

## **Thermostable lipases and their dynamics of improved enzymatic properties**

### **ABSTRACT**

Thermal stability is one of the most desirable characteristics in the search for novel lipases. The search for thermophilic microorganisms for synthesising functional enzyme biocatalysts with the ability to withstand high temperature, and capacity to maintain their native state in extreme conditions opens up new opportunities for their biotechnological applications. Thermophilic organisms are one of the most favoured organisms, whose distinctive characteristics are extremely related to their cellular constituent particularly biologically active proteins. Modifications on the enzyme structure are critical in optimizing the stability of enzyme to thermophilic conditions. Thermostable lipases are one of the most favourable enzymes used in food industries, pharmaceutical field, and actively been studied as potential biocatalyst in biodiesel production and other biotechnology application. Particularly, there is a trade-off between the use of enzymes in high concentration of organic solvents and product generation. Enhancement of the enzyme stability needs to be achieved for them to maintain their enzymatic activity regardless the environment. Various approaches on protein modification applied since decades ago conveyed a better understanding on how to improve the enzymatic properties in thermophilic bacteria. In fact, preliminary approach using advanced computational analysis is practically conducted before any modification is being performed experimentally. Apart from that, isolation of novel extremozymes from various microorganisms are offering great frontier in explaining the crucial native interaction within the molecules which could help in protein engineering. In this review, the thermostability prospect of lipases and the utility of protein engineering insights into achieving functional industrial usefulness at their high temperature habitat are highlighted. Similarly, the underlying thermodynamic and structural basis that defines the forces that stabilize these thermostable lipase is discussed.

**Keyword:** Thermostable lipases; Biocatalyst; Dynamics; Enzyme properties