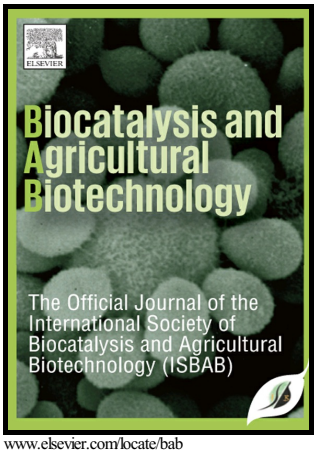

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Catalase Enzyme: Application in Bioremediation and Food Industry

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Abstract

The enzyme catalase is known to catalyse the breakdown of hydrogen peroxide into oxygen and water. Hydrogen peroxide metabolism is mainly regulated by this enzyme. Catalase is a common enzyme found in nearly all living organisms. It has one of the highest turnovers of all enzymes as it has the capacity to decompose more than one million molecules of hydrogen peroxide, per molecule of enzyme. Catalase has been used as an important enzyme in many biotechnological areas including bioremediation. This paper gives a review of its use and application in the field of bioremediation as an indicator of hydrocarbon degradation in soil (an important aspect in bioremediation of crude oil pollution), as a provider of oxygen in aerobic bioremediation process and in the removal of H_2O_2 from bleaching industry effluent and also its potential use in the food industry.

Keywords: Catalase; Hydrogen peroxide; Bioremediation; Food.

Introduction

Catalase (EC 1.11.1.6) enzyme is an oxidoreductase enzyme as it plays a crucial role in quenching the reactive oxygen species (ROS), i.e. hydrogen peroxide, often produced as a by-product of aerobic respiration (Beers and Sizer., 1952). Hence it acts as an antioxidant and protects the cell against oxidative stress (Abbott et al., 2009, Kirkman et al., 1987). The enzyme is found in a wide range of aerobic and anaerobic organisms. Catalase has one of the highest turnover number as one molecule of enzyme hydrolysing over a million molecules of the substrate i.e. hydrogen peroxide per second. New applications for catalases are constantly emerging thanks to their high turnover number (Lončar and Fraaije 2015, Zamocky et al., 1999), distinct evolutionary origin, reasonably simple (Alptekin et al. 2008) and well-defined reaction mechanisms (Baeza et al., 2013).

The basic mechanism of the working of this enzyme involves the breakdown and subsequent breakdown of the reactive oxygen specie i.e. hydrogen peroxide (H_2O_2) into oxygen and water thus relieving the oxidative stress caused by this substrate as depicted in the following reaction (Barynin et al., 2001).