View metadata, citation and similar papers at core.ac.uk
brought to you by CORE
provided by Ghent University Academic Bibliography

UNIVERSITEIT GENT
FACULTY OF BIOSCIENCE ENGINEERING
veg-i-trade safe food for a changing world
IBW DEPARTMENT OF INDUSTRIAL BIOLOGICAL SCIENCES

Methodology for modeling the disinfection efficiency of fresh-cut leafy vegetables wash water applied on peracetic acid combined with lactic acid

Van Haute S.[a], López-Gálvez F.[b,c], Gómez-López V.M.[b], Eriksson M.[c], Devlieghere F.[c], Allende A.[b], Sampers I.[a]

[a]Laboratory of Food Microbiology and Biotechnology, Department of Industrial Biological Sciences, Faculty of Bioscience Engineering, Ghent University Campus Kortrijk, Graaf Karel de Goedelaan 5, 8500 Kortrijk, Belgium

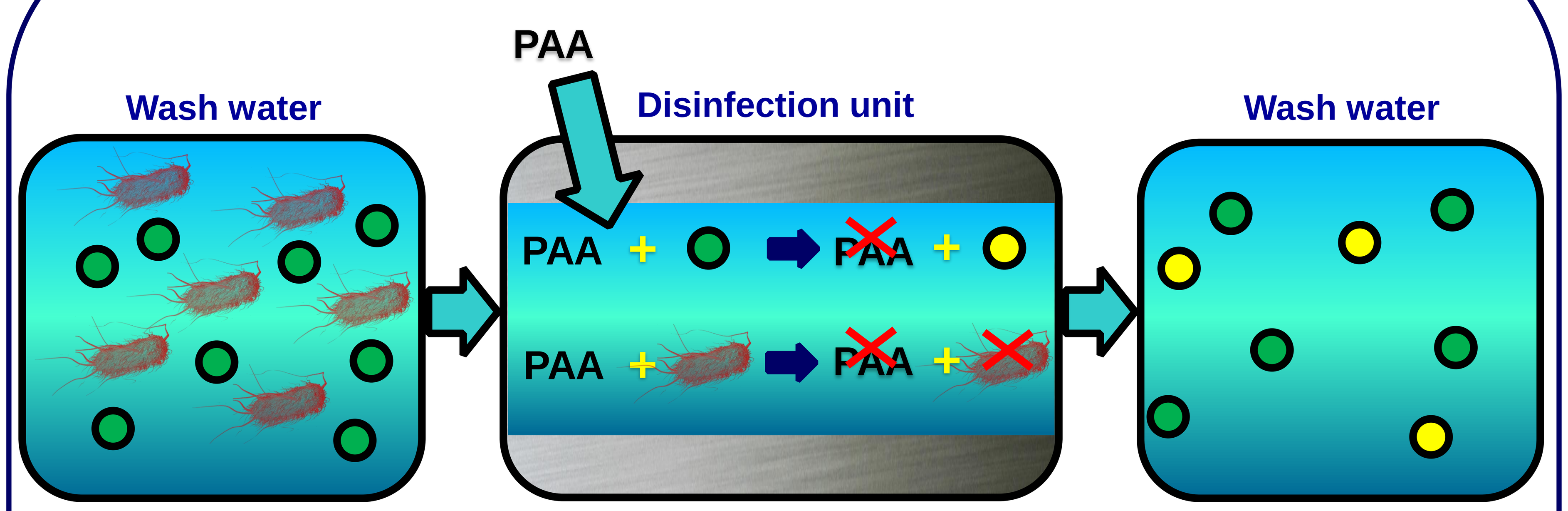
[b]CEBAS-CSIC, P.O. Box 164, 30100 Espinardo, Murcia, Spain

[c]Laboratory of Food Microbiology and Food Preservation, Department of Food Safety and Food Quality, Faculty of Bioscience Engineering, Ghent University, Coupure links 653, B-9000 Ghent, Belgium

Introduction

Chemical oxidants, including peracetic acid (PAA), are more effective for inactivation of bacterial pathogens and spoilage microorganisms in wash water than for removing them from fresh produce. The primary purpose of water disinfection in fresh produce washing operations is avoiding cross-contamination *via* wash water. PAA + lactic acid (LA) is studied to used to understand the relation between the water disinfection efficiency and the physicochemical quality of the water, the disinfectant residual and the water refreshing rate, as well as to compare it with free chlorine.

