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Antibiofilm Activity of *Senna alata* Against Pathogenic Bacteria and Fungi

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Structured Abstract

Background: Biofilms are complex microbial communities encased in extracellular polymeric substances, posing significant health risks due to their resistance to conventional treatments and their role in various infections, including those linked to medical devices and tissues. Biofilm formation involves several steps: bacterial attachment, growth, maturation, detachment, and redevelopment. These biofilms can be difficult to eradicate with traditional antibiotics, leading to persistent infections and contributing to antibiotic resistance. *Senna alata*, a medicinal plant traditionally used for its antibacterial and antifungal properties, offers a potential natural solution to inhibit biofilm formation by pathogenic bacteria and fungi.

Methods: The research commenced by converting *Senna alata* leaves into a powdered form, followed by extraction using 95% ethanol. Pathogenic bacteria (*E. coli, S. aureus, S. mutans, S. typhi*) and fungi (*C. albicans, C. utilis*) were subcultured and then inoculated onto Congo red agar to identify biofilm producers. Inhibition assays were performed on both initial and pre-formed biofilms. For initial biofilm formation, bacteria and fungi were exposed to the *S. alata* extract immediately after inoculation. For pre-formed biofilms, established biofilms were treated with the extract. Biofilm formation and inhibition were assessed through pellicle assays and optical density measurements at 570 nm.

Results: The study found that *S. alata* extract significantly inhibited the biofilm formation of the tested microorganisms. The inhibition of initial biofilm formation was more pronounced than that of pre-formed biofilms, suggesting the extract's potential as a preventive measure. Among the pathogens, *E. coli* was the strongest biofilm producer, followed by *S. aureus, S. mutans, S. typhi,* and *C. albicans*. The extract showed potent antibiofilm activity, particularly against the initial formation stages, indicating its efficacy in disrupting early biofilm development.

Conclusion: In conclusion, these findings suggest that *Senna alata* could be a valuable natural agent in addressing biofilm-associated infections, antibiotic resistance, and environmental contamination. The significant antibiofilm activity observed, especially during the initial formation stages, highlights its potential for preventive applications. Continued research is essential to further explore the extract's applications, efficacy, and mechanisms of action, paving the way for improved healthcare and environmental practices.

Keywords: Biofilm, Antibiofilm activity, *Senna alata*, Congo red assay, Pellicle assay

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