Phytology

Effect of different potting media on the growth of Bullock's heart (*Annona reticulata* L.)

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Abstract

The effect of different potting media on the growth of Bullock's heart (Annona reticulata L.) was determined. The growth parameters viz. height (cm), number of leaves per seedling, leaf area (cm2), and root length (cm) were significantly influenced by different potting media. The highest seedling height (66.07 cm), number of leaves (23.40), leaf area (34.25 cm2), and root length (38.34 cm) were recorded in treatment T1 i.e. Soil + FYM (2:1). The lowest height (26.22 cm), number of leaves (12.67) and leaf area (17.73 cm2) were recorded in T4 i.e. Soil + Cocopeat (1:1). Whereas. the lowest root length (26.88 cm) was observed in T3 i.e. Soil + FYM (1:2). Among different growth parameters studied, all the potting media treatments had a non-significant effect on the number of side branches and length of side branches per seedling. It can be concluded that the growth performance of Bullock's heart seedlings was the best in Soil +FYM (2:1) considering all the growth parameters studied. However, performance was also better in soil + vermicompost (1:1), soil + FYM + cocopeat (1:1:1) and FYM + vermicompost + cocopeat (1:1:1). Moreover, FYM + vermicompost + cocopeat (1:1:1) is a soilless medium understudy that also showed better results. With the view to reducing the weight of potting media or the use of soilless media to avoid soilborne diseases and promote good drainage, these potting medium has future prospects.

Keywords: potting media, *Annona reticulata*, growth, bullock's heart, plant height, leaf area, root length

Introduction

Bullock's heart (*Annona reticulata* L.) is an important crop in dryland Horticulture which is usually cultivated in homestead gardens in Konkan region. As the demand for Bullock's heart in local as well as in metropolitan markets is increasing at an alarming rate (Indira, 2014) [8] the systemic efforts for its crop improvement and propagation should be implemented.

Growth of seedlings is closely linked with the nutritional status of potting media. Merely, the soil is not satisfactory media for raising healthy and vigorous growing seedlings in containers. Dozens of different ingredients are used in varying combinations to create commercial growing media. By understanding the functions of growing media, one can evaluate the qualities of individual types and select which ones might work best for the container garden. The choice is very important because plants are dependent on a relatively small volume of growing medium. Considering these aspects, attempts were made to study the effect of different potting media on the growth of Bullock's heart (*Annona reticulata* L.).

Material and Methods

A field experiment was conducted at the Department of Horticulture, College of Agriculture, Dapoli, Dist. Ratnagiri during the year 2016-2017. The experiment was conducted in Randomized Block Design (RBD). There were seven treatments of potting media and each was replicated thrice. The treatments were T_1: Control i.e. Soil + FYM (2:1), T_2: Soil + Vermicompost (1:1), T_3: Soil + FYM (1:2), T_4: Soil + Cocopeat (1:1), T_5: Soil + FYM + Cocopeat (1:1:1), T_6: Soil + Vermicompost + Cocopeat (1:1:1) and T_7: FYM + Vermicompost + Cocopeat (1:1:1).

The required numbers of seeds were soaked in 250 ml Gibberellic acid solution at the concentration of 250 ppm for 24 hrs. Potting mixtures were prepared as per the treatments. Then the mixture was filled in black polythene bags of size 15 cm x 20 cm. The treated seeds were sown 2 cm deep.

To record the observations, five Bullock's heart seedlings were selected randomly from each treatment per replication and observations were recorded at monthly intervals. The averages of five seedlings were computed for further statistical analysis. The data obtained in the present investigations were statistically analysed by the method suggested by Panse and Sukhatme (1995) [11].

Results and Discussion

Seedling Height(cm)

