Exploring Sanitizers in the Produce Industry Including Usage and Labels

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AFDO 2025 – Produce Track

Today's Objectives

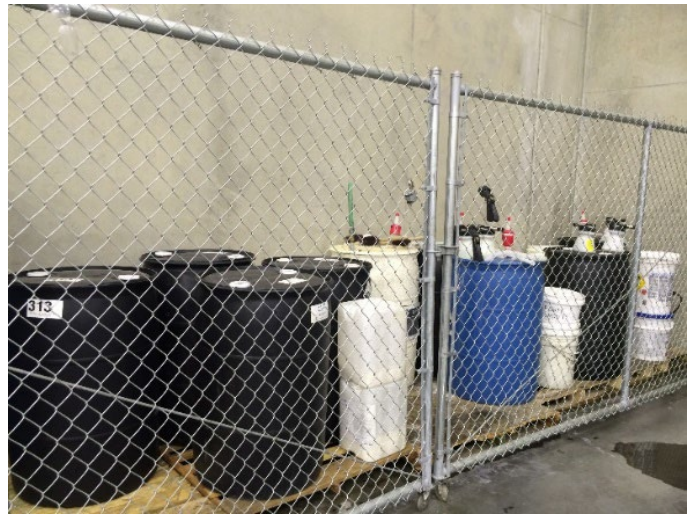
Why are Sanitizers Used?

What Factors to Consider?

Which Sanitizers are Commonly Used?

What is a Sanitizer?

- A substance that reduces the amount of microorganisms to acceptable levels
- Focus on sanitizers used for two purposes:
  - Food contact surfaces
  - Fruit and vegetable wash water



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Sanitizer Use: Food Contact Surfaces

- Part of the cleaning and sanitizing process for food contact surfaces
  - Treatment of a cleaned surface to reduce or eliminate microorganisms
  - Harvest knives, bins, tables
  - Reduces biofilm formation

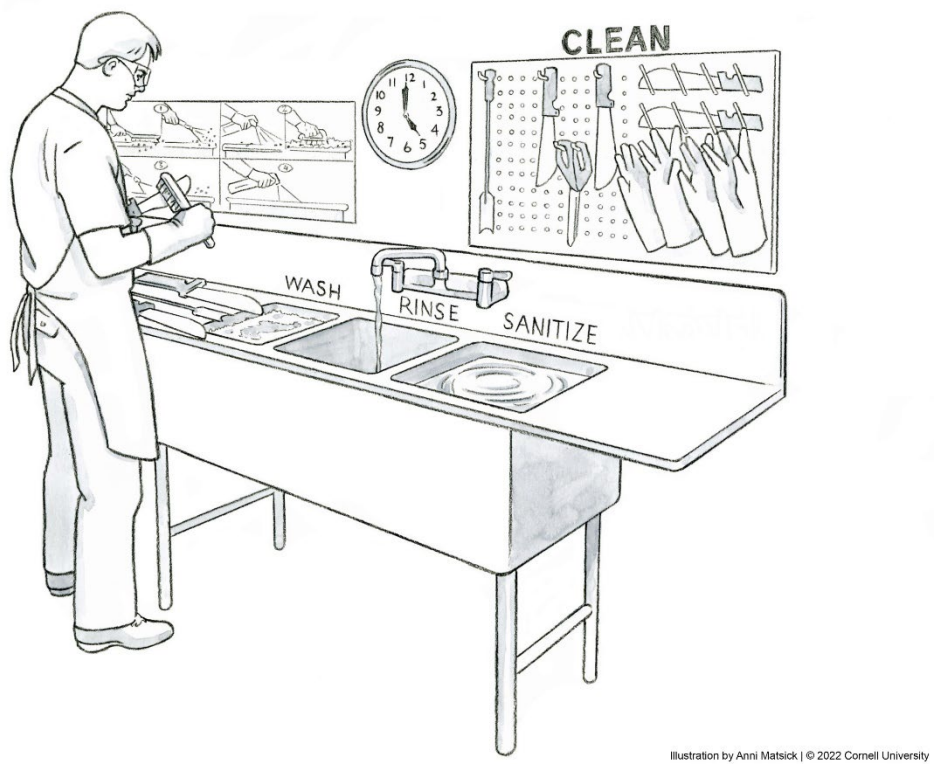

Illustration by Anni Matsick | © 2022 Cornell University

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Sanitizer Use: Fruit and Vegetable Wash Water

