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Effect of different potting media on growth and flowering of kalanchoe (*Kalanchoe blossfeldiana* Poelln.)

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ABSTRACT

Fourteen potting media combinations were prepared for growing kalanchoe, while soil and FYM were used as control. Maximum plant height (21.20 cm) and plant spread (18.10 cm) was observed in paddy straw compost + burnt rice husk. Minimum days to bud appearance were recorded in paddy straw compost + burnt rice husk (147 days) and sewage sludge + burnt rice husk (147 days). Minimum number of days to first flower opening was also recorded in paddy straw compost + burnt rice husk (215.80 days) and sewage sludge + burnt rice husk (215.80 days). Duration of flowering (50.4 days) and number of flowers (122.40 days) were also maximum in paddy straw compost + burnt rice husk. Among the growing media paddy straw compost + burnt rice husk showed overall improved growth and flowering as compared to control and other treatments. Control took more number of days to bud appearance (175.80 days).

Key words: Potting media, kalanchoe, compost, burnt rice husk.

INTRODUCTION

Genus *Kalanchoe* consists of nearly 125 species of tropical, succulent flowering plant belonging to family Crassulaceae, most species being native to Madagascar. *Kalanchoe blossfeldiana* Pollen. is commonly cultivated house plant mainly for its thick foliage with fleshy, leaves that require moderate amount of watering .The growing media for a pot having finite volume should be well drained, with adequate aeration and be rich in organic matter. The garden soil mixed along with farm yard manure and leaf manure is the most common media being used for raising potted ornamentals. It has been observed that field soil are generally unsatisfactory for the production of plants in containers, primarily because they do not provide the required aeration and water retention status that are essential to maintain equilibrium between moisture content and gaseous exchange in a limited volume of pot (Kukal *et al.*, 7). Among the physical characteristics total porosity and water holding capacity are probably the most important factors, while chemical characteristics such as pH, EC and nutritional status of the media mixture play a crucial role in the plant development (Dewayne *et al.*, 3). Therefore, the present investigation was undertaken to formulate potting media mixture from organic waste to alert the physical and chemical nature of limited root-zone environment and to generate a logical understanding about the interaction of seraphic factors for growth and development of kalanchoe.

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MATERIALS AND METHODS

Present research was conducted at Landscape Nursery, Punjab Agricultural University. Fourteen different potting media combination comprising spent mushroom compost (T_1), sewage sludge (T_2), leaf mould (T_3), paddy straw compost (T_4), sewage sludge + fly ash (1:1) (T_5), sewage sludge + saw dust (1:1) (T_6), sewage sludge + burnt rice husk (1:1) (T_7), vermicompost + fly ash (1:1) (T_8), vermicompost + saw dust (1:1) (T_9), vermicompost + burnt rice husk (1:1) (T_{10}), paddy straw compost + fly ash (1:1) (T_{11}), paddy straw compost + saw dust (1:1) (T_{12}), paddy straw compost + burnt rice husk (1:1) (T_{13}) and soil + farm yard manure (1:1) (T_{14}) were mixed on volume basis. Pot media mixture comprising soil + farm yard manure (2:1) (T_0) was a control. The experiment was laid out in Completely Randomized Block Design ensuring uniformity to all the treatments. Vegetative characters such as plant height (cm), plant spread (cm), number of branches and flowering characters such as number of days to bud appearance, number of days to first flower opening, number of flowers/plant, duration of flowering (days), were recorded. The chemical properties of each medium including pH, organic carbon (%), nitrogen (%), phosphorus (%), potassium (%), EC (dSm^{-1}) and physical properties such as bulk density (g/cm^3) and porosity (%) were also determined to identify the factors that affect the growth of kalanchoe plants by different methods.

Soil pH was determined by the potentiometric method with the help of pH meter. Organic carbon in soil + farm yard manure was measured by Walkley and

Blacks rapid titration method and in other treatments organic carbon was measured by dry combustion method. Nitrogen was determined by alkaline potassium permanganate method as described by Subbiah and Asija (11). Phosphorus was determined by Olsen's method. Potassium was determined with the help of flame photometer. EC was measured with the help of conductivity meter and expressed in dS/m.

Bulk density (Db) was determined by weighing bottle method and expressed in gm/cm^3. Particle density (Dp) was determined by the pycnometer method and porosity was also calculated (Table 1). The observations such as plant height (cm), plant spread (cm), number of branches, number of days to bud appearance, number of days to first flower opening, number of flowers/plant, duration of flowering (days), were recorded at monthly intervals.

