

Produce Safety Study Report

Effectiveness of Multiple Washings and/or Organic Sanitizer Treatment in Reducing *E. coli* Levels in Leafy Greens Wash Water

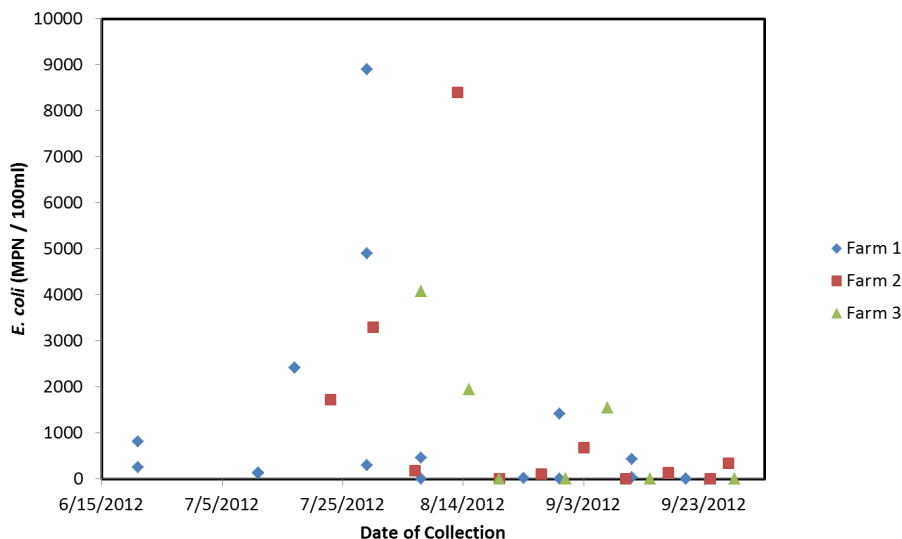
Reducing levels of bacteria in wash water is one way to reduce the risk of cross-contamination where one contaminated item can lead to the spread of microbes to other items being washed in the same water.

What we did: We sampled wash water from several leafy green wash systems on Vermont farms during the 2012 and 2013 growing season. An organic-approved sanitizer (SaniDate® 5.0) was added to some of the washes, with water collection before and after each addition. All water samples were tested for the presence of generic *E. coli*, a species of bacteria found in the mammalian gut which is used as an indicator for fecal contamination. To estimate the effectiveness of multiple washings and/or the addition of organic sanitizer, we calculated the percent reduction of generic *E. coli* after various treatments compared with a single wash without sanitizer.

Why it's important: Leafy greens are most commonly associated with foodborne outbreaks related to consumption of fresh produce, as they grow close to the soil and are typically eaten raw. A range of leafy greens wash systems exists on small diversified vegetable farms that characterize Vermont vegetable production; however, the effectiveness of such wash systems is not as well studied as large processing systems.



Figure 1. *E. coli* count (MPN / 100ml) in first wash by date



MPN = Most Probable Number

Take-home message:

The data in Figure 1 represent the *E. coli* levels in the wash water in the first vessel, reflecting the incoming bacterial load. Seasonal trends were observed during both the 2012 and 2013 seasons, with spikes of *E. coli* more common in mid summer. *E. coli* levels were moderately correlated with the high temperature of the day(s) before harvest.

Percent Reduction of *E. coli* by Wash and/or Sanitizer Treatment Compared to Single Wash

| | Double Wash | Triple Wash | Full Rate in First Wash | Full Rate in Second Wash | Half Rate Second Wash |
|----------------|-------------|-------------|-------------------------|--------------------------|-----------------------|
| Minimum | 56.6 | 89.6 | 55.3 | 98.1 | 94.6 |
| Average (mean) | 90.6 | 98.0 | 99.1 | 99.6 | 99.5 |
| Maximum | 100 | 100 | 100 | 100.0 | 100 |

Take-home message:

- All washing methods greatly reduce bacterial loads as compared to a single rinse without sanitizer.
- A full rate of SaniDate® 5.0 is effective when added to a single, double, or triple rinse system.
- A half rate of SaniDate® 5.0 should only be using in combination with multiple rinses.
- Extra precautions, such as multiple rinses or the addition of a sanitizer, are warranted during the summer months and/or during warm weather when bacteria multiply quickly.

What this means: Bacterial loads can be greatly reduced with the addition of a full-dose of sanitizer (SaniDate® 5.0, or similar product) if washing in a single vessel. This method requires less infrastructure and water.

Two rinses with the addition of a half or full dose of sanitizer to the second wash is an effective system when multiple rinses are desired to reduce grit but if there is a reduction in quality of greens from a third wash.

Triple washing is the best washing method for farms with appropriate infrastructure (e.g., triple bay sink, multiple stock tubs) when the use of sanitizer is not desired.

These practices are affordable, require a small amount of additional management, and reduce risk of cross contamination.

First Wash Second Wash Third Wash



Turbidity and E. coli loads are greatly reduced with subsequent washes.

What is a full dose? We considered a full dose of sanitizer to be 0.5oz / 10 gallons of wash water, based on label at the time the study began. The label recommendations have since changed to 0.6-2.0 oz (18-60ml) / 10 gallons of water. <http://www.biosafesystems.com/assets/sanidate-5.0-specimen-label.pdf>

Lynn Zanardi Blevins and Vern Grubinger. February 2014. University of Vermont Extension. <http://www.uvm.edu/vtvegandberry/factsheets/welcome.html>

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