

水中プラズマを用いた野菜殺菌

Inactivation of Bacteria Adhering to Vegetables Using Discharge in Water

輝鉦昇¹⁾, 及川陸也¹⁾, 高橋克幸^{1,2)}, 高木浩一^{1,2)}, 青木仁史³⁾

Yusheng Hui, Rikuya Oikawa, Katsuyuki Takahashi, Koichi Takaki and Hitoshi Aoki

1)岩手大学,2)岩手大学次世代アグリイノベーションセンター

3)株式会社ニチレイフーズ研究開発部

1) Iwate University, 2) Agri-Innovation Center, Iwate University

3) Research and Development Division, Nichirei Foods Inc.

Introduction

Reactive oxygen species such as ozone produced by the discharges have high potential for inactivation of bacteria in solution [1]. Since fresh vegetables can be contaminated with bacteria at any time, the surface of them should be remediated by a sterilization treatment to avoid decay. In this paper, the effect of plasma treatment on inactivation of bacteria on fresh vegetables is evaluated.

Experimental setup

The discharge reactor used in this study has been described in the previous paper [2]. Room air is injected into the reactor with a gas flow rate of 15 L/min. Magnetic pulse compression (MPC) pulsed power generator is used to generate voltage approximately 10 kV in peak. Pulse width and repetition rate are 150 ns and 2000 pulse per second, respectively. Fresh broccoli are purchased from local market and used as the samples, which are put into the water in the reactor. The sterilization effect is evaluated by counting number of viable bacteria and coliform bacteria in solution and on the surface of broccoli using a colony-counting method with a plate count agar. Standard agar medium and pore media desoxycholate medium are used for counting viable bacteria and coliform, respectively.

Result

Figure 1 shows the number of viable bacteria in the solution as a function of treatment time. The number of viable bacteria increases to 2.5 log (CFU/mL) at treatment time of 15 s without discharge treatment because the bacteria is diluted into the solution from the surface of the broccoli. Viable bacteria in the solution is decontaminated by approximately 1 log cycle with discharge treatment, coliform bacteria is out of the countable range. Figure 2 shows number of viable bacteria and coliform bacteria on the surface of broccoli. The number of viable bacteria fall from 4.5 log (CFU/g) to 3.7 log (CFU/g) with discharge treatment and

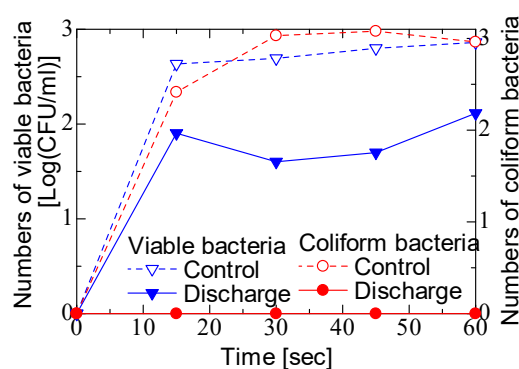


Fig.1 The number of bacteria in solution

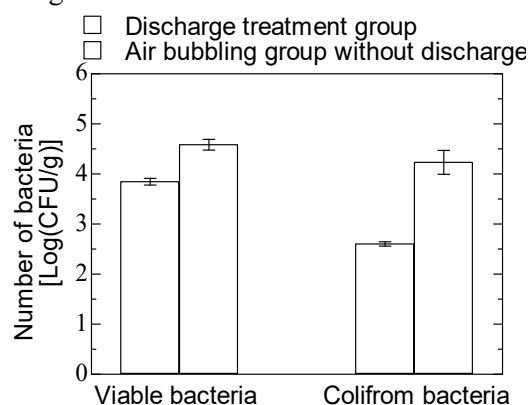


Fig.2 The number of bacteria from surface
coliform bacteria fall from 4.2 log (CFU/g) to 2.6 log (CFU/g). These results show that plasma treatment has a sterilization effect on the surface of vegetables.

Reference

- [1] H.Izumi: "Microbiological Quality and Control of Microbes on Fresh-Cut Vegetables", *Nippon Shokuhin Kagaku Kaishi*, Vol. 52, No. 5, pp. 197-206(2005).
- [2] K.Takahashi *et al*: "Development of automatically controlled corona plasma system for inactivation of pathogen in hydroponic cultivation medium of tomato", *Journal of Electrostatics*, Vol. 91, pp.61-69(2018).