

## **The Donizetti Project: innovative bio-based and eco-friendly coatings for textile functionalization**

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Functionalization of textile fibers and fabrics improves their performance, increasing durability and longevity, and providing various biological activities, including antibacterial ones. The antimicrobial effect is usually obtained through the application of chemical substances, employing expensive materials with high environmental impacts, as well as thermal treatment. For this reason, in the last decade, the textile industry has focused its attention on safer and more sustainable alternatives, using bio-based products and materials from non-critical and secondary raw sources. In this context, the Donizetti Project, part of the spoke 3 of the extended partnership MICS (Circular and Sustainable Made in Italy), concerns the study, application and characterization of eco-friendly solutions for textile finishing. In this study, the antibacterial activity of active compounds, including polyphenols, organic acids and nanoparticles was assessed. Biomolecules were then used as functionalizing agents for cotton and polyester fabrics employing dip-coating or dip-pad-dry cure methods. The antimicrobial activity of functionalized textiles against two bacterial strains, *Escherichia coli* as Gram-negative and *Staphylococcus aureus* as Gram-positive was determined by the ASTM E2149 standard method, under dynamic contact conditions. In the next step, textiles that exhibited antibacterial properties were washed according to the UNI EN ISO 105-C06 or UNI EN ISO 105-X05 and then subjected to antibacterial tests. Functionalized fabrics showed excellent antibacterial activity against *E. coli* and *S. aureus*, which is preserved even after washing. These promising results demonstrated the antimicrobial efficacy of bio-based coatings both against Gram-negative and Gram-positive microorganisms, representing a safer, sustainable and eco-friendly alternative for textile functionalization, according to circular economy principles, with future applications in industrial, biomedical, environmental and energy fields.

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