

Evaluation of growing media and pot size for growth and flowering of *Primula malacoides* Franch

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ABSTRACT

The investigations were carried out at the experimental farm of Department of Floriculture and Landscape Architecture, Dr YS Parmar University of Horticulture and Forestry, Nauni, Solan, HP to work out the most suitable growing media and pot size for producing the best quality and most presentable potted primulas. The experiment was laid out in a completely randomized design (factorial) having seven growing media viz T₁ (Soil:FYM:sand, 1:1:1, v/v), T₂ (*Quercus semicarpifolia* leaf mould:FYM:soil, 2:1:1, v/v), T₃ (*Rhododendron arboreum* leaf mould:FYM:soil, 2:1:1, v/v), T₄ (*Picea smithiana* leaf mould:FYM:soil, 2:1:1, v/v), T₅ (Chirpine leaf mould:FYM:soil, 2:1:1, v/v), T₆ (Cocopeat:FYM:sand, 1:1:1, v/v), T₇ (Spent mushroom compost:FYM:soil, 2:1:1, v/v) and three pot sizes of 15, 20 and 25 cm diameter. The observations were recorded on various growth and flowering parameters. The growing medium comprising cocopeat:FYM:sand (1:1:1, v/v) recorded maximum values in terms of number of branches per plant (36.37), shoot length (25.38 cm), length of inflorescence stalk (17.43 cm), inflorescence diameter (5.89 cm), number of flowers per inflorescence (18.28), minimum days to flower bud formation (104.10 days) as well as earliest first flower opening (106.80 days). Further 25 cm diameter pots exhibited maximum number of branches or shoots per plant (35.16), shoot length (23.18 cm), days to flower bud formation (108.10 days), days to first flower opening (111.70 days), length of inflorescence stalk (16.78 cm), inflorescence diameter (5.89 cm) and number of flowers per inflorescence (20.13). Among interactions, growing media × pot size, maximum number of branches per plant (47.07), shoot length (27.67 cm), length of inflorescence stalk (18.31 cm), inflorescence diameter (6.40 cm) and number of flowers per inflorescence (21.02) were recorded in growing medium comprising cocopeat:FYM:sand (1:1:1,v/v) and using 25 cm diameter pot size. Hence primula plants grown in growing medium cocopeat:FYM:sand (1:1:1, v/v) and using 25 cm diameter pot size resulted in most desirable and presentable potted primula.

Keywords: Growing media; pot size; primula; growth; flowering

INTRODUCTION

Primula malacoides Franch, the most important and magnificent flowering pot

plant in the temperate zone belongs to family Primulaceae. It is a non-hardy species generally grown in pots as an annual for indoor use. The selection of

suitable growing media and pot size play an important role in manipulating the growth, development and flowering of primula. It is well documented that growing media have some considerable effects on growth and flowering of various container grown foliage and flowering indoor plants including primulas therefore selection and formulation of an appropriate growing medium is important for the successful production of primulas. Similarly the container size also plays an important role in manipulating the growth, development and flowering of indoor plants in general and potted primulas in particular. The container size has been known to change the rooting volume of the plants which in turn greatly affects plant growth and flowering. Hence present studies were carried out to find out suitable growing media and pot size for the quality growth and flowering of potted primulas.

MATERIAL and METHODS

Seven growing media viz T₁ (Soil:FYM:sand, 1:1:1, v/v), T₂ (*Quercus semicarpifolia* leaf mould:FYM:soil, 2:1:1, v/v), T₃ (*Rhododendron arboreum* leaf mould:FYM:soil, 2:1:1, v/v), T₄ (*Picea smithiana* leaf mould:FYM:soil, 2:1:1, v/v), T₅ (Chirpine leaf mould:FYM:soil, 2:1:1, v/v), T₆ (Cocopeat:FYM:sand, 1:1:1, v/v), T₇ (Spent mushroom compost:FYM:soil, 2:1:1, v/v) were prepared after thoroughly mixing of various ingredients on volume by volume basis and filled in plastic pots of 15, 20 and 25 cm diameter. After filling the pots

