

Review Article
ANIMAL AND PLANT PROTEINS EXTRACTION

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Huge efforts have been made in extracting proteins from various sources for food applications. So far, proteins from two major sources (milk proteins and soy protein) are most widely used in the food industry, either as a general nutrients supply or as functional ingredients. Milk proteins (e.g., whey proteins or caseins) are probably the most commonly used proteins in all major types of food products (Fox and McSweeney, 1998). As from non-animal source, soy protein becomes increasingly used in food products because of its health benefits and characteristic physico-chemical properties (Endres, 2001; Hoogenkamp, 2005). Proteins from other sources have also been studied for their functionality and potential food applications. Examples include corn protein (Myers *et al.*, 1994), wheat protein (Hettiarachchy and Ziegler, 1994), rice protein (Morita *et al.*, 1996), seaweed protein (Fleurence, 1999), protein from yeast (Ganeva and Galutzov, 1999), fish protein (Afonso *et al.*, 2004), etc. However, the applications of these proteins were still very limited, either due to the limited source of supply or the non-satisfactory functionality.

Principles of protein extraction:

Most of the protein extraction principles are based on factors that affect the solubility of proteins

Factors affecting protein solubility:

- Protein solubility as affected by pH:

Table 1: Protein extraction methods

Protein solubilization techniques:	Precipitation of proteins techniques:	Concentration of protein techniques:
➤ Acid/Alkaline solubilization process <i>(Hultin and Kelleher, 1999)</i>	➤ Iso electric precipitation <i>(Hultin and Kelleher, 1999)</i> ➤ Polyuronates -CMC, Alginates, Pectates. <i>(Imeson et al., 1978)</i>	➤ Extrusion <i>(Mittal and Lawrie, 1984)</i> ➤ Fibre spinning ➤ Ultrafiltration ➤ Freeze drying
➤ Salting in	➤ Salting out	➤ Extrusion ➤ Fibre spinning ➤ Ultrafiltration ➤ Freeze drying
➤ Controlled hydrolysis by enzymes <i>(Back and Cadwallader, 1995)</i>	➤ Isoelectric precipitation	➤ Extrusion ➤ Fibre spinning ➤ Ultrafiltration ➤ Freeze drying

- As pH changes certain groups (eg. Asp, Glu, Lys, His, Arg, Try) go from neutral to charged, or from charged to neutral.
- Alters surface charges & interactions with water.

- Protein solubility as affected Ionic strength:

Salts affect protein surface charges & interact with water.

- Salting in (adding salt increases protein solubility).
- Salting out (adding salt decreases protein solubility).

- Polar solvents.

- eg. polyetheleneglycol (PEG) soaks up water.

The above said methods extract the proteins in its native functional form

- Temperature

Thermodynamic factors influence solubility

- Controlled Hydrolysis by use of Endogenous or Exogenous enzymes

REFERENCES

- [1] Afonso, M.D., J. Ferrer and R. Borquez, 2004. An economic assessment of proteins recovery from fish meal effluents by ultrafiltration. *Trends in Food Science and Technology*, 15: 506–512.
- [2] Endres, J.G., 2001. Soy protein products: Characteristics nutritional aspects and utilization. Campaign, IL: AOCS Press.
- [3] Fleurence, J., 1999. Seaweed proteins: Biochemical, nutritional aspects and potential uses. *Trends in Food Science & Technology*, 10: 25–28.
- [4] Fox, P.F. and P.L.H. McSweeney, 1998. Dairy chemistry and biochemistry. Blackie Academic & Professional, London.
- [5] Ganeva, V. and B. Galutzov, 1999. Electropulsation as an alternative method for protein extraction from yeast. *FEMS Microbiology Letters*, 174: 279–284.
- [6] Hettiarachchy, N.S. and G.R. Ziegler, 1994. Protein functionality in food systems. New York: Marcel Dekker.
- [7] Hoogenkamp, H.W., 2005. Soy Protein and Formulated Meat Products. CAB International, Wallingford, UK.
- [8] Morita, T., A. Ohhashi, S. Kasaoka, M. Ikai and S. Kiriyama, 1996. Rice protein isolates produced by the two different methods lower serum cholesterol concentration in rats compared with casein. *Journal of the Science of Food and Agriculture*, 71: 415–424.
- [9] Myers, D.J., M.P. Hojillaevangelista and L.A. Johnson, 1994. Functional-properties of protein extracted from flaked, defatted, whole corn by ethanol/alkali during sequential extraction processing. *Journal of American Oil Chemists Society*, 71: 1201–1204.