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EFFECT OF POT SIZE AND CULTIVARS ON GROWTH AND FLOWERING OF POT CHRYSANTHEMUM (*Chrysanthemum morifolium* Ramat.)

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ABSTRACT

The present investigation was carried out at the College Farm, College of Horticulture, SDAU, Jagudan, Gujarat, from August 2024 to January 2025, to study the effect of pot size and cultivar on the growth and flowering of chrysanthemum (*Chrysanthemum morifolium* Ramat.) under pot culture. The experiment was laid out in a Completely Randomized Design (CRD) with a factorial concept, comprising three pot sizes (25 cm, 20 cm and 15 cm diameter) and ten cultivars (Ajina Purple, Winter Queen, Mother Teresa, Deep Red, Basanti, Yellow Charm, Pusa Guldasta, Royal White, Pusa Aditya and Dolly Orange) which was replicated thrice. Results revealed that larger pot size (25 cm diameter) significantly enhanced growth parameters, recording maximum plant height (17.18 cm), number of branches (14.91), number of leaves (96.08) and plant spread (17.67 cm E-W and 17.68 cm N-S) at 90 days after transplanting. Additionally, the highest shoot biomass (191.30 g), root biomass (93.20 g) and root length (25.14 cm) were noted in 25 cm pots. Flowering traits such as flower longevity (11.15 days), blooming period (32.34 days), flower diameter (4.71 cm) and number of flowers per plant (70.97) were also superior in the largest pot size. Among the cultivars, 'Royal White' (C8) performed best, showing maximum plant height (26.56 cm), shoot (204.98 g) and root biomass (100.23 g), longest root (27.21 cm), earliest bud initiation (62.76 days), extended blooming period (37.60 days) and largest flower diameter (6.68 cm). Cultivar 'Deep Red' (C4) produced the highest number of flowers (98.18) and branches (18.14), while 'Basanti' showed wider early-stage plant spread. The interaction between 25 cm pot size and cultivar 'Royal White' (S₁C₈) recorded the best overall results in shoot biomass, root length, flower longevity (14.83 days) and blooming period (41.07 days). From this study, it can be concluded that the use of 25 cm diameter pots significantly improves the growth and flowering traits of chrysanthemum. Among the cultivars 'Royal White' proved most suitable for pot cultivation, especially when grown in larger pot size, making the combination (S₁C₈) ideal for maximizing both aesthetic appeal and commercial value.

Keywords : Chrysanthemum (*Chrysanthemum morifolium* Ramat.), Pot Size, Cultivars, Growth, Flowering

Introduction

Chrysanthemum (*Chrysanthemum morifolium* Ramat. Syn. *Dendranthema grandiflora* Tzvelev) belongs to the family Asteraceae and is popular commercial flower grown for cut and loose as well as a pot plant in different parts of the world.

In chrysanthemum medium growth habit and freedom of profuse flower production, make it especially desirable for growing in pots. Pot mums occupy an important place in world floriculture trade

and specially in the European, North American and Japanese floriculture trade mums have unique preference. Chrysanthemum are also excellent bedding plants for winter and spring displays. Apart from its unsurpassed beauty, wide array of flower colours, shape, size and keeping quality of blooms, its ease in cultivation has also made it popular among the consumers and commercial growers. In recent years, demand of pot mums for decorations in ceremonies, exhibitions, flower shows and various other occasions have been increased tremendously.

Getting bloom of excellent quality in chrysanthemums, especially which are grown in containers, is a challenge for nurserymen due to restricted volume of pots. Due to finite volume of the pots, there is a greater tendency for increased competition among the roots in the rhizosphere for water, air and space (Dubik *et al.*, 1990) for achieving potential plant growth. The container size plays an important role in manipulating the growth, development and flowering besides the presentability of pot plants. Both the size and quantity of blooms can be influenced by the pot size. Bigger plants with greater root systems are supported by larger pots, which frequently leads to larger blooms and more vigorous flowering. Larger pots provide extra space, which is beneficial for chrysanthemum kinds with huge flowers. Plant size may be restricted in smaller pots, which could result in fewer or smaller flowers. For taller or top-heavy cultivars, larger pots provide superior stability and lower the chance of toppling over. This is crucial to preserving the plant's structure and making sure it can develop to its maximum capacity without collapsing.

