out with 20 genotypes of spray chrysanthemum to evaluate the performance for vegetative and flowering characters in RBD with three replications, during the year 2022-23 at the Department of Floriculture and Landscape Architecture, College of Horticulture and Forestry, Central Agricultural University, Pasighat, Arunachal Pradesh. Significant variations among the 20 genotypes were observed for all the characters. The genotype BC-24 recorded maximum leaf length (12.67 cm) and maximum petiole length (3.30 cm). The genotype Bidhan Sweeta was observed the maximum leaf breadth (6.59 cm). Maximum flower head height (3.67 cm) was noted in genotype BC-31, maximum ray floret length (3.93 cm) and maximum ray floret width (0.85 cm) was observed in genotype Bidhan Shova. Among the 20 spray chrysanthemum genotypes evaluated, Bidhan Mallika and Bidhan Sweeta performed the best in terms of flower colour, Chrysanthemum genotypes have a broad range of variation in their leaf colour, flower head type and flower colour which may be used for various purposes.

Keywords: Spray Chrysanthemum, genotypes, vegetative, flowering, variation.

INTRODUCTION

The chrysanthemum (*Chrysanthemum morifolium* Ramat.), belonging to the Asteraceae family, is a well-known commercial flower that is produced all over the world for cut flowers, loose flowers, and pot plants. It is one of the most important ornamental species and the second-most important flower crop in the world commercially after roses. Chrysanthemum cultivation is adaptable to a diverse array of climatic conditions, yet the genotype's performance is notably influenced by the distinct nuances of each region, season, and various other growing factors (Singh *et al.*, 2017).

Chrysanthemum inflorescences are a fascinating botanical spectacle, comprising a central assembly of hermaphrodite disc florets (possessing both pistils and stamens) encircled by outer ray florets, which are also pistillate in nature. What truly distinguishes this remarkable flower is the remarkable diversity that characterizes a multitude of cultivars. These variations encompass an array of growth habits, sizes, colors, and distinctive bloom shapes. This vast spectrum of possibilities renders the chrysanthemum an exceptionally versatile flower, suitable for an extensive range of purposes. Whether it's gracing garden borders, adorning floral arrangements as cut flowers, thriving as potted plants, contributing to the artistry of garland making, enhancing the allure of hair decorations, or taking center stage in exhibitions, the chrysanthemum

effortlessly adapts to and enriches a multitude of creative and practical endeavors.

The demand for fresh chrysanthemum flowers is constantly increasing for a wide range of uses, including essential oils, cosmetics, aromatherapy, dried flowers, potpourri, natural dyes and medicines etc. Chrysanthemums are widely used in India for religious offerings, garlands, veni, bracelets, and floral decorations. Due to its adaptability as a potted plant, the demand for potted chrysanthemums has increased in recent years (Abrol *et al*., 2018). The process of selection stands as a crucial cornerstone in the realm of breeding, serving as the preferred method for pinpointing chrysanthemum genotypes that boast highly sought-after horticultural traits. These traits are meticulously chosen to align with specific purposes, ultimately aimed at optimizing production within the realm of commercial cultivation.

MATERIAL AND METHODS

The present investigation was conducted at Department of Floriculture & Landscape Architecture, College of Horticulture and Forestry, Central Agricultural University, Pasighat, Arunachal Pradesh during 2022-23. The experimental site was geographically located at 28.07° N Latitude, 95.33° E Longitude and at an elevation of 155 m above mean sea level. The soil was sandy loam soil with pH 5.75 and E.C. of 0.006376 dS/m. A total of 20 spray chrysanthemum genotypes were evaluated for vegetative, flowering characters in randomized block design with three replications following the recommended spacing of 30 cm × 25 cm under naturally ventilated polyhouse.

