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Evaluation of Nitrogen and Potassium Fertilization on Vegetative Parameters of Acroclinium (*Helipterum roseum*)

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Authors' contributions

This work was carried out in collaboration among all authors. All authors read and approved the final manuscript.

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ABSTRACT

The present investigation entitled "Effect of N and K fertilization on vegetative growth of Acroclinium (*Helipterum roseum*)" was carried out at the laboratory of floriculture and experimental farm of Mata Gujri college, Fatehgarh Sahib, Punjab. The experiment was laid out in randomized block design (RBD) with twelve treatments and three replications. The treatments were T_1 i.e., 125 kg/acre urea + 60 kg/acre MOP, T_2 i.e., 175 kg/acre urea + 60 kg/acre MOP, T_3 i.e., 225 kg/acre urea + 60 kg/acre MOP, T_4 i.e., 125 kg/acre urea + 80 kg/acre MOP, T_5 i.e., 175 kg/acre urea + 80 kg/acre MOP, T_6 i.e., 225 kg/acre urea + 80 kg/acre MOP, T_7 i.e., 125 kg/acre urea + 0 kg/acre MOP, T_8 i.e., 175 kg/acre urea + 0 kg/acre MOP, T_9 i.e., 225 kg/acre urea + 0 kg/acre MOP, T_{10} i.e., 0 kg/acre urea + 80 kg/acre MOP, T_{11} i.e., 0 kg/acre urea + 60 kg/acre MOP and T_{12} i.e., control. Observations were recorded for vegetative, flowering and seed yield parameters. Among all treatments maximum plant height (44.86 cm and 59.91 cm), leaf length (5.01 cm and 5.33 cm), plant spread (17.68 cm^2 and 32.37 cm^2) and diameter of main stem (6.13 mm and 10.77 mm) were

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found maximum in T_3 i.e., 225 kg/acre urea + 60 kg/acre MOP and maximum number of leaves per stem (37.28 and 54.98) and number of leaves per plant (645.67 and 1055.13) was observed in T_9 i.e., 225 kg/acre urea + 0 kg/acre MOP at 45 and 90 days respectively. Best vegetative parameters were recorded in 225 kg/acre urea + 60 kg/acre MOP and 225 kg/acre urea + 0 kg/acre MOP are best dosage for Acroclinium flower.

Keywords: Acroclinium; urea; MOP; fertilizer.

1. INTRODUCTION

The growing demand for floricultural products as a result of rising living standards and increased awareness among people of the need to live in an environmentally friendly environment has made it a profitable agribusiness in recent years. The plant Acroclinium, botanically known as *Helipterum roseum*, is frequently referred to as "paper daisies" or "everlasting flowers". The genus Acroclinium, which is native to Australia and belongs to the family Asteraceae of flowering plants, is well-known for both its ecological resilience and ornamental value.

The herb *Helipterum roseum* blooms from late spring to early autumn, adding a delicate and charming touch to gardens and floral arrangements. Its ability to retain its colour even after drying makes it a favourite for crafting everlasting bouquets. Acroclinium can adapt to different climates, but it generally thrives well in warm and sunny conditions. It is well-suited for regions with a Mediterranean climate or similar, with dry summers and mild winters. This flower prefers well-drained soil and plenty of sunlight to bloom beautifully.

