Efficacy of Peragreen 5.6% (Peracetic Acid) Against *E. coli* in Irrigation Water

October 2th, 2019
Joseph Donabed, B.Sc.

Purpose

The goal of this study is to determine the relative efficacy of 2-, 5-, and 10-mg/L peracetic acid (PAA) from Peragreen 5.6% against planktonic *E. coli* with a 2, 5, and 10-minute contact in irrigation water.

Materials and Methods

E. coli Culture

A freeze-dried pellet *E. coli* (ATCC® 25922, Bactrol™ Plus) was dissolved in 10-mL of Brain Heart Infusion (BHI) Broth (Hardy Diagnostics Cat. No. K25). Next, five aliquots were taken and plated on individual 5% Sheep Blood Tryptic Soy Agar (blood agar) plates. The plates were incubated at 37°C for 24-hours. Next, three, 10-µL inoculation loops of bacteria was aseptically transferred from the blood agar plate to 2000-mL of Modesto city water (irrigation water). The *E. coli* solution culture was mixed to ensure homogeneity.

Control Sample Analysis

One 100-mL sample of the untreated inoculated water was aseptically transferred to a sterile jar containing sodium thiosulfate neutralizer. Idexx Colilert-18 powder reagent was then added to the jar and agitated until dissolved. The sample was then transferred to an Idexx Quanti-Tray/2000, heat sealed, and placed in an incubator at 35.0 ± 0.5°C. This sample would serve as the undiluted and untreated control sample for *E. coli*. Next, a 1 mL aliquot of the untreated inoculated water was transferred to a sterile jar containing 99 mL of sterile reverse osmosis (RO) water and sodium thiosulfate neutralizer. Idexx Colilert-18 powder reagent was then added to the jar and agitated until dissolved. The sample was transferred to an Idexx Quanti-Tray/2000, heat sealed, and placed in an incubator at 35.0 ± 0.5°C. This sample would serve as the 1:100 diluted and untreated control sample for the study.

Next, the *E. coli* stock solution was divided into three individual, 500-mL samples. The individual samples would be treated with 2-, 5-, and 10-ppm active PAA from Peragreen 5.6%.

PAA Treatment

The *E. coli* inoculated water samples were treated with a nominal 2-, 5-, and 10-ppm PAA from Peragreen 5.6% by dosing each sample with 16, 40, and 80-µL, respectively. The solutions were mixed via magnetic stir bar at 200-rmp to simulate in-line mixing. After 2, 5, and 10-minutes of contact, 100-mL samples of the treated water were aseptically transferred to individual sterile jars containing sodium thiosulfate neutralizer. Idexx Colilert-18 powder reagent was then added to the jar and agitated until dissolved. The sample was then transferred to an Idexx Quanti-Tray/2000, heat sealed, and placed in an incubator at 35.0 ± 0.5°C then enumerated.

Results

Table 1 lists the *E. coli* counts in the control (untreated) sample as well as the 2-ppm PAA treated samples after 2, 5, and 10-minutes of contact.

Description	*E. coli* (MPN/100-mL)	% Reduction
Control (Untreated)	3088	NA
2-ppm PAA, 2-minutes	51.2	98.3
2-ppm PAA, 5-minutes	ND	>99.9
2-ppm PAA, 10-minutes	ND	>99.9

Table 2 lists the *E. coli* counts in the control (untreated) sample as well as the 5-ppm PAA treated samples after 2, 5, and 10-minutes of contact.

Description	*E. coli* (MPN/100-mL)	% Reduction
Control (Untreated)	3088	NA
5-ppm PAA, 2-minutes	ND	>99.9
5-ppm PAA, 5-minutes	ND	>99.9
5-ppm PAA, 10-minutes	ND	>99.9

Table 3 lists the *E. coli* counts in the control (untreated) sample as well as the 10-ppm PAA treated samples after 2, 5, and 10-minutes of contact.

Description	*E. coli* (MPN/100-mL)	% Reduction
Control (Untreated)	3088	NA
10-ppm PAA, 2-minutes	ND	>99.9
10-ppm PAA, 5-minutes	ND	>99.9
10-ppm PAA, 10-minutes	ND	>99.9

Conclusions

- The untreated control sample contained an *E. coli* count of 3088 MPN/100-mL
- Treatment with a nominal 2-ppm PAA from Peragreen 5.6% for 2-minutes decreased the *E. coli* count to 51.2 MPN/100-mL which equates to a 98.3% reduction in 2-minutes. *E. coli* was non-detect (ND) after 5- and 10-minutes of contact.
- Treatment with a nominal 5- and 10-ppm PAA from Peragreen for 2-minutes resulted in no viable *E. coli* which equates to a >99.9% reduction.

It should be noted that while laboratory studies are often representative, full-scale application performance may differ due to the presence of variables that cannot be replicated in the laboratory.