RESULTS AND DISCUSSION

The observations recorded for leaf length, leaf breadth, petiole length, flower head height, ray floret length and ray floret width of different chrysanthemum genotypes grown in polyhouse condition are presented in Table 1. The data presented in table shows that there were significant differences amongst the genotypes. In terms of leaf colour, flower head type, and flower colour are presented in Table 2, chrysanthemum genotypes show a wide range of variability. Amongst the different genotypes, BC-24 recorded the maximum leaf length (12.67 cm), whereas minimum leaf length (7.09 cm) was seen in genotype BC-59 and it was followed by Bidhan Rupanjali (7.67 cm) and Bidhan Madhuri (7.12 cm). The genotype Bidhan Sweeta noted that the maximum leaf breadth (6.59 cm) and was found to be statistically at par with Bidhan Monami (6.58 cm), BC-24 (6.57 cm), Bidhan Gold (6.50 cm), Bidhan Purna (6.46 cm), Pusa Chitraksha (5.99 cm), BC-31(5.91 cm), Bidhan Tarun (5.85 cm), while, the minimum leaf breadth (3.59 cm) was recorded in genotype Bidhan Antara and was at par with BC-59 (4.45 cm). The present findings have shown that there were significant differences in leaf characters which were observed at all the stages of growth. Ahmed *et al.* (2014) also found similar results and attributed their findings to the fact that it might be due to their genetic composition which interact differently with the soil and climatic conditions of a particular area. A similar study on leaf characters have also been reported by Mushtaq *et al.* (2023); Mahale *et al*. (2023); Dewan *et al*. (2016) in chrysanthemum.

Genotype BC-24 had registered the maximum petiole length (3.30 cm), While shortest petiole length (1.71 cm) was exhibited in genotype BC-28 and it was followed by Bidhan Madhuri (1.83 cm) and Bidhan Rupanjali (1.85 cm). It is considered that these variations in petiole length of the different chrysanthemum genotypes might be due to the genetic make-up of cultivars and similar variations in petiole length have also been reported by Fanourakis *et al.* (2021); Sindhu *et al.* (2020) in chrysanthemum.

Maximum flower head height (3.67 cm) was noted in genotype BC-31, while it was minimum (1.30 cm) in genotype Pusa Chitraksha and was at par with BC-38 (1.45 cm). These results pointed out the highly significant differences among the genotypes for flowering characters and may be attributed to the genotypes genetic make-up which may have caused variations in these parameters. Such differences have also been observed by Kaushal and Bala (2019); Madhumathi *et al.* (2018) in chrysanthemum. With regard to the floret characters, ray floret length ranged from 1.64 cm (Bidhan Mum) to 3.93 cm (Bidhan Shova). Width of the ray floret was maximum (0.85 cm) in Bidhan Shova and minimum (0.39 cm) in BC-38. These variations are generally due to the genetic make-up of the genotypes and is a varietal character as also reported by Song *et al.* (2018); Dewan *et al*. (2016) in chrysanthemum. All the chrysanthemum genotypes evaluated were observed to have green leaf colour of different groups as indicated by Royal Horticulture Society Colour Chart. The variation in leaf colour is dependent on the cultivar and the plant species. It may also be attributed to the adverse effect of radiation of the process of chlorophyll production. Ruminska *et al.* (2013) opined that the content of chlorophylls in the leaves in chrysanthemum changes throughout the year and depends on the cultivar. The present findings are in line with Verma and Prasad (2015) in chrysanthemum. The twenty genotypes evaluated showed different flower head types and flower colour in the present studies. Bidhan Sweeta, Bidhan Agnidev, Bidhan Mallika had double korean flower type, Bidhan Purna, Bidhan Shova, Pusa Chitraksha showed single korean flower type, Bidhan Gold, Bidhan Tarun, Bidhan Madhuri, Bidhan Rupanjali, Bidhan Agnishikha, HCC-1, Bidhan Monami, BC-28, BC-59, BC-24 had a decorative flower type, Bidhan Mum, Bidhan Antara had a pompon flower type, BC-38 was noted to have spoon flower type and BC-31 had reflex flower type. Flower colours ranged from different shades of yellow, white and red. The genetic make-up and presence or absence of colouring pigment in a given genotype could be responsible for the diversity in flower hues seen across the different genotypes taken under study. Further, chrysanthemums differ in flower head type which is generally governed by genetics. Similar results were reported by Mahale *et al.* (2023); Pawar *et al*. (2021); Thakur *et al.* (2018) in chrysanthemum.

