



Results regarding the impact of environmental factors on Sedum planting elevations

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Abstract: This study investigates how elevation and climate impacts the survival and branching patterns of three Sedum varieties in container cultivation. The challenges posed by extreme climatic conditions necessitate careful consideration of plant selection for green roofs. Sedum species can withstand drought, sun exposure, wind, and fluctuating temperatures, making them prime candidates for harsh environments. This study revealed that each plant variety showed distinct preferences: Sedum spurium 'Purpur Winter' thrived at lower elevations, Sedum spathulifolium 'Cape Blanco' preferred mid-level elevations, and Sedum spathulifolium 'Purpureum' exhibited mixed preferences. These findings shed light on how Sedum plants respond to environmental factors, underscoring the importance of considering local conditions in urban green space planning. By employing informed plant selection and cultivation methodologies, this research contributes to the foundation of sustainability and resilience within urban vegetation systems, fostering the development of greener and more robust urban environments.

Introduction

- The escalating rise in global temperatures and the consequential alterations in weather patterns have profound implications for plant life. It is imperative for plants to exhibit resilience and adaptability in the face of these new challenging conditions, as they must confront environmental stressors with greater efficacy to ensure their survival and the stability of ecosystems.
- Sedums have gained popularity for their remarkable ability to flourish in challenging environments, rendering them a favored option for green roofs, slopes, and other elevated planting sites. Preferring full sun to partial shade, they exhibit exceptional tolerance to high heat and wind exposure. Nevertheless, selecting the appropriate species is crucial for ensuring optimal growth and resilience in these demanding conditions.
- Through careful observation of changes in plant survival rates and branching patterns influenced by different soil compositions, elevations and plant species, this study seeks to enhance our knowledge of how Sedum plants react to environmental factors. While plant survival is important, sometimes the benefits of plant branching outweigh concerns for individual survival.

Material and method

Biological material used:

- 482 pots, totaling 2,892 cuttings of Sedum spurium 'Purpur Winter' – SS'PW';
- 983 pots, totaling 5,898 cuttings of Sedum spathulifolium 'Cape Blanco' – SS'CB';
- 581 pots, totaling 3,486 cuttings of Sedum spathulifolium 'Purpureum' – SS'P'.

Culture substrates variants used:

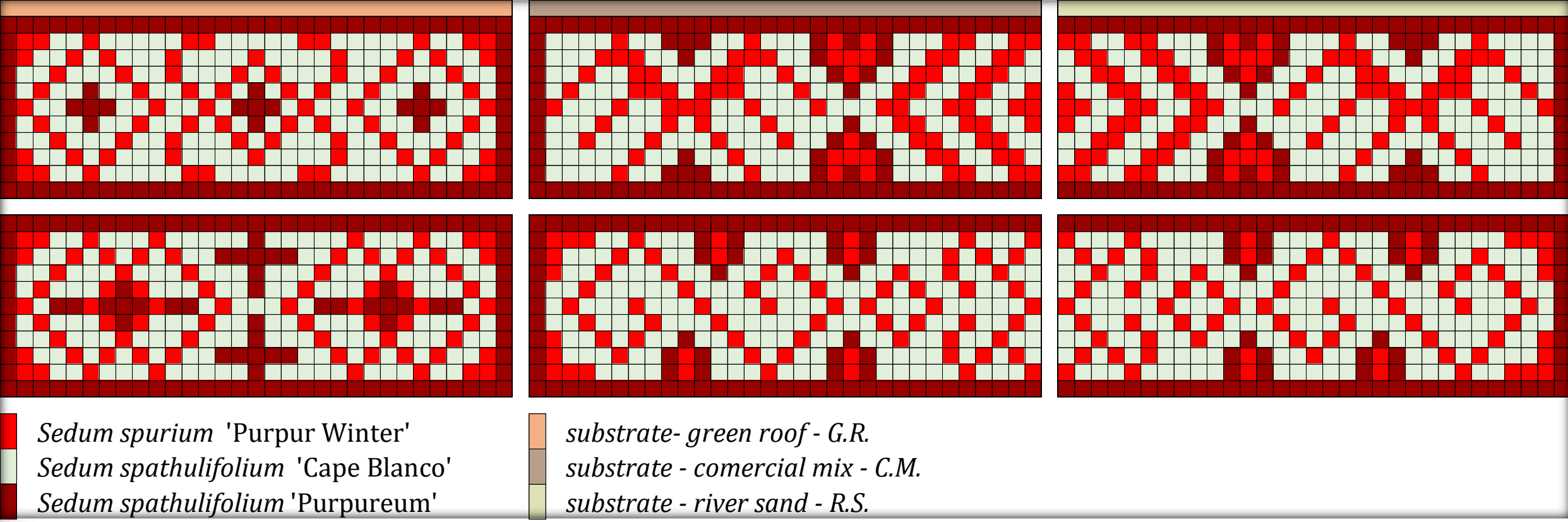
- Green roof substrate (G.R.);
- Commercial mix of topsoil, with traces of dolomite and perlite (C.M.);
- River sand (R.S.).

