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EXPLORING THE BIOTECHNOLOGICAL POTENTIAL OF THERMOPHILIC BACTERIA - DERIVED PECTIN LYASES: A MINI-REVIEW

Marija Pavlović[1], Aleksandra Margetić[1], Marina Ristović[1], Sanja Stojanović[1], Stefan Nikolić[2], Zoran Vujčić[3] and **Marinela Šokarda Slavić**[1]

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Bacteria are an ideal source for producing pectin lyases (PNLs) due to their amenability to laboratory cultivation and genetic manipulation, which facilitates enhanced enzyme production. Predominantly originating from various thermophilic bacteria, bacterial PNLs usually exhibit alkaline properties, although cases of acidic variants have also been documented. In particular, a thermostable alkaline pectin lyase, displaying optimal activity at 60°C, has been characterized from the thermophilic bacterium *Brevibacillus borstelensis* P35. Similarly, thermostable acidic PNLs have been identified in *Geobacillus stearothermophilus* Ah22 and *Bacillus subtilis* SAV-21. Thermophilic bacterial species are emerging as significant and highly efficient sources, boasting diverse enzymatic repertoires, including pectinolytic enzymes, rendering them attractive candidates for various biotechnological applications. This mini-review focuses on the characterization of pectin lyases from a thermophilic bacterium, shedding light on its biochemical properties, substrate specificity, and potential industrial applications. Enzymes exhibit outstanding biochemical properties, with optimal pH and temperature ranges conducive to industrial processes, along with notable thermostability and pH tolerance, augmenting their suitability for diverse biotechnological endeavours. Furthermore, the enzyme demonstrates specificity towards pectin, efficiently cleaving glycosidic bonds within the polysaccharide backbone. Understanding the substrate specificity of pectin lyases is crucial for its effective utilization in industrial processes, especially considering its preferences for high-methoxylated pectin while still demonstrating activity on low-methoxylated and amidated pectins, expanding its applicability. Additionally, the synergy of pectin lyases with other pectinolytic enzymes enhances the efficiency of pectin degradation, facilitating the production of valuable products such as biofuels, dietary fibers, and oligosaccharides. The versatility and efficiency of pectin lyases from thermophilic bacteria highlight its potential for application across various biotechnological sectors, including food and beverage, textile, and pharmaceutical industries. Its capability to modify pectinaceous materials offers sustainable solutions for waste valorization and bioconversion processes.

KEYWORDS: thermophilic bacteria; pectin lyases; thermostable pectin lyase

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