After one month to germination, all the potting media treatments showed a non-significant effect on the height of the seedlings (Table 1). However, after the first month, there was significant variation in the height of seedlings among the treatments. At the end of the sixth month, the highest height (66.07 cm) was recorded in the treatment T_1. It was followed by T_2 (61.43 cm), T_7 (56.15 cm) and T_5 (54.53 cm). T_4 recorded the lowest height (26.22 cm). Also, the cumulative per cent

increment in height was observed highest (561.99 %) in T_1 whereas lowest (173.88 %) was recorded in T_4. The use of media with sufficient amount of essential nutrients is important for seedlings to attain maximum height (Ikram *et al.,* 2013) [7]. The Soil + FYM medium (2: 1) increased plant height because the addition of FYM, which is organic matter, affects soil physics, chemistry and biology as it binds soil aggregates together and is a good source of soil nutrients. Present findings are in accordance with the results obtained by Singh and Mann (1976) [16] in Trifoliate Orange with soil +FYM; Deol and Uppal (1990) [5] in Pomegranate with soil + FYM; Parasana *et al.,* (2013) [12] in Mango with soil + sand + FYM (2: 1: 1); Bali *et al.,* (2013) [3] in *Terminalia bellirica* (Gaertn.) Roxb. under FYM; Ramteke *et al.,* (2013) [13] in Papaya with soil + FYM (1:1) and Raval *et al.,* (2016) [14] in Mango with soil + sand + FYM (2:1:1).

Table 1: Effect of potting media on the height of Bullock's heart seedling (cm)

Treatments	Plant height (cm) and increment in plant height (%)										
	After 1st month	After 2nd month		After 3rd month		After 4th month		After 5th month		After 6th month	
	Plant Height	Plant Height	% increment *	Plant Height	% increment *	Plant Height	% increment *	Plant Height	% increment *	Plant Height	% increment *
T_1	9.98	17.49	75.21	29.15	192.05	**47.31**	**374.0**	**57.61**	**477.28**	**66.07**	**561.99**
T_2	9.96	16.29	63.52	25.75	158.56	39.43	295.85	52.09	422.95	61.43	516.73
T_3	9.75	17.75	82.07	27.57	182.90	39.29	303.07	46.39	375.92	53.95	453.48
T_4	9.57	14.13	47.63	16.77	75.13	20.54	114.55	23.77	148.32	26.22	173.88
T_5	9.45	18.37	94.49	30.35	221.24	44.33	369.23	49.28	421.66	54.53	477.20
T_6	9.64	17.27	79.11	27.89	189.34	40.37	318.82	44.83	365.07	50.81	427.10
T_7	9.82	17.57	78.95	30.20	207.53	44.49	353.08	51.26	421.99	56.15	471.75
Mean	9.74	16.98		26.81		39.39		46.46		52.74	
S. Em ±	0.27	0.26		0.27		0.36		0.26		0.58	
CD at 5%	NS	0.81		0.82		1.10		0.80		1.78	

*Increment in seedling height over initial observation in per cent

The number of leaves per seedling

The number of leaves per seedling was significantly affected by potting media treatments (Table 2). After six months, the highest number of leaves (23.40) was recorded in T_1 which was at par with T_3 (22.07), T_7 (21.80) and T_2 (21.07). The lowest number of leaves (12.67) was observed in T_4. However, the cumulative per cent increment in a number of leaves was observed highest (760.53 %) in T_7 whereas lowest (313.04 %) was recorded in T_4 at the end of the sixth month. These results may be due to better nutrients availability in potting media combinations leading to higher production of photo-synthetically functional leaves due to growing media (Borah *et al.,* 2008) [4]. This results are similar with findings obtained by Indriyani *et al.,* (2011) [9] in Pineapple with soil +manure (1:1); Parasana *et al.,* (2013) [12] in Mango with soil + sand + FYM (2: 1: 1); Ramteke *et al.,* (2013) [13] in Papaya with soil + FYM (1:1). It can be concluded that using soil mixtures with organic substrates such as farmyard manure enhanced the number of leaves.

Table 2: Effect of potting media on number of leaves of Bullock's heart seedling

Treatments	Number of leaves per seedling and increment in no. of leaves (%)										
	After 1st month	After 2nd month		After 3rd month		After 4th month		After 5th month		After 6th month	
	No. of leaves	No. of leaves	% increment *	No. of leaves	Per cent increment *	No. of leaves	Per cent increment *	No. of leaves	% increment *	No. of leaves	% increment *
T_1	3.20	7.13	122.91	12.20	281.25	18.07	464.68	21.13	560.41	23.40	631.25
T_2	2.53	6.67	163.15	10.13	300	15.33	505.26	19.40	665.78	21.07	731.28
T_3	2.80	6.67	138.09	11.60	314.28	17.80	535.71	20.07	616.66	22.07	688.09
T_4	3.07	5.40	76.08	8.67	182.60	11.13	263.04	12.13	295.65	12.67	313.04
T_5	3.27	7.60	132.65	12.20	273.46	17.60	438.77	19.53	497.95	20.13	516.32
T_6	3.20	7.60	137.5	11.73	266.66	16.13	404.16	18.67	483.33	19.40	506.25
T_7	2.53	6.73	165.78	11.60	357.89	17.27	581.57	19.93	686.84	21.80	760.53
Mean	2.94	6.83		11.16		16.19		18.70		20.08	
S. Em ±	0.16	0.23		0.43		0.45		0.64		0.57	
CD at 5%	0.50	0.72		1.33		1.37		1.97		1.76	