RESULTS AND DISCUSSION

Maximum plant height was observed in paddy straw compost + burnt rice husk (21.20 cm) followed by vermicompost + saw dust (17.10 cm), sewage sludge + burnt rice husk (16.80 cm) and was statistically at par with vermicompost + burnt rice husk (16.20 cm). This might be due to more nitrogen content present in these treatments. Spent mushroom compost and sewage sludge had high amount of nitrogen content but their EC might have negatively affect the plant height. Riaz *et al.* (8) observed that although leaf manure had the highest amount of nutrients but it also had high EC, which reduced the growth. Minimum plant height observed in vermicompost + fly ash (12.10 cm) and leaf mould (12.40 cm) might be due to the low nitrogen content (Table 2) in these treatments. Lesser plant height was also observed in control (14.70 cm) as well as in paddy straw compost + fly ash (13.50 cm). This might be due to low nitrogen or low porosity (Table 2). Maximum plant spread was observed in paddy straw compost + burnt rice husk (18.10 cm) followed by sewage sludge + burnt rice husk (15.10 cm), which was statistically at par with spent mushroom compost (14.80 cm) and paddy straw compost + saw dust (14.70 cm). This might be due to more amount of nitrogen (Table 2). Nitrogen is essential part of nucleic acid, which plays a vital role in promoting plant growth. Similar findings were recorded in gerbera by Gupta *et al.* (5). Minimum plant spread was recorded in leaf mould (10.70 cm). This might be due to low nitrogen content in it or might be due to the compaction of media or higher bulk density, which might have led to the improper growth. Porosity was less in sewage sludge + fly ash, soil + farm yard manure and paddy straw compost + fly ash. Lesser plant spread might be due to this reason. Similar effect was found in *Ficus benjamina* as reported by Siminis *et al*. (12).

Maximum number of branches was observed in paddy straw compost + burnt rice husk (20.20) followed by spent mushroom compost (17.20), which was statistically at par with paddy straw compost (16.20). These media gave significant results, which could be attributed to their ability to supply sufficient amount of nutrients like nitrogen, phosphorus and potassium to the plants. Similar findings were also

Table 1. Chemical properties of fourteen potting media.

Treatment	pH	EC (dSm^{-1})	OC (%)	N (%)	P (%)	K (%)	D_b (g/cm^3)	Porosity (%)
Spent mushroom compost (T_1)	8.31	7.77	33.56	1.52	0.29	1.22	0.40	71.40
Sewage sludge (T_2)	4.75	7.58	38.40	1.64	0.32	0.10	0.38	73.40
Leaf mould (T_3)	7.51	0.97	18.16	0.29	0.09	0.21	0.99	60.40
Paddy straw compost (T_4)	8.91	6.60	20.63	0.92	0.51	1.25	0.62	62.60
Sewage sludge + Fly ash 1:1 (T_5)	5.53	5.51	9.55	0.47	0.14	0.05	0.84	19.20
Sewage sludge + Saw dust 1:1 (T_6)	5.25	6.52	44.54	0.91	0.26	0.10	0.29	80.60
Sewage sludge + Burnt rice husk 1:1 (T_7)	5.61	2.84	29.99	0.99	0.24	0.33	0.34	73.00
Vermicompost + Fly ash 1:1 (T_8)	6.95	2.46	18.27	0.38	0.32	0.22	0.80	60.00
Vermicompost + Saw dust 1:1 (T_9)	7.10	3.09	47.32	0.73	0.44	0.40	0.45	64.00
Vermicompost + Burnt rice husk 1:1 (T_{10})	7.01	3.66	39.99	0.58	0.45	0.44	0.48	73.33
Paddy straw compost + Fly ash 1:1 (T_{11})	8.95	4.66	12.29	0.48	0.27	0.79	1.02	38.55
Paddy straw compost + Saw dust 1:1 (T_{12})	8.90	5.86	28.22	0.50	0.36	1.01	0.59	68.30
Paddy straw compost + Burnt rice husk 1:1(T_{13})	8.27	5.41	21.36	0.79	0.41	1.29	0.57	54.40
Soil + FYM 1:1 control (T_{14})	8.67	2.79	5.42	0.33	0.22	0.56	1.07	24.60

Table 2. Effect of different potting media on flowering characteristics of kalanchoe.

