Chapter 25

An overview of enzyme technology used in food industry

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1. Basic considerations on enzymes

Humans have been harnessing the power of different enzymes to perform a variety of applications for thousands of years. Enzymes have played an essential part in general human health and nutrition as well as in some food processes. Enzymes assist in meat tenderization and facilitate the fermentation processes during beer, yogurt, cheese, and leavened bread production. Generally, enzymes are biological catalysts that are produced by all living cells for specific chemical reactions. Although enzymes are produced inside living cells including microorganisms, plants, animals, and human, they can also be extracted from cells which make them significant biocatalyst for various industrial processes. They are characterized by a significant competency and specificity which convert specific substrates, set of reactants on which enzymes work on, into specific products (Fernandes, 2019). A number of factors affect the rate of an enzyme's reactions, such as concentration, pH, and temperature. Enzymes therefore function best within a particular pH and temperature ranges and suboptimal environmental conditions can reduce the ability of enzyme to bind to its substrate. Enzymes are generally named according to its substrate that they modify (i.e., lactase and urease) or the type of reaction they carry out (i.e., alcohol dehydrogenase) by appending −*ase* with some of them have arbitrary names (i.e., bromelain and rennin). The International Union of Biochemistry and Molecular Biology have established a systematic naming for enzymes that relies on a numerical classification scheme, known as Enzyme Commission Number (EC Number), to identify them (Robinson, 2015). Based on the EC number, enzymes are classified into six functional classes rendering to the type of reaction they catalyze. These classes are oxidoreductases (EC 1), transferases (EC 2), hydrolases (EC 3), lyases (EC 4), isomerases (EC 5), and ligases (EC 6).

2. Implementation of enzymes in food processing

Food processing can be defined as any method used to convert raw food materials or fresh foods into food products for consumption by humans or animals. Food processing is a crucial component in the food supply chain and developing efficient food processing technologies can contribute to the sustainability of food production and food value chain (Monteiro et al., 2010). Food processing areas are getting a great deal of success with the support of biological agents for the efficient manufacturing of marketable food products. Enzymes are new alternatives to chemical or mechanical approaches for increasing yield, process, and quality performance in the food processing industries. The usage of enzymes in food makings is an ancient procedure. With technological advancement, many new enzymes with novel properties, broader range of industrial applications, and specificity have been established and new application areas are still being discovered (Raveendran et al., 2018).

The past of the food industry discloses the efficiency of enzymes in food processing related to their specificity and catalytic performance. The first evidence of the applications dates back to around 6000 BCE and includes brewing of beer, cheese, bread, and wine preparation followed by vinegar production (Vasic-Racki et al., 2006). Since then, the trend for the