

Impact of Spacing and Fertilizer Levels on Quality Attributes of Pinwheel Flower (*Tabernaemontana Divaricata* L.)

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ABSTRACT

The present experiment was carried out at the Department of Floriculture and Landscaping, College of Horticulture, Bagalkot during the year 2023–2024. The study tested three fertilizer levels (F₁: 20:40:40 g NPK/plant/year, F₂: 30:60:60 g NPK/plant/year and F₃: 40:80:80 g NPK/plant/year) and three spacing configurations (S₁: 1.5 x 1.2 m, S₂: 2.0 x 1.5 m and S₃: 2.5 x 1.8 m), resulting in nine treatment combinations, each replicated thrice in a Factorial Randomized Complete Block Design (RCBD). Fertilizers were applied at four intervals (May, July, September and November) using urea, diammonium phosphate and muriate of potash as sources of nitrogen, phosphorus and potash respectively. Quality attributes were measured at 240 days after treatment imposition. The results indicated that the combination of S₂ and F₃ (spacing of 2.0 x 1.5 m and fertilizer level of 40:80:80 g NPK/plant/year) resulted in the highest flower diameter (17.00 mm), bud diameter (11.32 mm), corolla tube length (2.44 cm), single (1.10 g), ten (11.0 g), fifty (50.0 g) and 100-flower bud weight (100.01 g) and flower bud shelf life (2.90 days). On the other hand, the lowest values for these traits were observed in the S₁ F₁ treatment combination (spacing of 1.5 x 1.2 m and fertilizer level of 20:40:40 g NPK/plant/year), with flower diameter (13.41 mm), bud diameter (7.98 mm), corolla tube length (1.94 cm), single (0.79 g), ten (7.9 g), fifty (46.1 g) and 100-flower bud weight (92.11 g) and flower bud shelf life (1.70 days). The study concluded that the ideal combination of spacing S₂ and F₃ proved to be highly beneficial for producing top-quality flower buds in Pinwheel flowers. Hence, can be recommended to the growers for ensuring superior flower quality.

Keywords: Pinwheel flower, Spacing, Fertilizer, Quality.

INTRODUCTION

Tabernaemontana divaricata (L.) R. Br. ex Roem. & Schult., commonly known as Pinwheel flower is a perennial shrub native to India and widely cultivated across Southeast Asia and other tropical regions, belongs to the Apocynaceae family. The plant is known for its striking white flowers, and approximately 120 species of *Tabernaemontana* are found in tropical regions such as Brazil, Egypt, India, Sri Lanka, Vietnam, Malaysia and Thailand (Samanta *et al*, 2015). It is referred to by various names, including East Indian rosebay, Pinwheel flower, and Moonbeam

in English, and by different vernacular names in India. Pinwheel flower typically grows to a height of 5–6 feet, with glossy dark green leaves. The flowers, arranged in pinwheel-shaped clusters, vary in form, with both single and double-flowered types. While the single-flowered variety is unscented, the double-flowered form carries a pleasant fragrance. These flowers primarily bloom in spring but can flower sporadically year-round. The plant is widely used in religious rituals in India and is a popular choice for gardens due to its year-round blooms and low maintenance needs.

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Table 1: Impact of different spacing and fertilizer levels on quality attributes of Pinwheel flower.

Treatment	Flower diameter (mm)	Bud diameter (mm)	Corolla tube length (cm)	Single flower bud weight (g)	Ten bud flower weight (g)	Fifty flower bud weight (g)	Hundred flower bud weight (g)	Shelf life of flower buds (days)
Spacing (S)								
S ₁	14.44	8.60	2.10	0.89	8.90	46.01	92.02	2.03
S ₂	15.75	10.30	2.37	1.03	10.30	47.83	95.66	2.57
S ₃	15.54	10.14	2.34	0.99	9.90	46.96	93.91	2.47
S.Em ±	0.09	0.07	0.01	0.01	0.0746	0.3264	0.65	0.02
C.D. at 5%	0.28	0.22	0.04	0.02	0.224	0.979	1.96	0.06
Fertilizer levels (F)								
F ₁	14.33	9.05	2.20	0.90	8.97	46.28	92.55	1.93
F ₂	15.20	9.74	2.25	0.97	9.67	46.60	93.19	2.40
F ₃	16.19	10.24	2.37	1.05	10.47	47.92	95.84	2.73
S.Em ±	0.09	0.07	0.01	0.01	0.0746	0.3264	0.65	0.02
C.D. at 5%	0.28	0.22	0.04	0.02	0.224	0.979	1.96	0.06
Interactions								
S ₁ F ₁	13.41	7.98	1.94	0.79	7.9	46.1	92.11	1.70
S ₁ F ₂	14.64	8.81	2.07	0.89	8.9	46.1	92.17	1.90
S ₁ F ₃	15.27	9.00	2.30	0.99	9.9	45.9	91.79	2.50
S ₂ F ₁	14.88	9.32	2.33	0.98	9.8	46.5	93.01	2.10
S ₂ F ₂	15.36	10.27	2.35	1.01	10.1	47.0	93.95	2.70
S ₂ F ₃	17.00	11.32	2.44	1.10	11.0	50.0	100.01	2.90
S ₃ F ₁	14.69	9.85	2.33	0.92	9.2	46.3	92.53	2.00
S ₃ F ₂	15.62	10.16	2.34	1.00	10.0	46.7	93.47	2.60
S ₃ F ₃	16.31	10.40	2.36	1.05	10.5	47.9	95.73	2.80
S.Em ±	0.16	0.12	0.02	0.01	0.1291	0.5654	1.13	0.03
C.D. at 5%	0.48	0.37	0.07	0.03	0.387	1.695	3.39	0.10

