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Microbial hydrolytic enzymes: In silico studies between polar and tropical regions

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Abstract

Enzyme is important as biocatalyst for industrial and biotechnological applications. Cold active enzymes have showed many advantages compare to mesophilic enzymes. Their cold active and thermolabile characteristics have shown potential benefits in many industries. In silico characterization of hydrolytic enzymes originated from polar and tropical regions was conducted. Amino acid sequences and molecular structures of mesophilic and psychrophilic bacterial enzyme homologues were compared thoroughly. Amino acid sequences from these two homologs do not showed any extraordinary differences. Overall, protein folds were highly similar when psychrophilic homologies were matched with mesophilic homologies. Active site residues located in catalytic domain of both psychrophilic and mesophilic enzymes were highly conserved. Thus, the hydrolytic mechanisms of these cold active enzymes still remain similar to mesophilic enzymes. However, the differences were indicated between these two enzymes at the substrate-binding sites. Cold active enzymes showed unique loop conformations and smaller side chains at the entrances. These characteristics provided larger active site of the enzymes. Larger entrance of active site was expected to stipulate substrates binding and products exiting with lower energy consumption. This part of the enzymes indicated one of the important features of cold active enzyme to work efficiently at lower temperature. Based on this in silico study, cold active enzymes have much more advantages compared to the mesophilic enzymes that made them valuable to be further researched and applied at industrial level.

Keywords

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