Production of potted petunias (*Petunia* × *hybrida* Vilm) as affected by growing media and Jeevamrit application

RAHUL SHARMA*, SUMAN BHATIA and SR DHIMAN

Department of Floriculture and Landscape Architecture
College of Horticulture, Dr YS Parmar University of Horticulture and Forestry
Nauni, Solan 173230, Himachal Pradesh, India
*Email for correspondence: ra7ul1996@gmail.com

 Received: 12.12.2022/Accepted: 24.01.2023

ABSTRACT

Effect of growing media and Jeevamrit on potted petunia (*Petunia hybrida* Vilm) was studied in a field experiment laid out in completely randomized design (factorial). Petunias were grown in pots consisting of three growing media viz soil + sand + FYM (1:1:1, v/v), soil + cocopeat + FYM (1:1:1 v/v) and soil + cocopeat + vermicompost (1:1:1, v/v). Jeevamrit (10%) was applied to pots in the form of foliar spray and drench at an interval of 15 and 30 days. Maximum plant height (23.32 cm), earliest peak flowering (49.32 days), larger diameter flowers (8.59 cm) and maximum pot presentability score (94.01) were recorded in growing medium comprising soil + cocopeat + FYM (1:1:1, v/v). Among different Jeevamrit treatments, its drench application at fortnightly and monthly interval produced plants with more height of 23.44 cm and 23.24 cm, took minimum days of 39.45 and 39.64 to first flower opening, took minimum period for peak flowering of 48.75 and 49.27 days and recorded highest pot presentability score of 96.93 and 95.04 respectively. Maximum plant spread (36.29 cm) and flowering duration (65.28 days) were recorded in treatment combination soil + cocopeat + FYM (1:1:1, v/v) and Jeevamrit drenching at fortnightly interval. It was concluded that for obtaining quality potted petunias, these should be grown on medium comprising soil + cocopeat + FYM (1:1:1, v/v) which should be applied with Jeevamrit (10%) as drench at fortnightly interval.

Keywords: *Petunia hybrida*; soil; cocopeat; vermicompost; Jeevamrit

INTRODUCTION

Petunia (*Petunia* × *hybrida* Vilm) belonging to family Solanaceae, is one of the most popular flowering pot and landscape plants. Its flowers are trumped shaped borne in leaf axils which are single, double and semi-double. Petunias are popular in modern landscape due to their long duration of flowering and availability in wide variety of colours like white, red, scarlet, blue, violet, light pink and magenta and some are bi-coloured and tri-coloured also. Petunias are used extensively in landscape gardening as bedding plants, for window boxes, hanging baskets and for herbaceous borders. Nowadays, soilless medium has become very popular among growers of ornamental plants because of its excellent consistency, good water holding capacity, aeration and low bulk density that reduce transportation and handling charges. Various growing media like peat, vermicompost, cocopeat, rockwool, woodchips, sawdust, perlite etc have been used singly or in mixture and found suitable for quality pot plant production. Keeping in view the importance of growing media for quality pot production of petunia, the present investigations were carried out to evaluate suitable growing media which are easily available and cheaper in price like sand, FYM, vermicompost and cocopeat, for potted petunia.

Due to booming business of floriculture industry, uncontrolled amount of chemical fertilizers, insecticides and fungicides are being used for many years. Use of chemical fertilizers and pesticides reduces the soil quality and microbial count in soil which decreases the soil productivity. To maintain the soil health, use of organic formulations is more beneficial as compared to chemical fertilizers. Liquid formulations used in natural farming include Jeevamrit, Panchagavya, Beejamrit etc prepared by using locally

available material like cow dung, cow urine, jaggery, grain flour and soil which are easily available to the farmers and are a rich source of beneficial microflora. Jeevamrit is a fermented liquid product made from cow dung, cow urine, jaggery, grain flour and soil. When applied to soil, Jeevamrit converts the non-available form of nutrients into available form. It contains large amount of microbial load which acts as a tonic for improving soil health and increasing activity of soil microorganisms which ensure the higher availability of nutrients. Jeevamrit, which contains essential and non-essential nutrients like amino acids, vitamins and other growth promoting compounds including indole acetic acid (IAA) and gibberellic acid (GA), can be used as spray or drench application in crops. The present investigations were carried out to study the effect of different growing media and Jeevamrit on production of quality potted petunia.

