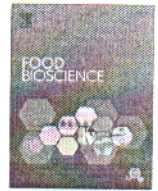


Contents lists available at ScienceDirect

Food Bioscience

journal homepage: www.elsevier.com/locate/fbio

The combined effect of ultrasound treatment and leek (*Allium ampeloprasum*) extract on the quality properties of beef

Ali Mehrabani^a, Ashkan Jebelli Javan^{a,*}, Mohammad Ali Hesarinejad^{b,*,**}, Ali Mahdavi^a, Mahnoosh Parsaeimehr^a

^a Department of Food Hygiene, Faculty of Veterinary Medicine, Semnan University, Semnan, Iran

^b Department of Food Processing, Research Institute of Food Science and Technology (RIFST), Mashhad, Iran

ARTICLE INFO

Keywords:

Leek extract
Proteolytic activity
Quality properties
Tenderization
Ultrasound-assisted enzyme treatment

ABSTRACT

One of the most important physicochemical properties of meat is its tenderness. The impact of Leek (*Allium ampeloprasum*) extract and ultrasound on meat quality and molecular weight distribution of *Longissimus lumborum* muscles was studied. Samples have been treated with ultrasound (100 and 300 W during 10, 20, and 30 min) and Leek-derived exogenous proteases (16.9 and 33.8U/g) simultaneously and separately. The combined effect of enzyme and ultrasound in 10 and 20 min increased the pH value. It was also increased the proteolytic activity of meat. Regarding meat quality, the filtering residues, cooking loss, shear force, and hardness were reduced; water-binding capacity, emulsion capacity, and emulsion stability were improved. The electrophoretic pattern of myofibrillar proteins showed the muscle fibers were severely degraded in the combined treatments. It can be concluded that this process could be used as an alternative to the chemical tenderizing agents in the meat industry.

1. Introduction

Meat is an essential component of the human diet, including high-quality protein, fatty acids, vitamins B, and trace elements. It contributes significantly to global food stability and nutritional wellbeing (Jiang & Xiong, 2016; Vahmani et al., 2020). It should be noted that meat is used in many food products for human consumption, so the physicochemical properties of fresh meat and its products are certainly of great importance (Owens, 2010). The molecular and biochemical properties of the proteins that make up muscle are responsible for the majority of the physicochemical properties of meat, which influence the actions of food products during processing, storage, and consumption. These properties are manifested by the reaction of proteins with other compounds such as water, ions, solvents, and other bioactive molecules such as lipids, sugars, or other proteins. Physicochemical properties influence the flavor, color, appearance, juiciness, texture, and tenderness of processed products, as well as their quality and organoleptic properties. Furthermore, these properties have an effect on many of the production processes, including cutting, grinding, mixing, emulsifying, and forming the substance (Owens, 2010; Sikorski, 2006). Through

improving and modifying the physicochemical properties of meat, new products can be created, waste can be reduced, and the characteristics of existing products on the market can be improved (Owens, 2010).

Traditional tenderizing technologies like ageing, chemical curing, and enzymatic hydrolysis have flaws that can be overcome with the hydrodynamic-pressure, high-pressure, pulsed electric field, ultrasound, and other mechanical technologies (Bhat, Morton, Mason, & Bekhit, 2018). Ultrasound is a cost-effective, non-invasive, green, physical, and non-thermal technique that can be used to improve the safety and quality of food (Awad, Moharram, Shaltout, Asker, & Youssef, 2012; Cao et al., 2021; Kang, Zhang, Lorenzo, & Chen, 2020; Turantas, Kılıç, & Kılıç, 2015). Ultrasound has mostly been used for curing, tenderizing meat products, and enhancing the properties of meat extracts in recent years. This novel technology has the potential to change the pH, color, water holding capacity, and microstructure of meat by chemical, biological, and mechanical effects (Alarcon-Rojo, Janacua, Rodriguez, Paniwnyk, & Mason, 2015; Demirdöven & Baysal, 2008; Wang, Majzoobi, & Farafnak, 2020). For several years, exogenous enzymes have been commonly used as meat tenderizers (Ashie, Sorensen, & Nielsen, 2002; Gereli, Ikauchi, & Suzuki, 2000; Kim & Joo, 2020). The

* Corresponding author.

** Corresponding author.

E-mail addresses: jebelli@semnan.ac.ir (A. Jebelli Javan), ma.hesarinejad@rifst.ac.ir, ma.hesarinejad@gmail.com (M.A. Hesarinejad).

<https://doi.org/10.1016/j.fbio.2022.101622>

Received 3 January 2022; Received in revised form 11 February 2022; Accepted 16 February 2022

Available online 19 February 2022

2212-4292/© 2022 Elsevier Ltd. All rights reserved.