

FIT – Technical Data on Usage and Sanitization

Benefits vs. Water only or Water + Chlorine

Because of the better cleaning properties of FIT, produce can be cleaned and sanitized at a faster rate with significantly less water used in the process. Due to the soil suspension agents in FIT, water can look “dirtier” than normal (high turbidity) and yet not allow soil to significantly redeposit back onto produce. Exact benefits will depend on the particular produce being washed, but a good estimate to start would be to use _ the water normally used in the cleaning process in _ the time spent. FIT has also shown extended shelf life, fresher smells, and better taste benefits in full scale plant testing. FIT is also much safer for your employees to use, and much less harsh on the equipment, saving a lot of money in future capital expenses.

Usage:

FIT can be mixed with regular tap or municipal water at a concentration of 1 part FIT to 128 parts water (one gallon of FIT for every 128 gallons of water). Slowly add FIT to flowing water for agitation purposes. FIT does not need to be rinsed off before consumption.

Activity level is measured via pH; at the correct dosage the wash water pH should be ~3.0, with the following upper and lower range limits:

pH Activity Range			
pH (solution)	Target: 3.0	Upper Limit: 3.5	Lower Limit: 2.5

Over time the pH will continue to rise as more and more produce (and hence soil) is dumped into the cleaning process. Continue to add FIT to bring the pH back down into the active range. No additional FIT is needed as long as the pH stays in the range from 2.5 to 3.2. There is no standard rule to change water based on turbidity; this should be tested at the produce facilities to confirm acceptance, with a starting point of at least twice a long between water changes vs. the current water usage.

Sanitization Data – Equal Log Kills on Bacteria Pathogens vs. 200 ppm Chlorine!

In Vitro Suspension Testing - AOAC 960.09 – Summary of the Methodology

A series of suspension tests using FIT were conducted at the SWTC Microbiology Laboratory and Viomed Laboratories. This method is a modification of AOAC suspension testing for Germicidal and Detergent Sanitizing Action of Disinfectants (Official Method 960.09). In this method one milliliter of an inoculum containing 10^9 to 10^{10} colony forming units of bacteria, prepared in 5% horse serum, was added to 99 ml of the Fit produce wash which was prepared at use strength. After 1 minute samples were removed, Fit was inactivated and the surviving organisms enumerated using standard plate counting techniques. Results are in Table 1:

Table 1: FIT Results after 1 Minute on Different Bacteria Strains

Bacteria	Log Reductions Using Fit (5 g/l) for 1 Min
Staphylococcus Aureus (ATCC 6538)	> 5 log ₁₀
Listeria Monocytogenes (ATCC 19117)	> 6 log ₁₀
Escherichia Coli (ATCC 11229)	> 6 log ₁₀
Pseudomonas Aeruginosa (ATCC 15442)	> 6 log ₁₀
Pseudomonas Cepacia (ATCC 25416)	> 6 log ₁₀
Salmonella Choleraesuis (ATCC 10708)	> 4 log ₁₀

Summary of the Methodology

Two test were conducted at HCRC Laboratories using 5g/l of FIT and 200 PPM chlorine against the five strains of Listeria Monocytogenes currently used in Fit produce testing. The specific strains of Listeria Monocytogenes tested were obtained from by Dr. Larry Beuchat and identified as CDC # HO222, F8369, F8027, F8255 and G1091.

Testing consisted of exposing a suspension of the challenge organism to the test material and a 200 PPM chlorine solution. After 30 seconds, 1 minute and 5 minute contact times, a 1.0 ml aliquot of the produce/bacteria suspension was neutralized in D/E broth, serially diluted, plated on Modified Oxford media supplemented with nalidixic acid (MOXN), and assayed for survivors. In addition, a suspension of each challenge organism was exposed to sterile USP water (parallel control) and the number of organisms determined per an colony forming units (CFU/ml) of the bacteria. Log reductions for each strain were then based on the strain’s parallel control numbers. Results are found in Table 2:

Table 2: FIT Provides >6.0 Log Kill Results in 30 seconds on Listeria and Equal to 200 ppm Chlorine

Test Product	L. Monocytogenes Strain (Individual/Cocktail)	Contact Time	L. Monocytogenes Log Reduction
FIT	HO222, F8369, F8027, F8255, G1091	30 Seconds	> 6.00
	HO222, F8369, F8027, F8255, G1091	1 Minute	> 6.00
	HO222, F8369, F8027, F8255, G1091	5 Minutes	> 6.00
200 PPM HOCl	HO222, F8369, F8027, F8255, G1091	30 Seconds	> 6.00
	HO222, F8369, F8027, F8255, G1091	1 Minute	> 6.00
	HO222, F8369, F8027, F8255, G1091	5 Minutes	> 6.00
FIT	Cocktail (5 Strain)	30 Seconds	> 6.00
	Cocktail (5 Strain)	1 Minutes	> 6.00
	Cocktail (5 Strain)	5 Minutes	> 6.00
200 PPM HOCl	Cocktail (5 Strain)	30 Seconds	> 6.00
	Cocktail (5 Strain)	1 Minutes	> 6.00
	Cocktail (5 Strain)	5 Minutes	> 6.46