MATERIAL and METHODS

In the present investigations, F_1 hybrid potted bright red petunias were selected for the experiment. Three growing media, consisting of combinations of soil + sand + FYM (1:1:1, v/v), soil + FYM + cocopeat (1:1:1, v/v) and soil + vermicompost + cocopeat (1:1:1, v/v) were prepared. The pots of six inches diameter were filled with the growing media and petunia seedlings were transplanted in them. The seedlings were irrigated immediately after transplanting. Jeevamrit was filtered before spray application. It was applied in the form of spray and drench at an interval of 15 and 30 days starting from 15 days after transplanting. Jeevamrit was diluted to 10 per cent before use by dissolving 10 litres of Jeevamrit solution in water making final volume 100 litres. Drench application of Jeevamrit was done (250 ml of Jeevamrit applied to each pot) at an interval of 15 and 30 days as per treatment. Spray was applied on the foliage till droplet formation. Pot presentability was calculated on the basis of point system modified after Conover (1986). The experiment was laid out in completely completely randomized design (CRD) with three replications. The data were analysed by following CRD (factorial) (Panse and Sukhatme 1985).

RESULTS and DISCUSSION

Plant height and spread

Data presented in Table 1 show that the plant height was recorded maximum (23.32 cm) in growing medium M_2 [Soil + cocopeat + FYM (1:1:1, v/v)]. In contrast, lowest plant height (21.89 cm) was recorded in the plants grown in M_1 [Soil + sand + FYM (1:1:1, v/v)]. Lower plant spread of 32.42 and 32.75 cm was recorded in M_1 and M_3 [Soil + cocopeat + vermicompost (1:1:1, v/v)] respectively which were statistically at par, whereas, M_3 was at par with M_2 (33.49 cm). Among different Jeevamrit treatments, its drench application at fortnightly (T_1) and monthly (T_2) interval produced plants with more height of 23.44 and 23.24 cm respectively, the two being at par as compared to T_5 (Control) (21.31 cm). Higher plant spread of 34.03, 33.82 and 32.99 cm was recorded in T_1, T_2 and T_3 (Jeevamrit foliar spray at fortnightly interval) respectively which were at par and lowest in T_5 (31.08 cm). Interaction effect exhibit that maximum plant height was recorded in M_2T_1 (25.06 cm) and M_3T_2 (23.87 cm) which were at par and maximum plant spread (36.29 cm) was recorded in (M_2T_1).

It was observed that both media amended with cocopeat resulted in significantly more plant height and spread in petunias over the standard medium ie soil + sand + FYM (1:1:1, v/v). Addition of cocopeat in the medium showed positive effects on size of the plant. Cocopeat increases the porosity of potting mixture which helps to keep the soil loose and airy and results in better root growth. Better root growth leads to better plant growth resulting in increased plant size. Gupta et al (2004) reported that medium amended with cocopeat [cocopeat + sand + sawdust (1:1:1, v/v)] to grow gerbera recorded maximum plant height. Similar observation was made by Singh et al (2016) in chrysanthemum. They found that when cocopeat + sewage sludge was used as growing medium in the ratio of 2:1 (v/v) gave better growth of chrysanthemum.

Simultaneously, it was noted that all the Jeevamrit treatments, irrespective of method of application (drench or spray), significantly increased plant height and spread in all the growing media over control. Jeevamrit contains macronutrients in the form of N (0.16%), P (0.02%) and K (0.123%) (Elizabeth 2012). Nitrogen helps in the production of carbohydrates and amino acids and assists in the synthesis of hormones like cytokinin, auxin and gibberellin. Jeevamrit is rich source of phosphorus which is important component in chlorophyll. Jeevamrit also converts the non-available form of nutrients into available form, hence, resulting in increase in plant height (Sreenivasa et al 2009). The efficacy of Jeevamrit for enhancing growth is well known. Jeevamrit acts as a tonic for soil health and promoter of growth as it is a rich source of N, P and K. Nitrogen

Table 1. Effect of growing media and Jeevamrit on plant height and spread of *Petunia* × *hybrida* Vilm

