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Opinion Article

Protease Enzyme and its Applications

Alyssa Conanain*

Department of Biotechnology, North Carolina State University, Raleigh, USA

DESCRIPTION

A protease is an enzyme that catalyses (increases reaction rate) proteolysis, allowing the breakdown of large protein chains into smaller pieces by breaking the peptide bonds that connect amino acid residues. Some exopeptidases (such as aminopeptidases and carboxypeptidase A) remove the protein chain's terminal amino acids, whereas others attack the protein's internal peptide bonds (endopeptidases, such as trypsin, chymotrypsin, pepsin, papain, elastase). Papaya and pineapple are the best food sources of proteolytic enzymes. Aspartic, glutamic, and metallo-proteases activate a water molecule, which then attacks the peptide bond with a nucleophilic attack to hydrolyze it.

Classification

1. Serine proteases
2. Cysteine proteases
3. Threonine proteases
4. Aspartic proteases
5. Glutamic proteases
6. Metalloproteases
7. Asparagine peptide lyases

Proteases have also found more specialized uses in the purification of non-protein compounds from animal or plant extracts, such as carbohydrate gums and mucopolysaccharides extraction. Proteases can be utilized to solubilize keratin compounds in order to transform waste items like feathers into protein concentrates that can be used in animal feeds. Streptomyces species have an alkaline protease with significant keratinolytic activity. Plant proteases such as papain and bromelain, as well as B. subtilis neutral protease, are good tenderizers. Proteases are also used in the recovery of silver from traditional gelatin-containing photographic film, such as X-ray film, and in the liquefaction of industrial and domestic organic waste. Proteases can also be used as digestion aids by humans and animals. Proteases play several roles in biosystems, including biochemical, physiological, and regulatory aspects of cells and organisms. Proteases denote the largest sector of the industrial enzyme market where they are used in detergents, in food processing, in leather and fabric upgrading, as catalysts in organic synthesis, and as therapeutics. Traditional screening, mutation/ selection procedures, and genetic engineering have been used to create microbial protease overproducing strains, while site-directed mutagenesis and directed evolution have been used to construct entirely new enzymes with changed specificity or stability. Chemical use in various industries around the world has skyrocketed, posing a serious threat to people's health. For the betterment of life on the earth, the contemporary world seeks to replace these poisonous chemicals with environmentally beneficial alternatives. Scientists have been working to establish enzymatic processes in the spite of chemical processes.

Various enzymes, particularly microbial proteases, are widely employed in a variety of industries, including textiles, detergents, leather, feed, trash, and others. Proteases play a critical role in both physiological and commercial functions. Proteases are found in plants, animals, and microorganisms because they conduct both synthetic and degradative roles. Bacillus sp. is the most economically utilized protease producer among the diverse microorganisms. Proteases have proven to be a successful alternative to chemicals and an environmentally benign signal for nature or the environment. The evolutionary relationship between acidic, neutral, and alkaline proteases has been studied using their protein sequences, but there remains a lack of information that regulates the diversity in their specificity. Researchers are looking for microbial proteases that can survive extreme circumstances, have mechanisms to avoid autoproteolytic activity, have a stable pH, and are substrate selective.

Correspondence to: Dr. Alyssa Conanain, Department of Biotechnology, North Carolina State University, Raleigh, USA, E-mail: AndresSalcedo@edu.com

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