RJH Vol. V, 2024: 197-204
10.51258/RJH.2024.23

Integrating Romanian traditional motifs with sustainable succulent landscapes

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ABSTRACT

This study explores sustainable landscape design solutions within the Romanian cultural context by examining two distinct landscape concepts that incorporate succulent and perennial plants, mainly from the *Sedum* genus. Both designs integrate floral mosaics inspired by traditional Romanian motifs, employing innovative planting practices. Design 1 features a modern suspended floral mosaic, while Design 2 presents a larger, historically themed landscape integrated within an ethnographic museum setting. Each design utilizedcultivars of *Sedum* species (*Sedum acre*, *Sedum spurium* and *Sedum spathulifolium)*, showcasing the aesthetic, cultural, and practical implications of using succulent-based mosaics in landscape architecture. The study highlights their durability and minimal maintenance requirements, positioning them as viable options for sustainable urban landscaping.

Keywords: sedum plants, mosaics, traditional motifs, sustainable design

INTRODUCTION

The driving motivation behind this study is the growing demand for urban green spaces that contribute to both environmental sustainability and cultural expression (Semeraro *et al.,* 2021). In urban and historical contexts, green spaces serve a dual purpose: they improve environmental conditions, such as air quality and biodiversity (Kruize *et al.,* 2019), while also acting as public art installations that reflect local cultural traditions and aesthetics (Blessings, 2024; Vishal and Vuilliomen, 2021). By integrating cultural elements into green spaces, public art installations contribute to both the aesthetic appeal and the cultural vibrancy of urban environments, thereby enriching the experience of visitors and residents alike. These artistic interventions often evoke a connection to local cultural traditions and serve as platforms for storytelling and collective memory, as noted in the article (Blessings, 2024). Romanian traditional motifs, with their intricate patterns and strong ties to national identity, are especially well-suited for sustainable landscape design. This approach aims to blend ecological resilience with cultural heritage. A similar cultural fusion can be seen in public art displays like the renowned Flower Carpet event in Brussels. This event features elaborate floral designs crafted by artists using thousands of begonias, drawing inspiration from traditional motifs and highlighting the intersection of nature and art in celebrating cultural diversity (https://flowercarpet.brussels/en).

Landscape design presents a unique opportunity to integrate cultural heritage with ecological sustainability, offering innovative solutions to modern environmental challenges. In Romania, traditional motifs found in textiles, ceramics, and other forms of folk art provide a rich source of inspiration for contemporary landscape architecture (Radu and Cantor, 2014). This study explores the use of succulent plants, particularly

species from the *Sedum* genus, to create floral mosaics that are not only visually striking but also environmentally sustainable.
By leveraging the durability and low-maintenance needs of succulents, these designs offer an aesthetic that merges traditional artistry with modern ecological concerns, demonstrating how cultural heritage can coexist with sustainable practices.
Historically, cultural exchange has played a pivotal role in the socio-economic development of societies and has had a lasting impact on professional fields such as landscape design. The evolution of garden design is a testament to this exchange of ideas. Ancient Egyptian geometric gardens influenced Greek landscaping, which in turn shaped Roman garden traditions. This chain of influence continued through to the development of French gardens, which subsequently inspired British landscape aesthetics, leading to a global reform in garden design (https://www.britannica.com/art/garden-and-landscape-design/Historical-development). One of the most prominent examples is the geometric gardens of Villandry in France, which display a blend of traditional French design elements with clear influences from Persian geometric motifs (Figure 1).

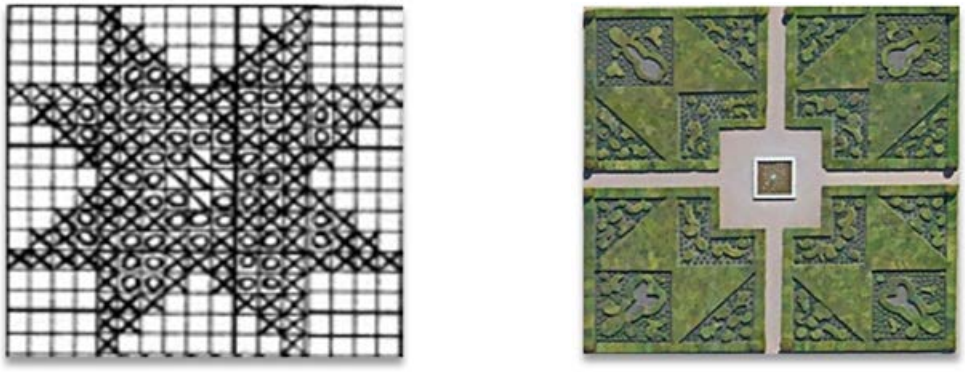

Figure 1. Traditional Persian motif (left) geometric landscape design of Villandry (right)
Source: Norbury, 1973; Google Earth

This study places particular emphasis on the use of *Sedum* species in green infrastructure, drawing on Romania's cultural heritage as a key design element. Cotoz (2024) states that *Sedum*s species are highly versatile and adaptable to various environmental conditions, making them ideal ground cover plants. *Sedum* plants are known for their resilience, thriving with minimal water and maintenance (Durhman *et al.,* 2006; Wolf and Lundholm, 2008; Zaharia *et al.,* 2016), making them ideal candidates for sustainable urban landscaping. By incorporating these plants into floral mosaics that reflect Romania's traditional geometric motifs, this approach aims to create urban green spaces that are not only ecologically sound but also culturally meaningful.