light watering was done so as to settle down the potting mixture properly and left as such in the shade net house. After 24 hours the healthy and stocky seedlings of *Primula malacoides* were planted in the plastic pots containing a sterilized mixture of different growing media in the shade net house on 1 September 2012. The requisite samples of different growing media were collected before planting and analyzed for various physical and chemical properties following standard procedures. The data recorded on various growth and flowering parameters were subjected to analysis of variance using completely randomized design (factorial). To facilitate vegetative growth, foliar spray of urea was given @ 4g/10 l of water on 5 October and foliar spray of Multi-K @ 1g/10 l of water was given on 25 October. Two irrigations per week during September to February and four irrigations per week were applied during March-April depending upon the weather conditions. All plants were inspected for disease/insect pest infestation at regular intervals. Attack of greenhouse white flies (*Trialeurodes vaporariorum*), bacterial soft rot (*Erwinia carotovora*) and cucumber mosaic virus were observed in *Primula malacoides* Franch. Drenching with mancozeb M-45 @ 0.2 per cent and carbendazim @ 0.1 per cent was done at fortnightly interval. For white flies, yellow traps were used and cypermethrin @ 1 ml/l was sprayed. Drenching of mancozeb M-45 @ 0.2 per cent and carbendazim @ 0.1 per cent was done for bacterial soft rot

and also chloropyriphos @ 2 ml/l drenching was done to safeguard the root system from root borer. All growth and flowering parameters except days to bud formation and days taken to first flower opening were recorded at the time of peak flowering. Days to flower bud formation were recorded as the time taken from transplanting till the visibility of colour of flower buds. Number of days taken to first flower opening were recorded as the time taken in days from transplanting of seedlings to the opening of first flower. The physical and chemical properties of growing media were analysed at Directorate of Mushroom Research, Chambaghat and Department of Environmental Sciences, Dr YS University Horticulture and Forestry, Nauni, Solan, HP.

RESULTS and DISCUSSION

Vegetative parameters

The data presented in Table 1 show that the growing medium comprising cocopeat:FYM:sand (1:1:1, v/v) recorded maximum values in terms of number of shoots or branches per plant (36.37) and shoot length (25.38 cm). More vegetative parameters of primula plants grown in this medium may be ascribed to the fact that this medium provided optimal physico-chemical properties (Table 2 & 3) especially the retention of sufficient moisture besides maintaining a requisite biological balance which might have contributed to the

better growth of plants in comparison to the other growing media tested. These findings get the support from the earlier reports of Wazir et al (2009) in *Alstroemeria*. Similar findings have also been reported in Dutch rose cv Naranga' by Hazarika et al (2010).

Similarly the response of pot size on vegetative parameters varied with the diameter of pots. Pots of 25 cm size exhibited maximum number of branches or shoots per plant (35.16) and shoot length (23.18 cm). The higher vegetative parameters in large size pots could be due to the reason that bigger containers could have accommodated higher quantity of material that was helpful in providing sufficient nutrients and space for the growth of adequate root system thus resulting in better growth of plants which in turn grew longer. These results are also in close conformity with the findings of Vernieri et al (2003) in sunflower. Similar findings have also been reported in weeping fig and loquat by McConnell (1987).

Among interactions vigorous vegetative parameters in growing medium composed of cocopeat:FYM:sand (1:1:1, v/v) grown in 25 cm pots resulted in maximum growth of plants that might be attributed to the conducive interactive effects of this growing medium and larger size of pots that could have accommodated more material which assured better physico-chemical properties for better

Table 1. Effect of growing media and pot size on vegetative and flowering parameters of *Primula malacoides* Franch