- Maintain quality of postharvest water
  - Reduces risks of **cross-contamination** from dirty water and contaminated food contact surfaces
  - NOT intended to “wash” the product
- Reduces plant pathogens that impact shelf life and rot

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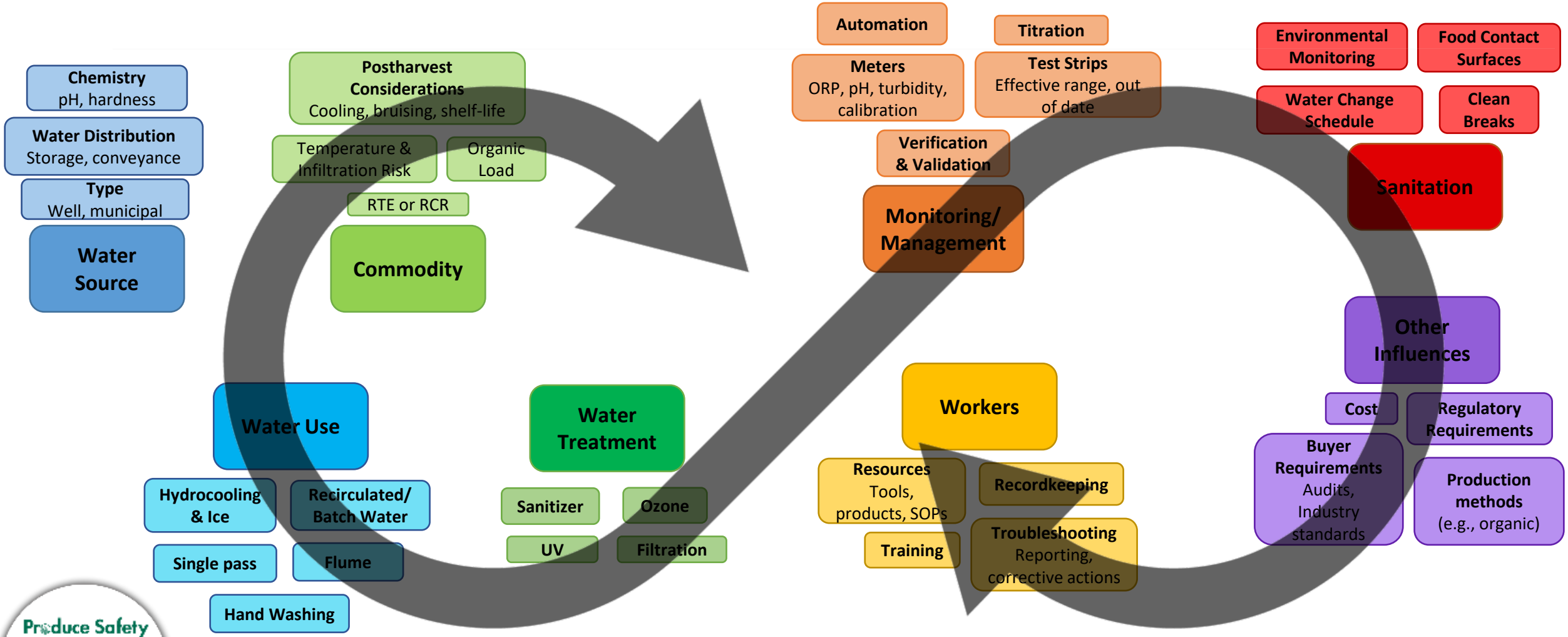
Necessary Criteria for a Sanitizer…

- Broad Spectrum (bacteria, viruses, and parasites)
- No harmful by-products
- No damage, off flavors, odor
- No damage to equipment
- No residual activity to the environment
- Cost effective - Cheap

No sanitizer meets all these!

All Decisions Are Part of a **System**!



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And the System Drives the **Considerations** in Making a Decision!