MATERIALS AND METHODS

Two landscape design concepts were developed to explore the integration of tradition and sustainability, utilizing *Sedum* plants to create floral mosaics. The first design was implemented on the 180 m^2 south-facing terrace of the Advanced Horticultural Research Institute of Transylvania (A.H.R.I.T.) building at the University of Agricultural Sciences and Veterinary Medicine campus, while the second concept was set within a fictional historical context, covering 865 m^2.

Design 1: Suspended floral mosaic

Design 1 (Figure 2) was implemented on the 180 m^2 south-facing terrace of the A.H.R.I.T. building on the campus of the University of Agricultural Sciences and Veterinary Medicine of Cluj-Napoca. The primary objective was to create a modern, modular succulent

installation that reflected traditional Romanian patterns. To achieve this, the design employed a suspended garden structure with a geometric layout inspired by folk textile motifs.

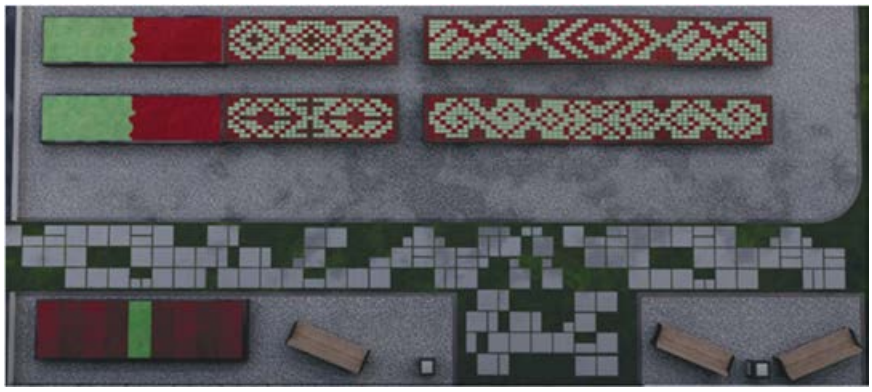

Figure 2. Planting scheme within the floral mosaic

- **Plant selection:** Three varieties of *Sedum* were chosen for their distinct colors and growth habits: *Sedum spurium* 'Purpur Winter' (red), *Sedum spathulifolium* 'Cape Blanco' (white), and *Sedum spathulifolium* 'Purpureum' (dark purple). These varieties were selected to mimic the red, white, and black color schemes typical of Romanian embroidery patterns.
- **Implementation:** A suspended garden system was used to support the mosaic, ensuring that the installation remained lightweight yet structurally sound (Cotoz, 2024). The use of a specialized green roof substrate provided excellent drainage and aeration while supporting the growth of the succulents. The substrate was composed of a blend of organic and inorganic materials optimized for succulent health, ensuring long-term sustainability with minimal maintenance.
- **Layout:** The mosaic was designed in a grid pattern, with each square representing a different color block. This arrangement allowed for easy maintenance and replanting if necessary. The evergreen nature of the selected plants ensured year-round visual appeal, with seasonal flowering adding additional interest during certain periods.

Design 2: Historically themed landscape

Design 2 (Figure 3) was conceived as a ground-level installation in a fictive historical context, covering 865 m^2. The setting was a former noble family mansion, converted into an ethnographic museum, with the floral mosaic serving as the centerpiece of the landscape design (Cotoz, 2024).

Figure 3. Planting scheme within the floral mosaic

- **Plant selection:** The second design utilized a broader range of *Sedum* species, including *Sedum acre, Sedum spurium* 'Purpur Winter', and *Sedum spurium* 'Voodoo'. These species were chosen for their adaptability to ground-based installations, their capacity for ground coverage, and their ornamental appeal. The color scheme for this design was more muted than in Design 1, reflecting the historical theme of the landscape.
- **Layout:** The floral mosaic was arranged in a trapezoidal pattern, echoing the geometric patterns found in Romanian folk art. The mosaic was framed by native trees and shrubs, which enhanced the sense of history and created a visual connection between the mosaic and its surroundings. The use of native plants also contributed to the overall sustainability of the design, reducing water and fertilizer needs.