Water recycling



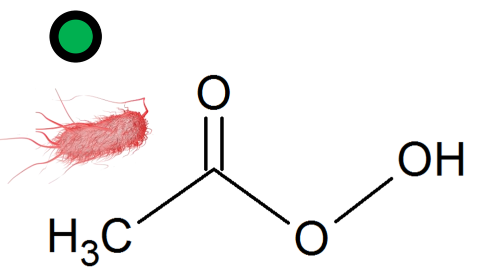
Influence on water recycling of:

pH

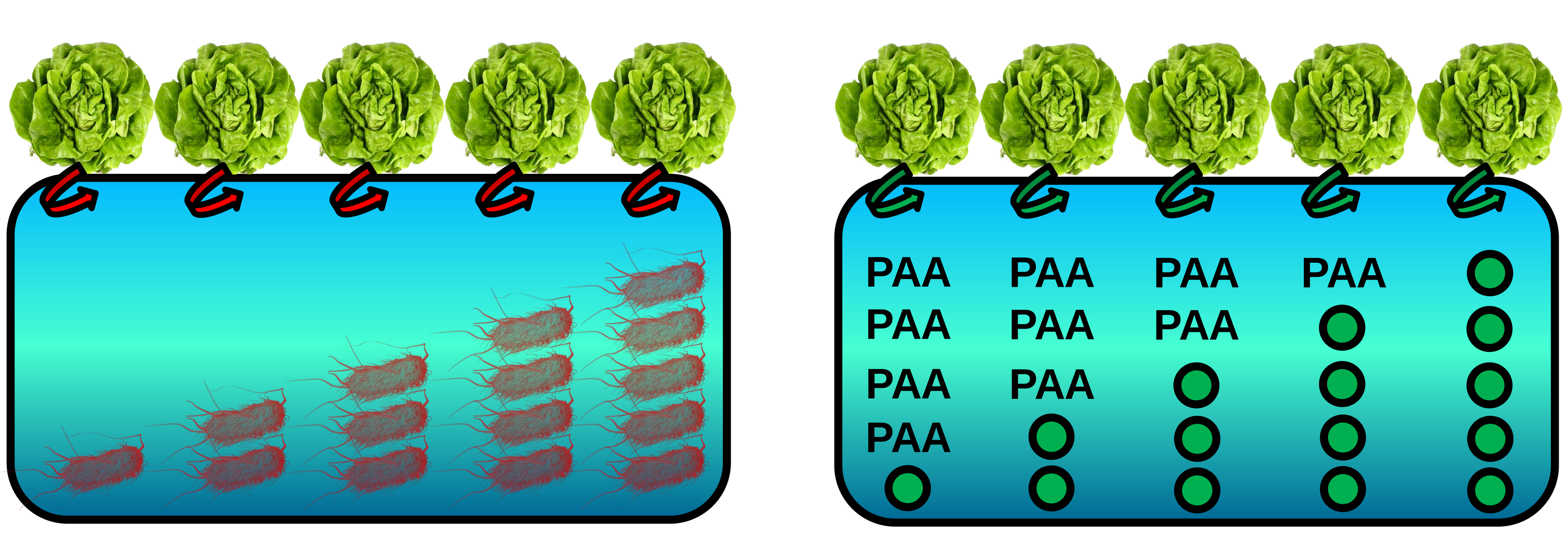
organic matter =

E. coli O157 =

