CHAPTER 18

Protease Inhibitors in Food Processing

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18.1. Introduction

Food technology is a market-driven activity. The current generation of food technologists is looking for added value for the consumer, better profit margins, and more efficient utilization of resources. Enzymatic modification of food proteins has an important role in the food industry with respect to both traditional and high technology food processing as well as food spoilage. The study of proteolysis in foodstuffs by food scientists and nutritionists has been a major area of research activity in food technology. Ancient traditional arts such as brewing, cheese making, meat tenderization with papaya leaves and condiment preparation (e.g., soy sauce and fish sauce) rely on proteolysis, albeit the methods were developed prior to our knowledge of enzymes. Early food processes involving proteolysis were normally the inadvertent consequence of endogenous or microbial enzyme activity in the foodstuff. The idea of adding exogenous enzymes to improve existing reactions or to create new products dates to early in the 20th century, and became a significant part of food processing in the 1960's.[1] Protein modification by enzymes yields products with improved nutritional, functional and organoleptic properties, and aids a variety of processing operations. Proteinases are used by the food industry to control viscosity, elasticity, cohesion, emulsification, foam stability and whipability, flavor development, texture modification, nutritional quality, solubility, digestibility and extractability. Applications include processes for meat flavor development and tenderization, continuous bread making and modification of cracker and cookie texture, malt supplementation and chill-proofing in the brewing industry, and hydrolysis of protein gels to lower viscosity for concentration or filtration.[2] The desired degree of hydrolysis (DH), or percentage of peptide bonds hydrolyzed, varies considerably with the different food processing operations. Some proteolytic processes, such as for bouillon from soy protein or fish sauce from whole fish, require a DH close to 100%. In contrast, in many food processing operations there is a balancing act in which just enough, but not too much protein hydrolysis must be achieved.[3-5] Among enzymatic food protein modifications, "limited hydrolysis" is a technique receiving considerable attention because it can yield products with improved properties and added value.

Protein hydrolysis is achieved by enzymes collectively called proteases. Enzymes hydrolyzing peptide bonds in the interior of the amino acid chain are called proteinases (or endopeptidases, or endoproteases) and belong to the IUB groups EC 3.4.21-24. Proteases hydrolyzing peptide bonds at either the amino- or carboxy-terminal end of the protein are called exopeptidases (or exopro- teases, or simply peptidases) and belong to the groups

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