Site preparation and substrate: A well-draining substrate was essential for both designs, as succulents are prone to root rot if waterlogged. For the historical site, a mix of sand, compost, and pumice was used to provide the necessary drainage while retaining enough moisture for the plants to thrive. The plants were spaced at high densities to ensure full ground coverage and prevent weed growth.

Table 1. Plant inventory for the landscape designs

No. Crt.	Specification	Quantity	Density	Height (cm)
	succulent plants – design 1			
1	*Sedum spurium* 'Purpur Winter'	482	1/pot	10-15
2	*Sedum spathulifolium* 'Cape Blanco'	983	1/pot	10
3	*Sedum spathulifolium* 'Purpureum'	581	1/pot	10
	succulent plants – design 2			
4	*Sedum acre*	3,588	13/m^2	10
5	*Sedum spurium* 'Purpur Winter'	2,223	13/m^2	10-15
6	*Sedum spurium* 'Voodoo'	2,093	13/m^2	10-15

Table 2. Decorative periods of the selected plants species

No. Crt.	Specification	Months											
		I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII
	succulent plants – design 1												
1	*Sedum spurium* 'Purpur Winter'												
2	*Sedum spathulifolium* 'Cape Blanco'												
3	*Sedum spathulifolium* 'Purpureum'												
	succulent plants – design 2												
4	*Sedum acre*												
5	*Sedum spurium* 'Purpur Winter'												
6	*Sedum spurium* 'Voodoo'												

Tools and software

To visualize and plan these designs, the study utilized the 3D modeling software Sketchup for creating virtual environments, while Lumion was used for rendering high-quality visualizations. These tools were instrumental in refining the planting schemes and ensuring the aesthetic alignment with traditional motifs.

Maintenance considerations

Succulents are known for their minimal water needs and ability to survive in challenging environments. However, initial care is essential to ensure successful establishment. During

the first few months after planting, the succulents in both designs require regular watering to establish their root systems. After this period, the plants were largely self-sustaining, with additional watering only necessary during extended periods of drought (Stephenson, 1994).

RESULTS AND DISCUSSIONS

Design 1: Floral mosaic with Sedum varieties

The suspended floral mosaic in Design 1 successfully demonstrated the aesthetic potential of *Sedum* species in replicating traditional Romanian motifs. The use of *Sedum spurium* 'Purpur Winter' for red tones, *Sedum spathulifolium* 'Cape Blanco' for white, and *Sedum spathulifolium* 'Purpureum' for black created a vibrant, year-round display that required minimal upkeep. The design's modular nature allowed for easy maintenance, with the mosaic framed by clear strips to facilitate trimming and preserve the integrity of the patterns.

The mosaic's resilience to varying environmental conditions further reinforced the practicality of using succulents in such designs. The plants thrived in the selected substrates, which were chosen for their ability to maintain adequate moisture levels without waterlogging. The temperature-regulating properties of the substrates also contributed to the health of the plants, as observed in the doctoral study on which the design was based (Cotoz, 2024).

Figure 4. Mosaic composition – "suspended garden"

From a plant care perspective, it is recommended to acquire specimens in pots with a diameter of 9 cm. These plants will need to be transplanted into substrates specifically designed for green roofs, as previous results have shown (Cotoz *et al.,* 2023)that this substrate generally exhibits the most suitable qualities and characteristics. Although it may be inferior in terms of nutrient content (Cotoz *et al.,* 2023), the green-roof substrate still provides a good source of essential nutrients for plant development. Because it does not compact, the green roof substrate allows for good air circulation around the plant roots, facilitating efficient nutrient absorption.

Watering once or twice a week, depending on weather conditions and soil moisture levels, will suffice (VanWoert *et al.*, 2005). Once established, the plants generally require minimal watering, surviving primarily on rainwater. However, during prolonged periods of drought or extreme heat, additional watering may be necessary. The frequency of watering should be adjusted according to seasonal changes (Stephenson, 1994).

Design 2: Floral mosaic in a historical context

Design 2 presented a more complex landscape, where the floral mosaic served as a visual centerpiece within a larger historical narrative. The use of *Sedum acre*, *Sedum spurium* 'Purpur Winter', and *Sedum spurium* 'Voodoo' mirrored the design principles of Design 1 but within a grander setting. The mosaic's geometric and traditional Romanian patterns connected the four symmetrically arranged garden islands, adding both thematic coherence and aesthetic harmony.

The inclusion of native trees and shrubs around the mosaic further enhanced the historical context of the design, providing a sense of continuity with the surrounding environment. The careful selection of plants, based on their growth habits and decorative periods, ensured that the landscape remained dynamic throughout the year, with different elements coming into prominence as the seasons changed.