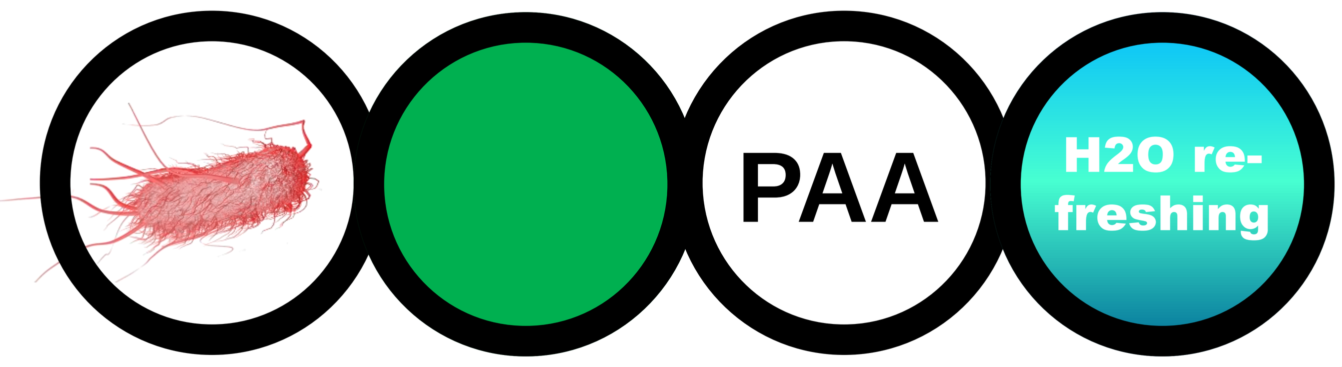
PAA =



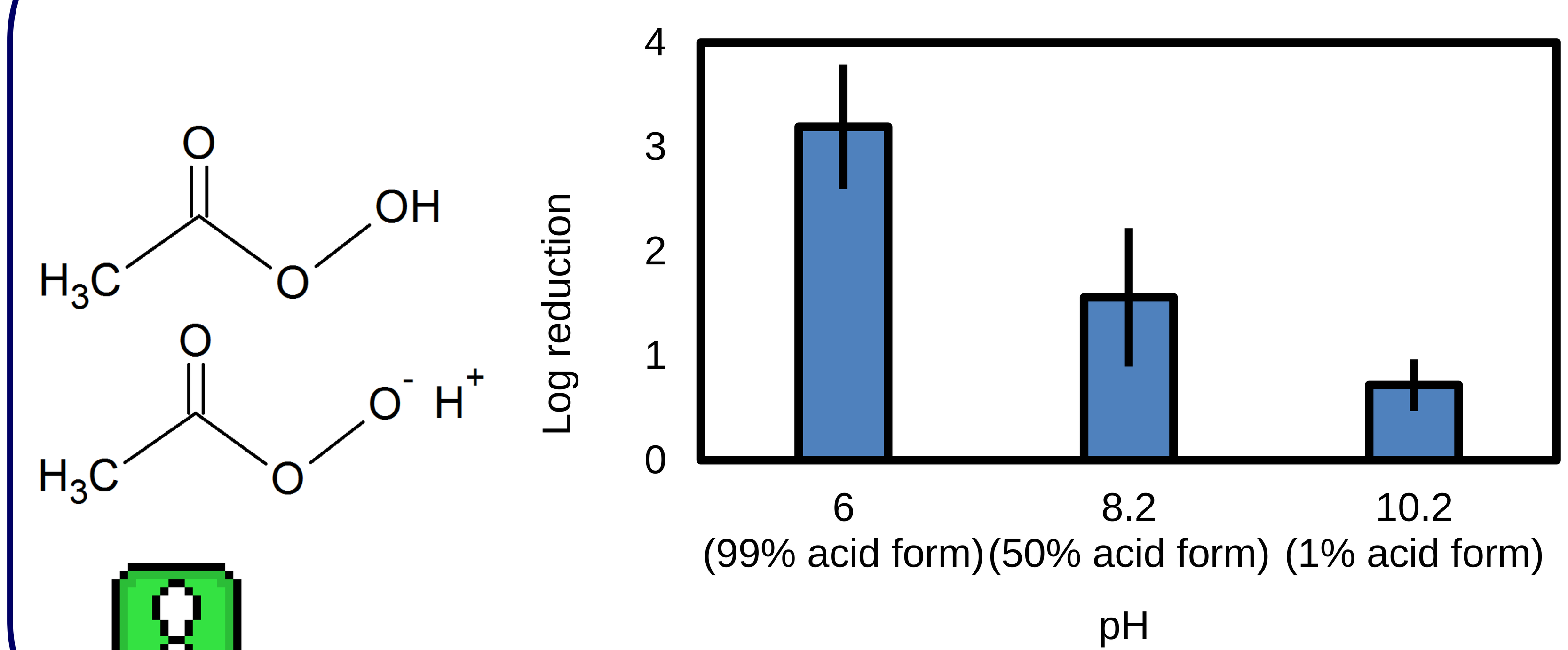
Wash water disinfection



Influence on wash water disinfection of and relation between:

