



ISSN (E): 2277- 7695
ISSN (P): 2349-8242
NAAS Rating: 5.23
TPI 2021; 10(12): 1185-1188
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www.thepharmajournal.com
Received: 13-10-2021
Accepted: 27-11-2021

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Establishment and evaluation of different varieties of *Kalanchoe blossfeldiana* under Prayagraj Agro-climatic conditions

Sharon Stephen and Devi Singh

Abstract

The research work entitled “Establishment and evaluation of different varieties of *Kalanchoe blossfeldiana* under Prayagraj agro climatic condition” was carried out between October 2020 to February 2021 at shade net in the Department of Horticulture, SHUATS, Prayagraj. Stem cuttings of *Kalanchoe blossfeldiana* plants “V1 (Double Red), V2 (Sidney), V3 (Carmen), V4 (Lindsay), V5 (Brava), V6 (Lina) and V7 (African Ruby)” were planted in pots on 17th October 2020 having 4 plants in one variety and they were replicated three times. The experiment was laid out in Completely Randomized Design (CRD) and data were collected on number of leaves, number of branches, plant height (cm), days to bud appearance, days to flower initiation, number of flowers, number of flowerheads, flower duration, flower colour and survivability under Prayagraj agro-climatic conditions. Different varieties have showed significant results in all aspects. Based on the results gained from experiment conducted it can be concluded that the performance of variety V3 (Carmen) was found to be best among all varieties in terms with 100% survivability, plant height(12.03 cm), maximum number of branches (5.08), number of leaves(34.66), minimum days taken for bud appearance (16 days), minimum days taken for flower initiation (59 days), maximum number of flowerheads (3.67), maximum number of flowers (15.50) and maximum flower duration(56 days) and based on these findings it can be concluded that it is best to grow under Prayagraj Agro-climatic conditions.

Keywords: *Kalanchoe blossfeldiana*, varieties, flower, Prayagraj Agro-climatic conditions

Introduction

Kalanchoe blossfeldiana (*Kalanchoe blossfeldiana* Poelln.) is the most popular flowering succulent belongs to the family Crassulaceae. The genus “*Kalanchoe*” is derived from the native name for a Chinese species, while the species “*blossfeldiana*” is for the German hybridizer Robert Blossfeld, who introduced this plant to Germany from its native Madagascar (Bailey, 1928) [3]. *Kalanchoe blossfeldiana* Poelln. is a glabrous herb to subshrub, upright in growth, with opposite leaves arranged in four ranks-like a cross, when viewed from above. The leaves of this crassulacean dicot are obtuse to acute, sinuate to crenate (upper half), 1 to 3 inches long, and taper to petioles about 1 inch long (Bailey, 1928, 1976; Hillman, 1962) [3, 4, 15]. The small flowers are grouped in tightly placed flowerheads borne on long stems. Each head has between 20-50 flowers. Its flower head is a cyme.

Kalanchoe blossfeldiana are increasing in popularity because of their improved quality, stem cuttings are relatively easy to propagate, flower colour range and increased in-home longevity. *Kalanchoe blossfeldiana* are easily programmed to flower for any date simply by regulating the night length under which they are grown. They naturally flower in December because they're short day plants. Once marketed, *Kalanchoe blossfeldiana* can remain flowering with minimum care in the home for six to eight weeks (Hessayon, 1994; Love, 1976; Pertuit, 1992; Schwabe, 1985; Versteeven, 1996) [14, 20, 26, 31, 37].

Usually it is cultivated as garden ornamental in rock and sand gardens, as novelty gifts, indoor plants, cut flowers, pot plants, vertical garden, hanging basket and border planting. In India *Kalanchoe blossfeldiana* is cultivated in garden and wild on the hills of North-Western India, Deccan and Bengal and in local nurseries of Pune, Bangalore, and Karnataka etc. It is also grown at plant tissue culture lab of Maharashtra.

The growing media should be well drained and well aerated. Cocopeat, vermicompost and sand in equal volume is the best potting media for *Kalanchoe blossfeldiana*. The mixture is adjusted with a little amount of perlite. *Kalanchoe blossfeldiana* cultivars vary in growth rate and foliage size.

