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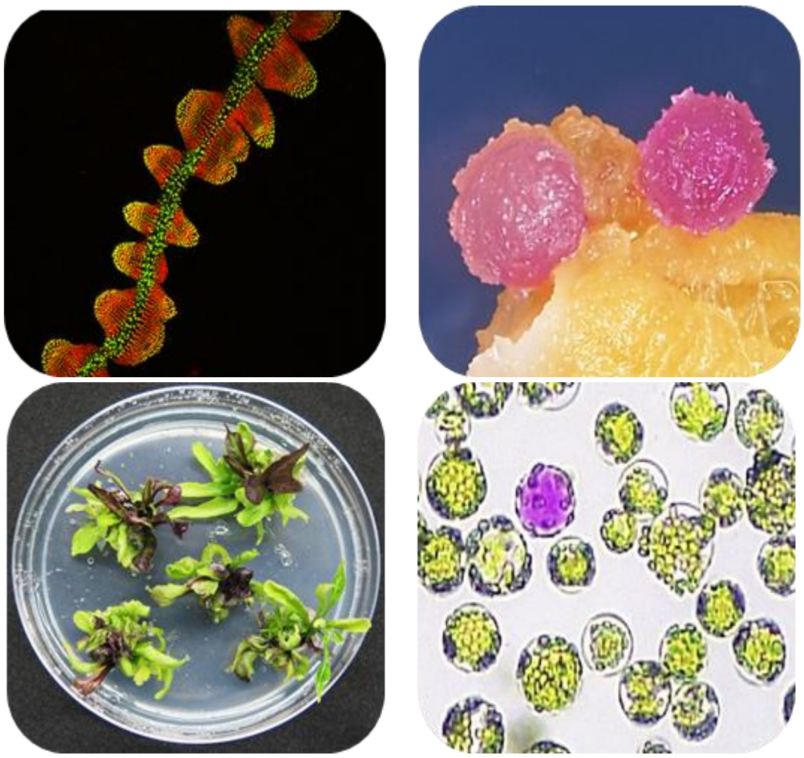
Plant Tissue Culture & Genome Engineering



Program
May 10 - 13, 2026
Santa Susanna, Barcelona, Spain
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ABSTRACTS
For Posters

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Development of a transgene-free genome editing tool for clonally propagated fruit crops

Prof. Roberto Botta

Dipartimento di Scienze agrarie, forestali e alimentari-DISAFA, Università degli Studi di Torino, L.go Paolo Braccini n. 2, 10095 Grugliasco (TO), Italy
roberto.botta@unito.it

Pavese Vera[1)], Marino Lorenzo Antonio[1)], Moglia Andrea[1)], Ferrero Martina[1)], Dondini Luca[2)], Porro Camilla[2)], Domenichini Cecilia[2)], Malnoy Mickael[3)], Miranda Chavez Simon David[3)], Nesler Maddalena[3)], Soto Arratia Francisco Andres[4)], Cavalli Roberta[4)], Argenziano Monica[4)]

[1)]Dipartimento di Scienze agrarie, forestali e alimentari-DISAFA, Università degli Studi di Torino, L.go Paolo Braccini n. 2, 10095 Grugliasco (TO), Italy
[2)]Department of Agriculture and Food Sciences, Bologna University, Viale Fanin 46, 40127 Bologna, Italy,
[3)]Research and Innovation Centre, Fondazione Edmund Mach (FEM), via E. Mach 1, 38098 San Michele all'Adige (TN), Italy
[4)]Dipartimento di Scienza e Tecnologia del Farmaco, Università degli Studi di Torino, via Pietro Giuria 9, Torino, Italy

Recent advances in the development of genome-editing tools have revolutionized researchers' ability to genetically investigate and modify living systems. However, the genetic engineering of mature plants and their plastids remains challenging due to the numerous physical barriers that must be overcome to enable genome editing in fully developed plant tissues. Nanomaterials and nanobubbles offer significant potential to expand the available toolsets for genome editing, particularly in plant science.

The plant cell wall represents a major physical barrier that limits the efficiency and process capacity of exogenous biomolecule delivery. Current Agrobacterium-mediated transformation techniques are constrained by host range limitations, low transformation efficiencies, toxicity, and the unavoidable integration of foreign DNA into the host genome. The TARGET project developed and applied nanoparticle- and nanobubble-based platforms enabling the electrostatic grafting of genome engineering biomolecules, facilitating their transport across the plant cell wall and membrane for the delivery of proteins and DNA. The following objectives were pursued: identify nanoparticles or nanobubbles with high efficiency for plant cell internalization; use these nanoparticles to deliver DNA and RNA to different plant matrices, such as calli, leaves, somatic embryos, meristems, or protoplasts, in a fruit tree species-independent manner.

Nanoparticles were produced using different materials, including dextran, chitosan, poly(lactic-co-glycolic acid) (PLGA), mesoporous silica, and carbon nanotubes. They were loaded with the nucleic acids by electrostatic interactions exploiting their surface charges or after nanoparticle functionalization with poly(ethyleneimine) (PEI).

In vitro-plant matrices of Nicotiana benthamiana, Castanea sativa, Malus × domestica, and Pyrus communis were treated with nanoparticles carrying a plasmid harbouring either the Green Fluorescent Protein (GFP) or Ruby polycistronic construct. The treated materials were examined to detect intracellular fluorescence (GFP) or red coloration as indicators of successful delivery.

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