Finding the Right Fit

- Application matters a lot, as we've just learned
- What crop is being packed?
- What are characteristics of the water source?
- How is the water being applied?
- Will the water be recirculated?
- How long is the water used before it is dumped?
- Think about these factors as we discuss a wide range of compounds which are used during postharvest washing

Most Commonly Used – Short List

Chemical

- Hypochlorites
- Chlorine Dioxide
- Peracetic Acid
- Other Labeled Sanitizers

Devices

- Ultraviolet light

Forms of Chlorine

- Liquid
  - Sodium Hypochlorite
  - NaOCl
  - 5.25 to 12.5%

Agricultural Uses [Sanitization/Washing]
Post-Harvest Protection - Potatoes can be sanitized after cleaning and prior to storage by spraying with a sanitizing solution at a level of 1 gallon of sanitizing solution per ton of potatoes. Thoroughly mix 2.5 fl.oz. of this product to 2 gallons of water to obtain 500 ppm available chlorine.
Food Egg Sanitization – Thoroughly clean all eggs. Thoroughly mix 4.5 fl. oz. of this product with 10 gallons of warm water to produce a 200 PPM available chlorine solution. The sanitizer temperature should not exceed 130º F. Spray the warm sanitizer so that the eggs are thoroughly wetted. Allow the eggs to thoroughly dry before casing or breaking. Do not apply a potable water rinse. The solution should not be re-used to sanitize eggs.
Fruit & Vegetable Washing - Thoroughly clean all fruits and vegetables in a wash tank. Thoroughly mix 11 fl.oz. of this product in 200 gallons of water to make a sanitizing solution of 25 ppm available chlorine. After draining the tank, submerge fruit or vegetables for 2 minutes in a second wash tank containing the recirculating sanitizing solution. Spray rinse vegetables with the sanitizing solution prior to packaging. Rinse fruit with potable water only prior to packaging.

- Solid - Tablets or Powder
  - Calcium Hypochlorite
  - $Ca(OCl)_2$
  - 68%

[**Fruit & Vegetable Washing:** Thoroughly clean all fruits and vegetables in a wash tank. Thoroughly mix 1 ounce of this product in 200 gallons of water to make a sanitizing solution of 25 ppm available chlorine. After draining the tank, submerge fruit or vegetables for two minutes in a second wash tank containing the recirculating sanitizing solution. Spray rinse vegetables with the sanitizing solution prior to packaging.]

[**Commodity Fruit & Vegetable Treatment:** Wash fruits and vegetables to remove organic matter; then treat as noted below.

Table of Recommended Levels and Use Dilutions for Available Chlorine

Commodity	Usage Dilution dry oz. added to 250 gal. of water	(ppm) Available Chlorine	Contact Time
Apple	7.7 - 10.3	150 - 200	45-90 sec.(dump tank) 5-15 sec. (spray)
Artichoke	5.1 - 7.7	100 - 150	5-15 sec. (spray)
Asparagus	6.4 - 7.7	125 - 150	5-15 sec. (spray) 20-30 min.(hydrocooler)
Brussels Sprouts	5.1 - 7.7	100 - 150	5-15 sec. (spray)

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[86460-4 ECR Calcium Hy hlorite AST
MASTER LABEL]

Carrots	5.1 - 10.3	100 - 200	1-5 min. (dump tank) 1-5 min. (flume)
Cauliflower	15.4 - 20.5	300 - 400	5-15 sec. (spray)
Celery	5.1 - 5.7	100 - 110	5-15 sec. (spray)
Cherry	3.9 - 5.1	75 - 100	5-15 sec. (spray)
Chopped Cabbage	4.1 - 5.1	80 - 100	5-15 sec. (spray)
Chopped Lettuce	4.1 - 5.1	80 - 100	5-15 sec. (spray)
Citrus Fruits	1.3 - 10.3	40 - 75 30 - 50 100 - 200	5-15 sec. (spray) 2-3 min. (dump tank) 3-5 min. (drench)
Cucumbers	15.4 - 18.0	300 - 350	5-15 sec. (spray)
Green Onions	3.9 - 8.2	75 - 120	5-15 sec. (spray)
Melons	5.1 - 7.7	100 - 150 30 - 75	5-15 sec. (spray) 20-30 min.(hydrocooler)
Peaches, Nectarines and Plums	2.6 - 5.1	50 - 100	5-15 sec. (spray)
Pears (without buffer)	10.3 - 15.4	200 - 300	2-3 min. (dump tank)
Peppers	15.4 - 20.5 5.1 - 8.9	300 - 400 100 - 135	5-15 sec. (spray) 2-5 min. (dump tank)
Potatoes	3.3 - 8.4	65 - 125	2-5 min.(dump tank)(30-100ppm) 2-5 min. (flume)(200-300ppm) 5-30 sec.(spray)(100-200ppm)
Radishes	5.1 - 7.7	100 - 150	5-15 sec. (spray)
Stonefruit	1.5 - 3.9	30 - 75	20-30 min. (hydrocooler)
Tomatoes	15.4 - 18.0	300 - 350	2-3 min (tank)(200-350 ppm) 5-15 sec.(spray)(100-150ppm)

Products are examples only, not an endorsement. Always check the label of the product before use.