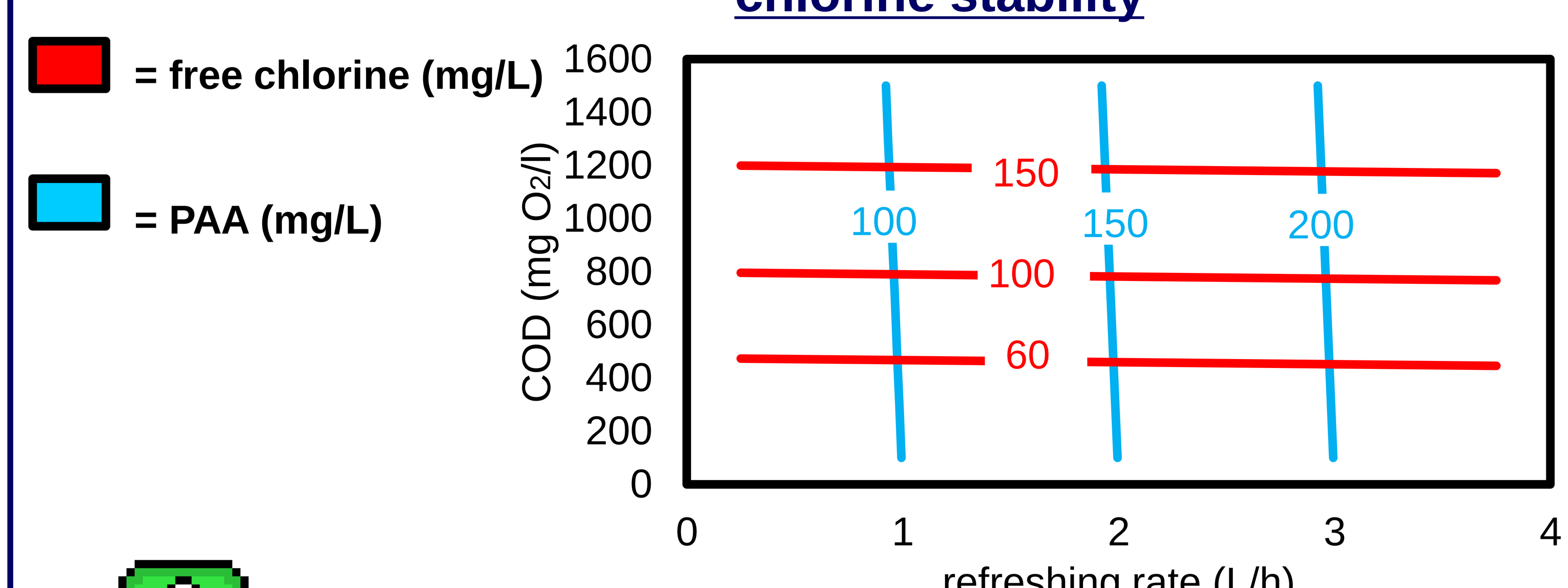


PAA is a stronger water disinfectant in the acid form



Reduction of *E. coli* O157 in oxidant demand free water after 20 min contact time with PAA + LA (1:40; 1.4 mg/L PAA) (n=3)

The influence of water refreshing and organic matter content on PAA stability is quite different than the influence on chlorine stability



Disinfectant consumption (mg/L) in fresh-cut lettuce wash water in function of refreshing rate and chemical oxygen demand (COD) of the wash water to maintain 50 mg/L PAA or 1 mg/L free chlorine

Microbial contamination in the washing bath at a certain moment in time

$$N(t)_{mL} = \left[-\frac{N0 \cdot e^{kmax \cdot SL} . \left(ln\left(e^{kmax \cdot SL} - 1 + e^{kmax \cdot t}\right) - kmax \cdot t \right)}{kmax \cdot \left(e^{kmax \cdot SL} - 1\right)} \right]_{0}^{t}$$

N(t)= *E. coli* O157 in washing bath at time t; N0= influx of microbial contamination (CFU/s/mL); kmax= maximum microbial inactivation constant; SL=shoulder length of inactivation curve

For information on the model:

Van Haute, S., López-Gálvez, F., Gómez-López, V.M., Eriksson, M., Devlieghere, F., Allende, A., Sampers, I., 2015. Methodology for modeling the disinfection efficiency of fresh-cut leafy vegetables wash water applied on peracetic acid combined with lactic acid. International Journal of Food Microbiology 208, 102-113.

Conclusion

The behavior of PAA (+LA) during wash water disinfection is relatively slow compared to free chlorine disinfection, i.e. slower in reaction with water matrix constituents and a slower inactivation of *E. coli* O157. PAA (+LA) seems a better choice than free chlorine for disinfecting wash water with a high physicochemical load. Addition of low PAA dosages (compared to high free chlorine dosages) during process water recycling can achieve sufficient *E. coli* O157 inactivation when long contact times are applied. However, for wash water disinfection, a higher PAA residual is necessary to achieve rapid microbial inactivation and therefore the impact of water refreshing on the necessary disinfectant dose is higher in the case of PAA (+LA) than of free chlorine. **This study was made possible by EC's 7th Framework Program (FP7) agreement no. 244994 (VEG-i-TRADE).**

For more information: TEL +32 56 24 12 37, FAX +32 56 24 12 24, e-mail: sam.vanhaute@ugent.be, website: http://www.enbichem.ugent.be