ULST Timisoara
Multidisciplinary Conference on Sustainable Development
21-22 May 2026

2026 MULTIDISCIPLINARY CONFERENCE ON SUSTAINABLE DEVELOPMENT

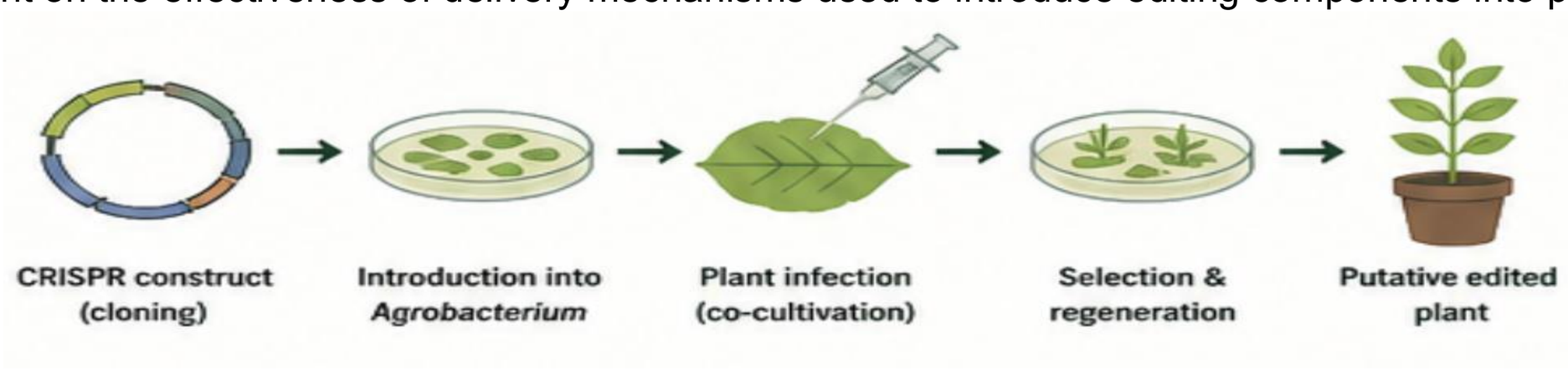
Agrobacterium-Mediated CRISPR Delivery in Plants: Key Factors and Current Limitations

Florin Adrian Huiban[1,2], Vladislava Galović[3], Maria Roberta Tripon[1,2,4], Saša Orlović[3], Camelia Tulcan[1,2,4,*], Dorin Dumitru Camen[1,2,4]

