



**UC DAVIS**  
UNIVERSITY OF CALIFORNIA

# Disinfection of Rough Rice Using Combined Pulsed Light and Holding Treatment

Bei Wang<sup>1,2</sup>, Ragab Khir<sup>1,4</sup>, Zhongli Pan<sup>1,3</sup>, Haile Ma<sup>2</sup>, Tara H McHugh<sup>3</sup>

<sup>1</sup> Department of Biological & Agricultural Engineering, University of California, Davis, One Shields Avenue, Davis, CA 95616, US

<sup>2</sup> College of Food and Biological Engineering, Jiangsu University, Zhenjiang, Jiangsu Province 212013, P. R. China

<sup>3</sup> Healthy Processed Foods Research Unit, USDA-ARS-WRRC, 800 Buchanan St., Albany, CA 94710, USA

<sup>4</sup> Department of Agricultural Engineering, Faculty of Agriculture, Suez Canal University, Ismailia, 41522 Egypt

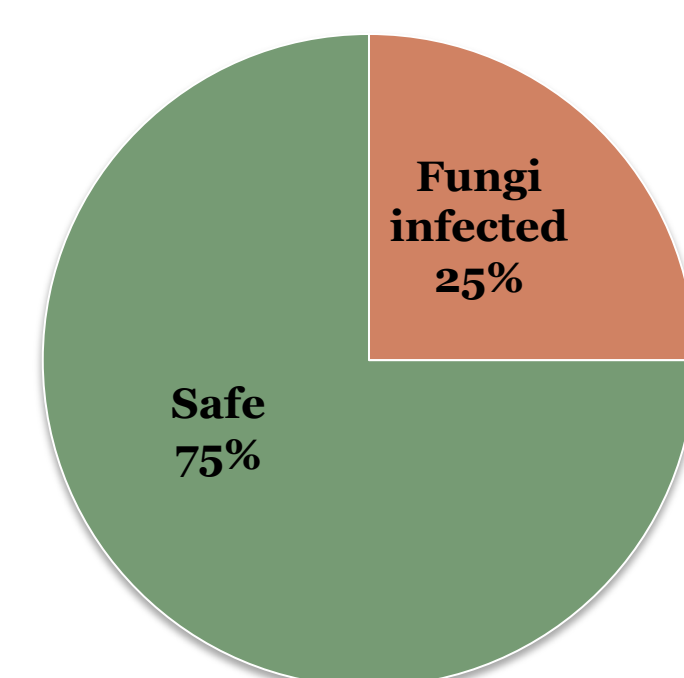


## Abstract

**Pulsed** light (PL) treatment as a rapid surface decontamination method has the potential to conduct an effective disinfection of rough rice. The objective of this study was to investigate the effectiveness of disinfection of rough rice against *Aspergillus flavus* using integrated pulsed light and holding treatment. The rice samples were treated using PL under different intensities and times. After PL treatment, a holding process was performed. The results revealed that 0.9-log cfu/g reduction was obtained when the rice sample was treated for 20 s under distance of 5 cm. PL followed by holding treatment for 4 h led to 5-log reduction for rough rice samples. The inactivation was achieved by damaging the cell wall structure of *Aspergillus flavus*.

## Background

Fungal contamination of rough rice during pre/post harvest and storage is a major cause of kernel damage and health hazard. The fungi *Aspergillus flavus* (*A. flavus*) as its ability of producing high toxicity aflatoxin has been reported as a serious pathogen in rough rice. Pulsed light (PL) treatment, a novel technique, has been considered as possible approach to reduce the level of microbial contamination on food product. PL kills pathogens and spoilage microorganisms using intense pulses with broad spectrum (100-1100 nm). The photochemical and photothermal reactions are the main effects for microorganisms inactivation.



FAO estimated that 25% of the world's food crops are affected by mycotoxin produced by fungi.

## Objective

To study the effect of pulsed UV light and holding treatment on effectiveness of rough rice disinfection.