Treatment	Plant height (cm)				Plant spread (cm)			
	M_1	M_2	M_3	Mean	M_1	M_2	M_3	Mean
T_1: Jeevamrit (drenching at fortnightly interval)	21.65	25.06	23.60	23.44	33.78	36.29	32.04	34.03
T_2: Jeevamrit (drenching at monthly interval)	23.04	22.82	23.87	23.24	33.06	34.42	33.97	33.82
T_3: Jeevamrit (foliar spray at fortnightly interval)	21.74	23.36	22.80	22.63	32.56	33.26	33.17	32.99
T_4: Jeevamrit (foliar spray at monthly interval)	21.55	23.37	22.89	22.60	32.28	32.17	33.06	32.50
T_5: Control (no application)	21.47	21.97	20.49	21.31	30.41	31.30	31.53	31.08
Mean	21.89	23.32	22.73		32.42	33.49	32.75	

M_1: Soil + sand + FYM (1:1:1, v/v), M_2: Soil + cocopeat + FYM (1:1:1, v/v), M_3: Soil + cocopeat + vermicompost (1:1:1, v/v)

$CD_{0.05}$

	Plant height	Plant spread
Media	0.56	0.83
Treatments	0.72	1.08
Media x Treatments	1.25	1.86

is a major constituent of proteins and also helps in increasing growth parameters. Further, phosphorus helps in the translocation and absorption of nutrients into plant and improves nutrient absorption. Similar results of enhancement in plant spread by application of Jeevamrit have also been reported by Sushma et al (2012) in heliconia.

Number of days taken to first flower opening

Plants grown in medium M_1 flowered at the earliest (39.64 days) as compared to other media (Table 2). All the Jeevamrit treatments resulted in earlier flowering over control. Minimum number of days taken to first flower opening was observed in T_1 (39.45) and T_2 (39.64), which were at par. Maximum number of days taken to first flower opening was recorded in T_5 (42.20). Interaction effect indicates that M_1T_1 (37.48), M_1T_2 (38.39) and M_2T_1 (39.04) resulted in minimum days taken to first flower opening. On the other hand, maximum number of days to first flower opening was observed in M_2T_5 (44.58 days).

Sandy soil is lighter and does not compact easily which is good for root growth. Better root growth combined with optimum vegetative growth might have resulted in earliest flower emergence. The finding is confirmed by the work of Singh et al (2015) in marigold who used sand with soil and vermicompost (1:1:2, v/v). Jeevamrit might have helped in increasing the nitrogen fixation in the soil that helped in the uptake of nutrients by the crop. All these factors combined together helped in the earliest flowering as suggested by Harshavardhan et al (2016) in carnation.

Number of days taken to peak flowering

Data presented in Table 2 show that the petunias attained earliest peak flowering in M_2 (49.32 days). In contrast, maximum number of days to attain peak flowering (51.45 days) was noted in M_3. Among different Jeevamrit treatments, T_1 (48.75 days) and T_2 (49.27 days) took minimum period for peak flowering, the two being at par, whereas, maximum period was taken in case of T_5 (52.92 days). In case of interaction, minimum duration for peak flowering was taken by M_1T_1 (46.69 days), M_1T_2 (47.53 days) and M_2T_3 (47.33 days), all the three being at par as against M_1T_5 (54.25 days) and M_2T_5 (52.75 days), the latter two being at par.

Earliest peak flowering was recorded when the plants were grown in soil + cocopeat + FYM (1:1:1, v/v) and drenched with Jeevamrit at fortnightly or monthly interval which can be directly correlated to better root growth of plants grown in soil + cocopeat + FYM (1:1:1, v/v) and further application of Jeevamrit, that might have helped in increasing nitrogen fixation in soil and uptake of nutrients by the plants.