2. MATERIALS AND METHODS

The present investigation was conducted at Research Farm, Mata Gujri College, Fatehgarh Sahib, Punjab during 2023-2024. Field of experimental site lies at 30.6435° North latitude and 76.3970° East longitudes. The altitude of the location is 246 meter above the mean sea level. The nursery of Acroclinium were obtained from the Biocarve seeds, Dhablan (Patiala). The experiment was laid out in Randomized Block Design (RBD) with twelve treatments three replications. The treatments were T_1 i.e., 125 kg/acre urea + 60 kg/acre MOP, T_2 i.e., 175 kg/acre urea + 60 kg/acre MOP, T_3 i.e., 225 kg/acre urea + 60 kg/acre MOP, T_4 i.e., 125 kg/acre urea + 80 kg/acre MOP, T_5 i.e., 175 kg/acre urea + 80 kg/acre MOP, T_6 i.e., 225 kg/acre urea + 80 kg/acre MOP, T_7 i.e., 125 kg/acre urea + 0 kg/acre MOP, T_8 i.e., 175 kg/acre urea + 0 kg/acre MOP, T_9 i.e., 225 kg/acre urea + 0 kg/acre MOP, T_{10} i.e., 0 kg/acre urea + 80 kg/acre MOP, T_{11} i.e., 0 kg/acre urea + 60 kg/acre MOP and T_{12} i.e., control.

3. RESULTS AND DISCUSSION

3.1 Plant Height (cm)

The maximum plant height was observed in T3 i.e., (urea 225 kg + 60 kg MOP per acre) 59.91cm, which was significantly superior than other treatments. When nitrogen and potash are applied in combination, the plant receives a more balanced nutritional supply, resulting in robust leaf growth, strong stems, and improved plant structure. This combination provides for greater plant height since nitrogen promotes general growth and potash supports strong stem development. This finding is similar with the results of Ahmed et al. [1] in gladiolus plant and Gawade et al. [2] in gaillardia. Minimum plant height was observed in T_{12} i.e., control 48.15 cm, which was significantly inferior due to the insufficient availability of nutrients to plant during critical period for its luxuriant growth. The present findings are also found in Maheta [3] in china aster, Acharya and Dashora [4], Sharma et al. [5] in marigold.

3.2 Number of Leaves Per Stem

There was significant effect on the number of leaves per stem of Acroclinium. The maximum number of leaves were observed in T_9 i.e., (urea 225 kg per acre + 0 kg MOP per acre) 37.28, which was significantly at par with T_8 i.e., (175 kg urea + 0 kg MOP per acre) 36.39. Number of leaves per stem increased linearly with corresponding increase in nitrogen doses. This may be attributed to the fact that nitrogen is an essential part of chlorophyll and nucleic acids, which might have played major role in promoting plant growth. Higher nitrogen concentrations can improve a leaf cell size, number, and overall production of leaves, as well as other aspects of the plant's vegetative growth [6,7]. Similar result was found by Aruna et al. [8] in crossandra.

Minimum number of leaves per stem was observed in T_{12} i.e., control 42.98 which was significantly inferior than other treatments. At the time of critical growth, the availability of N is less due to which it produces less number of leaves per stem. Similar results were found by Dorajeerao et al. [9], Grewal et al. [10] in plants of chrysanthemum and Ahmad et al. [11] in zinnia.

3.3 Number of Leaves Per Plant

The maximum number of leaves per plant were observed in T_9 i.e., (urea 225 kg + 0 kg MOP per acre) 1055.13, which was significantly superior. Which might be due to the reason that the nitrogen is a component of chlorophyll, the pigment that gives leaves their green coloration, and it is necessary for photosynthesis, the process by which plants manufacture food. When plants acquire enough nitrogen, they can grow more leaves because cell division and expansion are stimulated, resulting in greater leaf area and total leaf production. Similar results were found by Gupta et al. [12] and Chadha et al. [13] in marigold and Devi et al. [14] in carnation. The minimum number of leaves per plant was found in T_{12} i.e., control 799.31 which was significantly inferior. The reduction in number of leaves per plant could be due to the lack of sufficient nutrients at critical stage of plant growth. Similar results were found by Lehri et al. [15] in gladiolus and Agrawal et al. [16] and Seharwat et al. [17] and Abhipsa et al. [18] in marigold.

