

Editorial

Agronomic Practices for Enhancing Quality and Yield of Aromatic and Medicinal Crops

Matěj Malík *  and Pavel Tlustoš 

Department of Agroenvironmental Chemistry and Plant Nutrition, Faculty of Agrobiological Sciences, Food and Natural Resources, Czech University of Life Sciences Prague, Kamýcká 129, 6-Suchbát, 165 00 Prague, Czech Republic; tlustos@af.czu.cz

* Correspondence: malikmatej@af.czu.cz

This Special Issue was created around a central question, a question that is increasingly difficult to resolve in practice, namely what should be included among agronomic practices to cultivate aromatic and medicinal crops so that they achieve both high yield and high value while remaining productive and economically feasible and delivering products that are chemically consistent and safe for consumers? Demand for these crops continues to increase. Basil, medicinal mushrooms, cannabis, and many traditional pharmacopoeial species are no longer marginal or experimental commodities. They are embedded in established value chains in the food, nutraceutical, cosmetics, and, in some cases, regulated medical applications sectors. These value chains impose explicit requirements on primary production, including reproducible profiles of bioactive compounds, raw materials free of unacceptable contaminants, and cultivation systems that are transparent and auditable [1,2]. In this context, agronomy is expected to generate standardized biochemical products rather than undifferentiated biomass. Production conditions for these crops are also changing rapidly. Many aromatic and medicinal crops are now cultivated in semi-controlled or fully controlled environments using recirculating balanced nutrient solutions, spectrum-optimized LED lighting, biostimulants or growth regulators, and highly specialized soilless substrates [2,3]. These technologies enhance standardization and enable year-round output, but they also increase sensitivity to errors: small deviations in fertigation, sanitation, or substrate chemistry can be directly reflected in the chemical profile of the harvested tissue [4]. In open-field and greenhouse systems, by contrast, climatic stress and pathogen pressure can degrade quality even when total yield remains commercially acceptable. The contributions assembled in this Special Issue address these agronomic and physiological constraints together with the associated regulatory implications, rather than treating them as separate problems.

The first group of studies examines how the cultivation environment governs both growth and metabolite composition. Lee et al. investigated *Adenophora triphylla*, a medicinal species valued for root-associated secondary metabolites such as lupenone and β -sitosterol, and demonstrated that regional growing conditions in South Korea altered root development and the quantitative profile of these compounds in roots [5]. This finding shows that environmental conditions act as a primary determinant of phytochemical quality: maintaining species identity and general horticultural practice does not by itself ensure compositional uniformity. Postharvest physiology is addressed by Ly and Zheng, who focused on sweet basil (*Ocimum basilicum* L.), a perishable aromatic crop that is physiologically sensitive to low-temperature stress [6]. They evaluated silicon and abscisic acid treatments during postharvest storage and observed that these interventions mitigated chilling injury, preserved visual quality, and delayed the development of chilling-injury



Received: 24 November 2025

Accepted: 29 November 2025

Published: 4 December 2025

Citation: Malík, M.; Tlustoš, P. Agronomic Practices for Enhancing Quality and Yield of Aromatic and Medicinal Crops. *Agriculture* **2025**, *15*, 2517. <https://doi.org/10.3390/agriculture15232517>

Copyright: © 2025 by the authors. Licensee MDPI, Basel, Switzerland. This article is an open access article distributed under the terms and conditions of the Creative Commons Attribution (CC BY) license (<https://creativecommons.org/licenses/by/4.0/>).

symptoms, particularly leaf necrosis, while also reducing fresh weight loss and electrolyte leakage. This work demonstrates that agronomic management continues beyond harvest, and that postharvest handling directly determines how much of the harvested biomass ultimately remains marketable.

Nutrient supply and substrate design are explored in the work of Jozífek et al. on the medicinal mushroom *Hericium erinaceus* [7]. By manipulating selenium enrichment in production substrates, the authors quantified selenium uptake and distribution in basidiocarps and monitored effects on growth and yield. The study illustrates that substrate chemistry can be used deliberately to modulate elemental composition in a cultivated medicinal organism while maintaining productivity, thereby linking cultivation practice to verifiable compositional claims in functional food and supplement applications. The limits of input recycling are highlighted by Hanč et al., who cultivated hemp (*Cannabis sativa* L.) in soils amended with composts and vermicomposts derived from sewage sludge [8]. Pharmaceuticals and personal care product residues were traced from the amended substrates into cannabis tissues. This establishes a direct pathway from fertilization strategy to potential consumer exposure and indicates that nutrient recycling practices developed for broadacre biomass crops cannot be transferred unchanged to regulated medicinal crops without reassessing contaminant fate, permissible residue limits and market acceptance.

