



ISSN Print: 2618-060X
 ISSN Online: 2618-0618
 NAAS Rating (2026): 5.20
 IJRA 2026; SP-9(9): 594-597
www.agronomyjournals.com
 Received: 25-06-2026
 Accepted: 24-08-2026
 Published: 30-09-2026

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Innovative methods for lesser yam (*Dioscorea esculenta* L.) cultivation: Utilizing grow bags in urban and peri-urban area

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DOI: <https://www.doi.org/10.33545/2618060X.2026.v9.i9Sg.6713>

ABSTRACT

The present investigation entitled “Innovative Methods for Lesser Yam (*Dioscorea esculenta* L.) Cultivation: Utilizing Grow Bags in Urban and Peri-Urban Area” was conducted during 2025–26 at the Department of Vegetable Science, College of Horticulture, Dapoli, Dr. Balasaheb Sawant Konkan Krishi Vidyapeeth, Maharashtra. The experiment was laid out in a Factorial Randomized Block Design (FRBD) with eight treatment combinations replicated three times. Two growing bags, viz., P_1 (polypropylene bag) and P_2 (polythene bag), and four growing media, viz., M_1 (Soil), M_2 (Soil + FYM, 2:1), M_3 (Soil + Vermicompost, 2:1), and M_4 (Soil + Cocopeat, 2:1), were evaluated. The results revealed significant differences among the treatments for yield and yield attributes. The interaction treatment P_2M_3 recorded the highest tuber length (15.08 cm), tuber diameter (4.25 cm), number of tubers per plant (9.40), number of Grade-A tubers per plant (7.15), Grade-A tuber weight per plant (1022.45 g), total tuber yield per plant (1091.57 g), and tuber yield per square metre (4.36 kg). The highest number of Grade-B tubers per plant (5.50) and Grade-B tuber weight per plant (212.85 g) were recorded in P_1M_1 . Among the growing bags, P_2 performed better than P_1 for most yield parameters. Overall, cultivation of lesser yam in polythene grow bag with Soil + Vermicompost (2:1) proved to be the most effective treatment for obtaining higher tuber yield under grow bag conditions.

Keywords: Lesser yam, Growing bags, Media, Urban area, Tubers

Introduction

Lesser yam (*Dioscorea esculenta* L., $2n = 40$) is an underutilized tropical tuber crop of the family Dioscoreaceae, cultivated for its edible tubers and valued as a source of dietary energy and nutrition (Vishe *et al.*, 2023) [1]. Tuber crops are adaptable to marginal environments, drought and low-input conditions, making them important for sustainable food production (Mhaskar *et al.*, 2015) [2]. The genus *Dioscorea* is also recognized for its nutritional and bioactive properties, including steroidal sapogenins such as diosgenin, which have pharmaceutical importance (Obidiegwu *et al.*, 2020) [3]. Rapid urbanization and limited cultivable land necessitate alternative production systems for tuber crops. Lesser yam is an important crop in the Konkan region, where crop geometry has been reported to significantly affect tuber yield and economics (Mhaskar *et al.*, 2020) [4]. Growing media are critical in container and soilless cultivation as they regulate water, aeration and nutrient supply (Barrett *et al.*, 2016) [5], while organic management can improve yam yield, tuber quality and soil properties (Suja *et al.*, 2014) [6]. Therefore, grow-bag cultivation with suitable growing media offers potential for lesser yam production in urban and peri-urban areas. Hence, the present study entitled “Innovative Methods for Lesser Yam (*Dioscorea esculenta* L.) Cultivation: Utilizing Grow Bags in Urban and Peri-Urban Area” was undertaken to evaluate suitable growing bags and media for improving the growth, yield and quality of lesser yam.

Material and Methods

The present investigation was conducted during the *Kharif* and *Rabi* seasons of 2025–26 at the Vegetable Research Farm, Department of Vegetable Science, College of Horticulture, Dapoli, Dr. Balasaheb Sawant Konkan Krishi Vidyapeeth, Dapoli, Dist. Ratnagiri, Maharashtra, India. The experiment was laid out in a Factorial Randomized Block Design (FRBD) with three replications. Two factors were evaluated during the study, viz., growing bags (P): P_1 – Polypropylene bag and P_2 – Polythene bag; and growing media (M): M_1 – Soil, M_2 – Soil + Farmyard Manure (2:1), M_3 – Soil + Vermicompost (2:1), and M_4 – Soil + Cocopeat (2:1), resulting in eight treatment combinations. The total experimental area was 330.75 m². A total of 480 grow bags of 45 × 45 cm size were used, with 20 bags allotted to each treatment in each replication. The variety ‘Konkan Kanchan’ was used for the study. Healthy seed tubers weighing approximately 70–100 g were selected for planting. One tuber was planted per grow bag at a depth of 8–10 cm and covered with the re

spective growing medium. Planting was carried out on 29th May, 2025. The experimental data were statistically analysed using the analysis of variance (ANOVA) as described by Panse and Sukhatme (1995), and the significance of treatment differences was tested at the 5 per cent level of significance.