Forms of Chlorine

- Gas
  - Chlorine Gas
  - Cl_2
  - 99.5%

EPA REG. NO 37982-2
EPA EST. NO. 61667-CA-1, CA-2, LA-1, NV-1, WA-1, WA-2
71207-CAN-1, CAN-2, CAN-3

POST HARVEST TREATMENT OF FRUITS AND VEGETABLES

For the control of microorganisms causing decay of fruits and vegetables, please refer to the following tables for the recommended concentration levels of available chlorine.

For treatment of fruit and vegetable commodities, do not rinse with fresh water after treatment. After treatment, moisture must be removed by centrifuging. Mushrooms must be treated with an anti-oxidant after chlorine treatment to prevent browning.

Chlorine (HOCl)

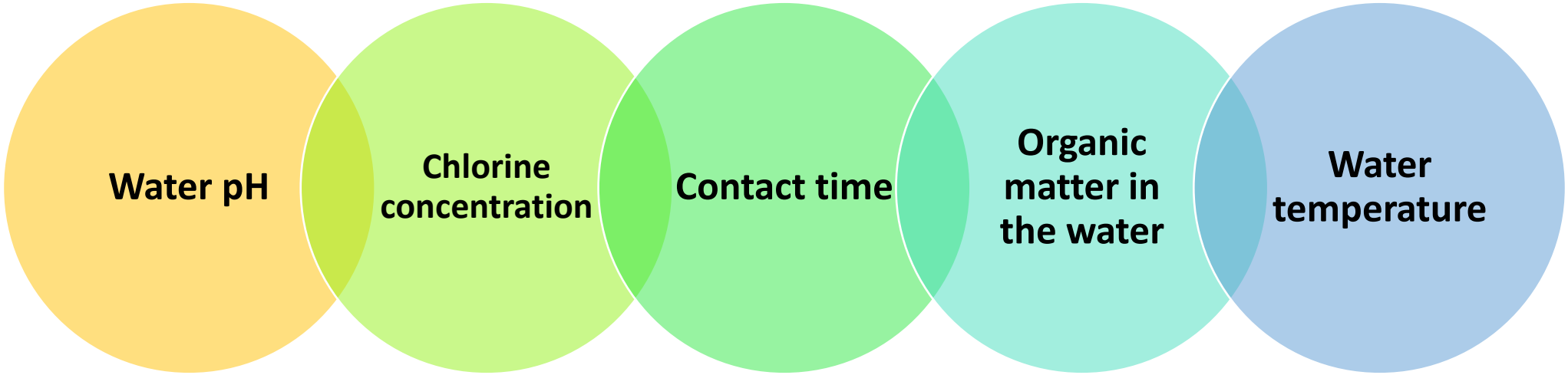
Advantages

- Broad spectrum
- Hard water tolerant
- Low temperature activity
- Relatively inexpensive
- No residual activity or film formation

Disadvantages

- Toxicity at low pH: Chlorine gas
  - Extremely low pH or high temperature
- Corrosive/Irritant
- Unstable
- Environmental concerns
  - Disinfection by-products (DBPs

Many Factors can Influence this Efficacy



Additional Chlorine Source

- Chlorine Dioxide
  - Powder or Liquid
  - ClO_2
  - 99.5%

[Specific Applications]

[†] [Use Anthium™ Dioxcide to Extend Freshness and Shelf Life of Fruits and Vegetables

1. Before treatment, whole fruits and vegetables must be washed and thoroughly rinsed with clean, potable water.
2. In a one (1) gallon container, add 1/3 fl. oz. (10 ml) of Anthium™ Dioxcide and add 0.002 grams of Activator-C or adjust the pH to 2.6 with vinegar. Allow to stand for 15 minutes then add to 24 gallons of water.
3. Pretreatment for Uncut, Unpeeled Fruits and Vegetables: Dip uncut, unpeeled fruits and vegetables in treatment solution for about ten (10) to twenty (20) seconds, then follow with a potable water rinse.**]**

Chlorine Dioxide (ClO_2)

Advantages

- Highly reactive - low use concentration
- Less pH sensitive than chlorine
- Less corrosive than chlorine
- More hard water tolerant than chlorine
- More environmentally friendly than chlorine
  - No trihalomethane prod.