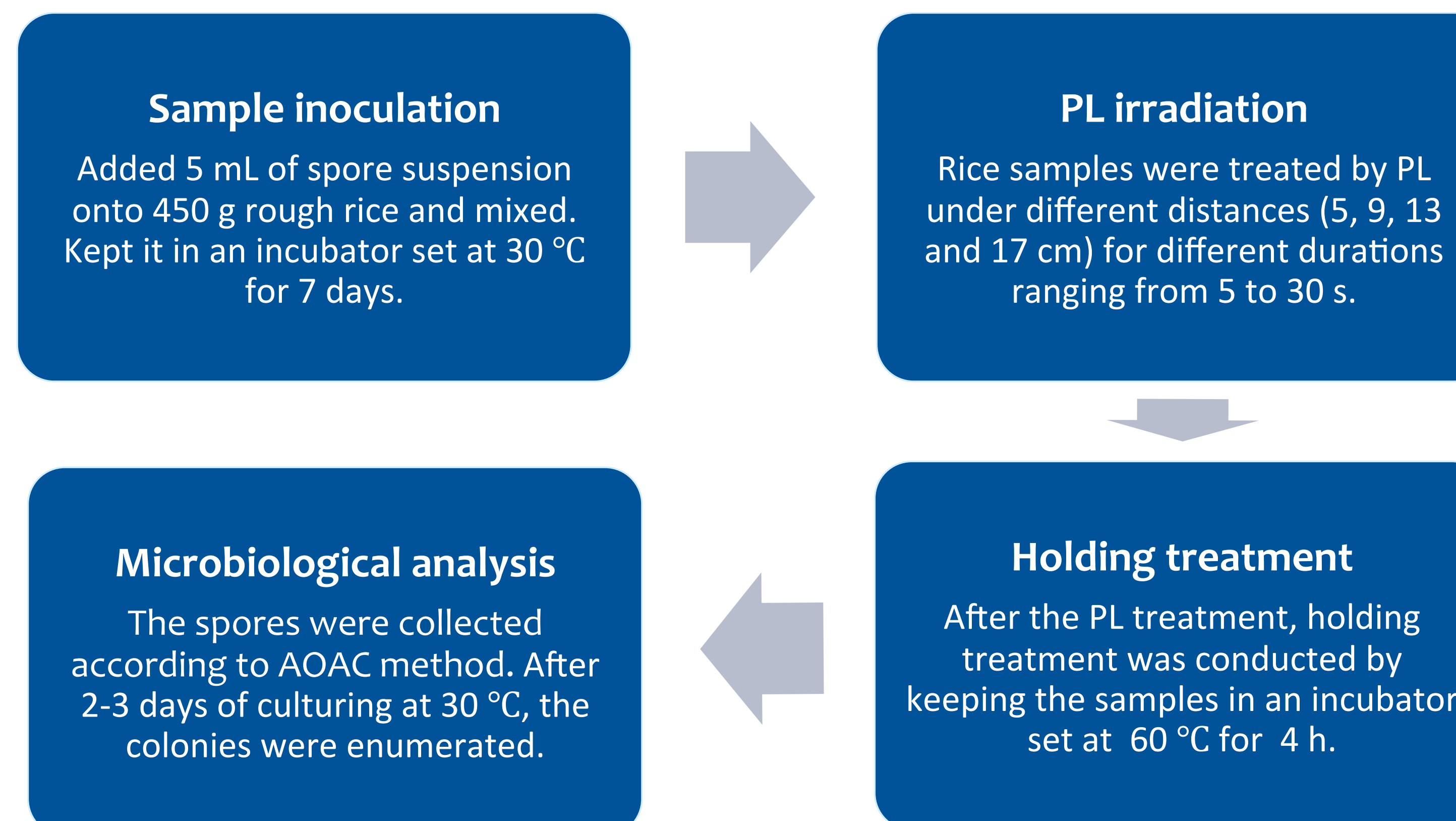
## Materials and Methods



XENON® Pulsed UV Light equipment



Rough rice



## Results and Discussion

The obtained results revealed that effective fungal disinfection of rough rice could be achieved using PL and holding treatment. PL treatment resulted in 0.9-log cfu/g reduction of *A. flavus* on rough rice samples treated for 20 s under the distance of 5 cm (Fig. 1A). Holding treatment after PL significantly