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Effect of Amoxicillin Biodegradation by Fungus *Aspergillus tamarii* and its Antimicrobial Activity

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Structured Abstract

Background: Amoxicillin biodegradation refers to the process by which microorganisms, such as fungi, break down the antibiotic amoxicillin into simpler, less harmful compounds. Amoxicillin is extensively used across multiple fields, including human medicine, agriculture, and aquaculture, due to its broad-spectrum antibacterial properties. However, the pervasive use of this antibiotic has led to significant ecological contamination and the development of antibiotic resistance, primarily due to the release of unmetabolized amoxicillin and its byproducts into aquatic environments. This contamination poses a threat to microbial ecosystems and necessitates effective biodegradation strategies.

Methods: This study investigates the potential of the fungus *Aspergillus tamarii* to enhance the degradation of amoxicillin. The primary objectives were to evaluate the antimicrobial activity of degraded amoxicillin and to monitor the growth rate of *Aspergillus tamarii* during the biodegradation process. Statistical analysis of variance (ANOVA) with a 95% confidence level was employed to assess the adequacy of the biodegradation assay. The results demonstrated a significant increase in fungal biomass over 192 hours of fermentation, indicating effective biodegradation activity.

Results: The study further explored the comparative antimicrobial activity of degraded versus non-degraded amoxicillin. It was found that the degradation process led to a marked decrease in the antibiotic's antimicrobial activity. The susceptibility tests revealed that *Staphylococcus aureus* (ATCC 25923) was the least sensitive to the degraded amoxicillin, while *Escherichia coli* (ATCC 10536) was the most susceptible. These findings highlight the potential of *Aspergillus tamarii* in reducing the antimicrobial potency of amoxicillin residues, thereby mitigating the risks associated with antibiotic resistance and environmental contamination.

Conclusion: In conclusion, this research provides valuable insights into the use of *Aspergillus tamarii* as a sustainable biodegradation agent for amoxicillin. The findings suggest that employing such fungal biodegradation methods could offer an effective and eco-friendly alternative for managing antibiotic pollution, ultimately contributing to environmental conservation and the reduction of antibiotic resistance.

Keywords: Amoxicillin, biodegradation, resistance, environmental

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