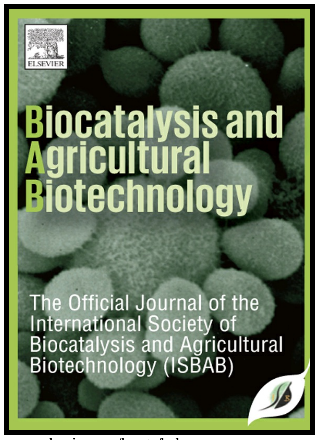

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Biofuels: Production of fungal-mediated ligninolytic enzymes and the modes of bioprocesses utilizing agro-based residues

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Abstract

The depletion of fossil fuels and rise in their global energy consumption and demand have had a major impact on the stability of the ecosystem and highlighted the need for efficient, sustainable, and renewable alternative sources of energy. Lignocellulosic biomass-based biofuels are highly advantageous due to their enormous supply in nature. Enzymatic bioconversion of lignocellulose polysaccharides into monomeric sugars has a higher efficiency than traditional chemical modes of action. Fungal-mediated ligninolytic enzymes offer even greater advantages in the bioconversion of lignocelluloses into simple sugars due to their thermostability, activity across a wide range of pH values, high specificity, and minimal by-products. This review, based on recent developments in the field of fungal-derived ligninolytic enzymes, discusses their mechanisms of action along with their production and the modes of bioprocesses involved as well as different techniques, such as heterologous gene expression, mutagenesis, and co-culturing, that enhance production and improve catalytic and stability properties.

Abbreviations

BGL, β-glucosidase; CE, carbohydrate esterase; CBHs, cellobiohydrolases; CDH, cellobiose dehydrogenase; CMC, carboxymethyl cellulose ; CMF, chelator-mediated Fenton; DNA, deoxyribonucleic acid; EGs, endo-β-1,4-glucanases; FPU, filter paper units; GH, glycoside hydrolase; NTG, N-methyl-N′-nitro-N-nitrosoguanidine; PCR, polymerase chain reaction; PMO, polysaccharide monooxygenase; SmF, submerged fermentation; SSF, solid-state fermentation; UV, ultraviolet.

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