

# Extremophiles in Bioprocessing: Biological Funnelling

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## ABSTRACT

Lignocellulosic residue is one of the biggest concerns for society. After harvesting of edible fraction, residual part mostly used as animal feed. However, the amplitude is too high to be managed by mere utilizing it as animal feed. In the same manner, it is also hard to store in agricultural fields for long hence stubble burning is commonly practiced which seriously affect the environment. In lignocellulosic bioethanol technology, the major issue is lignin and derivatives that remain after recovery of C5 and C6 fractions. It constitutes 15-40% of the lignocellulosic biomass on dry weight basis. Lignin and its derivatives exhibited antimicrobial activity which restrict the microbial activity on lignin fraction. Biological funnelling is the process that allow the conversion of lignin into high-valued organic compounds via “upper and lower pathway.” The extremophilic microorganisms have shown the potential to effective conversion. Alkalophilic and halotolerant *Bacillus ligniniphilus* L1 can transform lignin into vanillic acid and vanillin even at alkaline pH of 9. Similarly, thermophilic *Bacillus* sp. B1 can withstand at 60°C and can transform cinnamic acid, ferulic acid, and coumaric acid into catechol, protocatechuic acid, and gentisic acid. Laccase and laccase-mediator systems from *Bacillus* sp. SS4, *Thermobifida fusca*, and *Trametes trogii* can efficiently depolymerize lignin and transfor it to value added low-molecular weight phenolics and aromatics. Extremophiles have shown very high commercial potential with diverse product range.

**Keywords:** Lignin, Extremophiles, Enzymes, Commercial products.

## How to Cite

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