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Influence of potting media on growth of succulents under shade net condition

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Abstract

The present experiment was carried out during December 2020 to March 2021 under 50% shade net conditions at Horticultural Research Field, Department of Horticulture, SHUATS, Prayagraj. The experiment was conducted in Factorial Completely Randomized Design (FCRD), with two factors involving five succulents (Factor A) with three potting media combinations (Factor B) each Replicated thrice. The succulent plants were S₁ (*Crassula ovata*), S₂ (*Pachyphytum hookeri*), S₃ (*Senecio rowleyanus*), S₄ (*Sedum rubrotinctum*) and S₅ (*Crassula capitella*) with potting media combinations M₁ (Soil + Vermicompost + Sand), M₂ (Soil + Sand + Vermicompost + Charcoal) and M₃ (Cocopeat + Perlite + FYM). Observations were recorded on shoot parameter, root parameter, survivability percent and potting media performance and subjected to statistical analysis. On the basis of results it was found that succulent S₃ (*Senecio rowleyanus*) was found to be best in Prayagraj in terms of maximum plant height (cm), no. of leaves, leaf thickness (mm), no. of pups and no. of roots after 90 days. Maximum plant spread, root length and root spread were recorded in S₅ (*Crassula capitella*), maximum leaf area was recorded in S₁ (*Crassula ovata*). Succulent S₁ (*Crassula ovata*) recorded minimum no. of leaves, no. of pups and no. of roots. Minimum leaf area and root spread were recorded in succulent S₃ (*Senecio rowleyanus*), minimum plant spread and root spread was recorded in S₄ (*Sedum rubrotinctum*), minimum plant height and survivability was recorded in S₂ (*Pachyphytum hookeri*), minimum leaf thickness was recorded in S₅ (*Crassula capitella*). In terms of potting media of different succulents, potting media M₂ (soil + sand + vermicompost + charcoal) was found best in terms of maximum plant height (cm), leaf thickness (mm), leaf area (cm²), no. of pups and root length (cm). Maximum plant spread (cm²), no. of leaves, root spread (cm²) and no. of roots were observed in M₃ (Cocopeat + Perlite + FYM). Potting Media M₁ (Soil + Vermicompost + Sand) recorded minimum plant height (cm), no. of leaves, leaf thickness (mm), leaf area (cm²), no. of pups, root length (cm), root spread (cm²), no. of roots and survivability of succulents, minimum plant spread was recorded in M₂ (Soil + Sand + Vermicompost + Charcoal).

Keywords: potting media, shade net, cocopeat, charcoal, perlite and succulent

Introduction

The word "succulent" comes from the Latin word *sucus*, meaning juice, or sap. Succulent plants may store water in various structures, such as leaves and stems. The habitats of these water preserving plants are often in areas with high temperatures and low rainfall, such as deserts. Succulents have the ability to thrive on limited water sources, such as mist and dew, which makes them equipped to survive in an ecosystem which contains scarce water sources. A successful potting media should provide good physical support for the plant, a reservoir for nutrients and water, plus sufficient drainage and aeration. It must also be consistently reproducible. Commercial growers in particular must consider these things—but they also have additional requirements. Following are the points we consider when selecting components for our medium: The ingredients must be inexpensive; the mix must be reproducible and consistent; Ingredients must be readily available and of the same quality every time; it must hold sufficient water and nutrients. Our summer weather is very hot and dry irrigation frequency is a significant consideration; The roots need to be able to penetrate the medium easily; The medium should rewet easily—it should not shrink away from the walls of the container as it dries; Finally, the medium must be lightweight, so that potted plants are easy to lift and transport.

Materials and Method

A field experiment entitled "Influence of potting media on growth of succulents under shade net condition" will be carried out in the Department of Horticulture, SHUATS, Prayagraj

during 2020-21.” was conducted at Horticultural Research Field, Department of Horticulture, Sam Higginbottom

University of Agriculture, Technology and Sciences 2020-2021.

