

円筒形誘電体バリア放電内に噴霧した粉状茶葉の低温殺菌特性

Low-temperature Disinfection Property of Powdered Tea Leaves Sprayed into Cylindrical Dielectric Barrier Discharge

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1. Introduction

Recently, from the point of view of food safety, various seeds, granular, powdered foods required sterilization process. Heat sterilization and irradiation method with ultraviolet light are the generally used methods for food sterilization. However, the heat sterilization method causes the deterioration of food flavor and taste; the irradiation method is not simple method because it needs the use of a container and a wrapping for food sterilization. Compared with conventional methods, atmospheric pressure plasma technology has many advantages, such as less expensive and easy to use under air at low temperature. With the perspective of working with the disinfection of powdered foods, we have aimed to develop the non-equilibrium atmospheric pressure plasma device and method for disinfection of finely powdered tea leaves.

2. Experimental setup

We have carried out a preliminary experiment to inactivate *Escherichia coli* (*E*-coli) inoculated tea leaves (5.0 mg) by using dielectric-barrier discharge (DBD) non-equilibrium atmospheric pressure plasma. Fig. 1 shows experimental apparatus schematic and the experimental results of colony count of plasma-treated tea leaves applied on a nutrient agar.

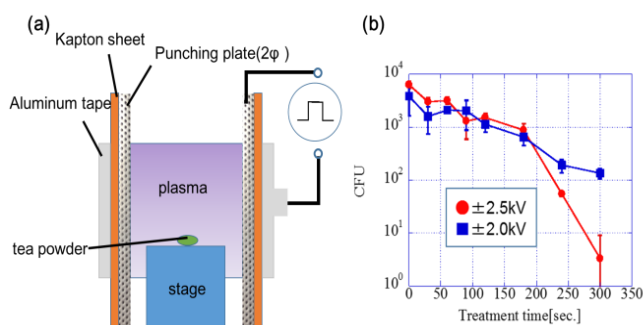


Fig. 1 (a) Schematic of experimental apparatus and (b) experimental results of colony counting method.

3. Experimental results and discussion

From Fig. 1(b), triple-digit of *E. coli* was inactivated by the plasma irradiation of 300 seconds. It was also confirmed that high sterilization efficiency was obtained even at a higher bacterial concentration by plasma irradiation. However, in practical situation, the shadowing effect will be a serious problem for plasma disinfection.

To solve this problem, we have used a powder explosion technique to blow up the powder into the plasma region and improved treatment uniformity as shown in Fig. 2 (a). As a result, reduction in processing time, no processing loss of samples and large-volume processing can be achieved.

By using N₂ gas flow, oxidation by ozone is avoided and we have carried out disinfection experiments for large amount (5.0 g) of tea leaves with this device. From Fig. 2 (b), the preliminary results of CFUs analysis showed a reduction in colonies from 300 to 2 in average after 5 min plasma treatment. Effect of varying plasma treatment time, number of blowing-up procedure and applied voltage on inactivation characteristic have been checked in detail. The details of these experimental results will be presented at the conference site.

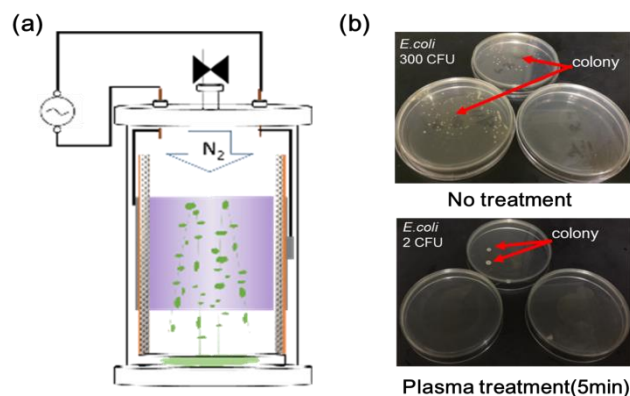


Fig. 2 (a) Experimental apparatus schematic (powder explosion method) and (b) experimental results of colony counting method (5.0g).