

ISSN Print: 2664-844X
ISSN Online: 2664-8458
NAAS Rating (2026): 4.97
IJAFS 2026; 8(11): 14-17
www.agriculturaljournals.com
Received: 25-08-2026
Accepted: 23-10-2026
Published: 02-11-2026

Snehal S Pandit
M.Sc. Scholar, Department of Floriculture and Landscaping, College of Horticulture, Dapoli, Maharashtra, India

Mandar H Khanvilkar
Assistant Professor, Department of Horticulture, Directorate of Extention Education, DBSKKV, Dapoli, Ratnagiri, Maharashtra, India

Nitesh V Dalvi
Professor (CAS), Head, Department of Floriculture and Landscaping, College of Horticulture, Dapoli, Maharashtra, India

Prafulla C Mali
Professor (CAS), Head, Department of Fruit Science, College of Horticulture, Dapoli, Ratnagiri, Maharashtra, India

Sangita S Sawant
Assistant Professor, Department of Botany, College of Agriculture, Dapoli, Maharashtra, India

Soundarya R Khasaki
M.Sc. Scholar, Department of Floriculture and Landscaping, College of Horticulture, Dapoli, Maharashtra, India

Corresponding Author:
Snehal S Pandit
M.Sc. Scholar, Department of Floriculture and Landscaping, College of Horticulture, Dapoli, Maharashtra, India

Effect of different polybag size on growth and development of bougainvillea (*Bougainvillea* spp.)

Snehal S Pandit[1], Mandar H Khanvilkar[2], Nitesh V Dalvi[3], Prafulla C Mali[4], Sangita S Sawant[5], Soundarya R Khasaki[6]

DOI: https://www.doi.org/10.33545/2664844X.2026.v8.i11a.2202

Abstract
An experiment entitled "Effect of different polybag size on growth and development of bougainvillea (*Bougainvillea* spp.)" was conducted during the year 2025-26 at College of Horticulture, Dapoli, Dist. Ratnagiri, Maharashtra. The experiment was laid out in Factorial Randomized Block Design (FRBD) within a partially protected environment with three replications and eighteen treatment combinations. The experiment involved three polybag size (6" × 4", 6" × 8", and 9" × 11") and six varieties (Pink Beauty, Singapore Red, Mahara, Gopal, *Chitra* and M.P.S.). The present investigation revealed that among three polybag sizes under study, the P_2 (6" × 8") recorded maximum sprouting percentage (73%) while P_3 recorded highest plant height (75.22 cm), stem girth (21.34 mm), shoot length (46.60 cm), number of leaves (80.94) and leaf area (41.43 cm^2). Findings revealed that in the interaction of polybag size and varieties P_2V_2 and P_2V_6 (polybag size 6" × 8" with variety Singapore Red and M.P.S. respectively) showed 92% and 90% of sprouting percentage respectively. The highest survival percentage by P_2V_2 (72%), plant height by P_3V_2 (75.22 cm), stem girth by P_3V_2 (23.99 mm) was recorded.

Keywords: *Bougainvillea*, polybag size, varieties, hardwood, propagation, konkan

1. Introduction

India is home to a diverse range of agroclimatic zones that are suitable for growing a wide range of floricultural crops. The Indian floriculture industry includes flowers and ornamental plants cultivated in both open fields and protected conditions. *Bougainvillea* is an ornamental perennial shrub belonging to the family Nyctaginaceae and is indigenous to South America's arid tropical regions. It is a multipurpose plant that thrives in tropical and subtropical environments and was first brought to India from Europe around 1860. The crop requires comparatively low water and maintenance for vegetative growth and flowering.

Bougainvillea is a very attractive and an important ornamental flowering shrub grown for its brightly coloured bracts over a wide range of climate across the world. It is an evergreen shrubby vine of tropical and sub-tropical regions. India is an important centre of bougainvillea diversity, with approximately 50% of the current cultivars having been developed within the country (Janakiram *et al.,* 2013) [1].

Bougainvillea, known as the "Glory of Gardens", is valued for its colourful papery bracts in shades such as magenta, white, red and yellow. The plants are widely used as hedges, topiary, climbers and for covering walls and trellises. In addition to its ornamental value, bougainvillea has been reported for its tolerance to particulate pollution (Kulshreshtha *et al.,* 2009) [2].