Table 1: Treatment and composition of different potting media with succulent plants

Treatments	Composition	
T ₁	<i>Crassula ovata</i>	Cocopeat + Perlite + FYM
T ₂	<i>Pachyphytum hookeri</i>	Soil + Vermicompost + Sand
T ₃	<i>Senecio rowleyanus</i>	Soil + Sand + Vermicompost + Charcoal
T ₄	<i>Sedum rubrotinctum</i>	Cocopeat + Perlite + FYM
T ₅	<i>Crassula capitella</i>	Soil + Vermicompost + Sand
T ₆	<i>Crassula ovata</i>	Soil + Sand + Vermicompost + Charcoal
T ₇	<i>Pachyphytum hookeri</i>	Cocopeat + Perlite + FYM
T ₈	<i>Senecio rowleyanus</i>	Soil + Vermicompost + Sand
T ₉	<i>Sedum rubrotinctum</i>	Soil + Sand + Vermicompost + Charcoal
T ₁₀	<i>Crassula capitella</i>	Cocopeat + Perlite + FYM
T ₁₁	<i>Crassula ovata</i>	Soil + Vermicompost + Sand
T ₁₂	<i>Pachyphytum hookeri</i>	Soil + Sand + Vermicompost + Charcoal
T ₁₃	<i>Senecio rowleyanus</i>	Cocopeat + Perlite + FYM
T ₁₄	<i>Sedum rubrotinctum</i>	Soil + Vermicompost + Sand
T ₁₅	<i>Crassula capitella</i>	Soil + Sand + Vermicompost + Charcoal

Experimental site

The experiment was conducted during winter season of the year 2020-2021 in Departmental Research field of Department of Horticulture, Naini Agricultural Institute, Sam Higginbottom University of Agricultural Technology and Sciences, Prayagraj. The area is situated on the South of Prayagraj on the right bank of Yamuna at Rewa road at a distance of about 6 km from Prayagraj city. It is situated at 25° 8' N latitude and 81° 50' E longitudes on elevation of 98 Meters from the sea level.

Climate and weather

The area of Prayagraj district comes under subtropical belt in the South east of Uttar Pradesh, which experience extremely hot summer and fairly cold winter. The maximum Temperature of the location reaches up to 46 °C – 48 °C and seldom falls as low as 4 °C 5 °C. The Relative humidity ranges between 20 to 94 per cent. The average rainfalls in this area are around 1013.4 mm annually. The meteorological data from (November, 2020 to March, 2021) with respective to total rainfall, maximum and minimum temperature, and relative humidity.

Results and Discussion

The present investigation entitled “Influence of potting media on growth of succulents under shade net condition” was conducted under Shade net condition at Department of Horticulture, Naini Agricultural Institute, Sam Higginbottom University of Agriculture, Technology and Sciences, Prayagraj, (U.P.) in the year 2020-2021. The results of the investigation, regarding the Succulent growth in different Potting Media are presented under the following heading.

Shoot Parameter

In different potting media, the maximum plant height at 90 DAP was observed in M₂ (Soil + Sand + Vermicompost + Charcoal) (12.85 cm) followed by M₁ (Soil + Vermicompost + Sand) (11.57 cm) and minimum plant height was observed in was observed in M₃ (Cocopeat + Perlite + FYM) (11.38 cm). Among different succulent plants the maximum plant height at 90 DAP was observed in S₃ *Senecio rowleyanus* (14.70 cm) followed by S₁ *Crassula ovata* (12.42 cm) and minimum plant height was observed in S₂ *Pachyphytum hookeri* (8.77 cm). Among the interaction of different

succulents and potting media, the maximum plant height at 90 DAP was observed in S₃M₂ (15.44 cm) followed by S₃M₁ (15.05 cm) and minimum plant height was observed in S₂M₁ (8.11 cm).