Observations and determinations were made based on the following:

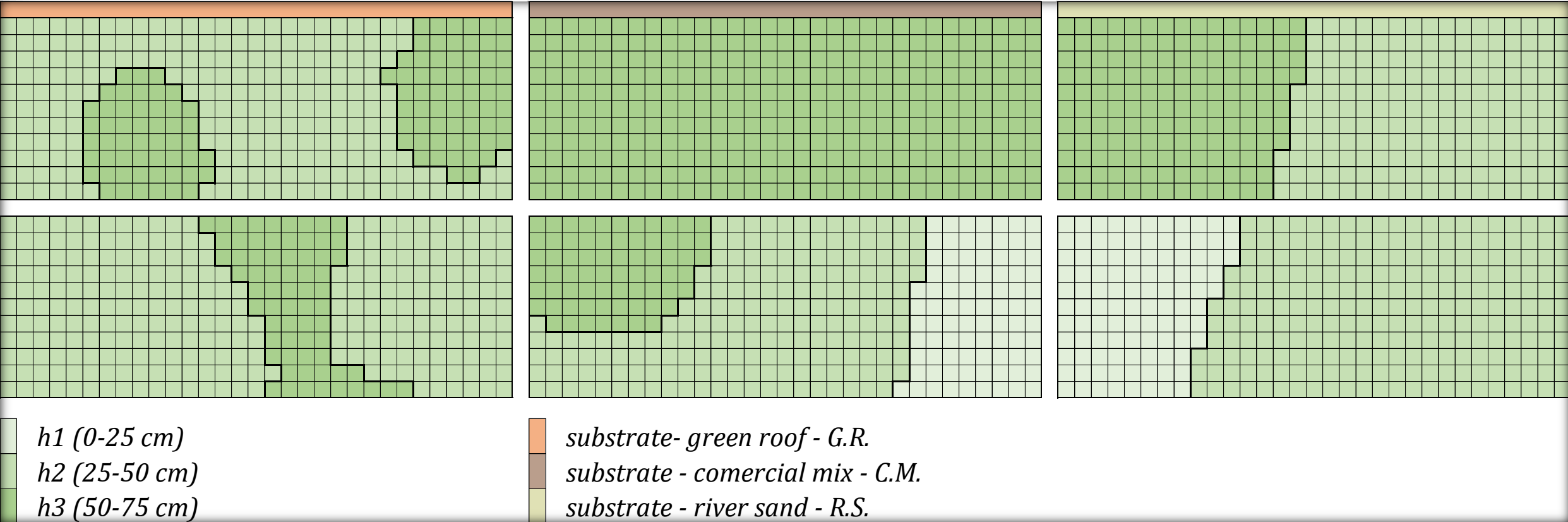
- Survival rate: the percentage of initial cuttings that remained viable;
- Branching patterns: growth behaviors analysis;
- Influence of Elevation: investigating how different work table heights (h1: 0-25 cm, h2: 25-50 cm, h3: 50-75 cm) affected plant development.



