J. Hortl. Sci.
Vol. 8(2):278-281, 2013

Short communication

Influence of potting media on growth of *Asparagus densiflorus* 'Meyersii'

K. Kayalvizhi, R. Arulmozhiyan, A. Sankari and M. Anand
Horticultural Research Station, Yercaud - 636 602, India
E-mail: arulmozhiyan@yahoo.co.in

ABSTRACT

A study was conducted on the influence of growth media on development of *Asparagus densiflorus* 'Meyersii' at Horticultural Research Station, Yercaud during the years 2011-12. The pot experiment was laid out under open condition, with nine set of treatments comprising various combinations of soil, sand, FYM, vermicompost and microbial consortia (*Azospirillum, phosphobacteria* and *Pseudomonas fluorescens)*. From among the media combinations used, the treatment involving Soil + Sand + FYM + Vermicompost (T3) @ 2:1:1:0.5 (670g+375g+375g+165g) was found to be the best substrate for vegetative and root characters like plant height, shoot number, leaflet number, leaflet length, leaflet width, root number, root length, bulb number, bulb length, bulb width and vase-life in *Asparagus densiflorus 'Meyersii'*.

Key words: *Asparagus densiflorus 'Meyersii'*, growth media, vegetative and root characters, vase-life

Asparagus densiflorus 'Meyersii' is a woody evergreen herbaceous perennial, with upright or trailing branches growing up-to 2 feet. Tiny spines are borne in axils along branches. Needle–like branchlets are clustred around nodes. *Asparagus* looks soft and fluffy. It can be easily grown with minimal care, without pest and disease problems. It can be grown as ground cover, indoor plant, hanging basket, landscape border and entry point ornamental. Best potted plants are raised in friable, mild-textured substrates for optimal growth and flowering. Some substrates such as peat, perlite and vermiculite have been successfully used by growers, but their cost and availability are limiting factors. Commonly used growth media containing soil, sand and FYM lead to compaction of this crop having fleshy and sensitive fibrous roots. Therefore, a need was felt to standardize locally available, cheap, good quality growth media for successful pot culture of *Asparagus densiflorus* 'Meyersii'.

The pot experiment was conducted at Horticultural Research Station, Tamil Nadu Agricultural Unversity, Yercaud. The experimental site is geographically situated between 11°04" and 11°05" North latitude and 78°05" and 78°23" East longitude at an altitude of 1500m above Mean Sea Level. Average maximum and minimum temperature range between 31.0°C and 12.4°C, respectively. Mean annual rainfall of Yercaud is 1572 mm and average relative humidity is 75%. Uniform sized young plants of 15cm height were collected and planted in 30cm diameter earthern pots, with one plant per pot, in the last week of September 2011 in six growth media formulated using soil, sand, FYM, Vermicompost, Cocopeat, microbial consortia, viz., *Azospirillum*, phosphobacteria and *Pseudomonas fluorescens*. The experiment was laid out in Completely Randomized Block Design, with nine set of treatments, and replicated three times containing ten plants each. Data was generated on vegetative and root characters at 30 day intervals. Vegetative characters like plant height, number of shoots, number of leaflets, length of leaflet, width of leaflet and root characters like number of roots, root length, number of bulbs, length of bulb, width of bulb and, finally, vase-life were studied. Available nitrogen in the media was estimated by alkaline permanganate as per Subbiah and Asijia (1956). Available phosphorus in the media was estimated by Klett Summerson colorimeter method using red filter (Olsen *et al*, 1954). Available potassium in the media was estimated using neutral, normal ammonium acetate, and values were expressed in kg/ha (Hanway and Heidal, 1952). Micronutrient content, viz., Fe, Zn, Mn and Cu in various media was estimated by the triple acid extract method, using an atomic absorption spectrophotometer, and expressed in g/kg (Jackson, 1973). Nitrogen content in the leaf sample on dry weight basis was estimated by the method of Humphries (1956). Phosphorus and potassium content in leaf samples were also estimated using a flame photometer

(Jackson, 1973). Micronutrients in leaf samples, viz., Fe, Mn, Zn and Cu, were estimated using an atomic absorption spectrophotometer, and were expressed as ppm (Lindsay and Norell, 1978).

