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Assessment of microbial inactivation on fruit juices by nanosecond electric pulses

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Food process engineering aims to create new products with improved quality to satisfy increasing consumer demand for fresh and healthy products [1,2]. To fulfill the expanding consumer demands for foods with higher nutritional value and “fresh-like” taste, novel technologies, such as pulsed electric fields (PEFs), are currently under investigation to replace conventional thermal processes [3]. Short duration PEFs permeabilize microorganism membranes [4] to inactivate them with minimal loss of food quality [3]. Thus, PEFs have great potential as an alternative to conventional thermal treatments for fruit juice sterilization [3]. Most PEF studies use microsecond to millisecond pulses with repetition rates on the order of hundreds of Hertz. The present study explores the potential of using nanosecond PEFs (nsPEFs) with lower repetition rates to inactivate microorganisms and retain fruit juice quality by minimizing PEF induced heating. This study reports the eradication of various microbial pathogens, such as *E. coli* O157:H7 and *Salmonella* Typhimurium. The implications of this study on the potential application of nsPEFs for microbial inactivation to generate safe and high quality fruit juices will be discussed.

[1] J. Mosqueda-Melgar, et al., “Non-thermal pasteurization of fruit juices by combining high-intensity pulsed electric fields with natural antimicrobials,” *Innov. Food Sci. Emerg. Technol.*, vol. 9, pp. 328–340, 2008.

[2] S. Bubler, et al., “Impact of thermal treatment versus cold atmospheric plasma processing on the techno-functional protein properties from *Pisum sativum* ‘Salamanca.’” *J. Food Eng.*, vol. 167, pp. 166–174, 2015.

[3] V. Heinz, et al., “Overview of Pulsed Electric Fields Processing for Food,” In: Sun, D. *Emerging Technologies for Food Processing*. 2nd ed. Academic Press, pp. 93-114, 2014.

[4] N. Yang, et al., “Pulsed electric field technology in the manufacturing processes of wine, beer, and rice wine: A review,” *Food Control*, vol. 61, pp. 28–38, 2016.

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