improved the disinfection effect. PL followed by holding treatment for 4 h led to 5.2-log reduction of *A. flavus* spores (Fig. 1B). The inactivation was achieved by damaging the cell wall structure. There was no adverse effect of PL and holding treatment on milling quality of rough rice.

## Results and Discussion (continued)

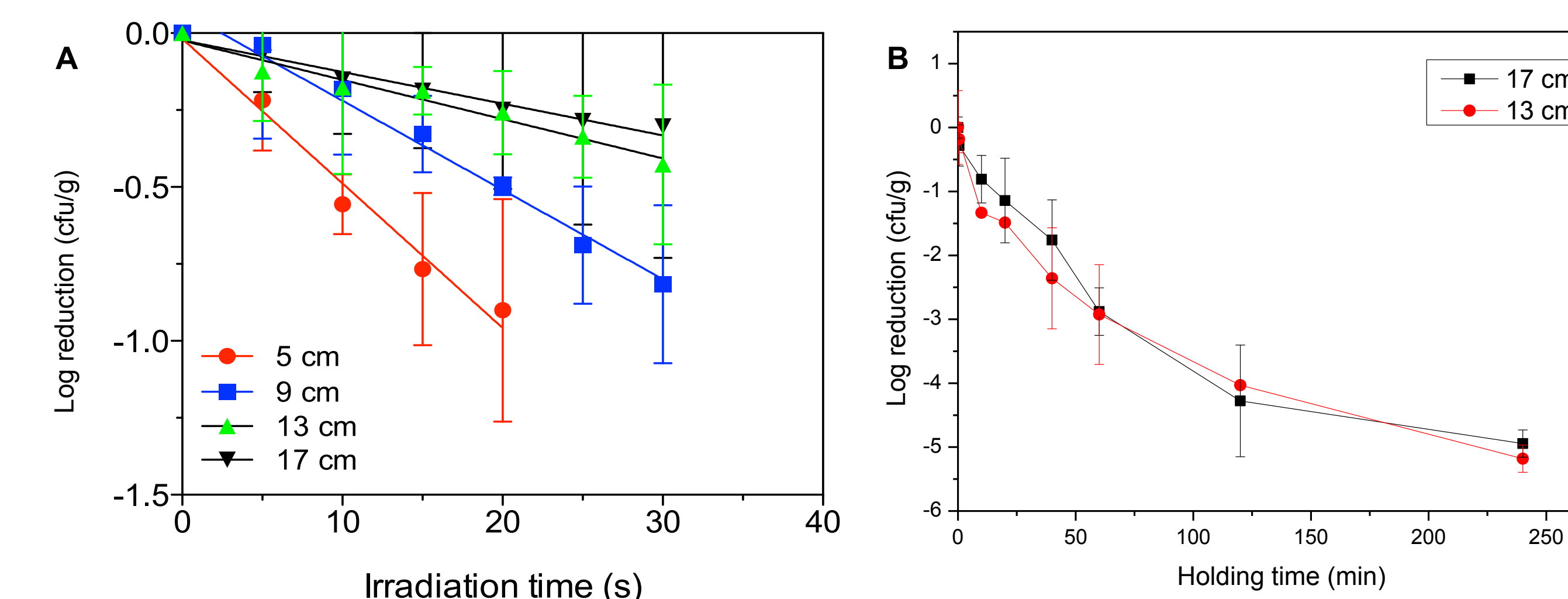


Fig.1 Disinfection effect of PL (A) and holding (B) treatment for rough rice.

