Efficacy of Perasan OG against Various Planktonic Organisms

March 21st, 2018
Joseph Donabed, B.Sc.

Introduction

The purpose of this study is to determine the relative efficacy of 265 ppm peracetic acid (PAA) from Perasan OG against planktonic *Byssochlamys fulva, Pediococcus damnosus, Lactobacillus buchneri*, and *Saccharomyces cerevisiae* given a 15 second contact time.

Materials and Methods

Perasan OG (lot# 39-100617-2) was analyzed via ceric sulfate and iodometric titration to yield PAA and H_2O_2 concentrations of 20.18 and 4.65%, respectively.

Byssochlamys fulva (ATCC 24474) freeze-dried pellet was reconstituted in 10-mL of Brain Heart Infusion Broth. The pellet was dissolved in the broth and ten, 1-mL aliquots were taken and plated on Potato Dextrose Agar. Agar plates were incubated at 32°C for 48-hours. The fungi were aseptically transferred from the plates to 500-mL of sterile, distilled water. The fungal solution was mixed via magnetic stir bar to ensure homogeneity. Aliquots were taken from the stock solution, serially diluted, and plated on potato dextrose agar. Plates were incubated at 32°C for 48-hours then enumerated. These plates would serve as the untreated control samples for the study.

Pediococcus damnosus (ATCC 29358) freeze-dried pellet was reconstituted in 10-mL of Brain Heart Infusion Broth (Hardy Diagnostic Cat. No. 0037178). The pellet was dissolved in the broth and ten, 1-mL aliquots were taken and plated on 5% Sheep's Blood Agar (Hardy Diagnostic, Cat. No. A10). Agar plates were incubated under microaerophilic atmosphere at 32°C for 24-hours. The bacteria were aseptically transferred from the plates to 500-mL of sterile, distilled water.

The bacterial solution was mixed via magnetic stir bar to ensure homogeneity. Aliquots were taken from the stock solution, serially diluted, and plated on blood agar. Plates were incubated under microaerophilic atmosphere at 32°C for 24-hours then enumerated. These plates would serve as the untreated control samples for the study.

Lactobacillus buchneri (ATCC 4005) freeze-dried pellet was reconstituted in 200-mL of Criterion MRS Broth. The pellet was dissolved in the broth and incubated at 37°C under anaerobic conditions for 48-hours. The broth and bacteria mixture were centrifuged and washed leaving the *Lactobacillus buchneri* pellet to be re-suspended in 500-mL sterile, distilled water.

The bacterial solution was mixed via magnetic stir bar to ensure homogeneity. Aliquots were taken from the stock solution, serially diluted, and plated on Lactobacilli MRS Agar (Hardy Diagnostic, Cat. No. G117). Plates were incubated at 32°C for 48-hours then enumerated. These plates would serve as the untreated control samples for the study.

Saccharomyces cerevisiae (ATCC 18824) freeze-dried pellet was reconstituted in 10-mL of Brain Heart Infusion Broth. The pellet was dissolved in the broth and ten, 1-mL aliquots were taken and plated on Potato Dextrose Agar. Agar plates were incubated at 32°C for 48-hours. The fungi were aseptically transferred from the plates to 500-mL of sterile, distilled water. The fungal solution was mixed via magnetic stir bar to ensure homogeneity. Aliquots were taken from the stock solution, serially diluted, and plated on potato dextrose agar. Plates were incubated at 32°C for 48-hours then enumerated. These plates would serve as the untreated control samples for the study.

A total of three, 100-mL samples of each organism stock solution were measured and transferred to individual, sterile beakers. Each solution was dosed with a nominal 265 ppm PAA along with 61 ppm H_2O_2 by adding 118 µL of the Perasan OG to each of the beakers. The solutions were mixed at 200 rpm using a magnetic stir bar. After 15-seconds of contact, 98 milligrams of erythorbic acid was added to each solution to neutralize any remaining peroxygen species. Aliquots were taken from each of the individual samples, serially diluted, and plated on the appropriate media.

Results

Table 1 shows the average remaining *Byssochlamys fulva* in the control (untreated) and 265 ppm PAA treated samples with a 15-second contact time.

Description	Avg. $\log_{10}$ (CFU/mL)	Avg. $\log_{10}$ Reduction	% Reduction	n
Control (Untreated)	5.98	NA	NA	3
265 ppm PAA (15 sec.)	<0.1	>5.88	>99.999	3

Table 2 shows the average remaining *Pediococcus damnosus* in the control (untreated) and 265 ppm PAA treated samples with a 15-second contact time.

Description	Avg. $\log_{10}$ (CFU/mL)	Avg. $\log_{10}$ Reduction	% Reduction	n
Control (Untreated)	7.02	NA	NA	3
265 ppm PAA (15 sec.)	<0.1	>6.92	>99.9999	3

Table 3 shows the average remaining *Lactobacillus buchneri* in the control (untreated) and 265 ppm PAA treated samples with a 15-second contact time.

Description	Avg. log_{10} (CFU/mL)	Avg. log_{10} Reduction	% Reduction	n
Control (Untreated)	6.15	NA	NA	3
265 ppm PAA (15 sec.)	<0.1	>6.05	>99.9999	3

Table 4 shows the average remaining *Saccharomyces cerevisiae* in the control (untreated) and 265 ppm PAA treated samples with a 15-second contact time.

Description	Avg. log_{10} (CFU/mL)	Avg. log_{10} Reduction	% Reduction	n
Control (Untreated)	5.55	NA	NA	3
265 ppm PAA (15 sec.)	<0.1	>5.45	>99.999	3

Conclusion

Byssochlamys fulva

- The control (untreated) had an average log_{10} of 5.98 CFU/mL.
- After treatment with a nominal 265 ppm PAA and 396 ppm H_2O_2 for 15 seconds, the average log_{10} decreased <0.1 CFU/mL which equates to a log_{10} reduction of >5.88 CFU/mL or >99.999% reduction.

Pediococcus damnosus

- The control (untreated) had an average log_{10} of 7.02 CFU/mL.
- After treatment with a nominal 265 ppm PAA and 396 ppm H_2O_2 for 15 seconds, the average log_{10} decreased <0.1 CFU/mL which equates to a log_{10} reduction of >6.92 CFU/mL or >99.9999% reduction.

Lactobacillus buchneri

- The control (untreated) had an average log_{10} of 6.15 CFU/mL.
- After treatment with a nominal 265 ppm PAA and 396 ppm H_2O_2 for 15 seconds, the average log_{10} decreased <0.1 CFU/mL which equates to a log_{10} reduction of >6.05 CFU/mL or >99.9999% reduction.

Saccharomyces cerevisiae

- The control (untreated) had an average $\log_{10}$ of 5.55 CFU/mL.
- After treatment with a nominal 265 ppm PAA and 396 ppm H_2O_2 for 15 seconds, the average $\log_{10}$ decreased <0.1 CFU/mL which equates to a $\log_{10}$ reduction of >5.45 CFU/mL or >99.999% reduction.