Non-thermal shelf-life extension technologies in plant-based food processing

Yupakanit Puangwerakul[1]*, Chitsuda Chaisakdanukul[1], Suvimol Soithongsuk[2], Surasak Sajjabut[3] and Wachiraporn Pewlong[3]

[1]Faculty of Food Technology, Rangsit University, Pathum Thani, Thailand
[2]Innovative Research and Incubation of Entrepreneur Center, Rangsit University, Pathum Thani, Thailand
[3]Thailand Institute of Nuclear Technology, Pathum Thani, Thailand
*Corresponding author, E-mail: yupakanit.p@rsu.ac.th

Abstract

The consumption of plant-based food can have a positive impact on health. Growing consumer demand for fresh and high-quality food products has led to increased interest in non-thermal technologies for the preservation of plant-based food products. Non-thermal food processing methods, such as irradiation by different methods and high pressure processing (HPP), have experienced a boom in recent years because they possess the capacity to destroy pathogens and microorganisms responsible for spoilage, thus meeting the requirements for food safety set by food authorities. This research aimed to study the effects of non-thermal processing, including HPP, gamma ray irradiation and electron beam irradiation, on the qualities of ready-to-eat, plant-based, hard-boiled eggs. This study provided important information for using non-thermal processing methods to extend the shelf-life of food products, thus leading to new market opportunities and the ability for producers to enter markets safely as well as serve as a database for making investment decisions. This research monitored the effects of radiation and HPP on changes in physical, chemical and microbial properties, including a sensory evaluation of plant-based, whole hard-boiled eggs. The shelf-life of the product by ASLT after treatment was also studied. The results showed that all forms of non-thermal processing used in this research could destroy the initial total aerobic bacteria, total yeast and mold, and Clostridium *perfringens*. However, HPP appeared to activate the germination of *Clostridium perfringens* spores, which caused a shorter shelf-life. Therefore, it is suggested to use 3.5 kGy of gamma ray or 5.0 kGy of EBI to extend the shelf life of whole hard-boiled eggs. HPP could also be combined with other processing techniques, such as HPP-assisted natural preservatives or pressure-assisted thermal sterilization, which is a FDA-approved technique.

Keywords**:** *Plant-based hard-boiled egg, Non-thermal food processing, HPP, EBI, gamma ray*