Table 1: Variation in vegetative and flowering characters among chrysanthemum genotypes.

Genotypes	Leaf length (cm)	Leaf breadth(cm)	Petiole length(cm)	Flower head height (cm)	Ray floret length (cm)	Ray floret width (cm)
Bidhan Sweeta	8.87	6.59	2.49	2.87	2.37	0.65
Bidhan Purna	8.99	6.46	2.24	2.63	3.29	0.62
Bidhan Gold	9.38	6.50	2.53	3.31	2.69	0.70
Bidhan Monami	9.29	6.58	2.25	3.16	2.39	0.59
Bidhan Tarun	9.63	5.85	2.28	2.36	2.34	0.56
Bidhan Madhuri	7.12	5.05	1.83	3.01	2.41	0.53
Bidhan Rupanjali	7.67	5.59	1.85	2.43	2.26	0.55
Bidhan Agnidev	8.02	5.51	2.29	2.39	2.38	0.65
Bidhan Mallika	9.05	5.24	2.30	2.58	2.55	0.53
Bidhan Mum	8.12	4.89	2.49	2.49	1.64	0.51
BC-28	8.38	4.59	1.71	3.17	2.61	0.72
Bidhan Shova	7.31	5.08	1.99	1.81	3.93	0.85
Pusa Chitraksha	10.22	5.99	2.82	1.30	2.82	0.76
Bidhan Antara	7.53	3.59	2.73	2.73	1.82	0.50
Bidhan Agnishikha	10.93	5.37	2.57	2.17	2.69	0.46
BC-24	12.67	6.57	3.30	2.39	2.68	0.48
HCC-1	8.41	5.21	2.29	2.69	2.12	0.55
BC-31	8.37	5.91	2.04	3.67	2.54	0.57
BC-38	9.17	5.40	2.39	1.45	3.82	0.39
BC-59	7.09	4.45	2.03	2.35	2.03	0.55
S.Em±	**0.42**	**0.34**	**0.13**	**0.07**	**0.02**	**0.01**
CDat 5%	**1.19**	**0.97**	**0.38**	**0.19**	**0.06**	**0.03**
CV	**8.20**	**10.55**	**9.86**	**4.57**	**1.40**	**3.62**

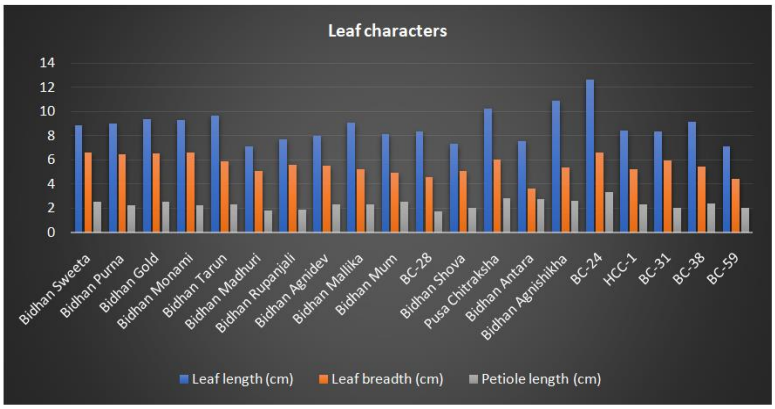

Fig. 1. Variation in leaf characters among 20 spray chrysanthemum genotypes at different stages.

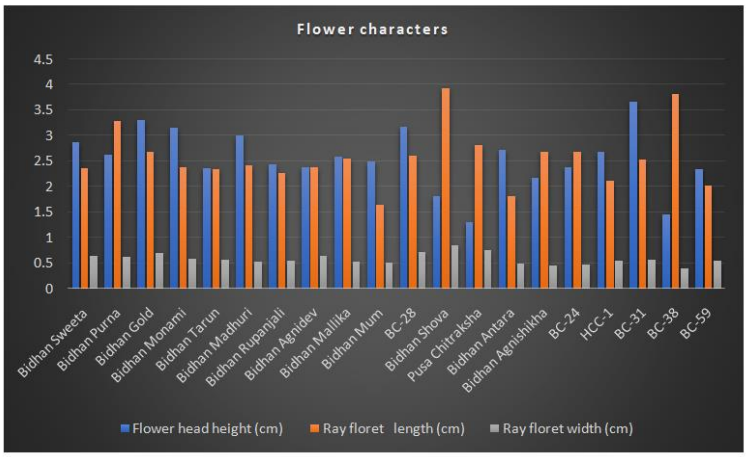

Fig. 2. Variation in flower characters among 20 spray chrysanthemum genotypes at different stages.