Table 2. Effect of growing media and Jeevamrit on days taken to first flower opening and peak flowering of *Petunia* × *hybrida* Vilm

Treatment	Days taken to first flower opening				Days taken to peak flowering			
	M_1	M_2	M_3	Mean	M_1	M_2	M_3	Mean
T_1: Jeevamrit (drenching at fortnightly interval)	37.48	39.04	41.84	39.45	46.69	48.33	51.24	48.75
T_2: Jeevamrit (drenching at monthly interval)	38.39	39.84	40.68	39.64	47.53	49.39	50.88	49.27
T_3: Jeevamrit (foliar spray at fortnightly interval)	41.06	40.70	41.15	40.97	51.89	47.33	51.83	50.35
T_4: Jeevamrit (foliar spray at monthly interval)	40.50	40.94	41.26	40.90	52.27	48.80	51.55	50.87
T_5: Control (no application)	40.79	44.58	41.22	42.20	54.25	52.75	51.76	52.92
Mean	39.64	41.02	41.23		50.53	49.32	51.45	

M_1: Soil + sand + FYM (1:1:1, v/v), M_2: Soil + cocopeat + FYM (1:1:1, v/v), M_3: Soil + cocopeat + vermicompost (1:1:1, v/v)

$CD_{0.05}$

	Days taken to first flower opening	Days taken to peak flowering
Media	0.88	0.72
Treatments	1.13	0.93
Media x Treatments	1.83	1.61

It is well known that cocopeat has high water holding and cation exchange capacity. It increases the soil porosity and helps to keep the soil loose and airy which may result in early flowering. Similar results were reported by Sushma et al (2012) in heliconia. Earliest peak flowering was obtained when the plants were grown in soil + cocopeat + FYM (1:1:1 v/v) and drenched with Jeevamrit which can be directly correlated to better growth of plants grown in soil + cocopeat + FYM. Further, application of Jeevamrit at fortnightly interval might have helped in increasing nitrogen fixation in soil and uptake of nutrients which resulted in earliest peak flowering.

Number of flowers opened at a time

Data given in Table 3 show that maximum number of flowers opened at a time (16.75 and 16.71) was noted when petunias were grown in M_2 and M_3 respectively, the two being at par as compared to M_1 (15.97). Different Jeevamrit treatments also significantly improved the number of flowers opening in a pot with a maximum value of 17.49 and 16.98 obtained in T_3 and T_2 which were at par, as compared to 14.88 in T_5. Interaction data show that all the treatments resulted in more number of flowers opened at a time in comparison to M_1T_5.

Cocopeat amended media offer congenial growth conditions for the overall development of plants and contribute to increased number of flowers. In chrysanthemum, cocopeat + soilrite used in the ratio of 1:1 (v/v) gave best results in terms of number of flowers opening at a time (Dutt et al 2002). All the Jeevamrit applications resulted in more number of flowers opening at a time over control. Jeevamrit is an organic amendment, rich in beneficial microorganisms like yeast, lactic acid bacteria and actinomycetes, which helps in increasing soil biomass and microbial count in soil. It helps in increasing availability and uptake of nutrients into media and thus in increasing the number of flowers (Sreenivasa et al 2009).

Duration of flowering

Duration of flowering was higher in M_2 (50.20 days) and M_3 (49.14 days), which were at par, in comparison to M_1 (43.53 days) (Table 3). Among Jeevamrit treatments, T_1 resulted in higher duration of flowering (57.60 days) in comparison to all other treatments. Under interaction effect, M_2T_1 resulted in higher duration (65.28 days) than all other combinations. On the other hand, minimum flowering duration of 32.43 and 34.85 days was observed in plants grown in M_1T_5 and M_2T_5 respectively, which were at par.

Table 3. Effect of growing media and Jeevamrit on maximum number of flowers opened at a time and duration of flowering of *Petunia* × *hybrida* Vilm

Treatment	Maximum number of flowers opened at a time				Duration of flowering (days)			
	M_1	M_2	M_3	Mean	M_1	M_2	M_3	Mean
T_1: Jeevamrit (drenching at fortnightly interval)	15.53	17.37	17.13	16.68	53.74	65.28	53.80	57.60
T_2: Jeevamrit (drenching at monthly interval)	17.53	16.93	16.48	16.98	45.07	53.26	47.14	48.49
T_3: Jeevamrit (foliar spray at fortnightly interval)	17.07	17.93	17.47	17.49	42.20	50.34	52.80	48.45
T_4: Jeevamrit (foliar spray at monthly interval)	16.07	16.73	16.26	16.35	44.22	47.29	49.98	47.16
T_5: Control (no application)	13.67	14.77	16.20	14.88	32.43	34.85	41.95	36.41
Mean	15.97	16.75	16.71		43.53	50.20	49.14	