Although considerable research has been conducted on propagation techniques, rooting hormones, nutrient management, and growth regulators in bougainvillea, limited scientific information is available on the influence of polybag size on the growth and development of different bougainvillea varieties under Konkan conditions. The present investigation was therefore undertaken to evaluate the response of six bougainvillea varieties to different polybag sizes.

2. Material and Methods

The experiment entitled "Effect of different polybag size on growth and development of bougainvillea (*Bougainvillea* spp.)" was conducted during the year 2025-26 at College of Horticulture, Dapoli, Dist. Ratnagiri, Maharashtra. The experiment was laid out in Factorial Randomized Block Design (FRBD) with two factors *viz.* polybag size (P_1: 6" × 4", P_2: 6" × 8", and P_3: 9" × 11") and varieties (V_1: Pink Beauty, V_2: Singapore Red, V_3: Mahara, V_4: Gopal, V_5: *Chitra* and V_6: M.P.S.) with three replications and eighteen treatment combinations.

The experimental material consisted of hardwood cuttings. Cuttings of 15 to 17 cm length were prepared by making a slant cut at the basal node and a flat cut at the top. The cuttings were kept in moist gunny bags after detachment from parent plants to prevent dehydration. Leaves were removed while retaining the thorns

26648458, 2026, 8(11), Downloaded from https://www.doi.org/10.33545/2664844X.2026.v8.i11a.2202 by International Journal of Agriculture and Food Science on [02/11/2026]. See the Terms and Conditions (https://www.agriculturaljournals.com) for rules of use; OA articles are governed by the applicable Creative Commons License

and 2-3 nodes were maintained on each cutting. Healthy cuttings were planted in polybags containing the medium. Small holes were made in the pre-watered medium before planting to facilitate easy insertion and minimize damage.

The basal portion of each cutting, approximately 2 cm long and including the last node, was dipped in freshly prepared IBA solution (1000 ppm) for 60 seconds before planting. Irrigation was carried out on alternate days using a rose can. Humic acid at 2.5 ml/L was applied as drench 15 days after planting. Nutrient drenching with 19:19:19 at 5 g/L was applied one month after planting and subsequently at 30-day intervals.

Hand weeding was performed as necessary to control weed growth in the polybags. Five plants were selected thoroughly and tagged in each replication in all treatments for the purpose of recording observations. The mean value of the five selected plants in each treatment of three replications was taken to represent a particular character. The generated data was subjected to statistical analysis methods as suggested by Panse *et al.* (1995) [3].

The study examined the interaction effects of both factors, focusing on sprouting percentage, vegetative parameters, rooting parameters and survival rates, which were recorded at the end of the experiment.

3. Results and Discussion

The results indicated that polybag size influenced sprouting, survival and vegetative growth of bougainvillea. The treatment means for the final vegetative observations are presented in Table 1, while sprouting and survival percentages are presented in Table 2.

3.1 Vegetative parameters

3.1.1 Plant height (cm)

At 180 days after planting (DAP), the highest plant height among the treatment combinations was recorded in P_3V_2 (75.22 cm), while the lowest was recorded in P_1V_4 (59.94 cm). The main effect of polybag size showed that P_3 recorded the highest mean plant height 70.51 cm, followed by P_2 (68.78 cm) and P_1 (64.17 cm). Among the varieties, V_2 (Singapore Red) recorded the highest mean plant height 72.59 cm, whereas V_4 (Gopal) recorded the lowest 64.14 cm. The interaction between polybag size and variety was significant at the final observation. The greater rooting volume provided by the larger polybag may have favoured better root development and consequently greater vegetative growth. Sood *et al.* (2019) [4] reported significant effects of container size and growing medium on seedling growth in *Oroxylum indicum*, while Verma *et al.*, (2018) [5] reported significant effects involving polybag size in nursery seedlings.