Crop health and sanitary status are addressed in the review by Pugliese et al. on basil downy mildew caused by *Peronospora belbahrii* [9]. Basil downy mildew is a production-limiting pathogen that drives visible deterioration and frequent market rejection, while at the same time leaving producers with restricted chemical control options due to residue tolerances on fresh culinary herbs. By integrating pathogen biology, epidemiology and management strategies, the review frames disease suppression as an economic requirement: in these crops, plant health directly determines commercial acceptability.

Finally, Malík and Tlustoš review soilless growing media for cannabis cultivation in controlled environments and compare commonly used media such as rockwool, coir and peat-based mixes in terms of water-holding capacity, air-filled porosity, cation exchange characteristics and sustainability considerations [10]. The review places cannabis alongside other controlled-environment crops such as lettuce and ornamentals and shows that, under pharmaceutical-style expectations for reproducibility and documentation, the growing medium functions as a regulated process parameter rather than a passive physical support.

Taken together, these studies show that modern agronomy for aromatic and medicinal crops is defined by three linked requirements. First, cultivation must deliver biomass with an internally consistent and reproducible chemical profile that can withstand regulatory and commercial scrutiny [1,2,4,10]. Second, inputs and interventions considered agronomically desirable, including organic amendments, micronutrient supplementation and postharvest treatments, must be evaluated not only for their effect on growth but also for their influence on contaminant load, metabolite stability and compositional claims [5–9]. Third, crop health, postharvest performance and regulatory compliance function as continuous components of the same production system [1–4,6,9]. This Special Issue therefore positions agronomy for aromatic and medicinal crops as an integrated discipline linking together cultivation strategy, plant physiology, environmental chemistry, product safety and regulatory readiness, rather than as a conventional yield maximization approach.

Conflicts of Interest: The authors declare no conflicts of interest.

References

1. Mahato, D.; Mahto, H.; Kumari, S. Medicinal and Aromatic Plant Cultivation and Sustainable Development. In *Industrial Crops Improvement*, 1st ed.; Sustainable Landscape Planning and Natural Resources Management; Springer: Cham, Switzerland, 2025; pp. 135–153. [\[CrossRef\]](#)
2. Nikšić, M.; Boh Podgornik, B.; Berovič, M. Farming of Medicinal Mushrooms. In *Biochemical Engineering and Biotechnology of Medicinal Mushrooms*; Advances in Biochemical Engineering/Biotechnology; Springer: Cham, Switzerland, 2022; Volume 184, pp. 29–76. [\[CrossRef\]](#)
3. Roychoudhury, A.; Bhowmik, R. State-of-the-Art Technologies for Improving the Quality of Medicinal and Aromatic Plants. In *Medicinal and Aromatic Plants*; Springer: Cham, Switzerland, 2021; pp. 593–627. [\[CrossRef\]](#)
4. Khan, W. *Crop Production: Techniques and Technology*, 1st ed.; Academic Guru Publishing House: Kanpur, India, 2024; pp. 1–228.
5. Lee, D.H.; Son, Y.; Jung, C.R.; Jang, J.H.; Kim, J.A.; Kim, H.-J. Impact of Environments on Root Growth and Marker Compounds of *Adenophora triphylla* in Different Regions of South Korea. *Agriculture* **2024**, *14*, 2301. [\[CrossRef\]](#)
6. Ly, V.; Zheng, Y. Alleviation of Chilling Injury in Postharvest Sweet Basil (*Ocimum basilicum* L.) with Silicon and Absciscic Acid Applications. *Agriculture* **2025**, *15*, 643. [\[CrossRef\]](#)
7. Jozífek, M.; Praus, L.; Matějka, J.; Jablonský, I.; Koudela, M. Selenium Uptake by *Hericium erinaceus* Basidiocarps on Various Substrates and Their Effect on Growth and Yield. *Agriculture* **2025**, *15*, 460. [\[CrossRef\]](#)
8. Hanč, A.; Dume, B.; Kusnierova, S.; Hřčka, M.; Hřebečková, T.; Michal, P.; Hleibieh, M.; Nehasilova, A.; Cajthaml, T. Occurrence of Pharmaceuticals and Personal Care Products in *Cannabis sativa* L. Following Application of Sewage Sludge Based Composts and Vermicomposts. *Agriculture* **2025**, *15*, 470. [\[CrossRef\]](#)
9. Pugliese, M.; Gilardi, G.; Garibaldi, A.; Gullino, M.L. Basil Downy Mildew (*Peronospora belbahrii*): A Major Threat to *Ocimum basilicum* L. Production. *Agriculture* **2025**, *15*, 1999. [\[CrossRef\]](#)
10. Malík, M.; Tlustoš, P. Soilless Growing Media for Cannabis Cultivation. *Agriculture* **2025**, *15*, 1955. [\[CrossRef\]](#)

Disclaimer/Publisher’s Note: The statements, opinions and data contained in all publications are solely those of the individual author(s) and contributor(s) and not of MDPI and/or the editor(s). MDPI and/or the editor(s) disclaim responsibility for any injury to people or property resulting from any ideas, methods, instructions or products referred to in the content.