F₁ - 20:40:40 g NPK/plant/year
S₁ - 1.5 x 1.2 m

F₂ - 30:60:60 g NPK/plant/year
S₂ - 2.0 x 1.5 m

F₃ - 40:80:80 g NPK/plant/year
S₃ - 2.5 X 1.8 m

Pinwheel flower thrives in well-drained sandy loam soil with an acidic to neutral pH and prefers sunny locations in tropical and subtropical climates. It is often propagated through stem cuttings and requires moderate watering throughout the year, along with occasional light pruning to maintain its size and shape. The plant plays an important role in landscaping, serving as an evergreen ornamental shrub with its abundant white flowers, often referred to as Moonbeam

due to their beauty under moonlight. To improve its growth and flowering, proper nutrient management is essential, particularly the supply of nitrogen, phosphorus and potassium. Enhancing the plant's nutritional needs has the potential to increase both its production and the quality of its flowers. This study aims to study the impact of spacing on quality attributes and to optimize NPK dosage for quality flower production of Pinwheel flower.

Impact of Spacing and Fertilizer Levels on Quality Attributes of Pinwheel Flower

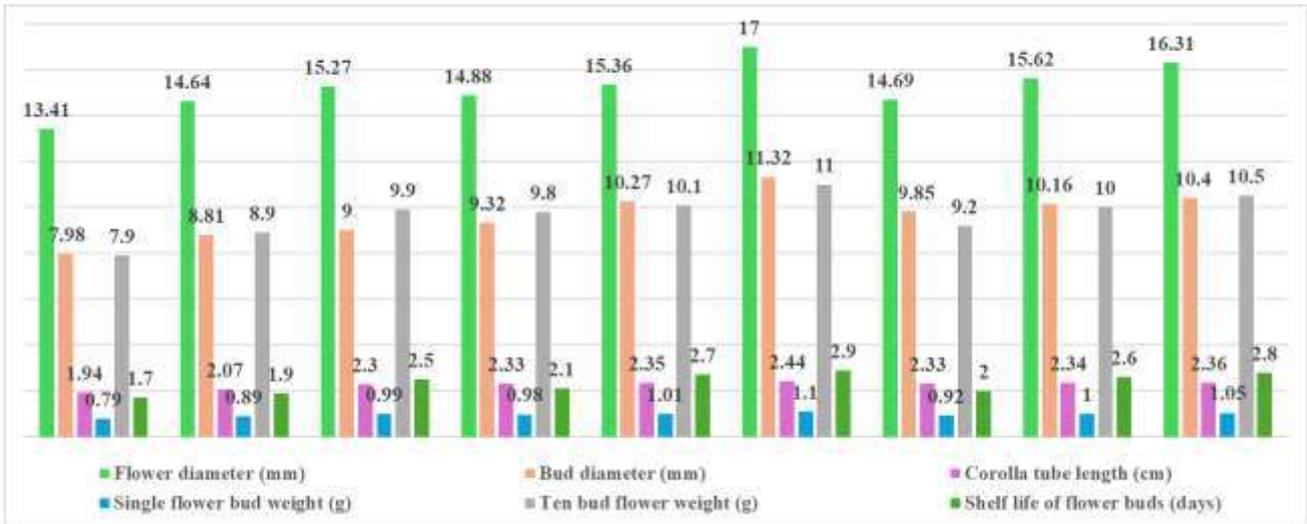


Fig. 1: Quality attributes of Pinwheel flower as influenced by spacing and fertilizer levels



$T_6 (S_2F_3): S_2 (2.0 \times 1.5 \text{ m}) + F_3 (40:80:80 \text{ g NPK/plant/year})$

Fig.2: Flower & bud diameter (mm) (a&b), corolla tube length (cm) (c), single & 100 flower bud weight (g) (d&e) of Pinwheel flower as influenced by spacing and fertilizer levels