Treatment combinations are detailed below:

Treatment combination	Particulars
T 1	Soil + Sand + FYM (2:1:1) (750g + 375g+ 375g)
T2	Soil + Sand + Vermicompost (2:1:1) (750g + 375g + 375g)
T3	Soil + Sand + FYM + Vermicompost (2:1:1:0.5) (670g + 335g + 335g + 165g)
T4	T3 (670g + 335g + 335g + 165g) + Microbial Consortia (*Azospirillum* 2g/pot, phosphobacteria 2g/pot and *Pseudomonas fluorescens* 20g/pot added at the time of media preparation)
T5	Cocopeat + Sand + FYM (2:1:1) (750g + 375g + 375g)
T6	Cocopeat + Sand + Vermicompost (2:1:1) (750g + 375g + 375g)
T7	Cocopeat + Sand + FYM + Vermicompost (2:1:1:0.5) (670g + 335g + 335g + 165g)
T8	T7 (670g + 335g + 335g + 165g) + Microbial Consortia (*Azospirillum* 2g/pot, phosphobacteria 2g/pot and *Pseudomonas fluorescens* 20g/pot) added at the time of media preparation)
T9	Control

Growth media consisting of Soil + Sand+ FYM+ Vermicompost (T3) induced higher plant height at all the stages. It resulted in the tallest plant (27cm) on 180th day after planting, while, the Control (T9) had dwarf plants (8.57cm) (Table 1). The substrate combination of Soil + Sand + FYM+ Vermicompost (2:1:1:0.5) (T3) produced higher number of stems in *Asparagus densiflorus* 'Meyersii'. Number of leaflets (238.33) was highest in media with (T3) Soil + Sand + FYM+ Vermicompost (2:1:1:0.5). This corroborates the results of Turski *et al* (1983) on anthurium plant and Khayyat *et al* (2007) on *Epipremnum aureum*. The same treatment (T3) produced longer leaflets (1.03cm) than the Control (0.18cm). These findings are in conformity with those of Fascella *et al* (2003) in *Ruscus hypoglossum*. Leaflet width in our study under different growth media had no significant influence on growth for the entire cropping period.

Table 2 shows significant effect of the media combination Soil + Sand + FYM + Vermicompost (T3) on number of roots (30.67) over the Control (10.47). This study confirms the findings of Fageria *et al* (2007). Root length under different growth media produced significantly longer roots (64cm) under Soil + Sand+ FYM + Vermicompost (T3) compared to Control (12.23cm). The present findings are in conformity with those of Papafotiou *et al* (2005) in *Codiaeum variegatum* L. The same treatment produced more bulbs (39.77) than in the untreated Control (12.20).

Length of bulb was significantly influenced by Soil + Sand + FYM + Vermicompost (T3). The same treatment T3 recorded larger bulbs (3.17cm). This is in accordance with Swaminathan *et al* (1999) and Munikrishnappa *et al* (2004) in tuberose.

Width of the bulb (1.75cm) and weight of the bulb (75g) were significantly higher in Soil + Sand + FYM + Vermicompost (T3) than in Control (1.19cm and 24.83g, respectively). These findings are in agreement with Munikrishnappa *et al* (2004) and Shankar Lal *et al* (2010) in tuberose.