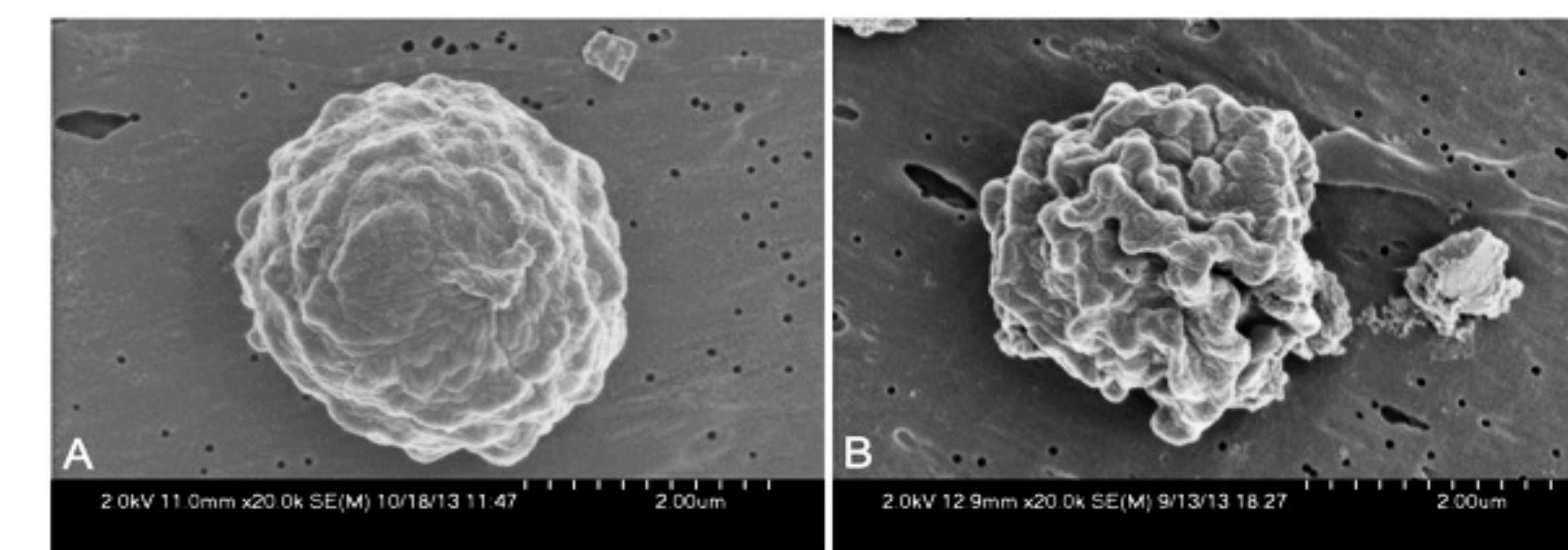


Fig. 2. Scanning electron micrographs of *A. flavus* spores. Images: (A) untreated control cells, (B) cell treated with pulsed light for 10 s with fluence of 5.2 J/cm<sup>2</sup>.

## Conclusions

This study revealed that PL followed by holding treatment was effective in reducing *Aspergillus flavus* spores that were inoculated onto rough rice. Consequently, effective disinfection of rough rice without affecting the milling quality can be achieved using PL for 20 s followed by holding treatment for 4 h.

## Acknowledgments

The authors would like to thank Donald Olson, Noreen Mahoney and De Wood at USDA-ARS-WRRC for their contributions to this work.



Contact Information Prof. Zhongli Pan  
Phone: 510-559-5861 Fax: 510-559-5851 E-mail: [zlp@ucdavis.edu](mailto:zlp@ucdavis.edu); [zhongli.pan@ars.usda.gov](mailto:zhongli.pan@ars.usda.gov)  
<http://research.engineering.ucdavis.edu/panlab/research/>