MATERIALS AND METHODS

A field experiment was conducted during the year 2023-24 at Floriculture block, MHREC (Main Horticultural Research and Extension Centre), College of Horticulture, University of Horticultural Sciences, Bagalkot-587104, Karnataka, India. For this experiment 5-month-old Pinwheel flower plot was selected. The treatment comprised of 3 levels of

fertilizer (F_1 : 20:40:40, F_2 : 30:60:60 and F_3 : 40:80:80 g of NPK/plant/year) and 3 different spacing (S_1 : 1.5 x 1.2 m, S_2 : 2.0 x 1.5 m and S_3 : 2.5 X 1.8 m) in 9 treatment combinations. These treatment combinations were replicated thrice and laid out in a Factorial RCB design. Nitrogen, phosphorus and potash were applied in the form of urea, di ammonium phosphate and muriate of potash, respectively. Fertilizer distribution occurred in

four stages at two-month intervals (during month of May, July, September and November). Other cultural operations were carried out as per recommendations. All quality attributes such as diameter of flower and flower bud, corolla tube length, shelf life of flower buds, single, ten, fifty and hundred flower bud weight were recorded at 240 DAT (days after treatment imposition).

RESULTS AND DISCUSSION

Impact of different spacing and fertilizer levels on quality attributes

The plant spacing had a significant impact on the quality attributes of the Pinwheel flower (Table 1). The largest flower bud diameter (10.30 mm) and flower diameter (15.75 mm), corolla tube length (2.37 cm), and the weight of single, ten, fifty and hundred flower buds (1.03 g, 10.30 g, 47.83 g and 95.66 g, respectively) as well as the flower shelf life (2.57 days) were observed at a plant spacing of S_2 (2.0 X 1.5 m). These values were statistically at par with S_3 (2.5 X 1.8 m), except for the weight of single and ten buds and the shelf life of flowers. In contrast, the lowest measurements (8.60 mm, 14.44 mm, 2.10 cm, 0.89 g, 8.90 g, 46.01 g, 92.02 g and 2.03 days, respectively) were recorded at the closest spacing of S_1 (1.5 X 1.2 m) (Table. 1). The optimal spacing allowed the plants to access more nutrients compared to the tighter spacing, despite the same nutrient availability in the soil, resulting in improved quality attributes of the flowers. Similar findings were reported by Sumangala *et al* (2013) in Jasmine, Kavya *et al* (2022) in lupin, and Dali *et al* (2023) in chrysanthemum.

The different levels of fertilizer (N, P_2O_5 and K_2O) had a significant impact on the quality attributes of the Pinwheel flower (Table 1). The application of 40:80:80 g of NPK per plant per year under the F_3 treatment resulted in the highest flower bud and flower diameters (10.24 mm and 16.19 mm, respectively), corolla tube length (2.37 cm), and the weight of single, ten, fifty and hundred flower buds (1.05 g, 10.47 g, 47.92 g and 95.84 g, respectively), as well as the longest shelf life (2.73 days). In contrast, the lowest values (9.05 mm, 14.33 mm, 2.20 cm, 0.90 g, 8.97 g, 46.28 g, 95.55 g and 1.93 days, respectively) were observed in the F_1 (20:40:40 g of NPK per plant per year) (Table. 1). An increase in nutrient doses led to improvements in the quality parameters of the flowers. These results align with the findings of Quasim *et al* (2008), Shoram *et al* (2012) and Bilji *et al* (2022) in Jasmine.

The combined effect of different plant spacing and fertilizer levels significantly influenced the quality parameters of the Pinwheel flower (Table 1). The highest flower bud and flower diameters (11.32 mm and 17.00 mm, respectively), corolla tube length (2.44 cm), and the weight of single, ten, fifty and hundred flower buds (1.10 g, 11.0 g, 50.0 g and 100.01 g, respectively), along with the longest shelf life (2.90 days), were observed in the treatment combination of S_2F_3 (2.5 X 1.8 m spacing and 40:80:80 g of NPK/plant/year). On the other hand, the lowest values (7.98 mm, 13.41 mm, 1.94 cm, 0.79 g, 7.90 g, 46.10 g, 92.11 g and 1.70 days) were recorded in the S_1F_1 treatment. The optimal spacing allowed for better nutrient supply to the plants and reduced competition for resources such as food, water and light. Similar findings were reported by Divyashree *et al* (2016) in Gaillardia, Manjula *et al* (2023) in Nerium and Paramagoudar (2015) in Spider Lily.

CONCLUSION

The experimental study concluded that the ideal combination of spacing S_2 (2.0 x 1.5 m) and 40:80:80 g NPK/plant/year (F_3) proved to be highly beneficial for producing top-quality flower buds in Pinwheel flowers. This combination resulted in the highest values for key quality attributes such as flower and bud diameter, corolla tube length, shelf life of flower buds, and the weight of single, ten, fifty and hundred flower buds. Hence can be recommended to the flower growers for ensuring superior flower quality in case of pinwheel flower.

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