In Vitro Suspension Testing

CEN EN 1276 – Summary of the Methodology:

A series of suspension tests using FIT were conducted at the RPTC Microbiology Laboratory. This method is the CEN EN1276 suspension test which simulates dirty wash conditions by adding an interfering substance (bovine albumin at 3 g/l) under hard water conditions. In this method one milliliter of bovine albumin and one milliliter of an inoculum containing 10⁸ colony forming units of bacteria was added to 8 ml of the Fit produce wash which was prepared at use strength. After 5 min exposure at 20⁰C samples were removed, Fit was inactivated and the surviving organisms enumerated using standard plate counting techniques. Results are in Table 3:

Table 3: EN 1276 suspension test data for FIT under dirty conditions

20 ⁰ C 5 Minutes	E. Hiraе		S. Aureus		E. Coli		Ps.Aeruginosa	
	Log ₁₀ Red	SD	Log ₁₀ Red	SD	Log ₁₀ Red	SD	Log ₁₀ Red	SD
Replicate 1	3.14	0.0	3.20	0.0	2.84	0.0	6.10	0.0
Replicate 2	3.14		3.20		2.84		6.10	
Replicate 3	3.14		3.20		2.84		6.10	
Average	3.14	0.0	3.20	0.0	2.84	0.0	5.61	0.0

Vitro Carrier Testing (Quantitative Use-Dilution Test)

Summary of the Methodology:

A series of carrier tests were conducted at the SWTC Microbiology Laboratory and Viomed Laboratories. This method is a quantified modification of the AOAC Use Dilution Test. In this method, the challenge organisms in the presence of 5% horse serum and 10 gpg AOAC hard water were inoculated and dried on stainless steel cylinders. The inoculated cylinders were exposed to Fit produce wash at use strength at 20⁰C for 10 minutes. After the 10 minute contact time, the carriers were removed and neutralized. The log₁₀ reductions were calculated versus the dry carrier controls, using standard plate counting techniques. Results are in Table 4:

Table 4: AOAC UDT Test – Equal Sanitization for FIT vs. 200 ppm Chlorine on Food Pathogen Bacteria

Test Product	S. Aureus Log Reduction	S. Choleraesuis Log Reduction	E. Coli Log Reduction	L. Monocytogenes Log Reduction
FIT	≥ 6.49	≥ 6.37	≥ 6.99	≥ 6.87
200 PPM HOCl	≥ 6.00	≥ 6.52	≥ 6.99	≥ 6.87

The initial dry carrier counts for S. Aureus, S. Choleraesuis, E. Coli, and L. Monocytogenes were 5.9×10^6 cfu/carrier, 3.3×10^6 cfu/carrier, 9.8×10^6 cfu/carrier, and 7.4×10^6 cfu/carrier, respectively.

Sanitization Testing with Inoculated Pathogenic Microorganisms

Summary of the Methodology:

In this method fresh produce was inoculated with various bacterial pathogen suspensions prepared in 5% horse serum. The horse serum was added to provide a standardized soil load. The bacterial suspensions were prepared to a density of approximately 10^9 colony forming units/ml and 100 ul of this suspension was placed onto the produce. The inoculated produce was allowed to dry in a laminar flow hood for approximately 90 minutes. After drying the produce was soaked in either 200 ppm chlorine or FIT (5 g/l) for five minutes. An untreated control was also included in the assay. The bacteria were then extracted from the produce and the produce wash was inactivated with a neutralizer solution. Following neutralization the bacteria were enumerated using standard plate counting techniques. The number of bacteria were converted into logarithmic units and a log reduction was calculated versus the untreated controls. Results are in Table 5:

Table 5: FIT Provides the Same Log Kill Benefits on Inoculated Produce vs. 200 ppm Chlorine

I. Escherichia Coli O157:H7

Produce	Log Reduction Using FIT (5 g/l)	Log Reduction HOCl (200 PPM)
Lettuce	1.43	1.79
Tomato	2.49	2.11
Broccoli	1.62	1.55

II. Staphylococcus Aureus

Produce	Log Reduction Using FIT (5 g/l)	Log Reduction HOCl (200 PPM)
Lettuce	2.08	2.09
Tomato	2.57	2.48
Broccoli	1.81	1.72

III. Salmonella SP:

Produce	Log Reduction Using FIT (5 g/l)	Log Reduction HOCl (200 PPM)
Tomato	4.17	5.18

Graph 1: FIT Efficacy on E. Coli over time