Results and Discussion

Significant variations were recorded for all the yield and yield-attributing characters of lesser yam as influenced by the type of growing bag. P₂ (Polythene bag) recorded the highest tuber length (13.64 cm), tuber diameter (3.93 cm), number of tubers per plant (8.71), number of Grade A tubers per plant (5.10), weight of Grade A tubers per plant (675.80 g), yield per plant (792.39 g) and yield per square metre (3.16 kg), whereas the corresponding values in P₁ (Polypropylene bag) were 12.97 cm, 3.69 cm, 7.72, 4.18, 485.23 g, 621.01 g and 2.48 kg, respectively. In contrast, the highest number of

Grade B tubers per plant (3.44) and weight of Grade B tubers per plant (135.78 g) were recorded in P₁, compared with 3.08 tubers and 125.59 g in P₂.

The superior performance of P₂ may be attributed to the favourable root-zone environment, moisture retention, drainage and aeration provided by the polythene bag, which might have promoted better root development, tuber initiation and tuber bulking. Lesser yam develops an extensive root system before tuber initiation, while continued tuber bulking during crop development requires favourable root-zone conditions. Similar observations regarding the importance of root development and crop growth in lesser yam were reported by Melteras *et al.*, (2008) [7]. The role of container properties in regulating water availability, aeration and root-zone conditions in substrate cultivation was also highlighted by Savvas *et al.* (2018) [8] and Fields *et al.* (2024) [9]. Further, Garg *et al.*, (2024) [10] reported that container type significantly influenced root development, biomass production and nutrient

Table 1. Effect of growing bags on yield of lesser yam

Growing bags	Length of tuber (cm)	Diameter of tuber (cm)	No. of tubers per plant	No. of Grade-A tubers per plant	No. of Grade-B tubers per plant	Weight of Grade-A tubers per plant (g)	Weight of Grade-B tubers per plant (g)	Yield per plant (kg)	Yield per Square meter (kg)
P1	12.97	3.69	7.72	4.18	3.44	485.23	135.78	621.01	2.48
P2	13.64	3.93	8.71	5.10	3.08	675.80	125.59	792.39	3.16
Result	SIG	SIG	SIG	SIG	SIG	SIG	SIG	SIG	SIG
S. Em. (±)	0.23	0.51	0.17	0.15	0.13	10.06	3.07	12.31	0.01
CD @ 5%	0.71	1.56	0.50	0.46	0.39	30.51	9.01	37.82	0.02

Growing bags - (P₁) Polypropylene bag (P₂) Polythene bag

uptake. Thus, the favourable growing conditions under P₂ might have enhanced tuber development and resulted in higher production of

Grade-A tubers and overall yield.

Table 2. Effect of media on yield of lesser yam

Media	Length of tuber (cm)	Diameter of tuber (cm)	No. of tubers per plant	No. of Grade A tubers per plant	No. of Grade B tubers per plant	Weight of Grade A tubers (g) per plant	Weight of Grade B tubers (g) per plant	Yield per plant (kg)	Yield per Square meter (kg)
M1	12.08	3.61	7.58	2.50	4.90	277.23	185.8	463.03	1.85
M2	13.81	3.88	8.48	5.62	3.13	706.45	107.7	814.22	3.25
M3	14.18	4.00	8.75	6.60	2.15	823.90	73.31	897.21	3.58
M4	13.15	3.77	8.03	4.12	4.41	496.47	155.9	652.36	2.60
Result	SIG	SIG	SIG	SIG	SIG	SIG	SIG	SIG	SIG
S.Em. (±)	0.33	0.82	0.37	0.32	0.33	35.79	10.57	29.31	0.21
CD @ 5%	1.01	2.47	1.12	0.97	0.99	105.31	32.21	85.33	0.64

Media - (M₁) Soil, (M₂) Soil + FYM, (M₃) Soil + Vermicompost, (M₄) Soil + Cocopeat

Significant variation was observed among the growing media for all the yield and yield-attributing characters of lesser yam. M₃ (Soil + Vermicompost) recorded the maximum tuber length (14.18 cm), tuber diameter (4.00 cm), number of tubers per plant (8.75), number of Grade-A tubers per plant (6.60), weight of Grade-A tubers per plant (823.90 g), yield per plant (897.21 g) and yield per square metre (3.58 kg), followed by M₂ (Soil + FYM), while the minimum values for these characters were recorded in M₁ (Soil) with tuber length (12.08 cm), tuber diameter (3.61 cm), number of tubers per plant (7.58), number of Grade-A tubers per plant (2.50), weight of Grade-A tubers per plant (277.23 g), yield per plant (463.03 g) and yield per square metre (1.85 kg), respectively. In contrast, the highest number of Grade-B tubers per plant (4.90) and weight of Grade-B tubers per plant (185.80 g) were recorded in M₁, whereas the lowest values were observed in M₃ (2.15 and 73.31 g, respectively). The superior performance of M₃ may be attributed to the addition of vermicompost,

which improved the physical and chemical properties of the growing medium, particularly nutrient availability, moisture retention, porosity and microbial activity, thereby providing a favourable environment for root development and tuber bulking. The similar research findings observed in Nepal *et al.* (2024), Dungdung *et al.* (2024) [11] in bell paper, Isaac *et al.* (2015) [12] in conventional elephant foot yam, Kumar *et al.* (2024) [13] in sweet potato.