3.4 Leaf Length (cm)

Result of experiment disclose that, compared to all other treatments tested, T_3 i.e., (225 kg urea +60 kg MOP per acre) 5.33 cm, produced highest leaf length. When nitrogen and potash applications are combined, they can work synergistically to promote floral crop growth and development, including increased leaf length. A balanced supply of essential minerals can promote healthy plant growth, resulting in longer and more robust leaves in flower yields. Similar findings are recorded chrysanthemum by Teja et al. [19]. In treatment T_{12} i.e., control 3.92 cm the minimum leaf length was observed which was significantly inferior. In the absence of enough nutrients, plants are likely to suffer suboptimal growth, resulting in shorter leaf length and overall weaker plant development as compared to plants that receive the appropriate nutrients. Same results found by Maheta [3] in china aster.

3.5 Plant Spread (cm^2)

The maximum plant spread was observed in T_3 i.e., (225 kg urea + 60 kg MOP per acre) 32.37 cm^2, which is statistically at par with T_6 i.e., (225 kg urea + 80 kg MOP per acre) 31.77 cm^2. This might be due to increased synthesis of protein and protoplasm as nitrogen is an essential part of nucleic acid which plays a vital role in promoting plant growth [20]. Potassium is a vital mineral that aids in the production of starch and sugar in plant tissues. It stimulates the growth of weak developing sections, regulates stomatal movement, and balances water relationships. Potassium also plays a crucial role in carbohydrate formation and starch translocation, which leads to better plant development. In combination with nitrogen and potassium, there was a significant improvement in plant spread. Sehrawat et al. [17] similarly found that increasing N and K levels improved growth rates. The minimum plant spread was seen in T_{12} i.e., control 25.49 cm^2 which was significantly inferior. Due to insufficient amount of nutrients availability to plant during critical period of time for its development may cause a decline in plant spread. Similar results found in Acharya et al. [4], in chrysanthemum.

3.6 Diameter of Main Stem (mm)

The maximum diameter of main stem was observed in T_3 i.e., (225 kg urea + 60 kg MOP per acre) 10.7 mm. The increase in stem diameter might be due to the fact that nitrogen being a constituent of protein, nucleic acids and nucleotides which are essential for the different metabolic function of plants [21]. Whereas potassium is an essential constituent which helps the formation of starch and sugar in plant body. It promotes the growth of tender growing parts, adjust stomata movement and balance water relationship. Similar results were also obtained by Khalaj et al. [22] in tuberose, Dhaked et al. [23] in calendula. The minimum diameter of main stem was found in T_{12} i.e., control 6.74 mm. Insufficient amount of nutrients availability to plant during critical times for its luxuriant growth may cause a decline in diameter of main stem. Similar result was found by Raghatate et al. [24] and Ravi et al. [19] in chrysanthemum [25,26].

Table 1. Effect of N and K fertilization on vegetative growth, Acroclinium (*Helipterum roseum)*

Treatments	Plant height (cm)	Number of leaves per stem	Number of leaves per plant	Leaf length (cm)	Plant spread (cm^2)	Diameter of main stem (mm)
T_1 125 kg/acre urea + 60 kg/acre MOP	55.49	47.27	860.08	4.24	26.98	7.20
T_2 175 kg/acre urea + 60 kg/acre MOP	56.81	49.02	866.96	4.50	29.02	7.81
T_3 225 kg/acre urea + 60 kg/acre MOP	59.91	50.42	910.92	5.33	32.37	10.77
T_4 125 kg/acre urea + 80 kg/acre MOP	55.45	48.69	891.21	4.36	27.24	7.83
T_5 175 kg/acre urea + 80 kg/acre MOP	56.50	49.60	902.48	4.42	28.09	8.35
T_6 225 kg/acre urea + 80 kg/acre MOP	57.49	51.02	954.46	5.09	31.77	9.42
T_7 125 kg/acre urea + 0 kg/acre MOP	53.49	48.00	858.46	4.15	27.57	7.58
T_8 175 kg/acre urea + 0 kg/acre MOP	54.12	51.81	906.46	4.37	29.66	7.42
T_9 225 kg/acre urea + 0 kg/acre MOP	54.93	54.98	1055.13	4.36	30.26	7.73
T_{10} 0 kg/acre urea + 80 kg/acre MOP	52.96	46.25	851.48	4.42	26.48	7.89
T_{11} 0 kg/acre urea + 60 kg/acre MOP	51.48	45.48	819.13	4.21	26.78	7.05
T_{12} Control	48.15	42.98	799.31	3.92	25.49	6.74
SEm±	0.24	0.39	1.05	0.04	0.21	0.09
$CD_{0.05}$	0.70	1.14	3.09	0.13	0.61	0.28