Disadvantages

- Safety
- Toxicity
- Light sensitive
- Temperature sensitive
- On-site generation (usually)
- Not approved for all applications
- Cost

Peroxyacetic Acid/Peracetic Acid (PAA)

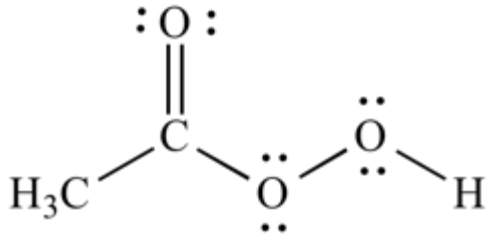
- Liquid
  - PAA - 5.6-21.5%
  - Hydrogen Peroxide - 10-22%

TREATMENT OF FRUIT AND VEGETABLE PROCESS WATER SYSTEMS

This product can be used in water or ice that contacts raw or fresh, post-harvest or further processed fruits and vegetables for the control of spoilage and decay causing bacteria and fungi in commercial operations and packinghouses.

Batch, Continuous or Spray System Processes: Fill vessel containing fruits and vegetables with known amount of water. Ensure that water is circulating in vessel if using the submersion method. Add this product to no more than 500 ppm residual peroxyacetic acid to the use solution in accordance with Food Contact Notification #1738, effective March 28, 2017. This can be accomplished by initially adding 3.8 fl. oz. per 10 gallons of water. The recommended concentration is between 30-300 ppm as peroxyacetic acid (0.23-2.3 fl. oz. per 10 gallons of water). The final concentration necessary to accomplish the intended task will vary from plant-to-plant. The fruits and vegetables can be continuously sprayed or submerged (dipped) in the resulting solution. Periodic or continuous additions of this product to maintain the required concentration may be added as necessary. It is also recommended to apply this product during the washing, chilling, or physical cleaning processes, including the roller-spreader, washer or brush washer manifold, dip tank, or sorting processes. Contact time of 60 seconds is recommended to insure efficacy. A potable water rinse is not required.

Peracetic Acid (PAA)



Advantages

- No residue
- Generally non-corrosive
- Mildly tolerant to organic soil
- Environmentally friendly
- Broad
  - pH range (Up to pH 7.5)
  - Spectrum activity
  - Temperature range
- Active against biofilms

Disadvantages

- Metal ion sensitivity
- Corrosive to soft metals
- Odor of concentrated solutions
- Irritant (concentrated solutions)
- Varied activity against fungi

Ultraviolet Light (UV)

Advantages

- Not effected by pH or temperature
- No residual taste or odor
- Low toxicity
- Often combined with other disinfectants
- Low cost associated with system use once initial investment is paid
- No downstream activity to interact with other compounds (e.g., fertilizers or pesticides)

Disadvantages

- Water turbidity will limit effectiveness, but with appropriate sizing, even turbid water can be treated (at an increase in cost of unit)
- No downstream activity- will not control for cross-contamination
- Not appropriate for postharvest water without other sanitizers
- Lamp degrades, but typically will get 10,000 hour run time

Chemical Sanitizer Regulations

- Approval as Sanitizer
  - Environmental Protection Agency
    - EPA label showing approval for washing fruits and vegetables
    - Look for:
      - Appropriate concentration
      - Contact time
      - Is a rinse needed
- The label is your hard-to-understand friend (and also legally required)

PSA EPA-Labeled Sanitizers for Produce Web Tool

https://resources.producesafetyalliance.cornell.edu/sanitizer/

- Tool was designed as a resource to help produce growers (and those who support them) review and select sanitizers based on their EPA label
  - Originally released in 2017 as an Excel file; limitations on usability so adapted into a web tool
- Resource is intended for educational use and not intended for regulatory purposes
  - Users should consult the manufacturer, supplier, and labels to find technical information

Total results found: 105

Type to search (e.g., product name, active ingredient)

