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Antimicrobial Activity of Biodegraded Amoxicillin using *Aspergillus tamarii* against *Escherichia coli* and *Staphylococcus aureus*

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Structured Abstract

Background: Antibiotic pollution in the environment has emerged as a critical issue, leading to the rise of antibiotic-resistant microorganisms. This poses a significant threat to both human health and ecological balance. The focus of this study is to investigate the potential of the filamentous fungus *Aspergillus tamarii* in biodegrading amoxicillin, a common β-lactam antibiotic, through enzymatic processes. The aim is to evaluate the effectiveness of *A. tamarii* in degrading amoxicillin and to assess the reduction in antimicrobial activity of the degraded antibiotic against *Escherichia coli* and *Staphylococcus aureus*.

Methods: The study employs batch fermentation techniques to culture *A. tamarii* in an amoxicillin-rich medium. The process involves monitoring the degradation of amoxicillin over time. The antimicrobial activity of the degraded antibiotic is compared with non-degraded controls to assess any reduction in effectiveness. Morphological observations are made to track changes in the fungal culture, and statistical analyses are conducted using Minitab Statistical Software. These analyses are crucial to determine the significance of the changes in amoxicillin concentration over the experimental period.

Results: Preliminary results indicate a statistically significant reduction in the dry weight of fungal biomass over time, suggesting that *A. tamarii* is effective in biodegrading the antibiotic. The reduction in amoxicillin concentration is accompanied by a corresponding decrease in its antimicrobial activity against both *Escherichia coli* and *Staphylococcus aureus*. This suggests that the enzymatic processes of *A. tamarii* not only degrade the antibiotic but also diminish its ability to exert antimicrobial effects, indicating effective bioremediation.

Conclusion: This study highlights the potential of *Aspergillus tamarii* in biodegrading amoxicillin, offering an eco-friendly solution to manage antibiotic contamination in the environment. The significant reduction of amoxicillin showed its antimicrobial activity underscores the role of *A. tamarii* in the biodegradation process. These findings contribute to a better understanding of sustainable bioremediation strategies and provide a foundation for developing methods to combat antibiotic pollution. The research underscores the importance of exploring biological alternatives to address the growing issue of antibiotic resistance, thus promoting ecological balance and public health.

Keywords: Antibiotic pollution, Biodegradation, *Aspergillus tamarii*, Amoxicillin, Bioremediation

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