M_1: Soil + sand + FYM (1:1:1, v/v), M_2: Soil + cocopeat + FYM (1:1:1, v/v), M_3: Soil + cocopeat + vermicompost (1:1:1, v/v)

$CD_{0.05}$

	Maximum number of flowers opened at a time	Duration of flowering
Media	0.47	1.45
Treatments	0.61	1.87
Media x Treatments	1.05	3.24

Dutt et al (2002) reported that chrysanthemum, which was grown on cocopeat amended medium ie cocopeat + soilrite (1:1v/v), gave best results in terms of duration of flowering. Jeevamrit is a rich source of beneficial microorganisms like yeast, lactic acid bacteria and actinomycetes which help in increasing soil biomass and microbial count in soil. Further, it helps in increasing availability and uptake of nutrients in the soil. Jeevamrit is rich in growth promoting hormones like IAA, GA and cytokinin which help in increasing the flowering duration (Gore and Sreenivasa 2011, Chadha et al 2012).

Flower diameter

Significantly, larger diameter petunia flowers (8.59 cm) were obtained in case of M_2 as compared to M_1 (8.34 cm) and M_3 (8.41 cm), the latter two being at par (Table 4). Application of Jeevamrit also proved effective with maximum flower diameter of 8.78, 8.70, 8.61 and 8.55 cm in T_2, T_1, T_3 and T_4 Jeevamrit (foliar spray at monthly interval), all being at par, whereas, T_3 and T_4 were at par with T_5 (7.60 cm). Among the interaction combinations, all treatments proved superior in comparison to M_1T_5 (7.31 cm) for this trait.

Interaction data show that maximum flower diameter (8.85 cm) was noted when petunias were grown in soil + cocopeat + FYM (1:1:1, v/v) and drenched with Jeevamrit at fortnightly interval (M_2T_1). It was found to be at par with M_1T_2 (8.79 cm), M_2T_2 (8.84 cm), M_3T_2 (8.70 cm) and M_2T_4 (8.76 cm). Gupta et al (2004) reported that maximum flower diameter was found in growing medium containing cocopeat + sand + sawdust in the ratio of 1:1:1 (v/v) in gerbera. Jeevamrit is rich in growth hormones like GA and IAA which help in increasing flower diameter. Similar observations were made by Sreenivasa et al (2009), Aulakh et al (2013) and Devakumar et al (2014).

Pot presentability

Data presented in Table 4 show that maximum pot presentability score (94.01) was observed in the plants grown in M_2 as compared to lower score of 91.79 and 92.26 recorded in M_1 and M_3 respectively, the latter two being at par. Among different Jeevamrit treatments, pot presentability score of 96.93 and 95.04 was recorded maximum in T_1 and T_2. Pot presentability score was recorded lowest (85.95) in T_5.

Pot presentability is directly dependent on scores given to various growth and flowering parameters. Maximum presentability score (94.01) obtained in plants grown in growing medium consisting of soil + cocopeat + FYM (1:1:1, v/v) (M_2) is directly

Table 4. Effect of growing media and Jeevamrit on flower diameter and pot presentability of *Petunia* × *hybrida* Vilm

Treatment	Flower diameter (cm)				Pot presentability			
	M_1	M_2	M_3	Mean	M_1	M_2	M_3	Mean
T_1: Jeevamrit (drenching at fortnightly interval)	8.64	8.85	8.60	8.70	95.93	98.67	96.20	96.93
T_2: Jeevamrit (drenching at monthly interval)	8.79	8.84	8.70	8.78	93.80	96.53	94.80	95.04
T_3: Jeevamrit (foliar spray at fortnightly interval)	8.57	8.61	8.64	8.61	92.87	93.00	92.33	92.73
T_4: Jeevamrit (foliar spray at monthly interval)	8.38	8.76	8.51	8.55	92.53	93.47	92.93	92.98
T_5: Control (no application)	7.31	7.91	7.59	7.60	84.33	88.40	85.13	85.95
Mean	8.34	8.59	8.41		91.79	94.01	92.26	

M_1: Soil + sand + FYM (1:1:1, v/v), M_2: Soil + cocopeat + FYM (1:1:1, v/v), M_3: Soil + cocopeat + vermicompost (1:1:1, v/v)

$CD_{0.05}$

	Flower diameter	Pot presentability
Media	0.09	0.84
Treatments	1.11	1.09
Media x Treatments	0.20	NS

correlated to maximum number of parameters scoring highest in this growing medium viz plant height, plant spread, earliest peak flowering, maximum number of flowers opening at a time, flower diameter and duration of flowering. Similarly, among Jeevamrit treatments, highest presentability score of 96.93 and 95.04 was noted in drench application of Jeevamrit.

