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Solid-state Fermentation for Production of Bio-coagulant on Rice Bran using *Candida utilis*, *Trichoderma* sp., *Phanerochaete chrysosporium* for Turbidity Removal

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Abstract

Solid-state fermentation is a microbial culture technique used to produce compounds and products of industrial interest. In this study, rice bran, a by-product of the rice processing industry, was used as a coagulant substrate for *Candida utilis*, *Trichoderma* sp., and *Phanerochaete chrysosporium* in solid-state fermentation (SSF). To the best of our knowledge, no study has reported the production of coagulants by *Trichoderma* sp. and *Candida utilis*. Moreover, no attempts have been made to utilize rice bran as a substrate for the production of coagulants in solid-state by these three microorganisms. Two different substrate proportions were used to produce natural coagulants. Bio-coagulants produced in this research were used to remove turbidity from the kaolin solution. The experiments were conducted with artificially turbid water and a conventional jar test apparatus. The

findings demonstrate that Substrate 2, distinguished by its lower water content, exhibited the highest turbidity removal efficiency compared to Substrate 1, which possessed higher water content. Moreover, *Trichoderma* sp. showed a maximum turbidity removal of 71%. While the maximum turbidity removal by the coagulants produced from *C. utilis* and *P. chrysosporium* was 59%. The microscopic observation of the microorganism's growth on rice bran substrate has also been performed. It was revealed that the three microorganisms fully colonized the substrate surface. Further optimization of the SSF process parameters is expected to achieve efficient turbidity reduction in wastewater. Copyright (c) 2026 IIUM Press. This work is licensed under a Creative Commons Attribution-NonCommercial 4.0 International License. <https://creativecommons.org/licenses/by-nc/4.0/>

Author keywords

Bio-Coagulant; Large-scale; Rice bran substrate; Solid-state fermentation; Turbidity removal

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Abstract