Treatment	# branches or shoots/plant	Shoot length (cm)	Days to flower bud formation	Days to first flower opening	Length of inflorescence stalk (cm)	Inflorescence diameter (cm)	# flowers/ inflorescence
Medium							
T ₁	18.64	19.07	105.00	107.70	15.23	4.88	15.98
T ₂	27.28	22.69	105.00	107.70	16.09	5.42	17.30
T ₃	18.97	21.16	106.70	109.40	15.16	5.35	17.22
T ₄	29.40	21.05	108.90	111.60	15.01	5.43	17.54
T ₅	31.29	20.58	104.70	107.40	15.24	5.46	16.85
T ₆	36.37	25.38	104.10	106.80	17.43	5.89	18.28
T ₇	33.56	22.54	107.60	110.20	15.45	5.39	16.72
SE	1.72	0.26	1.22	1.22	0.15	0.008	0.01
CD _{0.05}	3.48	0.52	2.46	2.47	0.30	0.17	0.35
Pot size							
P ₁	20.33	20.43	102.30	106.30	14.57	5.14	14.80
P ₂	28.29	21.74	107.70	108.10	15.63	5.41	16.45
P ₃	35.16	23.18	108.10	111.70	16.78	5.66	20.13
SE	1.13	0.17	0.80	0.80	0.009	0.005	0.01
CD _{0.05}	2.28	0.34	1.62	1.62	0.19	0.11	0.23
Interaction							
T ₁ P ₁	12.60	18.99	101.50	105.50	13.98	4.66	13.68
T ₁ P ₂	19.27	18.71	105.60	107.90	15.69	4.87	15.54
T ₁ P ₃	24.05	19.52	107.90	109.60	16.02	5.10	18.73
T ₂ P ₁	20.73	19.74	101.50	105.50	14.90	5.17	14.38
T ₂ P ₂	27.58	23.44	105.60	107.90	15.62	5.42	16.95
T ₂ P ₃	33.53	24.89	107.90	109.60	17.74	5.68	20.57
T ₃ P ₁	15.00	21.50	101.70	105.70	14.09	5.15	15.71
T ₃ P ₂	16.57	20.65	108.40	109.90	14.80	5.42	16.29
T ₃ P ₃	25.33	21.35	109.90	112.40	16.58	5.49	19.67
T ₄ P ₁	24.07	20.09	105.50	109.50	13.86	5.18	15.47
T ₄ P ₂	27.07	21.02	110.40	110.90	14.95	5.49	16.54
T ₄ P ₃	37.07	22.03	110.80	114.40	16.22	5.64	20.60
T ₅ P ₁	26.00	19.45	101.60	105.60	14.06	5.23	14.60
T ₅ P ₂	31.23	20.92	107.80	104.60	15.25	5.45	16.30
T ₅ P ₃	36.63	21.38	104.60	111.80	16.43	5.70	19.65
T ₆ P ₁	19.70	23.32	99.83	103.80	16.47	5.43	15.57
T ₆ P ₂	42.33	25.16	106.40	106.20	17.52	5.84	18.25
T ₆ P ₃	47.07	27.67	106.20	110.40	18.31	6.40	21.02
T ₇ P ₁	24.23	19.92	104.20	108.20	14.62	5.18	14.22
T ₇ P ₂	33.97	22.25	109.30	109.30	15.58	5.40	15.29
T ₇ P ₃	42.47	25.43	109.30	113.30	16.14	5.59	20.64
SE	2.99	0.45	2.12	2.12	0.26	0.01	0.03
CD _{0.05}	6.03	0.90	NS	NS	NS	0.30	0.60
Growing media					Pot diameter (cm)		
T ₁ = Soil: FYM:sand (1:1:1, v/v)					P ₁ = 15 cm diameter pots		
T ₂ = <i>Quercus semicarpifolia</i> leaf mould:FYM:soil (2:1:1, v/v)					P ₂ = 20 cm diameter pots		
T ₃ = <i>Rhododendron arboreum</i> leaf mould:FYM:soil (2:1:1, v/v)					P ₃ = 25 cm diameter pots		
T ₄ = <i>Picea smithiana</i> leaf mould:FYM:soil (2:1:1, v/v)							
T ₅ = Chirpine leaf mould:FYM:soil (1:1:1, v/v)							
T ₆ = Cocopeat:FYM:sand (1:1:1, v/v)							
T ₇ = Spent mushroom compost:FYM:sand (2:1:1, v/v)							

