

Review Article

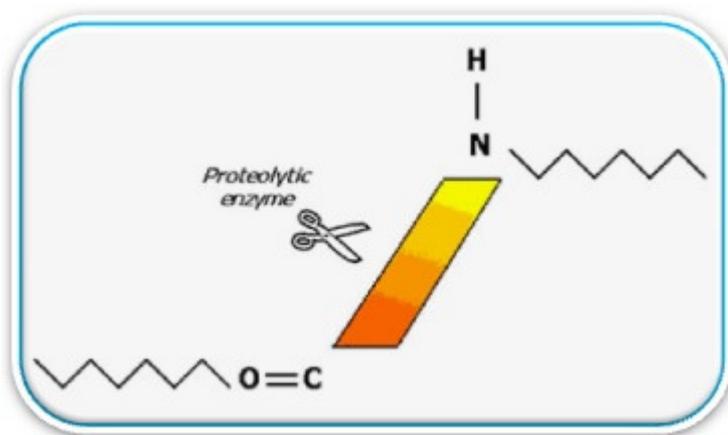
EXTRACTION OF PROTEIN BY ENZYMATIC HYDROLYSIS

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Controlled Enzymatic Hydrolysis has been used to produce protein isolates, Enzymatic hydrolysis of the byproducts is the effective method of protein recovery from animal and fish processing industries (Bhaskar *et al.*, 2008). The isolate is mostly used for production of dried nutritional, flavouring and emulsifying ingredients. In the hydrolysis process, only a minimum amount of water is added and temperature is raised to activate (55-60°C) the enzymes. By using different enzymes and by controlling temperature, time and pH, different end-products can be produced.

Methods:



- Rapid Autolytic Method by Endopeptidases (Acid and Alkaline proteases).
- Exogenous Enzymatic Hydrolysis by Exopeptidases (Pepsin, Bacterial proteases, Pancreatic-trypsin, Alcalase, Bromelin, Papain, Pancreatin).

Rapid Autolytic Method:

Principle: Viscera of animals are not only the rich source of protein and also the Proteolytic enzymes. Lysosomal Proteases (Cathepsin D) and Aspartic proteases were activated at acidic pH which have of proteolytic activity for wide range of protein substrates including actomyosin dissociating into LMW fragments.

Mechanism: Optimum pH (pH-2.8) for action of Pepsin and Cathepsins (Bohak,1969) coincides where maximum autolysis occurs which converts 87% of tissue proteins into LMW peptides (<10kDa) (Jamdar and Harikumar, 2008).

Process: Muscle homogenate was adjusted to pH from 6.8 to 2.8 and incubated at 55°C for 6 hrs with stirring at 150 rpm. Residual enzyme activity avoided by Ultra filtration after 6 hrs. (Jamdar and Harikumar,2008).

Advantages:

- Very high yield of Nutritional Protein than which is of dietary.
- High Protein and High Nitrogen
- Contains all Essential Amino acids
- Soluble
- Two-log cycle reduction in Aerobic and Coliform count

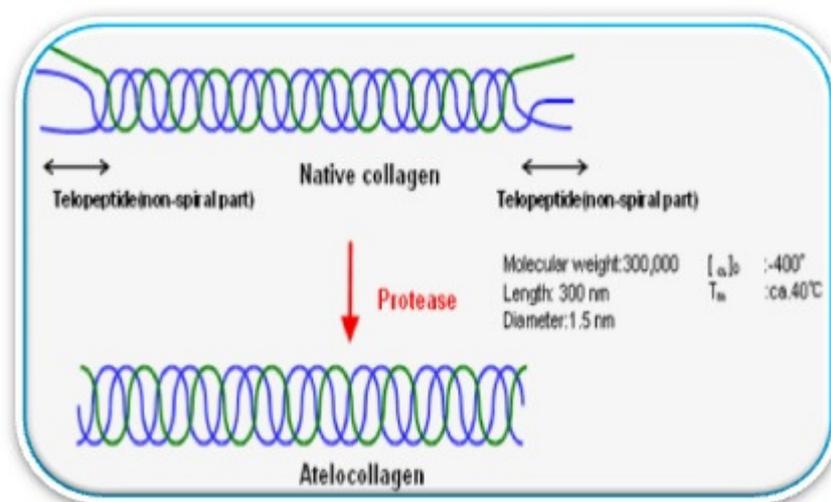
Disadvantages:

- Low emulsification activity index and emulsion stability due to extensive hydrolysis.

Exogenous Enzymatic Hydrolysis

Alcalase- Maximal hydrolysis at pH 7.5 for blood proteins at temp-58.8°C for 72 hrs (Raul *et al.*, 2011).

Pepsin –Chicken head pH-1.5 at 55° C for 72 h



Pepsin-Telopeptide free collagen pH-8.2 at 4° C for 48 hr

Atelocollagen is a collagen solubilized by protease, but its physical properties are virtually identical to those of natural, unsolubilized collagen. Furthermore, atelocollagen additionally has superior characteristics; Atelocollagen is a highly purified type I collagen of calf dermis with protease treatment. A collagen molecule has an amino acid sequence called a telopeptide

at both N and C termini, which confers most of the collagen's antigenicity. Atelocollagen obtained by protease treatment is low in immunogenicity because it is free from telopeptides. Atelocollagen is generally obtainable with a high degree of purity. This feature is due to the protease treatment, which when used to extract atelocollagen breaks down other protein contaminations. Atelocollagen is biodegradable. Therefore, atelocollagen is used in a variety of fields such as medicine, medical devices and cosmetics as a raw material, and research in cell culture.

Advantages and Disadvantages: Great emphasis has been placed on developing enzymatic hydrolysis methods for production of fish protein-based food ingredients. However, as the process does not remove prooxidants and pigments, the isolates are often rancid and dark coloured. Also, peptide formation yields bitterness and the high temperature used in the enzyme inactivation step denatures the sensitive proteins which destroy their functionality (Lanier, 1994). Today, the few commercially available enzymatically produced protein concentrates have found limited use due to poor product quality, lack of functionality and a rancid odour/taste.

References

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