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Comparative Efficacy of Perasan 'A' and Matrix to Field Strains of Bacteria, Yeast and Mold from Primary Vegetable Water Flume

Executive Summary

This study compares the efficacy of Perasan 'A' and Matrix (aka Vortexx) to field strains of bacteria, yeast and mold present in a primary tomato processing flume water. The 1 oz per 5 gal dilution ratio was chosen for both products and all studies were carried out at these dilution ratios. Both products are shown to be equally effective and perform indistinguishably. At the 1:640 dilution level, Perasan 'A' and Matrix yield a 2 log reduction in the aerobic plate count within 30 seconds. The products require a longer contact time of 60 seconds to achieve the same log reduction of the yeast plate counts. The tomato flume water did not contain any detectable strains of mold so the relative performance of Perasan 'A' and Matrix against these microorganisms is unknown.

Introduction

Perasan 'A' (5.6% peroxyacetic acid (PAA), 26.5% hydrogen peroxide) and Matrix (4.4% peroxyacetic acid, 3.3% peroctanoic acid, and 6.9% hydrogen peroxide) are competitive products marketed to the food processing industries. According to the EPA registered label, Perasan 'A' is used by diluting 1 ounce into 5 gallons of water (dilution factor is 1:640) and so this study was conducted at this dilution for both products. The goal was to understand how the compositional differences of the products impacted their relative performance. In particular, the comparative efficacy against field strains of aerobic bacteria, yeast and mold from a tomato water flume was investigated. The 'field' strains were chosen to give one a good understanding of the general efficacy of these products against the same challenge media. Of course, individual strains may have different resistance, but the minute differences in specie's tolerance were not investigated here.

Experimental Methods

The tomato flume water was retrieved from a local tomato processing plant. This was filtered to remove solid material such as soil and tomato debris (leaves, skin and flesh).

Stock solutions comprising a 1:640 dilution of Perasan 'A' and Matrix were prepared by diluting 5.9 g of each product to 1 gallon in deionized water. Two 99 g samples of the 1:640 diluted stock solutions were weighed out for both products. A stopwatch was started as 1 ml of filtered tomato flume water was added to each with vigorous mixing.

This corresponded to a serial dilution of 10^2 . After contact times of 30 and 60 seconds 2.0 ml of 10% sodium sulfite solution was added to the test solutions to quench the biocidal action of the peracetic acid and hydrogen peroxide. A serial dilution of 10^4 was then made by removing 1 ml of quenched sample and adding to 99 ml of Butterfield's buffer. The 10^2 and 10^4 serial dilutions were plated onto 3M Petrifilm aerobic count plates, and 3M Petrifilm yeast and mold count plates in duplicate. The aerobic count plates were introduced to a 35°C incubator and enumerated after 48 hours. The yeast and mold plates were left at ambient temperature and enumerated after 4 days. An untreated control sample consisting of 99 ml of Butterfield buffer was inoculated with 1 ml of tomato flume water. This aliquot was serially diluted to the 10^4 and 10^6 level, then plated in the same fashion and incubated simultaneously with the treated samples.

Results and Discussion

(i) Aerobic Plate Count Results

The data in Table I lists the average number of CFU/ml of aerobic bacteria that remained viable upon treatment with a 1:640 dilution of Perasan 'A' and Matrix after 30 seconds and 60 seconds contact time. The result obtained for an untreated control sample is also included.

It can be seen that both products afford a 2 log reduction in aerobic plate count bacteria over the untreated sample, regardless of the contact time. This indicates that at the 1:640 dilution level, Perasan 'A' and Matrix display rapid disinfection kinetics towards aerobic plate count bacteria. It is also apparent that the efficacy of Perasan 'A' and is generally indistinguishable to the efficacy of Matrix against the species of aerobic bacteria present in the tomato flume water.

Table I

Test System	CFU/ml
Untreated control	5.1×10^7
Perasan 'A' (30 seconds)	3.3×10^5
Matrix (30 seconds)	5.3×10^5
Perasan 'A' (60 seconds)	4.1×10^5
Matrix (60 seconds)	4.1×10^5

(ii) Yeast and Mold Plate Counts

After 4 days at ambient temperature, the yeast and mold plates were inspected. The colonies that developed in both treated and untreated samples were small, green in color and had well-defined edges. This indicated that the tomato flume water contained only yeasts, and that molds were largely absent. The data in Table II report the average number of CFU/ml of yeast remained viable upon treatment with a 1:640 dilution of

Perasan 'A' and Matrix after 30 seconds and 60 seconds contact time. The results obtained for an untreated control sample are also included.

It can be seen that both products require at least a 60 second contact time to have a meaningful effect on yeasts. Compared to the untreated sample, Perasan 'A' and Matrix achieve a 2 log reduction in yeast plate counts after 60 seconds. After 30 seconds, neither product has afforded significant benefit over the untreated control. It is also apparent that at the 1:640 dilution level, Perasan 'A' and Matrix display indistinguishable efficacy against the species of yeast present in the tomato flume water.

Table II

Test System	CFU/ml
Untreated control	3.8×10^4
Perasan 'A' (30 seconds)	1.5×10^4
Matrix (30 seconds)	1.0×10^4
Perasan 'A' (60 seconds)	4.8×10^2
Matrix (60 seconds)	4.0×10^2

Further testing will be required to establish a definitive comparative analysis for yeast and mold.

Numerous testing was done comparing the Perasan 'A' and Matrix, including peach flume and onion process water. The bacterial results were similar to those reported here, namely, there is no discernable difference in the efficacy of Perasan 'A' and Matrix as effective bactericides.

The investigators of this study recognize that 2-log reductions are relatively modest by most standards, but is in the range as was anticipated. The tomato flume water is highly contaminated with dirt, organic matter, plant material, residual pesticides and is a highly buffered medium. The conditions of this protocol were more severe than would commonly be seen in normal sanitation practices. However, any deficiencies of a potential sanitizer would be magnified many times over using this difficult challenge medium.

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