3.1.2 Stem girth (mm)

At 180 DAP, the highest stem girth 23.99 mm was recorded in P_3V_2, whereas the lowest 16.61 mm was recorded in P_1V_4. The mean stem girth increased with polybag size, with P_3 recording 21.34 mm, followed by P_2 (20.34 mm) and P_1 (18.74 mm). Among the varieties, V_2 recorded the highest mean stem girth (22.48 mm), whereas V_4 recorded the lowest (17.71 mm). The interaction effect was significant. The increase in rooting volume under larger polybags may have supported greater stem thickening and overall vegetative growth. Sood *et al.* (2019) [4] reported container-related effects on collar diameter in *Oroxylum indicum*, while Verma *et al.* (2018) [5] reported significant effects of nursery container size on seedling growth and root development.

3.1.3 Shoot length

The maximum shoot length 68.21 cm was recorded in P_3V_2, whereas the minimum shoot length 22.74 cm was observed in P_1V_1. The observed range was 22.74–68.21 cm. The marked superiority of P_3V_2 at the later stages suggests that Singapore Red was able to utilize the greater rooting space of the 9 × 11 inch polybag more effectively, resulting in vigorous shoot elongation. Ferdousee *et al.* (2011) [6] reported better shoot length and overall seedling growth in larger polybags in *Leucaena leucocephala* and *Gliricidia sepium*, with the 23 × 15 cm polybag giving the best overall performance. Gupta *et al.* (2018) [7] similarly observed greater shoot growth of litchi air layers in large polybags. Pawar *et al.* (2025) [8], support the present observation that vigorous genetic material can respond strongly when adequate root-zone space is available.

Table 1. Effect of different polybag size on growth and development of bougainvillea (*Bougainvillea* spp.)

Treatments combinations	Plant height (cm)	Stem girth (mm)	Shoot length (cm)	Number of leaves	Leaf area (cm^2)
P_1V_1	64.75	21.2	22.74	76.07	15.23
P_1V_2	69.03	20.12	28.2	58.57	60.14
P_1V_3	62.74	18.03	32.43	56.59	23.33
P_1V_4	59.94	16.61	23.56	53	34.32
P_1V_5	62.8	17.47	22.75	47.46	48.17
P_1V_6	65.78	19.01	36.47	61.31	29.92
P_2V_1	69.11	22.06	29.1	103.41	17.57
P_2V_2	73.53	23.34	38.07	63.98	62.93
P_2V_3	67.48	19.29	33.95	60.99	26.81
P_2V_4	64.96	17.74	29.33	70.53	37.62
P_2V_5	68.4	19.45	33	60.93	50.9
P_2V_6	69.19	20.16	45.85	68.65	32.78
P_3V_1	70.1	22.85	36.56	124.04	21.06
P_3V_2	75.22	23.99	68.21	74.55	66.73
P_3V_3	70.58	20.74	47.57	68.22	29.99
P_3V_4	67.52	18.78	47.73	74.25	40.3
P_3V_5	69.19	20.65	30.68	65.52	54.06
P_3V_6	70.45	21.03	48.84	79.08	36.45
Range	59.94-75.22	16.61-23.99	22.74-68.21	47.46-124.04	15.23-66.73
S.Em ±	0.17	0.06	1.42	0.20	0.24
CD at 5 %	0.49	0.18	4.09	0.57	0.70
Result	SIG	SIG	SIG	SIG	SIG

26648458, 2026, 8(1), Downloaded from https://www.doi.org/10.33545/26648458.2026.v8.i1a.202 by International Journal of Agriculture and Food Science on [02/11/2026]. See the Terms and Conditions (https://www.agriculturaljournals.com) for rules of use; OA articles are governed by the applicable Creative Commons License

3.1.4 Number of leaves

At the final observation, the largest polybag size (P_3) produced the greatest mean number of leaves. The maximum number of leaves (124.04) was recorded by the treatment combination P_3V_1 (P_3: 9 × 11 inch, V_1: Pink beauty). The minimum number of leaves (47.46) was observed in P_1V_5 (P_1: 6 × 4 inch, V_5: *Chitra*) 180 days after planting. The interaction effect was significant. The present P_3V_1 response therefore indicates that both container volume and varietal growth habit contributed to leaf production.

The higher leaf production under P_3 may be associated with greater rooting volume and better vegetative growth. Polybag size, variety and their interaction showed significant effects on leaf production at the final observation. The importance of treatment combinations for leaf production has also been reported by Gupta *et al.* (2018) [7], who observed the highest number of leaves in the best large-polybag × growing-medium treatment in litchi. Sood *et al.* (2019) [4] similarly reported significant interaction effects on leaf production in *Oroxylum indicum*.