*Increment in number of leaves over initial observation in per cent

Leaf area (cm^2)

After one month to germination, all the potting media treatments showed a non-significant effect on the leaf area (Table 3). However, the leaf area among all the potting media treatments varied significantly thereafter. At the end of the sixth month, the highest leaf area (34.25 cm^2) was recorded in the treatment T_1 which was significantly superior to all the other treatments and was followed by T_7 (32.33 cm^2) and T_6 (31.29 cm^2). The lowest leaf area (17.73 cm^2) was recorded in T_4. Similarly, cumulative per cent increment in leaf area was observed highest (405.68 %) in T_7 followed by T3 (403.26%) whereas lowest (148.18 %) was recorded in T_4. Improvement in the physical and chemical properties of the rooting medium (Dileep *et al.,* 1994) [6] improved the growth of the seedlings and produced healthy seedling with higher production of photo-synthetically functional leaves (Borah *et al.,* 2008) [4].

Moreover, the moisture availability and nutrition supply to the plant due to the organic matter might have resulted in a maximum leaf area. Similar results were obtained by Angrej *et al.,* (2010) [1] in Cherry with soil + sand + FYM (1:1:1/2:1:2); Anjawane (2011) [2] in Papaya with soil + sand + FYM (1:1:1); Ramteke *et al.,* (2013) [13] in Papaya with soil + FYM (1:1) and Raval *et al.,* (2016) [14] in Mango with soil + sand + FYM (2:1:1).

Table 3: Effect of potting media on leaf area (cm^2) of Bullock's heart seedling

Treatments	Leaf area (cm^2) and increment in leaf area (%)										
	After 1st month	After 2nd month		After 3rd month		After 4th month		After 5th month		After 6th month	
	Leaf area	Leaf area	% increment *	Leaf area	% increment *	Leaf area	% increment *	Leaf area	% increment *	Leaf area	% increment *
T_1	6.91	13.45	94.53	16.44	137.90	24.83	259.23	27.54	298.44	34.25	395.51
T_2	7.16	13.30	85.68	16.60	131.66	22.26	210.74	25.35	253.75	29.93	317.73
T_3	5.61	11.40	103.31	14.44	157.52	20.76	270.23	23.35	316.41	28.22	403.26
T_4	7.14	11.34	58.65	12.81	79.30	14.46	102.39	15.89	122.46	17.73	148.18
T_5	6.78	13.47	98.75	16.56	144.34	21.32	214.58	24.71	264.56	28.57	321.43
T_6	6.29	12.03	91.38	15.44	145.63	21.78	246.49	25.98	313.32	31.29	397.82
T_7	6.39	13.06	104.25	16.63	160.12	24.15	277.71	26.91	320.91	32.33	405.68
Mean	6.61	12.58		15.56		21.37		24.25		28.90	
S. Em ±	0.38	0.41		0.34		0.46		0.44		0.36	
CD at 5%	NS	1.27		1.05		1.43		1.34		1.34	

*Increment in leaf area over initial observation in per cent

Number of side branches

Branching started from third months onwards. There was no significant difference due to potting media on the number of branches in Bullock's heart seedlings from third to six months duration after germination. Branching was observed in all the treatments except in T_4 and T_6 (Table 4). The highest number of side branches (0.40) was produced in T_1 and T_5. The trend of these results might be because Bullock's heart exhibits strong apical dominance that reduces the sprouting of the side branches.

