

MWP – Young Researcher Abstract 2026

Project title: Synthetic plant cells for oral drug delivery systems	
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Abstract (approx. 200 words): Natural plant cells are efficient cargo carriers with strong potential for oral drug delivery. Inspired by their unique architecture, we engineer synthetic plant cells (“plantosomes”) from forest-derived cellulose nanofibers, pectin and lipid layers using a bottom-up assembly strategy. Unlike current natural plant-based delivery approaches, which mainly rely on genetically modified plants to produce recombinant proteins, our platform enables flexible encapsulation of diverse therapeutics, including non-protein drugs and nanoparticles. The plantosome mimics the dual protective barriers of natural plant cells: a rigid cellulose-based shell and a lipid layer. Together, these layers protect cargo in acidic gastric conditions while enabling size-dependent, dual-triggered release in simulated gastrointestinal environments. The system also demonstrates excellent cytocompatibility with intestinal Caco-2 cells. This research provides new opportunities for transforming forest waste into high-value biomedical materials, linking the forest-based industry with advanced healthcare technologies. Our vision is to establish sustainable, low-cost, and scalable bioinspired delivery systems and expand access to precision treatment. By integrating forest resources with nanobiotechnology, we aim to promote a circular bioeconomy with broad societal impact.	
Key words: Synthetic plant cells, cellulose nanofibers, bioinspiration	