Metal structure with fixed-in empty pots



Traditional motif design used in the composition

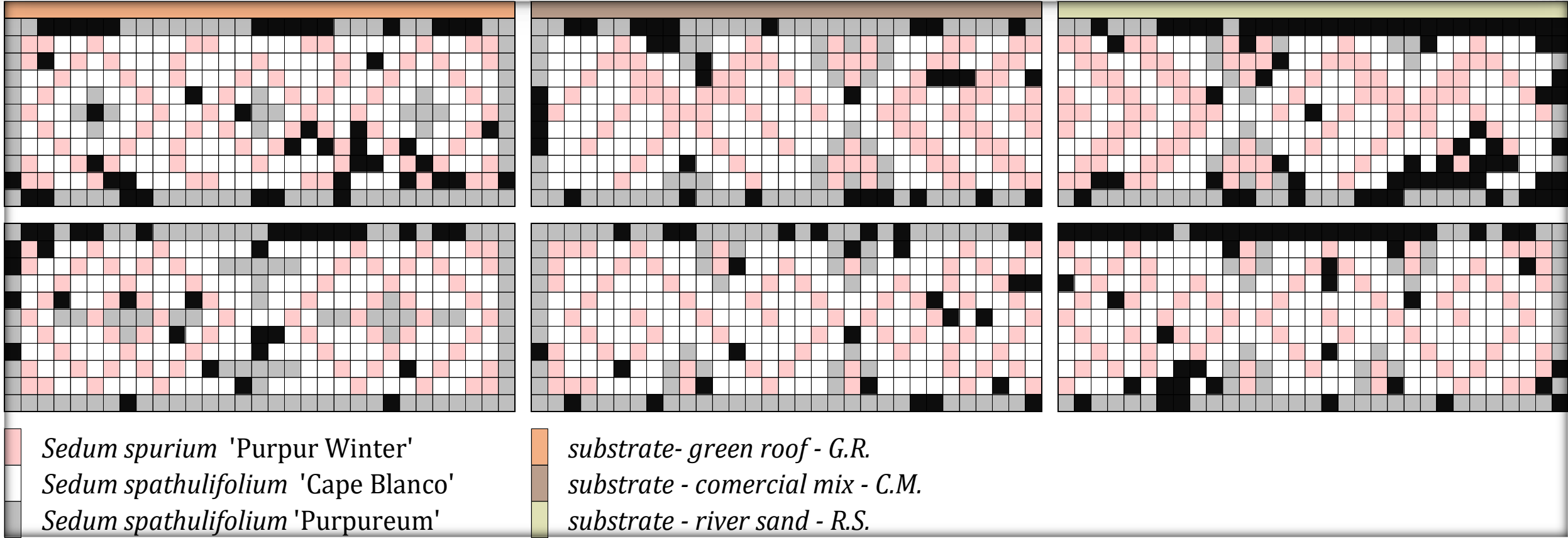


Sedum varieties workbench elevation map

Results and discussions

Out of the 2,046 pots, 13% remained completely empty, and:

- 214 pots (10%) - had 1 plant each - totaling 214 plants;
- 293 pots (14%) - had 2 plants each - totaling 586 plants;
- 339 pots (17%) - had 3 plants each - totaling 1,017 plants;
- 284 pots (14%) - had 4 plants each - totaling 1,136 plants;
- 243 pots (12%) - had 5 plants each - totaling 1,215 plants;
- 415 pots (20%) - had 6 plants each - totaling 2,490 plants.



The distribution of pots experiencing total plant loss. Black cells mark the containers with total plant loss

Table 1. The influence of soil elevation on plant development – G.R. substrate

	h2 - 25-50 cm				h3 - 50-75 cm			
	plants/pot	ramifications/pot			plants/pot	ramifications/pot		
SS'PW'	5.50	↓ 7%	15.72	↓ 6%	5.93		16.73	
SS'CB'	3.41		14.59		3.35	↓ 2%	14.07	↓ 4%
SS'P'	2.72		12.23		2.71	↓ 1%	11.65	↓ 5%

Table 2. The influence of soil elevation on plant development – C.M. substrate

	h1 - 0-25 cm		h2 - 25-50 cm		h3 - 50-75 cm	
	plants/pot	ramifications/pot	plants/pot	ramifications/pot	plants/pot	ramifications/pot
SS'PW'	6.00	45.50	5.97	↓ 0.51%	42.76	↓ 6%
SS'CB'	2.85	↓ 14%	21.27	↓ 17%	3.32	25.73
SS'P'	1.73	↓ 38%	13.45	↓ 31%	2.77	19.43

Table 3. The influence of soil elevation on plant development – R.S. substrate

	h1 - 0-25 cm		h2 - 25-50 cm		h3 - 50-75 cm	
	plants/pot	ramifications/pot	plants/pot	ramifications/pot	plants/pot	ramifications/pot
SS'PW'	5.42	11.83	5.40	↓ 0.25%	9.01	↓ 24%
SS'CB'	3.83	↓ 3%	11.58	3.96	10.67	↓ 8%
SS'P'	2.14	↓ 16%	9.43	2.46	↓ 3%	9.20

Conclusions

- Overall, the substrate type emerged as a critical determinant of plant success, with the commercial mix (C.M.) demonstrating superior performance compared to green roof substrate (G.R.) and river sand (R.S.);
- Species-specific preferences within each substrate were evident, emphasizing the need for tailored approaches to plant cultivation;
- Plant exposure played a pivotal role in shaping plant development, with distinct preferences observed across different Sedum species.
- While some species thrived in higher elevations (50-75 cm), others showed a preference for mid (25-50 cm), or lower elevations (0-25 cm), highlighting the necessity of matching plant species with suitable environmental conditions.