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Light intensity plays a major role in floral initiation in *Kalanchoe blossfeldiana*. High light intensity means more flower low light intensity means fewer flowers. It can withstand water stress relatively well. *Kalanchoe blossfeldiana* grow well at 67°F nights and this temperature is recommended (Anonymous, 1995a; Danielson, 1991; Grim, 1994; Heins, 1997) [2, 9, 12, 13]. A 75%-85% relative humidity is ideal. At vegetative stage use nitrogen based fertilizer at 15-20 days interval. When the plant starts flowering, feed it with an all purpose well balanced fertilizer that is high in phosphorus (to promote flowering) once in every two weeks.

Materials and Methods

The present investigation entitled “Establishment and evaluation of different varieties of *Kalanchoe blossfeldiana* under Prayagraj agro climatic condition” was carried out between October 2020 to February 2021 at shade net in the Department of Horticulture, Sam Higginbottom University of Agriculture Technology and Sciences, Prayagraj.

Experimental site

The experimental site is located in the sub-tropical region with 25° 57' N latitude, 81° 57' E longitude and 98 meter above the mean sea level. Prayagraj is situated in the south-eastern part of Uttar Pradesh, India, at an elevation of 98 meter above mean sea level. The experiment was conducted at shade net, Department of Horticulture, Naini Agricultural Institute, Sam Higginbottom University of Agriculture, Technology & Sciences, Prayagraj (UP) between October 2020 to February 2021.

Climatic conditions in the experimental area

Prayagraj has a semi-arid climatic with both the extremes of temperature during winter and summer. During December – January, the temperature may drop down to as low as 20 °C, while it may exceed 47 °C during the months of May – June. The average annual rainfall is about 102 cm with maximum concentration during July to September and with occasional showers during winter season.

Results and Discussion

The salient features from this research experiment are summarized below

1. The survival rate percentage of all the seven varieties was 100%.
2. Among the seven varieties, maximum plant height was recorded in variety V1 (Double Red) (7.08, 10.15, 11.42 and 12.38 cm) at 30, 60, 90 and 120 days respectively which was having at par value with variety V3 (Carmen) with (6.75, 10.6, 11.49 and 12.03 cm) at 30, 60, 90 and 120 days respectively, where as minimum plant height (5.33, 5.83, 6.59 and 7.21 cm) was recorded by variety V2 (Sidney) at 30, 60, 90 and 120 days respectively.
3. Based on the data it is found that the maximum number of branches per plant was recorded in the variety V3 (Carmen) (1.91, 2.16, 3.75 and 5.08) at 30, 60, 90 and 120 days respectively which was having at par value with variety V4 (Lindsay) with (0.41, 1.08, 2.5 and 4.5) at 30, 60, 90 and 120 days respectively, where as the minimum number of branches per plant was recorded in the variety V7 (African Ruby) with (0.6, 0.8, 1.4 and 2) at 30, 60, 90 and 120 days respectively.
4. Maximum number of leaves was recorded in the variety V1 (Double Red) (11.55, 26.25, 31.83 and 39.58). at 30, 60, 90 and 120 days respectively which was having at par value with variety V3 (Lindsay) with (11.66, 15.16, 29.33 and 38.75) at 30, 60, 90 and 120 days respectively, where as the minimum number of leaves was recorded in the variety V5 (Brava) with (13.83, 16.33, 22 and 27.58) at 30, 60, 90 and 120 days respectively.
5. The variety V3 (Carmen) recorded minimum days for flower bud appearance (16 days) which was having at par value with varieties V4(Lindsay) and V2(Sidney) 16 and 17 days respectively. Variety V7 (African ruby) recorded 29 days and variety V5 (Brava) recorded 30 days for flower bud appearance. The variety which recorded the maximum time taken for flower bud formation was V6 (Lina) (36 days).
6. The data on days required for flower initiation revealed that plant which recorded the earliest flowering was variety V3 (Carmen) (59 days) which was having at par value with varieties V1 (Double Red) (60 days) and V2 (Sidney) (60 days). The maximum days taken for flower initiation was recorded in the variety V6 (Lina) (98 days). Flower initiation in variety V7 (African Ruby) was (90 days), variety V5 (Brava) was (88 days) and variety V4 (Lindsay) was (81 days).
7. Flower colour of varieties are as follows: variety Double Red was dark red in colour, variety Sidney was pink in colour, variety Carmen was medium orange colour, variety Lindsay was medium yellow colour, variety Brava was light red pink in colour, variety Lina showed medium purple pink colour and variety African Ruby showed red pink colour by comparing with the colour shades mentioned in the Royal Horticultural Society (RHS) colour chart.
8. Maximum number of flowerheads was recorded in the variety V3 (Carmen) (3.34, 5.34, 5.67 and 3.67) at 30, 60, 90 and 120 days respectively which was having at par value with varieties V1(Double Red) with (0.67, 2.34, 2.34 and 3) and V5 (Brava) with (0.34, 3, 5.67, 2.34) at 30, 60, 90 and 120 days respectively, where as the minimum number of flowerheads was recorded in the variety V7 (African Ruby) with (0.34, 0.34, 0.34 and 0.34) at 30, 60, 90 and 120 days respectively.
9. Maximum number of flowers was recorded in the variety V3(Carmen) with (3.83, 6.5, 15.5) at 60, 90 and 120 days respectively which was having at par value with varieties V5(Brava) with (7.75, 4.5 and 10.58) and V4 (Lindsay) with (6.83, 5 and 9.83) at 60, 90 and 120 days respectively, where as the minimum number of flowers was recorded in the variety V7 (African Ruby) with (0, 0.16, and 0.16) at 60, 90 and 120 days respectively.
10. The data on flowering duration revealed that plant which recorded the longest flowering duration was variety Carmen (56 days) which was having at par value with varieties Brava (55 days) and Lindsay (54 days) followed by double Red (53 days), Sidney (36 days) and Lina (29 days). The minimum duration of flowering was observed in the variety African Ruby (7 days).

