ENVIRO TECH CHEMICALS, INC
Modesto, CA 209-581-9576

PERASAN® for USE in ICE

Producers have packed fruits and vegetables in ice for many years to reduce dehydration and preserve quality. Chlorine has been the mainstay as the chemical preservative, but producers are finding advantages with peracetic acid not afforded by chlorination of the ice used to pack the produce commodity.

One of the most important and costly issues associated with fresh-market produce and (seafood) distribution is the integrity of the product over the time it takes to process, cool, ship, resell, and distribute the product. The food product is not sterile by any long stretch, and decay and spoilage-causing bacteria and fungi continue to proliferate. As the ice melts the ability to keep the product cool decreases, and the microbial populations of bacteria and/or fungi increase rapidly, which accelerates the spoilage (decay) process. Since chlorine has been used as the primary inhibitor in the past, we performed a series of experiments using chlorine dioxide, chlorine bleach, and PERASAN 'A' peracetic acid.

ICE

Several products were chosen for trial exposure with ice treated with chlorine dioxide at 1 ppm, bleach at 10 ppm and Perasan 'A' at 20 ppm. The ice was made using distilled water and was placed in deep freeze immediately after preparation. The cubed ice took 3 hrs to freeze. The cube ice was chopped in a food service blender to an average size of 0.25".

PRODUCTS

The food products chosen for testing were of sufficient quantity so that all variations were performed on the same lot of food. The vegetables chosen were carrots and broccoli, and the fish was shelled fresh shrimp.

PROTOCOL

The products were purchased fresh and 5 lb lots of each vegetable and 2 lbs of the shrimp were covered in ice and placed in a refrigerator at 40 F. Four lots of each product were tested: One was the control, and the other 3 included the ClO_2, bleach, and PERASAN 'A' (total of 12 lots). After placing the lots in the refrigerator chemical analysis was performed after 4 hrs. using the DPD test method for residual product in the melted ice water.

RESULTS

DPD testing of the melted ice water revealed the following (in ppm):

	Chlorine	ClO_2	Perasan 'A'
Carrots	2.1	0.1	19
Broccoli	0.9	0.1	17
Shrimp	0	0	11

COMPARATIVE RESULTS

The products were stored in the refrigerator and the length of time until failure (wilted produce or mold development), and in the case of shrimp, we used our smell abilities to detect rancidity. The following chart reports the amount of increased storage integrity for the food products using several compounds vs. untreated ice only.

	Days Beyond Control		
Food Product	Chlorine	ClO_2	Perasan 'A'
Carrots	0	1	2
Broccoli	0	0	3
Shrimp	0	0	1.5

DISCUSSION

Chlorine and bleach products (sodium hypochlorite) are quite reactive but short lived, especially in the presence of organic matter, and quickly convert to chloramines, which have 50-100 times less efficacy on microbial populations. Likewise, chlorine dioxide is a dissolved gas and escapes quickly as the ice melts, leaving it less available to help control the microbes. The amount of chlorine bleach and chlorine dioxide that may be used in practice is limited due to high corrosion potentials and odor problems.

However, Peracetic Acid (PAA) is also quite reactive and is a more potent oxidizer than chlorine or chlorine dioxide. Its vapor coefficient is such that it prefers to remain in the liquid. In addition, the hydrogen peroxide fraction (HP) is quite stable for longer periods of time, and thus may act to inhibit growth of microorganisms, which is the objective in this application or use.

For your reference, we include 2 stability charts for the decay curve of peracetic acid and hydrogen peroxide. Keep in mind, however, these charts were done using room temperature conditions, and cold water (ice) applications would extend the decay curve significantly.

.

July 28, 2004

With Attachments (2 graphs)

Note: The results reported herein are part of intellectual property (patented) uses that have been or are being developed by Enviro Tech, Inc. Modesto, CA. This public disclosure does not waive any rights or issue conveyance of intellectual property from Enviro Tech to any person or user of Enviro Tech's peroxyacetic acid-based applications described herein without expressed written consent of Enviro Tech, Inc.

Figure 6: Long Term Decay Profile of Hydrogen Peroxide

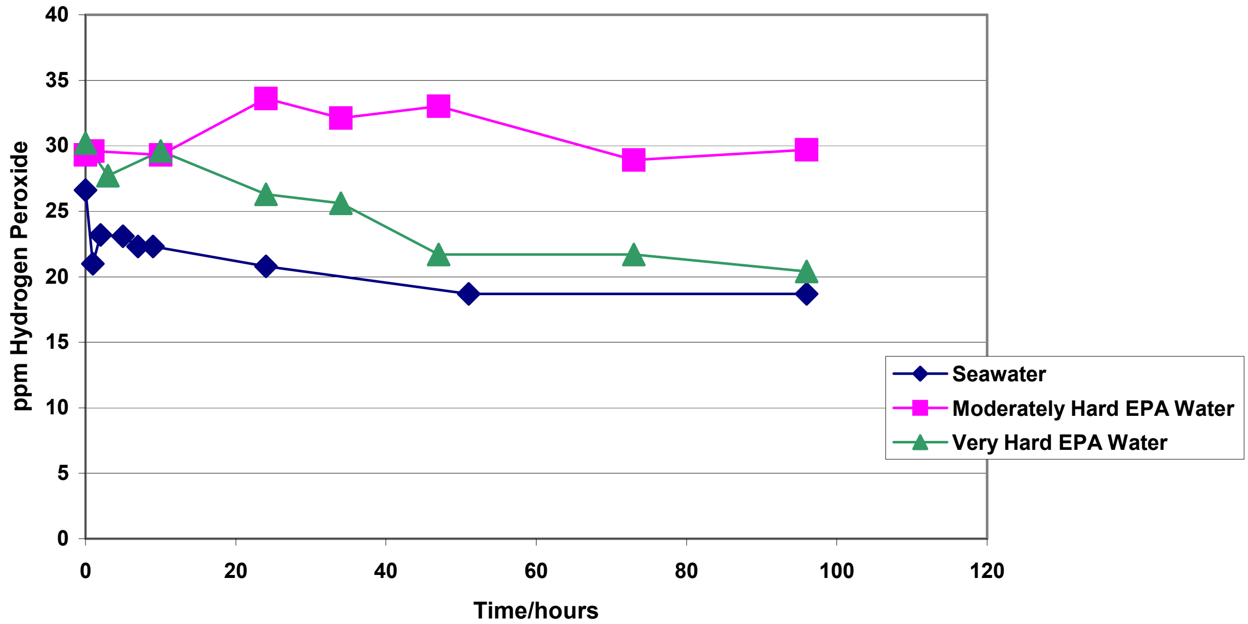

Figure 4: Long Term PAA Decay Profile