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A Review on The Antimicrobial Properties of Bacterial Metabolites from Serratia spp. As Dye Material on Textile

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Structured Abstract

Background: Natural dyes from plants, fruits, and animals were used in textiles until the mid-18th century. Synthetic dyes, developed during the Industrial Revolution, replaced them due to their affordability, stability, and incredibly vibrant colors. However, synthetic dyes cause environmental and health problems, including water pollution and mutations. Since the late 20th century, there has been a renewed interest in natural dyes, especially microbial dyes from bacteria, fungi, and algae. These dyes are environmentally friendly, biodegradable, and offer unique colors and bioactive properties, such as antimicrobial activity, UV protection, and pleasant scents.

Problem statements: Natural dyes have gained interest for their potential to reduce microorganism transmission in textiles. Microbial dyes, such as prodigiosin from *Serratia* spp., are a promising alternative to synthetic dyes. While prodigiosin is widely extracted, its low yield limits its use in textile dyeing. Furthermore, *Serratia* spp. are commonly found in soils, water, and moist environments. Despite the potential, the antimicrobial properties of prodigiosin in textiles are not well-documented, necessitating further review of its effectiveness during human contact. This review explores *Serratia* spp. as a promising microbial source for textile dyeing applications specifically focusing on producing prodigiosin pigment in mass production and its antimicrobial properties.

Results: Recent studies show that optimizing bioprocess conditions and substrates can significantly boost prodigiosin yields. Using bioreactors, the one-factor-at-a-time (OFAT) approach, and the Box-Behnken design (BBD) for fermentation optimization has led to high yields. Prodigiosin has strong antimicrobial properties, inhibiting bacteria and fungi, making it an eco-friendly alternative to synthetic dyes. Prodigiosin-dyed fabrics effectively inhibit harmful bacteria like Staphylococcus aureus, suggesting potential for hospital textiles and skin health applications.

Conclusion: The study concludes that prodigiosin by *Serratia* spp. shows potential to substitute synthetic dyes as dye material on textile industry by enhancing the yield of prodigiosin. Additionally, the effectiveness of prodigiosin from *Serratia* spp. on textiles has been evaluated, particularly highlighting its antimicrobial activity. These findings support the potential of prodigiosin as a sustainable and eco-friendly alternative in the textile industry, combining both functional and environmental benefits.

Keywords: *Serratia* spp., microbial dye, prodigiosin, antimicrobial activity, textile application

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