Table 1: Performance of different varieties of *Kalanchoe blossfeldiana* for Plant Height (cm) and Number of Branches/Plant.

Variety symbol	Variety name	Plant height(cm)				Number of Branches			
		30 DAP	60 DAP	90 DAP	120 DAP	30 DAP	60 DAP	90 DAP	120 DAP
V1	Double red	7	10.1	11.4	12.3	2.083	2.833	3.250	4.333
V2	Sidney	5.3	5.8	6.5	7.2	0.417	1.583	2.000	2.917
V3	Carmen	6.7	10.6	11.4	12.0	1.917	2.167	3.750	5.0834
V4	Lindsay	7.9	9.2	10	10.9	0.417	1.0832	2.500	4.50
V5	Brava	5.6	7.5	9	10	1.750	1.833	2.167	3.250
V6	Lina	5.1	6.3	7.3	8.2	1.333	1.833	2.667	3.167
V7	African ruby	6	7.6	8.4	9.2	0.667	0.833	1.417	2.000
	F-test	S	S	S	S	S	S	S	S
	SE(d)	0.46	1.25	1.55	1.21	0.42	0.34	0.58	0.83
	CD at 5% level	1.19	1.95	2.18	1.92	1.14	1.02	1.33	1.59

Table 2: Performance of different varieties of *Kalanchoe blossfeldiana* for Number of Leaves, Number of days taken for flower bud appearance and Number of days taken for flower initiation/Plant.

Treatments	Varieties	Number of leaves				Number of days taken for flower bud appearance	Days taken for flower initiation
		30 DAP	60 DAP	90 DAP	120 DAP		
V1	Double red	11.55	26.25	31.83	39.58	22	60
V2	Sidney pink	9.75	16.05	26	30.83	17	60
V3	Carmen orange	10.33	16.50	25.50	34.66	16	59
V4	Lindsay yellow	11.66	15.16	29.33	38.75	16	81
V5	Brava	13.83	16.33	22	27.58	30	88
V6	Lina	13.08	17.50	26.41	35.25	36	98
V7	African ruby	13.33	18.66	26.16	33.08	29	90
	F-Test	S	S	S	S	S	S
	SE(d)	1.44	9.76	6.04	16.56	2.23	181.23
	CD at 5% level	2.10	5.47	4.30	7.12	2.62	23.57

Table 3: Performance of different varieties of *Kalanchoe blossfeldiana* for Number of flower heads/Plant, Number of Flowers/Plant and Flowering Duration (Days)

