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Editorial

Application of Plant Biotechnology in Forestry

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Forests, often referred to as the lungs of our planet, stand as a testament to the incredible diversity and significance of our terrestrial ecosystems. These majestic giants, the forest trees, constitute the primary component of continental biomass and are guardians of terrestrial biodiversity. They provide us with a multitude of ecological services that sustain life on Earth and serve as a vital source of raw materials essential for various purposes.

In recent years, the global demand for wood and its derivatives has grown unabated and shows no sign of subsiding. As we navigate the complex landscape of environmental sustainability, it becomes imperative to address this surging demand with a concerted effort to minimize its ecological footprint. It is here that the fascinating realm of biotechnology comes into play, offering us a path forward that can harmonize our need for forest resources with the preservation of our fragile ecosystems.

Biotechnological tools have emerged as our allies in this endeavor. Genomic selection, micropropagation, and genetic engineering are poised to revolutionize how we manage and harness the potential of our forests. These tools promise not only to meet the increasing demand for wood but also to do so while minimizing its impact on our environment.

Forest regeneration, a process once left predominantly to natural forces, is now evolving through the strategic implementation of artificial regeneration with selected genotypes. This approach emerges as the most effective means to enhance forest yield and, by extension, our sustainability efforts. However, it is crucial to acknowledge the unique challenges posed by forest species in this context. Their sheer size, extended generation times, and prolonged juvenile stages make traditional plant breeding a demanding and time-consuming task. This is where genomic selection enters the stage, armed with the potential to accelerate breeding cycles, intensify selection, and enhance the accuracy of breeding values.

With this backdrop, the objective of this Special Issue is to delve deep into the latest biotechnological approaches in forestry. From rejuvenation through clonal propagation to somatic embryogenesis, cryopreservation of germplasm, and the use of molecular techniques and genetic engineering, we aim to unravel the potential and promise of these cutting-edge technologies.

In the pages that follow, leading experts in the field share their insights, research findings, and visions for the future. Together, we embark on a journey to unlock the full potential of biotechnology in forestry, seeking sustainable solutions that balance our insatiable need for forest resources with our responsibility to preserve the delicate balance of our planet's ecosystems.

The Special Issue comprises 10 papers. They represent a wide range of aspects related to the application of plant biotechnology in forestry and give timely examples of research activities that can be observed around the globe. An overview on conifer biotechnology is firstly presented [1]. Among the arsenal of biotechnological approaches, micropropagation techniques coupled with the rooting of cuttings [2–8] are currently recognized as the most potent tools for the large-scale propagation of elite forest varieties. These techniques harness the remarkable developmental plasticity of plants, enabling them to adapt to diverse environmental conditions while retaining their high regeneration capacity.

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Molecular studies and genetic engineering emerge as a game-changer, offering the power to analyze gene functions and transfer specific traits into selected genotypes without compromising their desirable genetic background [9,10]. This revolutionary tool holds the key to swiftly increase forest yield and wood quality, drastically shortening the traditional breeding process.

Join us in this exploration, as we pave the way towards a greener, more sustainable future where forests thrive, and humanity prospers in harmony with nature.

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References

1. Rodríguez, S.M.; Ordás, R.J.; Alvarez, J.M. Conifer Biotechnology: An Overview. *Forests* **2022**, *13*, 1061. [CrossRef]
2. Hazubska-Przybył, T.; Wawrzyniak, M.K.; Kijowska-Oberc, J.; Staszak, A.M.; Ratajczak, E. Somatic Embryogenesis of Norway Spruce and Scots Pine: Possibility of Application in Modern Forestry. *Forests* **2022**, *13*, 155. [CrossRef]
3. Varis, S.; Tikkinen, M.; Edesi, J.; Aronen, T. How to Capture Thousands of Genotypes; Initiation of Somatic Embryogenesis in Norway Spruce. *Forests* **2023**, *14*, 810. [CrossRef]
4. Martínez, M.T.; Corredoira, E. Efficient Procedure for Induction Somatic Embryogenesis in Holm Oak: Roles of Explant Type, Auxin Type, and Exposure Duration to Auxin. *Forests* **2023**, *14*, 430. [CrossRef]
5. Liu, X.; Liu, Y.; Yu, X.; Tretyakova, I.N.; Nosov, A.M.; Shen, H.; Yang, L. Improved Method for Cryopreservation of Embryogenic Callus of *Fraxinus mandshurica* Pupr. by Vitrification. *Forests* **2023**, *14*, 28. [CrossRef]
6. Rojas-Vargas, A.; Montalbán, I.A.; Moncaleán, P. Adult Trees *Cryptomeria japonica* (Thunb. ex L.f.) D. Don Micropropagation: Factors Involved in the Success of the Process. *Forests* **2023**, *14*, 743. [CrossRef]
7. Ioannidis, K.; Tomprou, I.; Panayiotopoulou, D.; Boutsios, S.; Daskalakou, E.N. Potential and Constraints on In Vitro Micropropagation of *Juniperus drupacea* Labill. *Forests* **2023**, *14*, 142. [CrossRef]
8. Abshahi, M.; García-Morote, F.A.; Zarei, H.; Zahedi, B.; Nejad, A.R. Improvement of Rooting Performance in Stem Cuttings of Savin Juniper (*Juniperus sabina* L.) as a Function of IBA Pretreatment, Substrate, and Season. *Forests* **2022**, *13*, 1705. [CrossRef]
9. Colavolpe, M.B.; Vaz Dias, F.; Serrazina, S.; Malhó, R.; Lourenço Costa, R. *Castanea crenata* Ginkbilobin-2-like Recombinant Protein Reveals Potential as an Antimicrobial against Phytophthora cinnamomi, the Causal Agent of Ink Disease in European Chestnut. *Forests* **2023**, *14*, 785. [CrossRef]
10. Alvarez, J.M.; Rodríguez, S.M.; Fuente-Maqueda, F.; Feito, I.; Ordás, R.J.; Cuesta, C. Identification of Candidate Genes Involved in Bud Growth in *Pinus pinaster* through Knowledge Transfer from *Arabidopsis thaliana* Models. *Forests* **2023**, *14*, 1765. [CrossRef]