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MICROBIAL BIOREMEDIATION OF SYNTHETIC TEXTILE DYES AND FUTURE PROSPECTS OF BIOPIGMENTS: A SYSTEMATIC REVIEW

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Abstract

Synthetic dyes are widely used in textile industries by replacing the natural dyes from the 19th century for their easy synthesis and vivid color properties. However, in recent times, synthetic dyes have become more resistant to degradation and hazardous to the environment and living beings due to their property of generating toxic compounds. Currently, the bioremediation of synthetic dyes using microorganisms is gaining more attention worldwide. Microorganisms such as *Aspergillus* sp., *Bacillus* sp., *Pseudomonas* sp.*, and Actinomycetes* sp. are very effective in dye degradation. Bacterial enzymes including laccase, azoreductase, and lignin peroxidase are capable of effectively degrading textile effluents. Prominent degradation was also achieved by using Genetically Modified Organisms (GMOs), biosurfactants, and nanoparticles. There is a need to develop alternatives to synthetic dyes. Natural dyes from plants and microbes could be a better choice to protect the environment and the ecosystem. Microorganisms are not only used for dye degradation, but they also produce bio-pigments, which are non-toxic with antimicrobial, anticancer, and antioxidant properties. Currently, biopigments from microorganisms have been used in textile dyeing, food coloring, and pharmaceutical products. This review summarizes the importance of microbial biodegradation of textile effluents using microbial enzymes, biosurfactants, advanced techniques, and the future prospects of using bio-pigments as an alternative to synthetic dyes.

Key words: bio-pigment, biosurfactant, enzymatic degradation, microbial degradation, nanoparticle

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