Chrysanthemum holds a prominent place in the floriculture industry as an ideal pot plant due to its wide range of flower colours, forms, and extended blooming period, especially during festive seasons. In modern landscaping, chrysanthemum is extensively used for seasonal displays in balconies, terraces, public gardens, and indoor décor, contributing to aesthetic enhancement and psychological well-being in urban environments. The selection of appropriate pot size is crucial for maximizing plant growth and floral quality; small-flowered varieties (spray types) perform well in smaller pots, enabling compact growth and mass display, while large-flowered varieties require bigger pots to support vigorous root development and larger blooms. Thus, the strategic use of pot sizes according to varietal characteristics not only optimizes space utilization but also enhances the commercial value and visual appeal of chrysanthemum in floriculture and landscaping practices.

Materials and Methods

A field experiment was carried out at College Farm, College of Horticulture, Jagudan, Mehsana during rabi season 2024-25 to study the effect of pot size and cultivars on growth and flowering of pot chrysanthemum. Present experiment consists of three pot size viz., S₁ (25 cm diameter pot), S₂ (20 cm diameter pot) and S₃ (15 cm diameter pot) and ten chrysanthemum cultivars viz., (Ajina Purple, Winter Queen, Mother Teresa, Deep Red, Basanti, Yellow Charm, Pusa Guldasta, Royal White, Pusa Aditya and

Dolly Orange). Pots of different size as per treatment were taken and filled with growing media i.e., Cocopeat + vermicompost (2:1 v/v). Uniform and healthy cuttings of chrysanthemum were selected and planted in each pot (one cutting in each pot) in second week of September, 2024 according to treatments and regularly watered twice in a day through drip system with microtubes. After 30 DAT pinching was done for suppress apical dominance and encourage the growth of lateral branches. Observations were recorded for various growth and flowering parameters in chrysanthemum.

Result and Discussion

Effect of pot size and cultivars on vegetative characters

The data in respect of plant height, number of branches per plant, plant spread and number of leaves were recorded at 90 DAT and fresh weight of shoot biomass, root biomass and root length recorded at end of full bloom stage. Significantly the maximum plant height (21.80 cm), number of branches (14.91), plant spread (17.67 cm in E-W and 17.68 cm in N-S directions), number of leaves (96.02), fresh weight of shoot biomass (204.98 g), root biomass (93.20 g) and root length (25.14 cm) were recorded in 25 cm diameter pot (S₁), whereas, the minimum plant height (17.18 cm), number of branches (7.89), plant spread (12.03 cm in E-W and 12.10 cm in N-S directions), number of leaves (54.07), fresh weight of shoot biomass (134.58 g), root biomass (57.69 g) and root length (14.92 cm) were recorded in 15 cm diameter pot (S₃). This might be due to that bigger pot size could have accommodated more amount of potting mixture would be helpful in providing sufficient nutrients and space for growth of adequate root system thus resulting in better growth of plant (Deogade *et al.*, 2020). Similar results were previously reported by Gupta and Dilta (2015) in fairy primerose, Taherpazir and Hashemabadi (2016) in zinnia, Alhajhoj (2017) in gladiolus, Kumar *et al.* (2022) in costus and Geethan *et al.* (2024) in Asiatic lily.