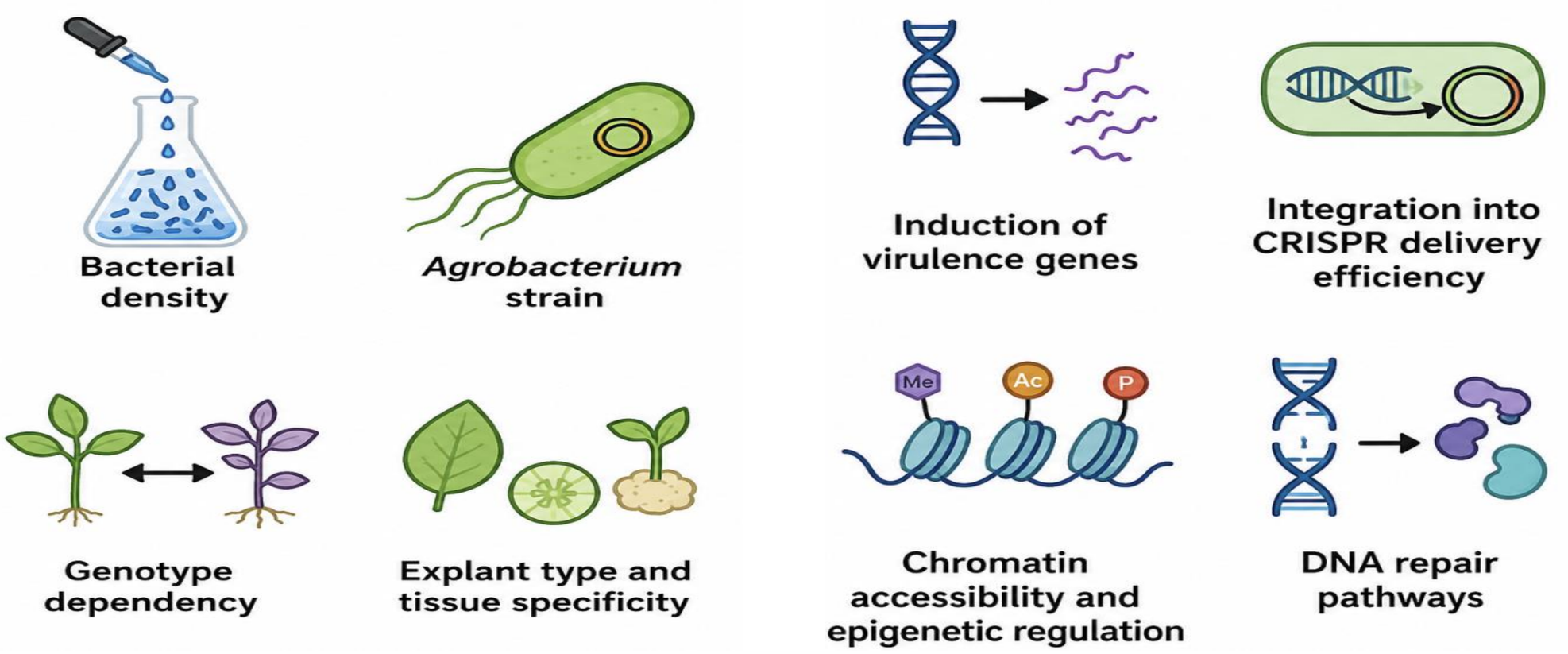
[1] University of Life Sciences "King Mihai I" from Timisoara, Doctoral School Engineering of Plant and Animal Resources
[2] University of Life Sciences "King Mihai I" from Timisoara, Research Institute for Biosecurity and Bioengineering
[3] University of Novi Sad, Institute of Lowland Forestry and Environment
[4] University of Life Sciences "King Mihai I" from Timisoara, Faculty of Engineering and Applied Technologies

Introduction

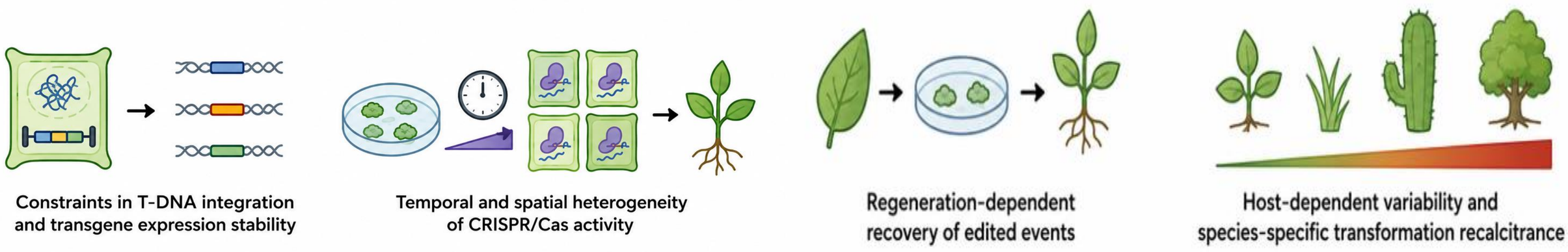
The emergence of CRISPR/Cas systems has revolutionized plant biotechnology by enabling precise and efficient genome editing across diverse plant species. These technologies have significantly accelerated functional genomics studies and crop improvement strategies by allowing targeted modification of specific genomic loci. Nonetheless, despite ongoing advancements in genome-editing technologies, the overall efficacy of CRISPR/Cas applications in plants is highly dependent on the effectiveness of delivery mechanisms used to introduce editing components into plant cells.



Factors influencing transformation



Current limitation



Conclusion

Agrobacterium-based CRISPR/Cas delivery continues to play a central role in plant genome engineering because of its versatility and broad applicability across plant systems. However, successful editing depends on complex interactions between biological and technical factors, often leading to variable and difficult-to-predict outcomes. Key challenges include inconsistent transgene integration, mosaic editing patterns, regeneration bottlenecks, and species-specific transformation recalcitrance. Although alternative delivery technologies are emerging, Agrobacterium remains a fundamental tool for current and future plant genetic engineering strategies. Continuous optimization of transformation strategies, tissue culture systems, and CRISPR delivery technologies is therefore essential for improving editing precision, stability, and applicability in diverse plant species.