4. CONCLUSION

From the present study it can be concluded that T_3 @ 225 kg/acre urea + 60 kg/acre MOP performed best in various vegetative parameters such as plant height (59.91 cm), leaf length (5.33 cm), plant spread (32.37 cm^2) and diameter of main stem (10.77 mm). While the highest dosage of urea i.e., T_9 @ 225 kg/acre urea + 0 kg/acre MOP has reported the best performance in number of leaves per stem (54.98) and number of leaves per plant (1055.13).

From the results, it can be concluded that 225 kg/acre urea + 60 kg/acre MOP and 225 kg/acre urea + 0 kg/acre MOP are best dosage for *Helipterum roseum.*

DISCLAIMER (ARTIFICIAL INTELLIGENCE)

Author(s) hereby declare that NO generative AI technologies such as Large Language Models (ChatGPT, COPILOT, etc) and text-to-image generators have been used during writing or editing of manuscripts.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

REFERENCES

1. Ahmed S, Sultana S, Kawochar MA, Naznin S, Tuli FU. Effect of corm size and nitrogen on the growth and flowering of gladiolus (*Gladiolus grandiflorous L.*). Emer. Life Sci. Res. 2015;1(1):18-25.
2. Gawade NV, Bhalekar SG, Katwate SM, Wadekar VD. Studies on different genotypes of gaillardia (*Gaillardia pulchella L.*) for quantitative and qualitative performance. Int. J. Curr. Microbiol. App. Sci.. 2016;7(03): 1030 - 1039.
3. Maheta P. Effect of nitrogen and phosphorous on growth, flowering and flower yield of China aster *(Callistephus chinensisNees.)* cv. Poornima. Asian J. of Hort. 2015;11:132-135.
4. Acharya MM, Dashora LK. Response of graded levels of nitrogen and phosphorus on vegetative growth and flowering in African marigold (*Tagetes erecta Linn*.). J. Ornamental Hort.. 2004; 7(2): 179-183.
5. Sharma DP, Patel, Manish, Nishith Gupta. Influence of nitrogen, phosphorus and pinching on vegetative growth and floral attributes in African marigold (*Tagetes erecta Linn*.) J. of Ornamental Hort.. 2006; 9(1): 25-28.
6. Meyer B S, Banderson D, Bohning D H, Fratianne D G. Introduction to plant physiology. New York: Van Nostrand Company. 1973;193–322.
7. Sigedar PD, Anserwadekhar KW, Rodge B M. Effect of different levels of nitrogen, phosphorus and potassium on growth and yield of Calendula officinalis Linn. South Indian Horticulture. 1991;39:308- 311.
8. Aruna P, Rajangam J, Geetha Rani P and Manivannan M I. Nutrient studies in crossandra (*Crossandra infundibuliformis* L. Nees). The Asian Journal of Horticulture. 2007;2(2):169-177.
9. Dorajeerao AVD. Standardisation of Production technology in garland chrysanthemum (*Chrysanthemum coronarium L*.). Ph.D. Thesis. Dept. of Horticulture, University of Agricultural Sciences, Dharwad (Karnataka); 2009.
10. Grewal HS, Kumar R, Singh H. Effect of nitrogen, planting time and pinching on flower production in chrysanthemum (Dendranthema grandiflora Ramat.) cv. 'Flirt'. Journal of Ornamental Horticulture. 2004;7(2): 189-192.