In different potting media, the maximum plant spread at 90 DAP was observed in M₃ (Cocopeat + Perlite + FYM) (10.70 cm²) followed by M₁ (Soil + Vermicompost + Sand) (10.25 cm²) and minimum plant spread was observed was observed in M₂ (Soil + Sand + Vermicompost + Charcoal) (10.12 cm²). Among different succulent plants the maximum plant spread at 90 DAP was observed in S₅ *Crassula capitella* (13.44 cm²) followed by S₁ *Crassula ovata* (11.69 cm²) and minimum plant spread was observed in S₄ *Sedum rubrotinctum* (6.06 cm²). Among the interaction of different succulents and potting media, the maximum plant spread at 90 DAP was observed in S₅M₂ (13.99 cm²) followed by S₃M₃ (13.33 cm²) and minimum plant spread was observed in S₄M₃ (5.30 cm²).

In different potting media, the maximum no. of leaves at 90 DAP was observed in M₃ (Cocopeat + Perlite + FYM) (44.24) followed by M₂ (Soil + Sand + Vermicompost + Charcoal) (43.66) and minimum no. of leaves were observed in M₁ (Soil + Vermicompost + Sand) (41.66).

Among different succulent plants the maximum no. of leaves at 90 DAP was observed in S₃ *Senecio rowleyanus* (68.88) followed by S₄ *Sedum rubrotinctum* (56.73) and minimum no. of leaves were observed in S₁ *Crassula ovata* (18.59). Among the interaction of different succulents and potting media, the maximum no. of leaves at 90 DAP was observed in S₃M₃ (75.55) followed by S₃M₁ (74.88) and minimum no. of leaves were observed in S₁M₂ (16.88).

In different potting media, the maximum leaf thickness at 90 DAP was observed in M₂ (Soil + Sand + Vermicompost + Charcoal) (5.91 mm) followed by M₃ (Cocopeat + Perlite + FYM) (5.61 mm) and minimum leaf thickness was observed in M₁ (Soil + Vermicompost + Sand) (5.17 mm). Among different succulent plants the maximum leaf thickness at 90 DAP was observed in S₂ *Pachyphytum hookeri* (7.00 mm) followed by S₃ *Senecio rowleyanus* (6.70 mm) and minimum leaf thickness was observed in S₅ *Crassula capitella* (3.26 mm). Among the interaction of different succulents and potting media, the maximum leaf thickness at 90 DAP was observed in S₃M₂ (7.86 mm) followed by S₂M₃ (7.36 mm) and minimum leaf thickness was observed in S₅M₁ (2.90 mm).

In different potting media, the maximum leaf area at 90 DAP was observed in M₂ (Soil + Sand + Vermicompost + Charcoal) (4.90 cm²) followed by M₃ (Cocopeat + Perlite + FYM) (4.71 cm²) and minimum leaf area was observed in M₁ (Soil + Vermicompost + Sand) (3.80 cm²). Among different succulent plants the maximum leaf area at 90 DAP was observed in S₁ *Crassula ovata* (9.90 cm²) followed by S₅ *Crassula capitella* (7.00 cm²) and minimum leaf area was observed in S₃ *Senecio rowleyanus* (0.33 cm²). Among the interaction of different succulents and potting media, the maximum leaf area at 90 DAP was observed in S₁M₂ (11.27 cm²) followed by S₁M₃ (10.99 cm²) and minimum leaf area was observed in S₃M₁ (0.29 cm²).

In different potting media, the maximum no. of pups per plant at 90 DAP was observed in M₂ (Soil + Sand + Vermicompost + Charcoal) (5.59) followed by M₃ (Cocopeat + Perlite + FYM) (4.93) and minimum no. of pups per plant was observed in M₁ (Soil + Vermicompost + Sand) (4.15). Among different succulent plants the maximum no. of pups per plant at 90 DAP was observed in S₃ *Senecio rowleyanus* (6.21) followed by S₂ *Pachyphytum hookeri* (5.18) and minimum no. of pups per plant was observed in S₁ *Crassula ovata* (3.29). Among the interaction of different succulents and potting media, the maximum no. of pups per plant at 90 DAP was observed in S₃M₂ (7.21) followed by S₂M₂ (6.44) and minimum no. of pups per plant was observed in S₁M₁ (2.32).

