

Bioconversion of date palm leaf waste by a cellulolytic enzyme complex produced by *Aspergillus niger* under solid-state fermentation

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Abstract

Lignocellulosic biomass represents a sustainable resource for enzyme production, yet indigenous microbial diversity remains underexplored in Algeria despite abundant agricultural residues. The present study investigates the potential of locally filamentous fungi isolated from Bejaia (Algeria) for lignocellulosic biomass valorization through cellulolytic enzyme production. A total of 201 native fungal strains were screened for cellulolytic potential, among which five showed high endoglucanase, exoglucanase, and β -glucosidase activities, with *Aspergillus niger* AZ193 identified as the most efficient strain. Cellulase production was carried out under solid-state fermentation using locally abundant lignocellulosic wastes. Date palm leaves resulted in the highest enzyme activities (201.78 U/ml endoglucanase, 11.83 U/ml exoglucanase, and 23.84 U/ml β -glucosidase). The selected strain and substrate were further optimized using Response Surface Methodology, leading to a five-fold increase in endoglucanase activity (1000 U/ml) and significant enhancement of other cellulases. The crude enzyme efficiently hydrolyzed pretreated date palm leaves, releasing up to 18 mg/ml glucose within 72 h. These findings highlight *A. niger* AZ193 as a robust cellulase producer and date palm leaves as an underutilized substrate for sustainable biotechnological applications. Further research should focus on enzyme

purification, process scale-up, and integration into biorefinery applications for bioethanol production

Keywords: [biotechnological conversion](#), [date palm leaves waste](#), [optimization](#), [solid-state fermentation](#), [cellulase complex activity](#), [saccharification](#)

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