Treatments	Varieties	Number of flowerheads				Number Of Flowers			Flowering duration (days)
		30 DAP	60 DAP	90 DAP	120 DAP	60 DAP	90 DAP	120 DAP	
V1	Double red	0.67	2.34	2.34	3	0.5	1.91	1.91	53
V2	Sidney pink	3.34	0.67	0.67	0	8.58	0.58	0.83	36
V3	Carmen orange	3.34	5.34	5.67	3.67	3.83	6.5	15.5	56
V4	Lindsay yellow	3.67	3	4.67	2.67	6.83	5	9.83	54
V5	Brava	0.34	3	5.67	2.34	7.75	4.5	10.58	55
V6	Lina	0	2	2.34	1	0	0.5	3.08	29
V7	African ruby	0.34	0.34	0.34	0.34	0	0.16	0.16	7
	F-Test	S	S	S	S	S	S	S	S
	SE(d)	0.85	0.90	1.47	1.33	9.92	1.05	6.25	45.90
	CD at 5% level	1.62	1.66	2.12	2.02	5.51	1.79	4.38	11.86

Conclusion

Based on the results gained from experiment conducted in Prayagraj region using 7 varieties of *Kalanchoe blossfeldiana* with respect to survivability, vegetative growth and flowering characters, the performance of variety V3 (Carmen) was found to be best among all varieties in terms with 100% survivability, plant height(12.03 cm), maximum number of branches (5.08), number of leaves(34.66), minimum days taken for bud appearance (16 days), minimum days taken for flower initiation (59 days), maximum number of flowerheads (3.67), maximum number of flowers (15.50) and maximum flower duration(56 days) and based on these findings it can be concluded that it is best to grow under Prayagraj Agro-climatic conditions.

References

1. Alton J, Pertuit Jr. *Kalanchoe*. Introduction to Floriculture 1992;2:429-450.
2. Anonymous. Cultural recommendation for prestige kalanchoes. Mikkelsen, Inc. Ashtabula, Ohio 1995, 429-450.

3. Bailey LH. *Kalanchoe*. The Standard Cyclopedia Of Horticulture, The Macmillan Co. New York 1928;2:1731-1732.
4. Bailey LH, Bailey EZ. *Kalanchoe*. *Hortus*, The Macmillan Publishing Co., Inc New York 1976;2:321-421.
5. Baldwin DL. Enjoying, growing and designing with succulents. Succulents simplified: growing, designing and crafting with 100 easy care varieties. Timber Press Inc., Portland, London, 2013, 15-63.
6. Cabahug RA, Soon YS, Sang YN. Growth of Crassulaceae Succulents as Influenced by Leaf Cutting Type and Planting Position. *Flower Res. J* 2016;24(4):255-263.
7. Cabahug RAM, Nam SY, Lim KB, Jeon JK, Hwang YJ. Propagation Techniques for Ornamental Succulents. *Flower Res. J* 2018;26(3):90-101.
8. Carvalho SMP, Wuillai SE, Heuvelink E. Combined effects of light and temperature on product quality of *Kalanchoe blossfeldiana*. *Acta Hort* 2006;711:121-126.
9. Danielson R. *Kalanchoe*. Ball Red Book (Ball, Vic, ed),