3.1.5 Leaf area (cm^2)

The highest leaf area 66.73 cm^2 was recorded in the combination P_3V_2, whereas the lowest 15.23 cm^2 was recorded in P_1V_1. The significant $P \times V$ interaction indicates that the response of varieties to polybag size was not uniform. The highest value in P_3V_2 demonstrates that Singapore Red benefited considerably from the larger growing space. In contrast, the lowest value in P_1V_1 indicates that the combination of a smaller polybag and a comparatively poor-performing variety restricted leaf development. Debaje *et al.* (2023) [9] recorded significant differences in leaf area of kokum seedlings grown in different nursery media and reported a maximum leaf area of 49.47 cm^2 at the graftable stage. Gupta *et al.* (2018) [7] similarly observed improved vegetative growth in larger polybags. These findings support the present increase in leaf area with better root-zone conditions.

3.2 Sprouting and survival percentage

3.2.1 Sprouting percentage

The interaction effect ($P \times V$) was also found to be significant. The highest sprouting percentage 92.00% was recorded in the treatment combination P_2V_2, followed by P_2V_6 (90.00%) and the lowest sprouting percentage 49.34% was observed in P_1V_1. This indicates that the combination of a medium polybag size with the variety V_2 provided favourable conditions for successful sprouting. Pawar *et al.* (2025) [8] reported a strong variety × cutting-length response in bougainvillea, with Singapore Red showing 100% sprouting in both cutting-length treatments. Borkar (2024) [10] similarly found that the performance of bougainvillea depended on the combination of variety and propagation method. These studies support the present result that the best performance was obtained from a particular combination rather than from either factor alone.

Table 2. Effect of different polybag size on sprouting percentage and survival percentage among different varieties of bougainvillea.

Treatment combinations	Sprouting (%)	Survival (%
P_1V_1	49.34	40.5
P_1V_2	85.34	66
P_1V_3	62.67	51
P_1V_4	58.67	46.5
P_1V_5	61.34	48.5
P_1V_6	88.67	69
P_2V_1	56	48
P_2V_2	92	72
P_2V_3	70	55
P_2V_4	64	51
P_2V_5	66	51.5
P_2V_6	90	70.5
P_3V_1	57.34	43.5
P_3V_2	88.67	69
P_3V_3	69.34	52.5
P_3V_4	62	48
P_3V_5	62.67	49.5
P_3V_6	88.67	61.5
Range	49.34-92	40.5-72
S.Em ±	1.38	0.64
CD at 5 %	3.97	1.85
Result	SIG	SIG

3.2.2 Survival percentage

The interaction effect ($P \times V$) was statistically significant, indicating that the response of individual varieties to container volume was not uniform. Variety V_2 maintained consistently high survival rates across all bag sizes, peaking at 72.00% under the P_2 treatment. In contrast, variety V_1 recorded lowest survival percentage under P_1, dropping to its lowest survival rate of 40.50 %. Gupta *et al.* (2018) [7] reported 95.5% survival of litchi air layers in a large polybag treatment, while smaller or alternative containers showed lower establishment under their conditions. Verma *et al.* (2018) [5] also found that polybag size significantly affected seedling growth and root development. These findings are consistent with the present observation that container size can influence plant establishment.

4. Conclusion

The present investigation entitled "Effect of different polybag sizes on growth and development of bougainvillea (*Bougainvillea* spp.)" revealed that polybag size significantly influences vegetative growth, sprouting and survival percentage of various bougainvillea varieties.

The polybag size 9 × 11 inch recorded the highest values for the measured vegetative parameters at 180 DAP. It recorded the highest mean

2664844X, 2026, 8(1), Downloaded from https://www.doi.org/10.33545/2664844X.2026.v8.i1a.202 by International Journal of Agriculture and Food Science on [02/11/2026]. See the Terms and Conditions (https://www.agriculturaljournals.com) for rules of use; OA articles are governed by the applicable Creative Commons License

plant height, stem girth, shoot length number of leaves and leaf area. Among the varieties, Singapore Red recorded the highest mean plant height, stem girth, shoot length and leaf area while Pink Beauty recorded the highest mean number of leaves, indicating varietal differences in leaf production and branching behavior. The interaction 9 × 11 inch × Singapore Red was the most promising combination for vigorous plant development. It recorded the maximum plant height, stem girth, shoot length and leaf area while 9 × 11 inch × Pink Beauty recorded the maximum number of leaves. For sprouting and survival, 6 × 8 inch × Singapore Red recorded 92.00 and 72.00 % respectively. However, the results reported from the present investigation are suggestive and need to be studied further for appropriate recommendations.