Root Parameter

In different potting media, the maximum root length at 90 DAP was observed in M₂ (Soil + Sand + Vermicompost + Charcoal) (6.04 cm) followed by M₃ (Cocopeat + Perlite + FYM) (5.95 cm) and minimum root length was observed in M₁ (Soil + Vermicompost + Sand) (5.79 cm). Among different succulent plants the maximum root length at 90 DAP was observed in S₅ *Crassula capitella* (13.04 cm) followed by S₂ *Pachyphytum hookeri* (4.65 cm) and minimum root length was observed in S₃ *Senecio rowleyanus* (3.19 cm). Among the

interaction of different succulents and potting media, the maximum root length at 90 DAP was observed in S₅M₃ (13.77 cm) followed by S₅M₁ (12.83 cm) and minimum root length was observed in S₃M₁ (2.83 cm).

In different potting media, the maximum root spread at 90 DAP was observed in M₃ (Cocopeat + Perlite + FYM) (3.35 cm²) followed by M₂ (Soil + Sand + Vermicompost + Charcoal) (3.3 cm²) and minimum root spread was observed in M₁ (Soil + Vermicompost + Sand) (2.93 cm²). Among different succulent plants the maximum root spread at 90 DAP was observed in S₅ *Crassula capitella* (4.48 cm²) followed by S₁ *Crassula ovata* (3.52 cm²) and minimum root spread was observed in S₄ *Sedum rubrotinctum* (2.13 cm²). Among the interaction of different succulents and potting media, the maximum root spread at 90 DAP was observed in S₅M₂ (4.63 cm²) followed by S₅M₃ (4.41 cm²) and minimum root spread was observed in S₄M₂ (1.99 cm²).

In different potting media, the maximum no. of roots at 90 DAP was observed in M₃ (Cocopeat + Perlite + FYM) (19.33) followed by M₂ (Soil + Sand + Vermicompost + Charcoal) (16.79) and minimum no. of roots were observed in M₁ (Soil + Vermicompost + Sand) (15.50). Among different succulent plants the maximum no. of roots at 90 DAP was observed in S₄ *Sedum rubrotinctum* (20.88) followed by S₃ *Senecio rowleyanus* (19.03) and minimum no. of roots were observed in S₁ *Crassula ovata* (14.92). Among the interaction of different succulents and potting media, the maximum no. of roots at 90 DAP was observed in S₃M₃ (23.11) followed by S₄M₃ (21.44) and minimum no. of roots were observed in S₁M₁ (10.88).

In different potting media, survivability was maximum in all the potting medias except M₁ (Soil + Vermicompost + Sand) (97.77%). Among different succulent plants, survivability was maximum in all the succulents except S₂ *Pachyphytum hookeri* (96.29%). Among the interaction of different succulents and potting media, survivability was maximum in all the interactions except S₂M₁ (88.88%).

Table 1: Effect of different potting media on different succulent plants for Plant Height (cm), Plant Spread (cm²) and Number of Leaves at 30, 60 and 90 DAP

Treatments	Treatment Combination	Plant Height (cm)			Plant Spread (cm ²)			Number of Leaves		
		30 DAP	60 DAP	90 DAP	30 DAP	60 DAP	90 DAP	30 DAP	60 DAP	90 DAP
T ₁	S ₁ M ₃	8	9.19	11.83	8.58	10.22	12.75	8	13.33	18.33
T ₂	S ₂ M ₁	5.14	6.89	8.11	5.72	6.67	7.61	13.78	21.22	29.67
T ₃	S ₃ M ₂	12.38	12.56	15.44	6.05	6.61	9.38	14.44	23.56	56.22
T ₄	S ₄ M ₃	7.44	8.94	9.16	3.94	4.14	5.3	26.44	22.67	54.11
T ₅	S ₅ M ₁	6.83	7.7	10.83	8.72	10.78	13.25	13.44	18.11	26.22
T ₆	S ₁ M ₂	8	8.89	12.11	9.64	9.69	10.47	6.78	10.89	16.89
T ₇	S ₂ M ₃	8.38	6.05	8.83	6.71	6.75	9.03	15.67	20.44	39.89
T ₈	S ₃ M ₁	14.55	16.55	15.05	7.22	8.44	12.14	21.33	37.89	74.89
T ₉	S ₄ M ₂	6.56	8.28	9.56	4.14	4.36	6.42	26.11	25.78	59.11
T ₁₀	S ₅ M ₃	6.21	7.17	10.83	7.92	10.58	13.22	10.78	15.78	33.33
T ₁₁	S ₁ M ₁	9.56	11	13.33	10.36	10.22	11.86	7.89	12.67	20.56
T ₁₂	S ₂ M ₂	4.87	6.89	9.38	6.27	7.25	10.3	15.11	20.67	56.44
T ₁₃	S ₃ M ₃	8.89	11.89	13.61	6	6.94	13.33	16.78	32.33	75.56
T ₁₄	S ₄ M ₁	7.56	8.67	9.27	3.8	4.25	6.55	26.67	23.11	57
T ₁₅	S ₅ M ₂	6.78	8.16	11.38	8.47	10.92	14	11.44	18.11	29.67
Critical difference	CD 5%	3.73	2.267	3.836	1.691	1.753	2.87	9.456	7.819	26.75