Compare | Reset

				EPA Master Label Details							Product Information			
				EPA Master Label		Preharvest Labeled Uses	Postharvest Labeled Uses			Efficacy Statement				
Compare	Product Name	Name on EPA Master Label	Active Ingredient (% Strength)	EPA Registration Number	Labeled Use Info Based on Version Date	Labeled For Use in Irrigation Water Systems	Labeled For Use on Non-Porous Food Contact Surfaces	Labeled For Use on Postharvest Water Distribution Systems	Labeled for Use in Fruit and Vegetable Wash Water	Labeled to Control Human Pathogens	Organic Materials Review Institute (OMRI) Listing	Quantity Purchasable per EPA Label	Manufacturer/ Distributor	Notes
☐	Agchlor 310	Agchlor 310	Sodium hypochlorite (12.5%)	2792-62	5/23/12	No	Yes, see page 7	No	Yes, see page 7	No	Not listed	Gallons: 55	Decco US Post-harvest, Inc.	None
☐	Alpet D2 Surface Sanitizer	Alpet D2	Isopropyl Alcohol (58.6%); Quaternary Ammonium (0.0075%, see label)	73232-1	4/21/20	No	Yes, see page 6	No	No	For Food Contact Surfaces	Not listed	Information not available	Best Sanitizers, Inc.	None
☐	Alpet D2 Quat-Free Surface Sanitizer	Alpet D2 Quat-Free Surface Sanitizer	Ethanol (62.5%); Isopropanol (7.5%)	73232-4	8/16/21	No	Yes, see page 5	No	No	For Food Contact Surfaces	Allowed with restrictions	Information not available	Best Sanitizers, Inc.	None
☐	Anthium Dioxcide	Anthium Dioxcide	Chlorine dioxide (5.0%)	9150-2	4/6/20	Yes, see page 22	Yes, see page 23	Yes, see page 12	Yes, see page 9	No	Not listed	Information not available	International Dioxcide, Inc.	None
☐	Antimicrobial Fruit & Vegetable Treatment	Antimicrobial Fruit and Vegetable Treatment	Lactic Acid (17.3%); Quaternary Ammonium (1.2%, see label)	1677-234	10/31/17	No	No	No	Yes, see page 6	For Washing Fruits and Vegetables	Not listed	Ounces: 4, 64, 96 Gallons: 1, 2.5, 4	Ecolab, Inc.	None

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PSA EPA-Labeled Sanitizers for Produce Web Tool

Updates included:

- Addition of product labels, when available
  - More accurate in identifying labeled uses for each sanitizer product
- Hyperlink to manufacturer/distributor contact information
- Search bar
- Compare function

Total results found: 105

Type to search (e.g., product name, active ingredient)

Compare | Reset

				EPA Master Label Details							
				EPA Master Label		Preharvest Labeled Uses	Postharvest Labeled Uses			Efficacy Statement	
Compare	Product Name	Name on EPA Master Label	Active Ingredient (% Strength)	EPA Registration Number	Labeled Use Info Based on Version Date	Labeled For Use in Irrigation Water Systems	Labeled For Use on Non-Porous Food Contact Surfaces	Labeled For Use on Postharvest Water Distribution Systems	Labeled for Use in Fruit and Vegetable Wash Water	Labeled to Control Human Pathogens	
☐	Agchlor 310	Agchlor 310	Sodium hypochlorite (12.5%)	2792-62	5/23/12	*No*	Yes, see page 7	*No*	Yes, see page 7	*No*	
☐	Alpet D2 Surface Sanitizer	Alpet D2	Isopropyl Alcohol (58.6%); Quaternary Ammonium (0.0075%, see label)	73232-1	4/21/20	*No*	Yes, see page 6	*No*	*No*	For Food Contact Surfaces	

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Walkthrough of the Tool

- Tool is divided into three sections, all viewable from one screen
- First section includes
  - Product name
  - Name on EPA Master Label
  - Active Ingredient (including the % strength for each)
- Both product labels and EPA labels are clickable hyperlinks (when available)

Total results found: 105

Type to search (e.g., product name, active ingredient)