Among the various cultivars, the cultivar 'Royal White' (C₈) exhibited the maximum plant height (26.56 cm), plant spread in E-W (18.89 cm) and N-S (19.05 cm) directions, fresh weight of shoot biomass (204.98 g), root biomass (100.23 g) and root length (27.21 cm), while maximum branches per plant (8.08) and number of leaves per plant were found in cultivar 'Deep Red' (C₄). In contrast the minimum plant height (12.49 cm), number of branches per plant (8.08), plant spread in E-W (11.19 cm) and N-S (11.31 cm) directions, fresh weight of shoot biomass (94.33 g),

root biomass (100.23 g) and root length (14.01 cm) was recorded in cultivar ‘Mother Teresa’ (C₃). While, cultivar ‘Dolly Orange’ (C₁₀) exhibited minimum number of leaves per plant (53.39). This might be due to varietal characters responsible for variation in gene as genetically controlled factor, plant height varied among the cultivars of chrysanthemum (Uddin *et al.*,

2015). Similar findings were also recorded by Archana *et al.* (2019), Kumar *et al.* (2021) and Mishra *et al.* (2023) in chrysanthemum.

The interaction effect between pot sizes and cultivars on plant height at 90 DAT was statistically non-significant and for other characters, it was highly significant.

Table 1 : Effect of pot size and cultivars on vegetative characters

Treatments	Plant height (cm)	Branches plant ⁻¹	Plant spread (cm)		Leaves plant ⁻¹	Fresh wt. of shoot	Fresh wt. of root	Root length
			E-W	N-S				
POT SIZE (S)								
S ₁	21.80	14.91	17.67	11.16	14.20	191.30	93.20	25.14
S ₂	19.63	11.87	14.97	10.19	11.81	171.45	82.39	20.83
S ₃	17.18	7.89	12.03	7.70	10.13	134.58	57.69	14.92
S.E. (m) ±	0.20	0.10	0.12	0.10	0.14	1.05	0.60	0.17
C. D. at 5%	0.57	0.30	0.34	0.30	0.39	3.00	1.70	0.48
F Test	**	**	**	**	**	**	**	**
CUTIVARS (C)								
C ₁	14.29	12.49	12.70	7.19	12.49	143.33	68.58	20.05
C ₂	24.21	8.08	14.06	8.61	11.91	162.89	75.39	26.86
C ₃	12.49	10.88	11.19	6.29	13.81	94.33	48.35	14.01
C ₄	23.21	18.14	17.86	13.10	12.25	188.45	89.11	18.64
C ₅	20.81	15.46	16.40	13.13	19.06	197.55	88.88	23.38
C ₆	21.42	12.19	16.15	9.34	9.86	199.34	82.22	18.36
C ₇	16.17	9.95	13.45	9.20	9.51	139.67	71.01	21.58
C ₈	26.56	9.76	18.89	12.33	13.23	204.98	100.23	27.21
C ₉	17.79	9.60	13.70	8.63	9.08	182.22	75.07	14.46
C ₁₀	18.41	9.01	14.54	9.00	9.26	145.03	78.76	18.43
S.E. (m) ±	0.37	0.19	0.22	0.19	0.25	1.92	1.09	0.31
C. D. at 5%	1.05	0.54	0.61	0.54	0.72	5.48	3.10	0.88
F Test	**	**	**	**	**	**	**	**
INTERACTION S × C								
F Test	NS	**	**	**	**	**	**	**
CV%	5.65	4.93	4.34	5.88	6.26	3.48	4.20	4.55

NS = Non-significant, * = Significant, ** = Highly significant

Effect of pot size and cultivars on flowering characters

Table 2 : Effect of pot size and cultivars on flowering characters

Treatments	Days to bud initiation	Days to colour break stage	Longevity of individual flower	Blooming period	flower diameter	No. of flower per plant
POT SIZE (S)						
S ₁	78.44	90.34	11.15	97.01	47.11	70.97
S ₂	75.38	88.76	10.38	28.96	45.21	65.48
S ₃	72.15	86.35	9.09	24.75	43.60	53.18
S.E. (m) ±	0.42	0.50	0.10	0.20	0.33	0.48
C. D. at 5%	1.21	1.43	0.30	0.56	0.94	1.35
F Test	**	**	**	**	**	**
CUTIVARS (C)						
C ₁	91.12	105.22	6.63	28.09	35.72	85.71
C ₂	90.03	104.98	12.61	29.89	57.22	54.07
C ₃	65.02	77.00	12.47	32.47	28.41	69.71
C ₄	75.71	85.96	7.67	23.31	42.48	98.18