Table 1. Effect of growth media on vegetative characters of *Asparagus densiflorus 'Meyersii'*

	Vegetative Characters								
Treatment	Plant height (cm)		Shoot number		Leaflet number		Leaflet length (cm)		Leaflet width
	Initial	Final	Initial	Final	Initial	Final	Initial	Final	(cm)
T1	9.69	22.63	7.23	10.43	125.00	190.33	0.47	0.73	0.1
T2	8.05	15.67	5.50	14.03	149.00	181.00	0.51	0.72	0.1
T3	10.20	27.00	9.17	19.00	155.33	238.33	0.61	1.03	0.1
T4	8.11	24.20	7.57	12.87	118.00	207.33	0.36	0.69	0.1
T5	7.79	11.03	5.37	7.77	133.33	175.00	0.26	0.51	0.1
T6	7.84	10.50	7.17	9.53	142.33	212.33	0.17	0.43	0.1
T7	7.16	9.83	5.37	7.57	110.67	169.00	0.30	0.27	0.1
T8	8.74	10.80	5.23	7.50	126.00	178.00	0.18	0.22	0.1
T9	7.29	8.57	4.80	6.97	97.33	154.67	0.10	0.18	0.1
SE(d)	0.95	0.69	1.22	1.20	21.14	32.61	0.12	0.11	NS
CD *(P=0.05)*	1.99	1.46	2.57	2.53	44.42	68.51	0.25	0.23	NS

Table 2. Effect of growth media on root characters and vase-life of *Asparagus densiflorus 'meyersii'*

Treatment	Root characters											
	Root number		Root length (cm)		Bulb number		Bulb length (cm)		Bulb width (cm)		Bulb	Vase-life
	Initial	Final	Initial	Final	Initial	Final	Initial	Final	Initial	Final	weight (g)	(days)
T1	13.57	23.60	52.27	62.00	20.30	31.00	1.60	2.83	0.87	1.39	60.00	5.97
T2	13.87	23.97	23.70	34.73	28.50	32.37	1.98	2.60	0.71	1.32	46.33	6.20
T3	18.47	30.67	54.00	64.00	30.17	39.77	2.08	3.17	0.89	1.75	75.00	7.47
T4	12.70	21.27	27.07	39.70	19.33	27.83	1.42	2.66	0.76	1.27	48.50	6.67
T5	10.43	15.37	8.38	13.93	10.97	17.60	1.40	2.97	0.85	1.36	30.67	5.20
T6	13.10	20.60	25.00	34.13	15.93	24.57	1.78	2.88	0.80	1.33	51.17	5.43
T7	9.83	17.33	18.03	27.20	9.03	14.53	1.67	2.65	0.79	1.34	29.23	5.27
T8	10.23	18.60	26.63	34.43	15.57	22.83	1.80	2.71	0.69	1.24	31.33	5.70
T9	6.83	10.47	5.67	12.23	8.30	12.20	1.30	2.45	0.60	1.19	24.83	4.33
SE(d)	2.42	2.12	2.83	1.57	1.55	1.10	0.20	0.19	0.12	0.08	1.27	0.32
CD *(P=0.05)*	5.07	4.46	5.94	3.30	3.26	2.31	0.44	0.39	0.24	0.16	2.67	0.68

Table 3. Effect of media on soil nutrient availability in *Asparagus densiflorus* 'Meyersii'

Treatment	Available soil nutrients						
	Macronutrients (Kg ha^{-1})			Micronutrients (ppm)			
	N	P	K	Fe	Zn	Mn	Cu
T1	221.00	10.37	91.33	18.17	1.96	19.22	3.82
T2	215.00	11.45	85.67	18.27	1.98	19.68	3.79
T3	191.00	9.65	80.33	16.97	1.89	18.50	3.57
T4	201.00	10.50	108.44	18.44	2.03	19.58	4.14
T5	230.00	10.65	106.00	18.46	1.99	22.11	4.16
T6	242.00	10.90	101.33	19.29	1.95	20.58	3.83
T7	241.00	10.93	119.00	18.40	1.95	22.33	3.93
T8	235.00	11.04	110.00	18.11	1.95	22.00	4.13
T9	252.00	12.17	120.00	19.94	2.20	22.67	4.22
SE(d)	3.74	0.42	3.49	0.25	0.04	0.69	0.08
CD *(P=0.05)*	7.86	0.88	7.34	0.52	0.08	1.46	0.16