Growing media, pot size evaluation for *Primula malacoides*

Table 2. Chemical properties of various growing media

Growing medium	Quantity of element (kg/ha)			pH (1:2.5)	EC (ms)
	N	P	K		
T ₁ = Soil:FYM:sand (1:1:1, v/v)	203	349.5	854	7.2	1.1
T ₂ = <i>Quercus semicarpifolia</i> leaf mould:FYM:soil (2:1:1, v/v)	287	157.4	1990	7.5	1.6
T ₃ = <i>Rhododendron arboreum</i> leaf mould:FYM:soil (2:1:1, v/v)	595	241.35	990	6.8	1.8
T ₄ = <i>Picea smithiana</i> leaf mould:FYM:soil (2:1:1, v/v)	707	196.64	2620	7.1	2.2
T ₅ = Chirpine leaf mould:FYM:soil (2:1:1, v/v)	469	215.09	815	7.1	1.5
T ₆ = Cocopeat:FYM:sand (1:1:1, v/v)	315	377.27	1640	7.2	0.9
T ₇ = Spent mushroom compost:FYM:soil (2:1:1, v/v)	455	385.69	1995	7.3	1.2

Table 3. Physical properties of various growing media

Growing medium	Bulk density (g/cc)	Particle density (g/cc)	Pore space (%)
T ₁ = Soil:FYM:sand (1:1:1, v/v)	1.25	1.6	25
T ₂ = <i>Quercus semicarpifolia</i> leaf mould:FYM:soil (2:1:1, v/v)	0.92	4.5	32.4
T ₃ = <i>Rhododendron arboreum</i> leaf mould:FYM:soil (2:1:1, v/v)	0.86	1.53	43.4
T ₄ = <i>Picea smithiana</i> leaf mould:FYM:soil (2:1:1, v/v)	0.79	1.08	22.91
T ₅ = Chirpine leaf mould:FYM:soil (2:1:1, v/v)	0.90	1.25	27.27
T ₆ = Cocopeat:FYM:sand (1:1:1, v/v)	0.80	1.33	40.0
T ₇ = Spent mushroom compost:FYM:soil (2:1:1, v/v)	1.25	1.42	12.5

growth of primula plants. These results are in close agreement with the earlier findings of Geplly et al (2011).

Flowering parameters

The data in Table 1 indicate that the growing medium comprising cocopeat: FYM:sand (1:1:1, v/v) recorded maximum values in terms of length of inflorescence stalk (17.43 cm), inflorescence diameter (5.89 cm) and number of flowers per inflorescence (18.28) which may be due to the reason that the said growing medium provided optimal conditions for the better

growth and consequently there was more production of shoots per plant. Similar findings have been reported by Khelikuzzaman (2007) in *Tradescantia* sp. The minimum days to flower bud formation (104.10 days) and earliest first flower opening (106.08 days) were recorded in T₆. Similar findings have been reported by Hazarika et al (2010) in Dutch rose cv Naranga. The earlier flower bud formation as well as first flower opening in this growing medium could be ascribed to the fact that plants grown in this medium might have utilized the available nutrients more

efficiently. Similar findings have been reported by Sekar and Sujata (2001) in gerbera and in geranium by Singh (2010).

Maximum length of inflorescence stalk (16.78 cm), inflorescence diameter (5.66 cm) and number of flowers per inflorescence (20.13) were recorded when plants were grown in 25 cm pot size. These results are in close agreement with the work of Biermann (1982) in cyclamen. As the pot diameter decreased space for root growth was less and hence there was low root:shoot ratio. Similar results were also reported by Schenk and Brundert (1979) in dieffenbachia. The earliest flower bud formation (102.30 days) as well as first flower opening (106.30 days) were noticed with the use of 15 cm pot size. Similar findings have also been reported by Vernieri et al (2003) in sunflower.

The interaction of different media and pot sizes showed that the maximum inflorescence diameter (6.40 cm) and number of flowers per inflorescence (21.02) were recorded when the plants were grown in cocopeat:FYM:sand (1:1:1, v/v) and using 25 cm pot size. The formation of flower buds was reported in lesser time (99.83 days) and first flower opening was earlier (103.80 days) in the plants grown in cocopeat:FYM:sand (1:1:1, v/v) and using 15 cm pot size. The earliest flower bud formation as well as first flower opening in cocopeat enriched growing medium may be due to the reason that this growing medium

might have provided conducive environment as a result of which the plants could put up requisite vegetative growth in lesser time period and pots of small size reduced the vegetative growth due to less root volume and hence early bud formation and first flower opening.

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