Compare | Reset

Compare	Product Name	Name on EPA Master Label	Active Ingredient (% Strength)
☐	Agchlor 310	Agchlor 310	Sodium hypochlorite (12.5%)
☐	Alpet D2 Surface Sanitizer	Alpet D2	Isopropyl Alcohol (58.6%); Quaternary Ammonium (0.0075%, see label)
☐	Alpet D2 Quat-Free Surface Sanitizer	Alpet D2 Quat-Free Surface Sanitizer	Ethanol (62.5%); Isopropanol (7.5%)

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EPA Master Label Details

- Content of the tool centers around EPA Master label details
  - Individual product labels could not always be found
  - Product labels may also differ by state

- Label uses are broken into four sections:
  - Pre-harvest (e.g., irrigation water systems)
  - Postharvest (food contact surfaces, postharvest water distribution systems, fruit and vegetable wash water)

EPA Master Label Details						
EPA Master Label		Preharvest Labeled Uses	Postharvest Labeled Uses			Efficacy Statement
EPA Registration Number	Labeled Use Info Based on Version Date	Labeled For Use in Irrigation Water Systems	Labeled For Use on Non-Porous Food Contact Surfaces	Labeled For Use on Postharvest Water Distribution Systems	Labeled for Use in Fruit and Vegetable Wash Water	Labeled to Control Human Pathogens
2792-62	5/23/12	*No*	Yes, see page 7	*No*	Yes, see page 7	*No*
73232-1	4/21/20	*No*	Yes, see page 6	*No*	*No*	For Food Contact Surfaces

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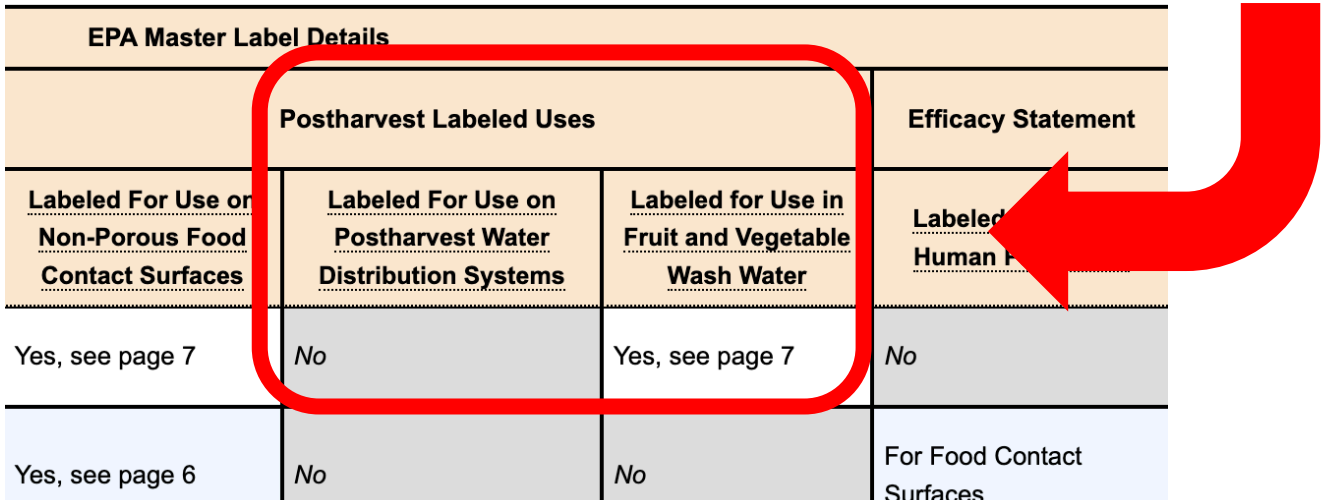
				EPA Master Label Details										
				EPA Master Label		Preharvest Labeled Uses	Postharvest Labeled Uses			Efficacy Statement	Product Information			
Compare	Product Name	Name on EPA Master Label	Active Ingredient (% Strength)	EPA Registration Number	Labeled Use Info Based on Version Date	Labeled For Use in Irrigation Water Systems	Labeled For Use on Non-Porous Food Contact Surfaces	Labeled For Use on Postharvest Water Distribution Systems	Labeled for Use in Fruit and Vegetable Wash Water	Labeled to Control Human Pathogens	Organic Materials Review Institute (OMRI) Listing	Amount Purchasable per EPA Label	Manufacturer/ Distributor	Notes
☐	Agchlor 310	Agchlor 310	Sodium hypochlorite (12.5%)	2792-62	2/2/24	*No*	Yes, see page 7	*No*	Yes, see page 7	*N*	Not listed	Gallons: 55	Decco US Post-harvest, Inc.	None
☐	Alpet D2 Surface Sanitizer	Alpet D2	Isopropyl Alcohol (58.6%); Quaternary Ammonium (0.0075%, see label)	73232-1	4/21/20	*No*	Yes, see page 6	*No*	*No*	F… Food Contact S…faces	Not listed	Information not available	Best Sanitizers, Inc.	None
☐	Alpet D2 Quat-Free Surface Sanitizer	Alpet D2 Quat-Free Surface Sanitizer	Ethanol (62.5%); Isopropanol (7.5%)	73232-4	8/16/21	*No*	Yes, see page 5	*No*	*No*	F… Food Contact S…faces	Allowed with restrictions	Information not available	Best Sanitizers, Inc.	None
☐	Anthium Dioxcide	Anthium Dioxcide	Chlorine dioxide (5.0%)	9150-2	4/6/20	Yes, see page 22	Yes, see page 23	Yes, see page 12	Yes, see page 9	*N*	Not listed	Information not available	International Dioxcide, Inc.	None
☐	Antimicrobial Fruit & Vegetable Treatment	Antimicrobial Fruit and Vegetable Treatment	Lactic Acid (17.3%); Quaternary Ammonium (1.2%, see label)	1677-234	10/31/17	*No*	*No*	*No*	Yes, see page 6	F… Washing Fruits and V…etables	Not listed	Ounces: 4, 64, 96 Gallons: 1, 2.5, 4	Ecolab, Inc.	None
☐	Marketguard 700	Antimicrobial Fruit and Vegetable Treatment	Lactic Acid (17.3%); Quaternary Ammonium (1.2%, see label)	1677-234	10/31/17	*No*	*No*	*No*	Yes, see page 6	F… Washing Fruits and V…etables	Not listed	Ounces: 4, 64, 96 Gallons: 1, 2.5, 4	Ecolab, Inc.	None
☐	Dixichlor	Bacticide	Sodium Hypochlorite (12.5%)	37982-20001	3/14/05	*No*	Yes, see page 4	*No*	Yes, see page 15	*N*	Not listed	Information not available	Pioneer Americas	• Allowed uses on Product Label differ from uses on EPA Master Label
☐	BioSide HS 15%	BioSide HS 15%	PAA (15.0%); Hydrogen Peroxide (22.0%)	63838-2	2/21/20	Yes, see page 15	Yes, see page 5	Yes, see page 10	Yes, see page 9	F… Food Contact S…faces	Allowed with restrictions	Information not available	Enviro Tech Chemical Services	• Allowed uses on Product Label differ from uses on EPA Master Label • EPA Master Label identifies State-level restrictions • EPA Master Label allows for foliar