Table 2: Effect of different potting media on different succulent plants for Leaf Thickness (mm), Leaf Area (cm²), No. Of Pups per Plant, Root Length (cm), Root Spread (cm²), No. of Roots, Survivability % of Succulents at 90 DAP

Treatments	Treatment Combination	Leaf thickness (mm)	Leaf area (cm ²)	No. of pups per plants	Root length (cm)	Root spread (cm ²)	No. of roots	Survivability %
T ₁	S ₁ M ₃	4.15	11	3.89	4.46	3.9	17.00	100
T ₂	S ₂ M ₁	6.35	3.93	3.67	4.58	2.62	11.44	88.89
T ₃	S ₃ M ₂	7.86	0.39	7.22	3.72	3.03	14.44	100
T ₄	S ₄ M ₃	6.93	0.90	4.78	4.31	2.36	21.44	100
T ₅	S ₅ M ₁	2.90	6.73	4.11	12.83	4.42	14.33	100
T ₆	S ₁ M ₂	4.76	11.27	3.66	3.88	3.5	16.89	100
T ₇	S ₂ M ₃	7.36	4.46	5.44	4.16	3.19	19.22	100
T ₈	S ₃ M ₁	6.32	0.29	5.89	2.83	2.42	19.56	100
T ₉	S ₄ M ₂	6.45	0.83	5.78	4.91	2	19.89	100
T ₁₀	S ₅ M ₃	3.71	6.87	5	13.78	4.42	15.89	100
T ₁₁	S ₁ M ₁	3.93	7.44	2.33	4.98	3.2	10.89	100
T ₁₂	S ₂ M ₂	7.28	4.64	6.44	5.22	3.42	17.89	100
T ₁₃	S ₃ M ₃	6.03	0.31	5.56	3.05	2.98	23.11	100
T ₁₄	S ₄ M ₁	6.39	0.61	4.78	3.77	2.03	21.33	100
T ₁₅	S ₅ M ₂	3.21	7.41	4.89	12.52	4.64	14.89	100
Critical difference	CD 5%	0.59	1.24	1.89	1.48	0.60	5.05	8.31

Conclusion

In terms of potting media, from the present investigation it is concluded that, Potting Media M₂ (Soil+Sand+Vermicompost+Charcoal) was found best in terms of maximum Plant Height (cm), Leaf Thickness (mm), Leaf Area (cm²), No. of Pups and Root Length..

In terms of Succulents, S₃ (*Senecio rowleyanus*) was found best performing succulent under shadenet conditions in terms of Maximum Plant Height (cm), No. of Leaves, Leaf Thickness (mm), No. of Pups and No. of Roots.

Therefore, from the above statements it is concluded that Media M₂ (Soil+Sand+Vermicompost+Charcoal) was found best for the growth of different succulents under shade net conditions and in terms of succulents, Succulent S₃ (*Senecio rowleyanus*) is found best performing succulent under shade net condition.

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