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Recent Advances in Processing and Packaging of Fishery Products: A Review

Ravishankar Chandragiri Nagarajarao*

Director, ICAR-Central Institute of Fisheries Technology (Indian Council of Agricultural Research, Govt. of India), Cochin 682 029 Kerala, India

Abstract

Health, nutrition and convenience are the major factors driving the global food industry. Fish products have attracted considerable attention as a source of protein, vitamins, minerals, fats and rank third among the food categories with fastest overall growth worldwide. As fish is highly perishable, proper processing and packaging helps in maintaining the quality of fish. Worldwide, an array of preservation techniques are followed, ranging from a simple chilled or ice storage to most recent and advanced high pressure and electromagnetic field application. Present article gives an insight into the recent advancements in the processing and packaging of fishery products.

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Keywords: Emerging technologies; fishery product; packaging; processing.

1. Introduction

Consumers demand high quality processed foods with minimal changes in nutritional and sensory properties. Alternative or novel processing technologies are being explored and implemented to provide safe, fresher-tasting, nutritive foods without the use of heat or chemical preservatives. Recent developments have improved techniques in

* Corresponding author. Tel.: +91 484 266 6880; fax: +91 484 266 8212.
E-mail address: cnrs2000@gmail.com; directorcift@gmail.com

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handling, product development, packaging, preservation and storage (Ahvenainen, 2003). To consumers, the most important attributes of a food product are its sensory characteristics. A goal of food manufacturers is to develop and employ processing technologies that retain or create desirable sensory qualities or reduce undesirable changes in food due to processing (Belcher, 2006).

Sea foods are highly perishable and usually spoil faster than other muscle foods. Freshly caught fish undergoes quality changes as a result of autolysis and bacterial activity. Extent of these changes with time determines shelf life of the product. Proper storage conditions are essential to prevent the spoilage of fish and fishery products. Many emerging technologies have the potential to extend the shelf life. Few of the emerging technologies that have application in fish processing are High Pressure Processing, Irradiation, Pulsed light technology, Pulsed Electric Field, Microwave Processing, Radio frequency, Ultrasoun, etc. Packaging technologies like Modified Atmosphere, Active and Intelligent packaging also plays an important role in fish preservation (Fellows, 2000; Da-Wen, 2005).

2. High pressure processing

High pressure processing (HPP) is an emerging and innovative technology that has a great potential for extending the shelf-life with minimal or no heat treatment (Tewari and Vijay, 2007). It is also effective in preserving the organoleptic attributes of many foods. High pressure Processing is a non-thermal technology in which the food product to be treated is placed in a pressure vessel capable of sustaining the required pressure and the product is submerged in a liquid, which acts as the pressure transmitting medium. Water, castor oil, silicone oil, sodium benzoate, ethanol or glycol may be used as the pressure transmitting medium. The ability of the pressure transmitting fluid to protect the inner vessel surface from corrosion, the specific HP system being used, the process temperature range and the viscosity of the fluid under pressure are some of the factors involved in selecting the medium (Hogan et al., 2005).

There are two general scientific principles of direct relevance to the use of high pressure in food processing. The first is Le Chatelier's Principle, which applies to all physical processes and states that, when a system at equilibrium is disturbed the system responds in a way that tends to minimize the disturbance. This means that HP stimulates reactions that result in a decrease in volume but opposes reactions that involve an increase in volume. Secondly, the Isostatic Rule states that pressure is instantaneously and uniformly transmitted throughout a sample under pressure, whether the sample is in direct contact with the pressure medium or hermetically sealed in a flexible package that transmits pressure. Pressure is transmitted in a uniform (isostatic) manner throughout the sample; the time necessary for pressure processing is therefore independent of sample size, in contrast to thermal processing (Hugas et al., 2002).

High-pressure processing holds the potential for preserving foods by combining elevated pressures (up to 900 MPa or approximately 9 000 atmospheres) and moderate temperatures (up to 120 °C) over a short period. Other advantages of the technology include uniform pressure application, minimal heat damage to food and potential for altering functional properties of foods. The possibility of extending shelf-life without heating the food for prolonged periods greatly helps to satisfy consumer demand for fresher and higher quality heat-sensitive foods that are otherwise difficult to process using conventional food preservation methods (Cheftel and Culioli, 1997).

Effects of HPP on microorganisms in surimi paste showed that all of the microbes were destroyed at 300 MPa to 400 MPa; fungi showed highest sensitivity to HPP, followed by Gram negative and Gram positive bacteria. In Japan, hydrostatic pressure has been used to induce the gelation of different kinds of surimi from pollack, sardine, skipjack tuna and squid. When shrimp was pressure treated at different levels a shelf life extension of 15 d was possible in high pressure treated shrimp at 435 MPa compared with 5 d in untreated sample. Pressure level of 220 MPa and a 30 min holding time were optimal and most effective in prolonging the storage period of tuna muscle, as well as in reducing the proteolysis activity, texture degradation, TVBN and histamine formation. High pressure treatment of 250 MPa and 200 MPa enhanced shelf life of Indian white prawns [*Fenneropeneaus indicus* (H. Milne Edwards, 1837)] and Yellowfin tuna chunks, respectively (Hugas et al., 2002; Hogan et al., 2005) .