11. Ahmad I, Ahmad T, Zafar MS, Nadeem A. Response of an elite cultivar of zinnia (*Zinnia elegans cv. 'Giant Dahlia Flowered'*) to varying levels of nitrogenous fertilizer. Sarhad Journal of Agriculture. 2007;23(2): 309-312.
12. Gupta NS, Sadavarte KT, Mahorkar VK, Jadhao BJ, Dorak SV. Effect of graded level nitrogen and bio-inoculants on growth and yield of marigold (*Tagetes erecta* L.). J. Soil and Crops. 1999;9(1):80-83.
13. Chadha APS, Rathore SVS, Ganeshe RK. Influence of N and P fertilization and ascorbic acid on growth and flowering of African marigold (*Tagetes erecta* L.). South Indian Hort. 1999;47(1-6):342-344.
14. Devi Sunita, Gupta AK, Sehrawat SK. Effect of different level of nitrogen and phosphorus on growth of carnation. Haryana J. Hort. Sci. 2003;32:209-211.
15. Lehri SM, Kurd AA, Rind MA, Bangulzai NA. The response of Gladiolus April 2020 | Volume 36 | Issue 2 | Page 401 Sarhad Journal of Agriculture tristis L. to N and P_2O_5 fertilizers. Sarhad J. Agric. 2011; 27(2): 185-188.
16. Agrawal S, Agrawal N, Dixit A, Yadav RN. Effect of N and K20 on African marigold in Chattisgarh region. Journal of Ornamental Horticulture New Series. 2002;5(1):86.
17. Sehrawat SK, Dahiya DS, Sukhbir Singh, Rana GS. Growth, flowering and corm production in gladiolus as influenced by NPK application. Haryana Journal of Horticulture Sciences. 2003;32 (3-4): 222-224.
18. Abhipsa P, Palai SK, Nath MR. Effect of source of nitrogen on growth and yield of African marigold (*Tagetes erecta L*.). The Pharma Innovative J. 2018;7(7):917-921
19. Ravi Teja P. Effect of graded levels of nitrogen and potassium on growth and flower yield of annual chrysanthemum (*Chrysanthemum coronarium L*.) Plant Archives. 2016;17(2):1371-1376.
20. Wandleigh CH. Growth of plants. Soil: The year book of USDA. 1957;38-44.
21. Bijimol G, Singh AK. Effect of spacing and nitrogen on flowering, flower quality and post harvest life of gladiolus. J. Applied Hort. 2001;3(1):48-50
22. Khalaj MA, Edrisi B, Amiri M. Effect of nitrogen and plant spacing on nutrient uptake, yield and growth of tuberose

(*Polianthes tuberosa L.*). Journal of Ornamental and Horticultural Plants 2:45-54.

23. Dhaked R, Satish C, Srivastava R. Effect of spacing and levels of nitrogen on growth, flowering and yield of Calendula (*Calendula officinalis*) single type. Pantnagar Journal of Research. 2013; 11:365-368.
24. Raghatate SM, Panchbhai DM. Effect of nitrogen, phosphorus and potassium levels on growth and flowering of annual chrysanthemum cv. PDKV Bijli Super. The Pharma Innovation Journal. 2021; 10(6):1007-1014.
25. Senapati SK, Das TK, Pandey G. Effect of nitrogen, phosphorus and potassium level on floral characteristics of chrysanthemum (*Chrysanthemum morifolium Ramat*) cv. Bidhan Madhuri. Int. J. Curr. Micro. Appl. Sci.. 2020;9(7):2594-2601.
26. Khan FN, Rahman MM, Karim AS. Effects of nitrogen and potassium on growth and yield of gladiolus corms. Journal of Agricultural Research. 2012; 37:607-616.

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