Study, application and characterization of eco-friendly solutions for antibacterial textile finishing: the potential of organic acids

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Textile functionalization with antibacterials, among the fabric finishing, is the main focus of our work, paired with the need to find eco-friendly alternatives to the currently applied agents [1]. This aim reflects the consistency with the project DONIZETTI ("Study, application and characterization of eco-friendly solutions for textile finishing"), developed in response to the growing demand for sustainable textile materials and formulations, and part of the MICS (Made in Italy Circular and Sustainable), Spoke 3 ("Green and sustainable products & materials from non-critical and secondary raw sources"). The requirements for sustainable antimicrobial agents for fabric functionalizations are natural origin, non-toxicity, safety, biocompatibility, low cost and availability. These features make organic acids (OAs) possible candidates, already characterized for their antibacterial effect, related to diffusion and dissociation phenomena occurring in the bacterial cell [2]. The starting pull of organic acids includes plant extracts and subproducts - such as caffeic, gallic, trans-ferulic, tartaric, L-ascorbic acid - and also lactic acid, obtained by bacterial fermentation. Tests have been performed on representative bacterial strains by following international standards. The results have led to further testing of a subset for bacterial reduction performed on the cotton functionalized with the OAs. Laundering and dry cleaning simulations were performed on the samples, also obtained by coupling the OAs to bio-based matrices, in order to evaluate the range of potential applications and the possible room for improvement. The current evidences show the great efficacy of tartaric acid, in particular, resulting in a further investigation on the functionalization of animal fibre (wool, cashmere) with this organic acid.

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