The interaction effect of growing bags and growing media was found to be significant for all the studied yield and yield-contributing parameters of lesser yam. The maximum tuber length (15.08 cm), tuber diameter (4.25 cm), number of tubers per plant (9.40), number of Grade-A tubers per plant (7.15), weight of Grade-A tubers per plant (1022.45 g), yield per plant (1091.57 g) and yield per square metre (4.36 kg) were recorded in P₂M₃ (polythene bag + soil + vermicompost). In contrast, the minimum tuber length (11.50 cm), tuber diameter (3.58 cm), number of tubers per plant (6.30), Grade-A tubers per

plant (2.00), weight of Grade-A tubers per plant (206.00 g), yield per plant (418.85 g) and yield per square metre (1.67 kg) were recorded

in P₁M₁ (polypropylene bag + soil).

Table 3. Effect of growing bags and media on yield of lesser yam

Media	Length of tuber (cm)	Diameter of tuber (cm)	No. of tubers per plant	No. of Grade-A tubers per plant	No. of Grade-B tubers per plant	Weight of Grade-A tubers (g) per plant	Weight of Grade-B tubers (g) per plant	Yield per plant (g)	Yield per Square meter (kg)
P ₁ M ₁	11.50	3.63	6.30	2.00	5.50	206.00	212.85	418.85	1.67
P ₁ M ₂	14.17	3.84	8.40	5.20	3.20	593.32	110.46	703.78	2.81
P ₁ M ₃	13.28	3.74	8.10	5.50	2.25	625.35	77.500	702.85	2.81
P ₁ M ₄	12.93	3.58	8.07	4.05	4.02	516.25	142.34	658.59	2.63
P ₂ M ₁	12.66	3.59	8.87	3.03	4.30	348.46	158.75	507.21	2.02
P ₂ M ₂	13.44	3.92	8.57	6.05	3.07	819.59	105.08	924.67	3.69
P ₂ M ₃	15.08	4.25	9.40	7.15	2.05	1022.45	69.120	1091.57	4.36
P ₂ M ₄	13.37	3.97	8.00	4.20	4.80	476.7	169.44	646.14	2.58
Result	SIG	SIG	SIG	SIG	SIG	SIG	SIG	SIG	SIG
S. Em. (±)	0.33	0.73	0.24	0.35	0.18	26.33	4.08	25.21	0.01
CD @ 5%	1.00	2.21	0.71	1.07	0.55	78.99	13.57	76.25	0.03
Growing bags -(P₁) Polypropylene bag (P₂) Polythene bag Media - (M₁) Soil, (M₂) Soil + FYM, (M₃) Soil + Vermicompost, (M₄) Soil + Cocopeat									

Regarding Grade-B tubers, the maximum number of Grade-B tubers per plant (5.50) was recorded in P₁M₁, whereas the minimum (2.05) was observed in P₂M₃. Similarly, the highest weight of Grade-B tubers per plant (212.85 g) was recorded in P₁M₁ and the lowest (69.12 g) in P₂M₃. The superior performance of P₂M₃ may be attributed to the better physical properties, aeration, moisture retention and nutrient availability provided by vermicompost, while the polythene bag provided a favourable root-zone environment with adequate moisture and reduced nutrient loss. The combined effect of improved growing media and favourable bag conditions probably promoted better root development, nutrient uptake and tuber bulking, resulting in higher yield and a greater proportion of Grade-A tubers.

Conclusion

Based on the present investigation, it can be concluded that among the different growing media evaluated, M₃: Soil + Vermicompost (2:1) proved to be the most effective, recording superior performance for the majority of growth, yield, and quality parameters of lesser yam. Among the grow bag types, P₂: polythene grow bags were found to be superior to polypropylene grow bags, resulting in better crop growth, tuber development, and economic returns. Therefore, the use of Soil + Vermicompost (2:1) as the growing medium in polythene grow bags is recommended for the successful cultivation of lesser yam under urban and peri-urban conditions.

Acknowledgement

The authors express their sincere gratitude to the Department of Vegetable Science, College of Horticulture, Dapoli, Dr. Balasaheb Sawant Konkan Krishi Vidyapeeth, Dapoli, Maharashtra, India, for providing the necessary facilities and support to conduct this research. The authors also extend their heartfelt thanks to Dr. Pradnya S. Gudadhe for her valuable guidance and constructive suggestions during the preparation of the manuscript.

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How to cite this article: Patil R, Gudadhe P, Parulekar Y, Thorat S, Meshram N, Borkar A. Innovative methods for lesser yam (*Dioscorea esculenta* L.) cultivation: Utilizing grow bags in urban and peri-urban area. *International Journal of Research in Agronomy*. 2026;SP-9(9):594-597. doi: <https://www.doi.org/10.33545/2618060X.2026.v9.i9Sg.6713>