Treatment	Plant height (cm)	Plant spread (cm)	No. of branches/ plant	No. of days to bud appearance	No. of days to first flower opening	No. of flowers per plant	Duration of flowering (days)
Spent mushroom compost (T_1)	15.30	14.80	17.20	150.0	217.60	72.00	44.40
Sewage sludge (T_2)	15.90	14.20	14.60	149.0	217.40	79.00	44.20
Leaf mould (T_3)	12.40	10.70	8.20	152.0	218.80	26.40	43.00
Paddy straw compost (T_4)	14.90	14.20	16.20	149.0	217.20	52.40	50.40
Sewage sludge + Fly ash 1:1 (T_5)	15.60	11.70	9.60	151.6	218.00	57.20	47.00
Sewage sludge + Saw dust 1:1 (T_6)	15.20	11.70	9.60	148.0	216.20	58.20	46.60
Sewage sludge + Burnt rice husk 1:1 (T_7)	16.80	15.10	15.60	147.0	215.80	78.00	45.00
Vermicompost + Fly ash 1:1 (T_8)	12.10	11.95	8.80	151.6	218.00	40.00	43.20
Vermicompost + Saw dust 1:1 (T_9)	17.10	13.40	13.80	148.0	216.80	61.00	44.20
Vermicompost + Burnt rice husk 1:1 (T_{10})	16.20	14.20	15.20	149.0	217.40	55.40	44.60
Paddy straw compost + Fly ash 1:1 (T_{11})	13.50	11.30	11.00	160.8	217.00	26.40	44.00
Paddy straw compost + Saw dust 1:1 (T_{12})	15.00	14.70	14.60	148.4	217.00	45.60	46.00
Paddy straw compost + Burnt rice husk 1:1 (T_{13})	21.20	18.10	20.20	147.0	215.80	122.40	49.40
Soil + Farm yard manure 1:1 control (T_{14})	14.70	12.00	9.00	175.8	221.80	31.00	43.40
CD at 5%	2.90	2.89	5.45	1.62	1.49	32.44	3.89

reported in alstroemeria by Gupta *et al*. (6) and in safflower by Girase *et al.* (4). Minimum number of branches was recorded in leaf mould (8.20) and vermicompost + fly ash (8.80). This might be due to the low amount of nutrients in these media. Less number of branches was also recorded in soil + farm yard manure (9.80) as well as sewage sludge + fly ash (9.60). This might be due to the low porosity or might be due to the low amount of nutrients. Thangam *et al.* (13) observed that media consisting of soil + sand produced less vegetative growth due to low availability of nutrients. Minimum number of days to bud appearance was recorded in paddy straw compost + burnt rice husk (147), which was statistically at par with sewage sludge + burnt rice husk (147). This might be due to adequate amount of nitrogen present in both the substrates. Maximum number of days to bud appearance was recorded in soil + farm yard manure (175.8). This might be due to the low nitrogen. Minimum number of days to first flower opening was recorded in paddy straw compost + burnt rice husk (215.80) and it was at par with sewage sludge + burnt rice husk (215.80). Adequate amount of nitrogen present in substrate coupled with satisfactory carbohydrate content leads to early flowering. The similar results have been obtained in chrysanthemum by Tomati *et al*. (14). Maximum number of flowers was observed in paddy straw compost + burnt rice husk (122.40) followed by sewage sludge (79), which was statistically at par with sewage sludge + burnt rice husk (78). This might be due to the more nitrogen content. Vijayakumar *et al.* (15) reported that increasing levels of nitrogen increase the flower yields in China aster had no effect on flowering. Minimum number of flowers was recorded in leaf mould (26.40) and paddy straw compost + fly ash (26.40). Less number of flowers was also observed in soil + farm yard manure (31). This might be due to the less nitrogen content in these media. Sangwan *et al.* (9) also recorded less number of flowers in marigold when grown in soil. Although spent mushroom and sewage sludge also had higher amount of nitrogen but the number of flowers/plant was less as compared to paddy straw compost + burnt rice husk. This might be due to higher EC. Flower production increased with increasing conductivity but declined at higher conductivities (Smith *et al.,* 10). The flower number has been correlated with a number of important chemical properties including conductivity and plant nutrient status as reported by Davis and Smith (2).

Maximum duration of flowering was observed in paddy straw compost (50.4 days), which was at par with paddy straw compost + burnt rice husk

(49.4 days). This might be due to the more amount of nitrogen (0.92%), phosphorus (0.51%) and potassium (1.25%) in paddy straw compost. The increase in days till 50% flowering could be attributed to conducive conditions in the substrate and higher nutrient uptake and utilization. Boodley *et al.* (1) obtained similar results in chrysanthemum, where greater duration from full bloom to flower deterioration was observed in plants grown in peat perlite substrate.

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