From the present investigations, it can be concluded that petunias may be grown on substrate comprising soil + cocopeat + FYM (1:1:1, v/v) combined with application of Jeevamrit (10%) as drench at fortnightly interval for obtaining quality pot plants.

REFERENCES

Aulakh CS, Singh H, Walia SS, Phutela RP and Singh G 2013. Evaluation of microbial culture (Jeevamrit) preparation and its effect on productivity of field crops. Indian Journal of Agronomy **58(2):** 182-186.

Chadha S, Rameshwar, Ashlesha, Saini JP and Paul YS 2012. Vedic Krishi: sustainable livelihood option for small and marginal farmers. Indian Journal Traditional Knowledge **11(3):** 480-486.

Conover CA 1986. Quality. Acta Horticulturae **181:** 201-206.

Devakumar N, Shubha S, Gouder SB and Rao GGE 2014. Microbial analytical studies of traditional organic preparations Beejamrutha and Jeevamrutha. In: Building Organic Bridges, Proceedings of the 4th ISOFAR Scientific Conference, Building Organic Bridges, Organic World Congress, 13-15 October 2014, Istanbul, Turkey, pp 639-642.

Dutt M, Patil MT and Sonawane PC 2002. Effect of various substrates on growth and flowering of chrysanthemum. Indian Journal Horticulture **59(2):** 191-195.

Elizabeth G 2012. Integrated nutrient management on growth, flower yield and post-harvest quality of gerbera (*Gerbera jamesonii* Bolus) cv Galileo Red under polyhouse condition. PhD Thesis. University of Agricultural Sciences, Bengaluru, Karnataka, India, 124p.

Gore NS and Sreenivasa MN 2011. Influence of liquid organic manures on growth, nutrient content and yield of tomato (*Lycopersicon esculentum* Mill) in the sterilized soil. Karnataka Journal of Agricultural Sciences **24(2):** 153-57.

Gupta YC, Dien LC, Dhiman SR and Jain R 2004. Standardization of growing media under protected environment in gerbera in mid-hills of Himachal Pradesh. Journal of Ornamental Horticulture **7(1):** 99-102.

Harshavardhan M, Kumar DP, Rajesh AM, Yathindra HA and Hongal S 2016. Growth and development of carnation (*Dianthus caryophyllus* L) as influenced by integrated nutrient management. Bioscan **11(4):** 2691-2694.

Panse VG and Sukhatme PV 1985. Statistical methods for agricultural workers. 4th Edn, Indian Council of Agriculture Research, New Delhi, India, 359p.

Singh M, Dwivedi DH and Kumar M 2015. Efficiency of organic and biodynamic manures on growth and flowering in marigold (*Tagetes patula* L). Progressive Agriculture **15(1):** 134-137.

Singh S, Dubey RK and Kukal SS 2016. Nitrogen supplemented cocopeat-based organic wastes as potting media mixtures for the growth and flowering of chrysanthemum. Communications in Soil Science and Plant Analysis **47(16):** 1856-1865.

Sreenivasa MN, Naik N and Bhat SN 2009. Beneficial traits of microbial isolates of organic liquid manures. In: Abstracts, First Asian PGPR Congress for Sustainable Agriculture (S Desai, MS Reddy, V Krishna Rao, YR Sarma, B Chenchu Reddy and KRK Reddy, Eds), 21-24 June 2009, Rajendranagar, Hyderabad, Andhra Pradesh, India, 133p.

Sushma HE, Reddy BS, Patil CP and Kulkarni BS 2012. Effect of organic and inorganic nutrients on sprouting, growth, flowering and nutrient status in heliconia (*Heliconia* sp) cv Golden Torch. Karnataka Journal of Agricultural Sciences **25(3):** 370-372.