Table 2: Variation in leaf colour, flower head type and flower colour of chrysanthemum genotypes.

Genotypes	Leaf colour (RHS Colour Chart)	Flower head type	Flower colour (RHS Colour Chart)
Bidhan Sweeta	N138B	Double Korean	White group (NN155D)
Bidhan Purna	132B	Single Korean	Yellow group (13A) with Yellow Orange group (21 B)
Bidhan Gold	N134B	Decorative	Yellow group (9C)
Bidhan Monami	132B	Decorative	Yellow group (4A) with Orange group (N25A)
Bidhan Tarun	136A	Decorative	Red-Purple group (65A)
Bidhan Madhuri	132B	Decorative	Red-Purple group (65A)
Bidhan Rupanjali	135A	Decorative	Yellow group (6A)
Bidhan Agnidev	132A	Double Korean	Orange group (N25B)
Bidhan Mallika	135A	Double Korean	Yellow group (12A)
Bidhan Mum	N134B	Pompon	Yellow-Orange group (21B)
BC-28	135A	Decorative	Pink group (70C)
Bidhan Shova	135B	Single Korean	White group (NN155D)
Pusa Chitraksha	135A	Single Korean	Red- Purple group(NN78B)
Bidhan Antara	136B	Pompon	Red group(46B)
Bidhan Agnishikha	131A	Decorative	Pink-Purple group(73C)
BC-24	132B	Decorative	Pink-Purple group (N74C)
HCC-1	N134B	Decorative	Pink-Purple group (N74C)
BC-31	N134A	Reflex	Purple –Violet group (N74A)
BC-38	132B	Spoon	Purple –Violet group (77B)
BC-59	136A	Decorative	Red-Purple group (65A)

CONCLUSIONS

In conclusion, the study revealed significant variations in leaf length, leaf breadth, and petiole length among different chrysanthemum genotypes at various stages of growth. Genotype BC-24 consistently exhibited the maximum leaf length throughout the growth stages, while genotype BC-59 consistently had the minimum leaf length. The findings highlight the diversity in morphological traits among chrysanthemum genotypes, providing valuable insights for further research and breeding efforts in this plant species. The study also unveiled noteworthy variations in the morphological characteristics of chrysanthemum flower heads among different genotypes. These findings shed light on the diverse characteristics of chrysanthemum genotypes, offering valuable insights for further research and breeding programs aimed at enhancing the quality and appearance of this beloved flower.

FUTURE SCOPE

The observed variations in flower head height, ray floret dimensions, and the number of ray florets per head highlight the potential for genotype-specific breeding programs. Future research can focus on developing chrysanthemum varieties with desired characteristics, such as taller flower heads or specific ray floret attributes, to cater to diverse market preferences. The data on leaf length, leaf breadth, and petiole length across different genotypes provide an opportunity for targeted trait enhancement. Future studies can aim to optimize these morphological traits through selective breeding or genetic modification, with the goal of creating chrysanthemum plants that exhibit improved foliage and stem characteristics. Investigating how these genotypes perform under varying environmental conditions, including different soil types, temperature regimes, and humidity levels, could be a promising avenue for future research. This could lead to the development of chrysanthemum varieties that are more resilient and adaptable to a range of growing conditions. In conclusion, the insights gained from this study not only provide a deeper understanding of chrysanthemum genotypes' morphological traits but also lay the groundwork for future research endeavors aimed at enhancing the ornamental and horticultural value of this beloved flower. These potential research directions hold promise for advancing chrysanthemum cultivation practices and meeting the evolving demands of the floral industry and consumers.

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Conflict of Interest. None.

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