

## MWP – Young Researcher Abstract 2024

<b>Project title:</b> Multifunctional biogenic films and coatings from synergistic aqueous dispersion of wood-derived suberin and cellulose nanofibers	
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<b>Abstract</b> (approx. 200 words): To address the substantial financial (1 trillion USD) and environmental (700 billion USD) impacts of global food waste, there has been increasing interest in developing active food packaging. Conventional active food packaging often relies on complex inorganic or organic constituents, which may have limitations in terms of functionality, biodegradability, and recyclability. To overcome these challenges, a simple yet multifunctional active food coating and packaging system was developed, featuring UV shielding, antimicrobial, and antioxidant properties. This system utilizes an aqueous dispersion of suberin, an industrial byproduct, stabilized with amphiphilic cellulose nanofibers (CNF). The CNF, synthesized in a deep eutectic solvent, serves a dual role as both an effective dispersant for suberin and as a reinforcing agent. A low CNF concentration of 0.5 wt.% produced a dispersion with optimal viscosity (208.70 Pa.s), enhanced stability (instability index <0.001), and reduced particle size ( $9.37 \pm 2.43 \mu\text{m}$ ). This suberin-CNF dispersion was subsequently transformed into self-standing films that exhibited superior UV-blocking capabilities, good thermal stability, improved hydrophobicity (water contact angle increased from $61^\circ \pm 0.15$ to $83^\circ \pm 5.11$ ), and antimicrobial activity against gram-negative bacteria. The application of these bicomponent dispersions as fruit coatings for bananas and as packaging for strawberries demonstrated their effectiveness in extending shelf life by reducing moisture loss and inhibiting microbial growth. This sustainable approach holds promise for advancing the development of biogenic, active food packaging derived from widely available bioresources.	
<b>Key words:</b> Nanocellulose, deep eutectic solvent, food coatings, antimicrobial, packaging	