Table 4. Effect of media on leaf nutrient content in *Asparagus densiflorus* 'Meyersii'

Treatment	Leaf nutrients						
	Macronutrients (Kg ha^{-1})			Micronutrients (ppm)			
	N	P	K	Fe	Zn	Mn	Cu
T1	1.96	0.17	4.89	65.00	39.00	67.33	7.33
T2	1.95	0.19	4.55	64.00	35.67	63.33	9.04
T3	2.00	0.22	5.11	80.67	41.00	70.18	10.50
T4	1.95	0.18	4.87	68.00	34.00	65.67	7.33
T5	1.87	0.17	4.30	63.00	36.67	65.00	9.04
T6	1.93	0.18	4.54	66.67	34.00	63.67	6.50
T7	1.97	0.17	4.26	67.33	37.00	62.33	9.04
T8	1.95	0.16	4.67	67.52	32.67	61.78	8.43
T9	1.84	0.14	4.11	60.33	31.33	60.40	5.00
SE(d)	0.03	0.02	0.08	1.33	1.40	1.47	0.31
CD *(P=0.05)*	0.06	0.05	0.16	2.80	2.93	3.09	0.66

Nutrient availability

Plants in the treatment comprising Soil + Sand+ FYM + Vermicompost (T_3) had highest available nitrogen (191.00kg ha^{-1}), phosphorus (9.65kg ha^{-1}) and potassium (80.33kg ha^{-1}) and also recorded higher concentration of micronutrients like iron (16.97ppm), zinc (1.89ppm), manganese (18.50ppm) and copper (3.57ppm) than in the Control (Table 3). Yansong *et al* (2008) reported chicken manure to contain greater amounts of available N than peat moss; Bunt (1988) and Meinken and Schraff (1988) in chrysanthemum; Basker and Saravanan (1977) and Richard *et al* (2010) in Aglaonema 'Science Bay'. Ahmad and Qasim (2003) found that Poultry manure + Sand + Silt + Sawdust (2:1:1:1) combination resulted in maximum available phosphorus.

Mineralization and immobilization process of N, and its availability, are influenced by the amount of organic waste added. Phosphorus content of any media had a significant influence on root development in the crop. Chen *et al* (1988) experimented with various media, viz., peat, composted cattle-manure and their mixtures, to analyze 'P' content. They observed that cattle manure had the highest P content (125mg 100g^{-1}). This holds true in the present investigation where addition of FYM to the media consortia increased P content in the media. Potassium content in various media was influenced by addition of organic amendments to the media. Yansong *et al* (2008) reported higher levels of N, K, Ca and Mg in a medium consisting of 100% poultry manure. Vermicompost and FYM may have acted as a source of macro- and micronutrients (Zn, Fe, Cu and Mn), enzymes and growth hormones in the early crop-growth phase which, in turn, encouraged early vigorous growth (Table 4).

Foliage from the treatment combination Soil + Sand + FYM + Vermicompost (T_3) had the longest vase-life (7.47 days). Increase in vase-life was probably due to a trigger in metabolic activity, and due to narrowing of C:N ratio by

significant accumulation of carbohydrates. This is in accordance with Khalaj *et al* (2010) in gerbera.

From our study, it can be concluded that media consisting of Soil + Sand + FYM + Vermicompost (T3) (2:1:1:0.5 - 670g + 335g + 335g + 165g) can significantly improve growth, yield and quality parameters, which ultimately result in increased net returns (2.72:1) in *Asparagus densiflorus* 'Meyersii' under pot culture.