Table 4: Effect of potting media on number of side branches of Bullock's heart seedling

Treatments	Number of side branches and increment (%)						
	After 3rd month	After 4th month		After 5th month		After 6th month	
	No. of branches	No. of branches	Per cent increment *	No. of branches	Per cent increment *	No. of branches	Per cent increment *
T_1	0.40	0.40	0	0.40	0	0.40	0
T_2	0.07	0.07	0	0.07	0	0.07	0
T_3	0.20	0.33	66.66	0.33	66.66	0.33	66.66
T_4	0.00	0.00	0	0.00	0	0.00	0
T_5	0.40	0.40	0	0.40	0	0.40	0
T_6	0.00	0.00	0	0.00	0	0.00	0
T_7	0.13	0.13	0	0.13	0	0.13	0
Mean	0.17	0.19		0.19		0.19	
S. Em ±	0.11	0.12		0.11		0.11	
CD at 5%	NS	NS		NS		NS	

*Increment in number of branches over initial observation in per cent

Length of side branches

Significant effect due to different potting media on the number of branches in Bullock's heart seedlings was not observed from third to sixth months (Table 5). The maximum length of branches (2.52 cm) was recorded in T_5 however, the cumulative per cent increment in length of branches was observed highest (253.88 %) in T_3. Seedlings under T_2 achieved the lowest length of side branch (0.76 cm). Similarly, per cent increment in length of side branch was also the lowest (28.08 %) in T_2. It can be concluded that the length of side branches may be higher in a few treatments due to the supply of nutrients from organic matter in the potting media.

Table 5: Effect of potting media on length of side branches (cm) of Bullock's heart seedling

Treatments	Length of side branches (cm) and increment (%)						
	After 3rd month	After 4th month		After 5th month		After 6th month	
	Length of branches	Length of branches	Per cent increment *	Length of branches	Per cent increment *	Length of branches	Per cent increment *
T_1	1.37	1.88	37.37	1.96	42.71	2.14	56.06
T_2	0.59	0.7	17.97	0.71	19.66	0.76	28.08
T_3	0.6	1.50	150.55	1.84	207.22	2.12	253.88
T_4	0	0	0	0	0	0	0
T_5	0.88	1.42	61.36	1.98	125.37	2.52	187.12

T_6	0	0	0	0	0	0	0
T_7	0.66	1.02	54	1.06	60	1.16	75
Mean	0.59	0.79		0.84		0.95	
S. Em ±	1.82	2.45		2.60		2.94	
CD at 5%	NS	NS		NS		NS	

*Increment in the length of branches over initial observation in per cent

Root length (cm)

At the end of the sixth month, the root length was significantly influenced by the different potting media treatments. The root length varied from 26.88 cm to 38.34 cm (Table 6). The highest root length (38.34 cm) was recorded in the treatment T_1 and was significantly superior over the rest of the treatments which was followed by T_2 (37.25 cm) and T_5 (36.38 cm). The lowest root length (26.88 cm) was noticed in T_3. Organic substances present in rooting media initially forms a conductive environment with regards to physical parameters of soil which promotes better root growth (Ramteke *et al.,* 2013) [13] and finally leads to increase in root growth. Organic amendment in potting mixture improved the structure of the soil by improving the water holding capacity, aeration and drainage that encourage better root growth and nutrient absorption (Kumar *et al.,* 2009) [10]. Similar trend in data were obtained by Parasana *et al.,* (2013) [12] in Mango with soil + sand + FYM (2: 1: 1); Deol and Uppal (1990) [5] in Pomegranate with soil + FYM; Ramteke *et al.,* (2013) [13] in Papaya with Soil + FYM (1:1) and Raval *et al.,* (2016) [14] in Mango with soil + sand + FYM (2:1:1); Shikha (2013) [15] in Kagzi Lime air layers soil + silt + FYM.

Table 6: Effect of different potting media on root length (cm) of Bullock's heart seedlings at the end of the sixth month

Sr. No.	Treatments	Root length (cm)
1	T_1- Control – Soil + FYM (2:1)	38.34
2	T_2- Soil + Vermicompost (1:1)	37.25
3	T_3- Soil + FYM (1:2)	26.88
4	T_4- Soil + Cocopeat (1:1)	34.31
5	T_5- Soil + FYM + Cocopeat (1:1:1)	36.38
6	T_6- Soil + Vermicompost + Cocopeat (1:1:1)	33.55
7	T_7- FYM + Vermicompost + Cocopeat (1:1:1)	32.69
	Mean	34.20
	S. Em ±	0.17
	CD at 5%	0.53

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