Figure 5. Mosaic composition -fictitive historical site

The study explored two distinct landscape design concepts that integrated succulent plants and Romanian traditional motifs to achieve both aesthetic and sustainable outcomes. The comparative analysis of these designs, one urban and one historical, reveals several important insights into the balance between modern and traditional elements, the practical advantages of using succulents, and the cultural significance of integrating heritage into contemporary settings.

Aesthetic and cultural integration

Both designs leveraged the symbolic power of traditional Romanian motifs, using floral mosaics to establish a visual connection between the past and present. However, their success in doing so varied due to differences in setting and scale. Design 1, which was located in an urban, rooftop environment, relied on the contrast between modern architecture and traditional floral motifs. This juxtaposition created a visually interesting dynamic, but the potential risk of the design feeling out of place underscores the challenge

of blending cultural elements with contemporary structures. The design's success depended heavily on careful integration with its surroundings to avoid disrupting the modern aesthetic of the A.H.R.I.T. building.
In contrast, Design 2, situated in a historical context, achieved a more harmonious integration by aligning the floral mosaic with the architectural narrative of the site. The use of traditional motifs within a historically themed environment allowed the design to enhance, rather than compete with, its surroundings. The symmetry and geometric patterns of the mosaic reinforced the sense of order and balance often associated with historical landscapes. This thematic cohesion made the mosaic feel like a natural extension of the site's cultural heritage, creating a visually captivating and contextually relevant landscape.

Functionality and Sustainability
The use of succulent plants, particularly *Sedum* species, proved essential to the functionality and durability of both designs. Sedum's low water requirements and ability to thrive in harsh conditions made it an ideal choice for public spaces, where long-term sustainability and minimal maintenance are critical. These plants provided both aesthetic value and environmental benefits, as their resilience reduced the need for irrigation and upkeep, also noted by Durhman *et al*. (2006) and Wolf and Lundholm (2008).
In Design 1, the rooftop setting posed challenges related to weight and drainage. The green roof substrate addressed these concerns by maintaining moisture without becoming waterlogged and by providing a microenvironment with slightly elevated temperatures, which supported plant growth. The substrate's lightweight, well-draining properties were crucial in preventing structural issues on the rooftop, ensuring that the mosaic would remain sustainable over time.
Design 2, which occupied a larger, ground-based site, also benefitted from the use of *Sedum* plants. The trapezoidal mosaic, surrounded by native trees and shrubs, created a focal point within the landscape, emphasizing the cultural and natural elements of the historical setting while the low-maintenance characteristics of succulents allowed the design to retain its visual impact without requiring extensive care, making it an ideal solution for large, historically significant spaces.

Comparative outcomes
Both designs successfully demonstrated the versatility of succulent-based floral mosaics in different contexts. Design 1, with its compact, urban arrangement, highlighted the potential for integrating green infrastructure into densely populated areas. The minimal maintenance required by succulent plants made it an efficient solution for small urban spaces, where resources and space are limited. In this context, the floral mosaic served not only as an ornamental feature but also as a functional element of the green roof, contributing to urban sustainability.
Design 2, on the other hand, showcased the potential for integrating succulents into larger, more complex landscapes. The cultural and historical significance of the setting enhanced the impact of the floral mosaic, making it a central visual and thematic feature of the site. The alignment of traditional motifs with the historical context created a deeper sense of place, enriching the visitor experience by connecting them to Romania's cultural heritage.

Broader implications
The findings from this study suggest that the use of succulent plants in landscape design is a highly effective strategy for achieving both sustainability and cultural relevance. Succulents not only reduce the environmental footprint of landscaping projects but also offer a versatile medium for expressing cultural narratives through design. By integrating

traditional motifs into modern urban and historical landscapes, the study demonstrated how landscape design can bridge the gap between past and present, enhancing both aesthetic appeal and cultural significance.

CONCLUSIONS

This study highlights the potential of integrating plants, specifically *Sedum* species, into landscape designs that draw on Romanian cultural motifs. The use of floral mosaics in both the modern and historical contexts demonstrated how traditional patterns could be effectively incorporated into contemporary landscapes. The durability and low maintenance requirements of succulent plants make them an ideal choice for sustainable urban green spaces.

The findings suggest that floral mosaics inspired by cultural traditions can enhance both the aesthetic and cultural value of public landscapes. By carefully selecting plant species and designing layouts that reflect traditional motifs, landscape architects can create spaces that are not only visually appealing but also resonate with local history and identity. The use of succulents offers a long-lasting, eco-friendly alternative to conventional floral arrangements, making them a viable option for future landscape projects.

Permanent solutions that use succulent and hardy plants are more suitable due to their lower maintenance costs and ease of implementation. These plants require less water, are more resistant to varied environmental conditions, and generally have a longer lifespan compared to conventional plants used in floral mosaics.

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