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Alternative Materials for Sustainable Floriculture: From Waste to Resource and from Linear to Circular Production

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Abstract

Floriculture is a dynamic and rapidly evolving sector of horticulture, increasingly influenced by climate change, resource scarcity, technological innovation and changing consumer expectations. While the production and marketing of flowers and ornamental plants contribute substantially to economic activity and human well-being, conventional floricultural systems may rely heavily on non-renewable resources, fossil energy, synthetic inputs and single-use plastics. Consequently, the transition towards more sustainable production systems requires a comprehensive rethinking of the resources and materials used throughout the floricultural value chain. This work explores emerging trends and sustainable practices in floriculture, with particular emphasis on the potential of alternative, renewable, recycled and waste-derived materials. Growing media represent one of the most important areas of this transition. Environmental concerns associated with peat extraction have accelerated the search for suitable alternatives, including composts derived from green and organic residues, coir, bark, rice husks, wood-based materials, biochar and other locally available by-products. Their potential to replace or complement peat depends not only on their physical and chemical properties, but also on their availability, consistency, environmental performance and suitability for specific production systems. Beyond growing media, the transition towards sustainable floriculture encompasses biodegradable and reusable containers, plant-based and recycled packaging materials, and alternative materials for floral design and post-harvest handling. At the same time, sustainable floriculture requires complementary strategies, including the selection of native, drought-tolerant, perennial and pest- or disease-resistant plant species, efficient water and nutrient management, integrated pest management, energy efficiency, renewable energy, protected cultivation, and innovative technologies for monitoring and resource optimisation. Particular attention is given to composting, recycling and the valorisation of organic residues as strategies for improving resource efficiency and supporting circular production. Materials traditionally regarded as waste can, through appropriate processing and quality control, become valuable inputs for floricultural production, reducing dependence on virgin resources, potentially lowering environmental impacts and supporting local circular bioeconomies. The future of floriculture depends on the ability to adapt, innovate and rethink resource use. The transition from a linear model of production and consumption towards a circular and resource-efficient floriculture can transform waste from an environmental burden into a valuable resource, contributing to a more resilient and sustainable floricultural sector.

Keywords: Sustainable floriculture, alternative growing media, compost, waste valorisation, circular

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economy, renewable resources, peat alternatives

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