

**The effect of N-terminal domain removal towards the biochemical and structural features of a thermotolerant lipase from an Antarctic *Pseudomonas* sp. strain AMS3**

ABSTRACT

Lipase plays an important role in industrial and biotechnological applications. Lipases have been subject to modification at the N and C terminals, allowing better understanding of lipase stability and the discovery of novel properties. A thermotolerant lipase has been isolated from Antarctic *Pseudomonas* sp. The purified Antarctic AMS3 lipase (native) was found to be stable across a broad range of temperatures and pH levels. The lipase has a partial GlutathioneS-transferase type C (GST-C) domain at the N-terminal not found in other lipases. To understand the influence of N-terminal GST-C domain on the biochemical and structural features of the native lipase, the deletion of the GST-C domain was carried out. The truncated protein was successfully expressed in *E. coli* BL21(DE3). The molecular weight of truncated AMS3 lipase was approximately ~45 kDa. The number of truncated AMS3 lipase purification folds was higher than native lipase. Various mono and divalent metal ions increased the activity of the AMS3 lipase. The truncated AMS3 lipase demonstrated a similarly broad temperature range, with the pH profile exhibiting higher activity under alkaline conditions. The purified lipase showed a substrate preference for a long carbon chain substrate. In addition, the enzyme activity in organic solvents was enhanced, especially for toluene, Dimethylsulfoxide (DMSO), chloroform and xylene. Molecular simulation revealed that the truncated lipase had increased structural compactness and rigidity as compared to native lipase. Removal of the N terminal GST-C generally improved the lipase biochemical characteristics. This enzyme may be utilized for industrial purposes.

**Keyword:** Microbial enzyme; N-terminal domain; Biochemical characterization; Insilico; Lipase; Antarctic