Chapter 6
Foodborne Pathogen Inactivation by Cold Plasma Reactive Species

Linda Agun
Universiti Teknologi Malaysia, Malaysia

Chang Shu Ting
Universiti Tunku Abdul Rahman, Malaysia

Norizah Redzuan
Universiti Teknologi Malaysia, Malaysia

Santhana Krishnan
Universiti Teknologi Malaysia, Malaysia

Siti Sarah Safaai
Universiti Teknologi Malaysia, Malaysia

Zarita Zakaria
Universiti Teknologi Malaysia, Malaysia

Muhamad Nor Firdaus Zainal
Universiti Teknologi Malaysia, Malaysia

Mohd Fadthul Ikmal Misnal
Universiti Teknologi Malaysia, Malaysia

Norhayati Ahmad
Universiti Teknologi Malaysia, Malaysia

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ABSTRACT

Cold plasma is implemented in the food industry for protecting the agricultural product from foodborne pathogens. In this case, dielectric barrier discharge cold plasma pen (DBD-CP) was applied to study its efficiency in inactivation of bacterial on oyster mushroom. The surface of the fresh oyster mushroom was treated with 5 kV of AC voltage with variable of treatment times (0-4 min). Data showed sufficient energy by DBD-CPP has inactivated the existence of bacterial on the oyster mushroom surface with undetectable of bacteria colony. The reactive species generated by cold plasma undoubtedly irreversibly damage the deoxyribonucleic acid, ribonucleic acid, and enzymes of gram bacterial, which eventually causes cell death. Above all, an understanding of the microorganism cell structure, the food surface types, and roughness is an essential in manipulating cold plasma processing parameters to achieve the maximum rate of microbial inactivation.

INTRODUCTION

As the awareness of food safety and quality increases among consumers, demand for fresher, safer, and higher quality foods is increasing (Ji et al., 2018). High production and consumption of fresh crops, "ready to eat" such as vegetables and fruits, have resulted in the rise of agricultural associated foodborne outbreaks worldwide (Castro-Ibáñez et al., 2017). A wide range of fresh fruits and vegetables were implicated with foodborne diseases (FBD) due to the consumption of raw and minimally processed foods that do not meet the food safety and hygiene standard practices in a food supply chain (Shah et al., 2019). FBD caused either by infectious agents or their toxins that enter the body through the ingestion of food (Bayliss, 2012; Bastien et al., 2019). Viruses causing FBD attack cells of the digestive tract and propagate inside them subsequently they attack other cells of the digestive tract or enter other organs such as the liver or central nervous system and cause disease (Vasickova et al., 2005; O'Shea et al., 2019).

Several techniques were introduced to inactivate microorganisms during postharvest processing which includes the use of aqueous chemical sanitizers such as chlorine (Gabriel et al., 2016; Ramos et al., 2020) and organic acids (Sabillón et al., 2020), gaseous sanitizers (Rodríguez et al., 2017), non-thermal processing techniques such as high hydrostatic pressure, ozone and gamma irradiation, nanotechnology and electro-spraying of water (Atungulu et al., 2012; Neetoo & Chen, 2014). However, the use of these techniques have resulted in lower consumer acceptance, reduction in the nutritional values, affected the quality attributes of foods, increase the acid concentration and their reaction with organic matter can produce various