REFERENCES

Ahamed, I. and Qasim, M. 2003. Nutrient uptake efficiency of *Scindapsus aurens*. *Indian J. Agril. Biol.*, **5**:594 -597

Basker, M. and Saravanan, A. 1997. Effect of coir pith based potting mix and methods of fertilizer application on tomato. *Madras Agri. J.*, **84**:476-480

Bunt, A.C. 1988. Physical properties of mixtures of peat and minerals of different particle size and bulk density for potting substrates. *Acta Hort*., **150**:143-153

Chen, Y., Inbar, Y. and Hader, Y. 1988. Composted agricultural wastes potting media for ornamental plants. *Soil Sci*., **145**:298-303

Fageria, N.K., Baliger, V.C. and Clark, R.B. 2007. Physiological functions of nutrients. In: Physiology of crop production. IDBC, Lucknow, India, pp. 206-251

Fascella, G., Zizzo, G.V., Costantino, C. and Agnello, S. 2003. Effect of different substrates on soilless cultivation of *Ruscus hypoglossum* for cut foliage production. *Acta Hort*., **614**:211-215

Hanway, J. and Heidal, H.S. 1952. Soil analysis methods used in IOWA Satate college, Soil testing lab. *IOWA Agri.*, **57**:1-31

Humphries, E.C. 1956. Mineral component and analysis. In: modern methods of plant analysis (Eds. Peach, K. and Tradey, M.V.), Springer Berlin Heidelberg

Jackson, M.L. 1973. Soil chemical analysis. Prentice Hall of India Pvt. Ltd., New Delhi, pp. 498

Khalaj, M.A., Amiri, M. and Sinthu, S.S. 2011. Response of different growing media on the growth and yield of gerbera in hydroponic open system. *Indian J. Hort.*, **68**:583-586

Khayyat, M., Nazari, F. and Salehi, H. 2007. Effects of different pot mixtures on Pothos (*Epipremnum aureum* Lindl. and Andre 'Golden Pothos') growth and development. *Amer. Eur. J. Agri. & Env. Sci.*, **2**:341-348

Lindsay, W.L. and Norell, W.A. 1978. Development of DTPa soil test for zinc, iron, manganese and copper. *Soil Sci. Amer. J*., **42**:421-428

Meinken, E. and Scharff, H.C. 1988. Preparation and use of tree bark as a growing substrate. GB+GW, **88**:518–521

Munikrishnappa, P.M., Katimani, K.N. and Ravikumar, M. 2004. Effect of vermicompost on growth and yield of tuberose (*Polianthes tuberosa* L.) under semi-arid tropics of North Karnataka. National Symposium on Recent Trends and Future Strategies in Ornamental Horticulture, University of Agricultural Sciences, Dharwad, India, p.61

Olsen, S.R., Cole, C.L., Watanbe, F.S. and Dean, D.A. 1954. Estimation of available phosphorus in soils by extraction with sodium bicarbonate. U.S.D.A. Cic. 339

Papafotiou, M., Kargas, G. and Lytra, I. 2005. Olive-mill waste compost as a growth medium component for foliage potted plants. *Hort. Sci.*, **40**:1746-1750

Richard. J., Henny and Jianjun Chen. 2010. "Science Bay" Aglaonema. *Hort. Sci.*, **45**:1281-1282

Shankar Lal, Lakhawat, S.S. and Choudhary, M.K. 2010. Effect of organic manure and biofertilizers on growth, flowering and bulb production in tuberose. *Indian J. Hort.*, **67**:554-555

Subbiah, B.V. and Asiija, G.L. 1956. A rapid procedure for determining available nitrogen in soil. *Curr. Sci*., **25:**259-260

Swaminathan, V., Ramaswamy, N. and Pallia, O.A.A. 1999. Effect of *Azosporillum*, phosphobacteria and inorganic nutrients on the growth and yield of tuberose. *South Indian Hort.*, **47**:331-334

Turski, R., Flis-Bujak, M. and Martyn, W. 1983. Effect of different contents of organic matter on substrate properties and growth of *Anthurium andreanum*. Prace Institutu Sadownictwa, Kwiaciarstwa Wskierniewlcach, **8**:123-132

Yansong, A.O., Min Sun and Yuqi Li. 2008. Effect of organic substrates on available elemental contents in nutrient solution. *Biol. Res. Tech.*, **99:**5006-5010

(MS Received 06 December 2012, Revised 17 October 2013, Accepted 19 November 2013)