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Application of Bioderived Pigments in Textile Dyeing and Bioremediation

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Traditional textile dyeing relies on synthetic dyes which are toxic to all living forms and also cause environmental pollution. To shift towards eco-friendly alternatives, bioderived pigments are option. These pigments can be extracted from natural sources such as plants and microorganisms and these pigments offer a promising solution to reduce the environmental footprint, their widespread adoption is hindered by challenges like low yield, poor colour fastness, and inconsistent shades. This review delves into the innovative use of these natural pigments, not only as dyes but also as precursors for producing non-toxic nanoparticles, particularly silver nanoparticles, through a "green synthesis" approach. This review also explores how these pigment-derived nanoparticles can enhance the textile dyeing process by improving colour fixation and imparting new functionalities, such as antimicrobial and UV-protective properties, to fabrics. Furthermore, the review extends beyond textile applications to highlight the significant role of these nanoparticles in bioremediation, where their unique properties, including high surface area and catalytic activity, make them effective agents for degrading pollutants and cleaning up industrial wastewater. By showcasing the dual potential of bioderived pigments, this study emphasizes a sustainable, multi-faceted approach to valorizing natural resources, paving the way for a more circular economy in both the textile and environmental sectors.

Keywords: Bioderived pigments, Textile industry, Antibacterial, Silver nanoparticle, Bioremediation