- Ed. George J. Ball Publishing Co, Inc. West Chicago, Illinois 1991;15:614-621.
10. Erwin EJ, Currey CJ. Basics & Beyond: New Kalanchoe For Cultivation 2014. (<https://www.greenhousegrower.com/author/ccurrey/>)
 11. Gideon F, Smith Abraham, van Wyk E. Taxonomic Variety. *Kalanchoe (Crassulaceae) in Southern Africa, Classification, Biology and Cultivation* 2019, 131-303.
 12. Grimm A. Guidelines for kalanchoe cultivation. Balfour Greenhouses, Ltd. Ontario, Canada, 1994, 280p.
 13. Heins R. Grower guides- potted plants. *K. Spartan Ornamental Network*. Michigan State University Extension Publication 1997. (<http://www.msue.msu.edu/son/mod10/mod10k.html>).
 14. Hessayon DG. Kalanchoe. *The Greenhouse Expert*. Transworld Publishers, Ltd. London, England 1994, 37p.
 15. Hillman WS. The Physiology Of Flowering. Holt, Rinehart, and Winston. New York, 1962, 4-5, 22, 26-27, 92, 94, 112.
 16. Ikeuchi M, Sugimoto K, Iwase A. Plant callus: mechanisms of induction and repression. *The Plant Cell* 2013;25:3159-3173.
 17. Jeong JH. Influence of several factors on the rooting of *Sedum rotundifolium* stem and leaf cuttings. *J Korean Soc Hort Sci* 1999;40:631-634.
 18. Johnson AT, Smith HA. Kalanchoe. *Plant Names Simplified*. Landsmans Bookshop, Ltd. Buckenhill, England 1986, 58p.
 19. Leiv Mortensen M. Effects of day/night temperature variations on growth, morphogenesis and flowering of *Kalanchoe blossfeldiana* v. Poelln. at different CO₂ concentrations, daylengths and photon flux densities. *Scientia Horticulturae*, 1994;59(3-4):233-241.
 20. Love JW. Kalanchoe production. *N.C. Flower Grower Bull*, 1976;20(2):1-3.
 21. McNeilan R, Gorman R. Plant Propagation 2013. (<https://www.uaf.edu/files/ces/districts/tanana/mg/manual/4-PlantProp.pdf>)
 22. Mihaela Doina C, Carmen A, Manuela NM. Research on the influence of the sampling periods of propagation on the influence of the sampling periods on the propagation to cuttings at some succulent plants. *J Horticult Sci Bio* 2011;15:109-114.
 23. Mortensen LM, Rao RM. Effects of CO₂ enrichment and different day/night temperature combinations on growth and flowering of *Rosa L.* and *Kalanchoe blossfeldiana* v. poelln. *Scientia horticulture* 1992;51(1-2):145-153.
 24. Neisen P. Propagation of cacti and succulents 2013. (<https://www.ndsu.edu/pubweb/chiwonlee/plsc368/student/papers01/pneisen/Propagationofcactiandsucculents>).
 25. Paterson KE, Rost TL. Effects of light and hormones on regeneration of *Crassula argentea* from leaves. *Am J Bot* 1978;66:463-469.
 26. Pertuit AJ. Kalanchoes. Introduction to Floriculture (R.A.Larson, ed.), Academic Press, Inc. New York 1992, 429-459.
 27. Prisa D. EM-Bokashi Addition to the Growing Media for the Quality Improvement of *Kalanchoe blossfeldiana*. *International Journal of Multidisciplinary Sciences and Advanced Technology (IJMSAT)* 2020;1(2):54-59.
 28. Rinu. Varietal evaluation of china aster under Rajnandgaon district of Chattisgarh. *M.Sc. Thesis*, IGKV, Raipur. (90p <https://krishikosh.egranth.ac.in>) 2020.
 29. Sangma Sierra M, Kumar Sunil, Collis JP, Momin Baggio. Performance of gerbera(*Gerbera jamesonii* Bolus ex Hooker F) cultivars for growth, flowering and yield characters under naturally ventilated polyhouse. *Journal of Ornamental Horticulture* 2017;20(3,4):108-112.
 30. Sanikhani M, Stefan F, Margrethe S. TDZ induces shoot regeneration in various *Kalanchoe blossfeldiana* Poelln cultivars in the absence of auxin. *Plant Cell, tissue and organ culture*, 2006;85(1):75-82.
 31. Schwabe WW. *Kalanchoe Blossfeldiana*, Handbook Of Flowering. (A.H. Halevy, ed) CRC Press, Inc. Boca Raton, Florida 1985;3:217-235.
 32. Sharon Gwaltney M. Christmastime Plants. *Small Animal Toxicology* 2013;(III):499-511.
 33. Soner S, Şener K, Merve K, Aysun U, Emine MS, In-Young C. First report of powdery mildew caused by *Erysiphe sedi* on *Kalanchoe blossfeldiana* in Turkey. *Journal of Plant Pathology* 2021;103(2):685-686.
 34. Sorenson DC. Plant Propagation 2015. (<https://extension.umaine.edu/gardening/mastergardeners/manual/propagation/plant-propagation/>)
 35. Talang Fatmi D, Kumar U, Raquib SA. Evaluation of different hybrids of *Petunia*(*Petunia hybrida*) under Allahabad agro-climatic conditions. *Journal of Pharmacognosy and Phytochemistry* 2019;8(3):66-68.
 36. Tuttle C. Propagating succulents from leaves 2012. (<http://www.succulentsandsunshine.com/propagatingsucculents/propagating-succulents-from-leaves-part-2>)
 37. Versteeven H. Aalsmeer Horticultural Sites 1996. (<http://www.netland.nl/~hanns/exiV102.html>)
 38. Vielander H. *Kalanchoe* cultural guide. Fides Potplants, Maasland, Holland, 1996, 132-168.
 39. Voorst AV, Johan CA. The origin and chromosome numbers of cultivars of *Kalanchoe blossfeldiana* V Poelln: Their history and evolution. *Euphytica* 1982;31(3):573-584.