Characterization of thermostable aminoacylase from Geobacillus sp. strain SZN

ABSTRACT

Aminoacylase (EC 3.5.1.14) hydrolyzes N–acetylated amino acids to produce amino acids. Although thermostable aminoacylase has been commercially produced since 2004, there was a knowledge gap in the field of understanding aminoacylase thermostability from a structural point of view. This study investigated the physical and structural properties of the purified thermostable aminoacylase SZN. The spectropolarimetry data for structural determination has indicated a gradual decrease of α-helix from 36 to 27.6%, followed by tremendous disorientation of the structure at the transition of temperatures from 60 to 70°C (27.6 to 19.5%). In contrast, the percentage of β-sheet has increased steadily over the tested temperatures. The α-helix, where notable metal binding and catalytic residues are located, was totally weakened at temperatures above 70□C, thus resulted in loss of activity. The loss of the α-helical structure could further explain drastic deterioration of activity at temperatures beyond 70□C. The activity of aminoacylase SZN was enhanced by divalent metal ions, such as Mn2+ and Cu2+, and inhibited by detergent Triton-X-100. As a conclusion, the isolated aminoacylase SZN was characterized as a thermostable enzyme based on the α-helical structure integrity and functional stability in high temperatures. This enzyme could be used as an alternative enzyme for bioindustries in view of its activity enhancement in high temperatures and stability in various tested inhibitors.

Keyword: Aminoacylase; Geobacillus sp.; Secondary structure; Thermostable enzyme; A-helix