C ₅	73.78	88.29	10.79	36.07	39.12	90.82
C ₆	72.60	87.73	11.94	30.13	42.42	72.09
C ₇	75.90	88.20	7.62	21.96	42.42	41.42
C ₈	62.76	76.04	13.01	37.60	66.78	38.96
C ₉	65.08	77.02	11.00	27.22	50.56	40.04
C ₁₀	81.23	94.38	8.32	20.08	43.12	41.09
S.E. (m) ±	0.78	0.92	0.19	0.36	0.61	0.87
C. D. at 5%	2.21	2.62	0.54	1.01	1.72	2.47
F Test	**	**	**	**	**	**
INTERACTION S × C						
F Test	NS	NS	**	*	NS	**
CV%	3.09	3.12	5.58	3.73	4.01	4.12

NS = Non-significant, * = Significant, ** = Highly significant

From the experiment, in different pot size the minimum days to flower bud visibility and colour break stage (72.15 and 86.35 days) were recorded in 15 cm diameter pot (S₃), while maximum days for bud initiation (78.44 days) and colour break stage (90.34) were recorded in 25 cm diameter pot (S₁). This might be due to the reason that the plants grown in smaller pots failed to put up vigorous vegetative growth and as a result there was early induction of reproductive buds which later on turns into flowering (Thapa, 2014). The maximum flower longevity (11.15 days), longest blooming period (32.34 days), maximum flower diameter (4.71 cm) and number of flowers per plant (70.97) were recorded with 25 cm diameter pot (S₁), while minimum flower longevity (9.09 days), shortest blooming period (24.75 days), minimum flower diameter (4.36 cm) and number of flowers per plant (53.18) were recorded with 15 cm diameter pot (S₃). This might be due to plants grown in small pots have less root volume than those grown in larger pots, they receive limited water and nutrients. Therefore, it is expected that the vegetative and reproductive growth of these plants be less than plants grown in the bigger space (Yashaswini *et al.*, 2023).

Among the all cultivars minimum days to bud initiation (72.15 days) and colour break stage (76.08 days), while maximum longevity of individual flower (13.01 days), blooming period (37.60 days), flower diameter (6.68 cm) and number of flowers per plant (70.97) were recorded found in cultivar 'Royal White' (C₈). The maximum days to bud initiation (91.12 days) and colour break stage (105.22 days) was found in cultivar 'Ajina Purple' (C₁), while, the minimum longevity of individual flower (9.09 days) was recorded in cultivar 'Ajina Purple' (C₁), blooming period (20.08 days) in cultivar 'Dolly Orange' (C₁₀), flower diameter (2.84 cm) in cultivar 'Mother Teresa' (C₂) and number of flowers per plant (38.96) in cultivar 'Royal White' (C₈). This variation may be due to differences in the genetic makeup of cultivars and

due to the genotypic differences in phenotypic expression of flower diameter (Mishra *et al.*, 2023).

The interaction effect between different pot sizes and cultivars in respect to days taken to bud initiation, colour break stage and flower diameter was non-significant, while flower longevity and blooming period was significant.

Conclusion

From the present study, it may be concluded that different pot size and cultivars has significantly affected growth and flowering parameters of pot chrysanthemum. Big pot size *i.e.*, 25 cm diameter pot size (S₁) with cultivar 'Royal White' (C₈) attained maximum plant height, branches plant⁻¹, plant spread, leaves plant⁻¹, fresh weight of shoot biomass, root biomass, root length, flower longevity, flower diameter and blooming period, so that it is concluded that pot size S₁ with cultivar 'Royal White' (C₈) highly suited for pot culture.

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