5. Acknowledgement

We express our sincere thanks to Department of Floriculture and Landscaping, College of Horticulture, Dr. Balasaheb Sawant Konkan Krishi Vidyapeeth, Dapoli- 415712, Dist: Ratnagiri, Maharashtra, India, for providing necessary facilities and valuable guidance during investigation.

References

1. Janakiram T, Jain R, Swaroop K, Narkar ND. Bougainvilleas—Glory of the garden. ICAR News letter. 2013;19(1):6–7.
2. Kulshreshtha K, Rai A, Mohanty CS, Roy RK, Sharma SC. Particulate pollution mitigating ability of some plant species. International Journal of Environmental Research. 2009;3(1):137–142.
3. Panse VG, Sukhatme PV. Statistical Methods for Agricultural Workers. ICAR Rev.Ed. 1995:97-156.
4. Sood KK, Ram J. Growth and development of seedlings in relation to container size and potting media under nursery conditions in *Oroxylum* indicum—A multipurpose medicinal plant. Indian Journal of Ecology. 2019;46(1):143-148.
5. Verma A, Kumar P, Rathakrishnan P, Saresh NV, Kumar S, Kumar P. Seedling vigour of *Prosopis cineraria* (L.) in response to different growth media and polybag sizes in arid climatic conditions. Range Management and Agroforestry. 2018;39(2):206–214.
6. Ferdousee N, Jabbar F, Hossain MK, Hoque ATMR. Comparative Growth Performance of *Leucaena leucocephala* and *Gliricidia sepium* Seedlings Raised in Nursery Bed, Polybag and Root Trainers. International Journal of Environment. 2011;1(1).
7. Gupta N, Wali VK, Bakshi P, Sharma A, Kumar V, Jasrotia A. Evaluation of root trainers as alternative containers to polybags for raising litchi air layers using various potting media. Journal of Research, SKUAST-J. 2018;17(2):125-132.
8. Pawar VP, Malshe KV, Khanvilkar MH, Mali PC, Thaware BG. Optimizing hardwood cutting lengths for enhanced propagation success and growth of *Bougainvillea* varieties in Konkan agroclimatic conditions. International Journal of Research in Agronomy. 2025;8(7):1481–1484.
9. Debaje PP, Gawankar MS, Naik HP, Haldavanakar PC, Khandakar RG, Haldankar PM. Standardization of growing media for growth of kokum (*Garcinia indica* Choisy) to find out suitable growing media for growth of kokum seedling grown in polybag. International Journal of Current Microbiology and Applied Sciences. 2023;12(7):31–39.
10. Borkar YA. Studies on types of cuttings for early propagation in different bougainvillea (*Bougainvillea glabra*) varieties. M. Sc. Horticulture (Floriculture and Landscaping) Thesis. Submitted to Dr. Balasaheb Sawant Konkan Krishi Vidyapeeth, Dapoli, Ratnagiri. 2024.
11. Gupta R, Singh L, Singh R. Growth and flowering behaviour studies in Indian varieties of bougainvillea. Proceedings of the National Conference on *Bougainvillea*. 2006:57–62.

How to cite this article: Pandit SS, Khanvilkar MH, Dalvi NV, Mali PC, Sawant SS, Khasaki SR. Effect of different polybag size on growth and development of bougainvillea (*Bougainvillea* spp.). *International Journal of Agriculture and Food Science*. 2026;8(11):14-17. doi: https://www.doi.org/10.33545/2664844X.2026.v8.i11a.2202

2664844X, 2026, 8(11), Downloaded from https://www.doi.org/10.33545/2664844X.2026.v8.i11a.2202 by International Journal of Agriculture and Food Science on [02/11/2026]. See the Terms and Conditions (https://www.agriculturaljournals.com) for rules of use; OA articles are governed by the applicable Creative Commons License