

Solid-State Fermentation of Sugarcane Bagasse using *Aspergillus Niger* Sp. for Cellulase Production

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Structured Abstract

Background: Sugarcane bagasse, a major agricultural byproduct of the sugar industry in Malaysia, is often underutilized and contributes to environmental pollution when improperly disposed. The conventional production of cellulase enzymes is expensive and highly dependent on imported resources, creating financial and environmental challenges. In response to these issues, this study explored the potential of utilizing sugarcane bagasse as a substrate for cellulase production via solid-state fermentation (SSF) using *Aspergillus niger* sp. The main objectives were to evaluate the effectiveness of sugarcane bagasse as a substrate for SSF, determine cellulase enzyme activity during fermentation, and identify the optimal fermentation duration for maximum enzyme yield. The study involved preparing dried, ground sugarcane bagasse, inoculating it with *A.niger* sp., and fermenting under controlled conditions. Enzyme activity was measured using the filter paper method over a 9-day period at intervals of 1, 3, 5, 7, and 9 days.

Methods: The method involved washing, drying, grinding, and sieving sugarcane bagasse, followed by fermentation using nine flasks with varying moisture contents (60%, 70%, and 80%) and spore inoculum volumes (0.5, 1.0, and 1.5 mL). The samples were incubated for up to 9 days at 30 °C, and cellulase activity was determined using the DNS method. Crude fibre analysis was also performed to assess lignocellulosic degradation.

Results: The results indicated that cellulase activity peaked on Day 3, particularly in Flask 5 with 70% moisture content and 1.0 mL inoculum, achieving the highest enzyme activity (0.184 U/mL) and the most significant crude fiber reduction (66.9%). Crude fiber decreased from 20% in raw bagasse to 6.62%, confirming substantial lignocellulosic degradation. However, crude protein analysis was not completed due to experimental limitations.

Conclusion: In conclusion, this study demonstrated that sugarcane bagasse is a viable, cost-effective, and sustainable substrate for cellulase production using SSF. It is recommended that future studies include crude protein analysis, optimizing additional parameters such as pH and temperature, and exploring pretreatment methods or co-cultures to enhance enzyme yields and the nutritional value of fermented bagasse for broader industrial applications.

Keywords: Sugarcane Bagasse, Cellulase Production, Solid-state Fermentation, *Aspergillus niger* sp., Crude Fibre Reduction