Food Safety – Wash Water Sanitizers

Outbreaks of foodborne-illnesses from fresh produce in recent years have inspired new on-farm food safety regulations, and prompted farmers at all production scales to consider new practices aimed at reducing the risks of microbial pathogen contamination on their produce. Post-harvest sanitation is a key area where some of these improvements can be made. One sanitation practice is the addition of chemical sanitizers to vegetable wash water. More and more, smaller-scale farmers and food producers are adopting the use of sanitizing agents in wash waters to manage potential pathogens. Protocols for the use of these sanitizers were not necessarily written for the ranges of scale and level of infrastructure that exist on New England’s farms and more appropriate methods and rates are still being determined, as are the regulations and guidelines surrounding food safety.

The purpose of adding a sanitizer to vegetable wash water is not to try to sanitize the produce being washed, but to ensure that, if any item is contaminated with a microbial pathogen before it goes into a dunk tank, the wash water itself doesn’t become a source of contamination for every other piece of produce that passes through it. Because sanitizers are pesticides – they are used to kill harmful microorganisms – each must have an EPA registration number, and must be used in accordance with its label.

The anti-microbial activity of sanitizer solutions can be affected by several factors, including the presence of organic matter, and the pH and temperature of the solution. Different sanitizers are impacted by different variables. Chlorine is significantly impacted by temperature and pH, and the presence of organic matter, while peracetic acid (PAA) sanitizers are less affected by organic matter. These factors can be challenging to control in a farm wash room, so it is important to utilize available tools and practices for managing them. Remove as much soil and debris as possible from crops before they go into the sanitizer solution. Some crops, like zucchini or carrots, might be brushed or sprayed before being dunked in the sanitizer solution to remove excess debris, while more delicate crops like salad greens can be pre-washed in plain water. This will reduce the amount of organic matter present in the wash water tank and prolong the activity of the sanitizer. See the University of Vermont’s leafy greens wash water study and video on using triple washing to reduce E. coli in wash water.

Monitor pH levels in the water with pH test strips. You can also monitor the concentration of sanitizer with test strips specific to the product being used. For instance, chlorine levels can be measured with chlorine test papers, which will tell you the parts per million of free chlorine present. It is critical that you use test strips for free chlorine (not total chlorine), which measures the levels of the active, anti-microbial form of chlorine in the water. Also, be sure to get strips that measure differences within the solution’s targeted concentration range. Low range strips are available that allow you to measure between 0 and 7 parts per million in 1 ppm intervals, while high range strips will measure from 0 to several hundred ppm in 25 or 50 ppm intervals. There are also other strips specific to either PAA or chlorine dioxide. You need to know which sanitizer chemistry you are using to know which strips to use. There are a variety of products on the market, from several different producers. Some examples include: LaMotte, Industrial Tech Systems, and HACH. These strips can be found on-line, at restaurant supply stores, or some farm supply stores.

The particular concentrations and other methods for use and monitoring will be on the product label. Some sanitizers may require a certain amount of surface contact time, others may require a rinse step. Again, the label is the law. Organic growers should check with their certifying agency to be sure a sanitizer is allowed with their certification.

A helpful resource list of sanitizers is the Organic Materials Review Board (OMRI) list of processing & handling products. The section called Processing Sanitizers and Cleaners lists the categories and chemistries, product names, and some specifications particular to organic production. OMRI screens products for compliance with USDA organic standards, but the result is a good compilation of products that can be useful to all growers. You can also search the National Pesticide Information Retrieval System database to determine EPA registration status of a chemical or specific product.
Below are some of the most common active ingredients used for vegetable wash water sanitation, and an example of a labeled product. No endorsement is intended for any of the products listed in this article. Information is provided for educational purposes only.

**Sodium hypochlorite**, the active ingredient in household bleach, is probably the most commonly used sanitation product on farms because it is both inexpensive and accessible. However, if bleach is going to be used as a sanitizer in wash water, or on food-contact surfaces, the particular product must be registered with the EPA, and be labeled for this use. Not all bleach products have this label, and many formulations of bleach have added fragrances or other chemicals that would make them unsuitable for vegetable washing. There are hypochlorite products on the market that are labeled specifically for produce washing, both in liquid and tablet form, and at different concentrations.

**Clorox Germicidal Concentrated Bleach** (8.25% sodium hypochlorite) does have an EPA registration (EPA# 5813-102), and is labeled for use as a fruit and vegetable wash, as well as for sanitizing food contact surfaces. Be aware that the Clorox label states that for fruit and vegetable washing, the concentration of chlorine in the water may not be more than 25 ppm, and use rates are given accordingly. Fact sheets and other food safety resources may recommend preparing wash solutions at higher concentrations using household bleach, but be sure to follow the label for whichever product you are using. Using chlorine test strips to measure ppms will help you determine product use rates to stay within the allowable limit. AFCO and Birko are two other companies that sell hypochlorite products for use in fruit and vegetable wash waters.

As mentioned above, the level of active chlorine in the water will vary with the condition of the wash water. Chlorine is very sensitive to deactivation by organic matter, so pre-rinsing vegetables and changing the sanitizing solution frequently are important steps in maintaining the sanitizer’s effectiveness. Remember that the pre-rinse water will have a high organic load and therefore will be the highest risk water for contamination if it is not routinely changed or treated. Chlorine is most active as an anti-microbial agent at a pH between 6.0-7.5. It is important to target this range. Above 7.5, the sanitizer will not be as effective, or if pH is too high you can add citric or acetic acid (white vinegar) to lower the pH. Caution: below 6.0 the solution may form a toxic chlorine gas. An excellent and accessible resource that includes detailed information on the use of pH and chlorine test strips is Top FAQs about Produce Wash Water Management for Small-Scale and Direct Market Farms, a webinar originally presented by Trevor Suslow, an Extension specialist from the University of California Davis, Center for Produce Safety.

**Peracetic acid, also known as Peroxyacetic acid or PAA** dissolves into acetic acid and hydrogen peroxide in water, is much less sensitive to organic matter and is active over a broad pH range – 1.0 to 8.0. There are several sanitizer products available through companies such as BioSafe Systems and Ecolab, Inc. and through retailers such as Johnny’s Seeds.

**Sanidate 5.0** is labeled for use as a vegetable wash water sanitizer. As described in the University of Vermont greens washing study, adding a full-dose of a Sanidate 5.0 to leafy greens wash water reduced the generic E. coli levels in the water after the first rinse by 99.1% compared to a single wash in plain potable water. There are a variety of other product names that use this chemistry. EcoLab sells a product called Tsunami, Spartan sells PAA Sanitizer FP.

**Chlorine dioxide**, is a gas that is effective at a broader pH range and lower concentrations than hypochlorite, and is less affected by organic matter. It may be more expensive. You traditionally need a dosing unit to penetrate the CLO2 into your water source. Research has shown that this is an effective treatment but there is an initial investment to get it installed.

**Oxine**, made by Bio-Cide International, is registered with the EPA and labeled for use in vegetable washing systems.

For more information on wash water sanitation, please see the following resources:
Washington State University Post-harvest Information Network: Wash Water Sanitation: How Do I Compare Different Systems?

University of California, Davis publication: Postharvest Chlorination: Basic Properties and Key Points for Effective Disinfection

Penn State Bulletin: Use of Bleach as a Disinfectant in Post-harvest Washing Systems

UVM Produce Safety Study Report on Leafy Greens Washing

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