EPA Master Label Details			
	Postharvest Labeled Uses		Efficacy Statement
Labeled For Use on Non-Porous Food Contact Surfaces	Labeled For Use on Postharvest Water Distribution Systems	Labeled for Use in Fruit and Vegetable Wash Water	Labeled Human P…
Yes, see page 7	*No*	Yes, see page 7	*No*
Yes, see page 6	*No*	*No*	For Food Contact Surfaces

Additional Product Information

- Organic Materials Review Institute (OMRI) column identifies whether produce is listed for organic use
- Amount purchasable
- Manufacturer/Distributor contact information is hyperlinked, when available
  - Intent is to make accessing information easy for the user

Product Information			
Organic Materials Review Institute (OMRI) Listing	Amount Purchasable per EPA Label	Manufacturer/ Distributor	Notes
Not listed	Gallons: 55	Decco US Post-harvest, Inc.	None
Not listed	Information not available	Best Sanitizers, Inc.	None
Allowed with restrictions	Information not available	Best Sanitizers, Inc.	None

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What we learned about EPA Labels vs. Product Labels

- One of the challenges is that people say “the label is the law”
  - Our earlier interpretation was that the EPA Master Label is required
- EPA’s Introduction to Pesticide Labels website defines a label as: “the written, printed, or graphic matter **on, or attached to, the pesticide** or device or **any of its containers or wrappers**”
  - New understanding is that the product label (and any other attached literature) is the governing document and legally enforceable
- Benefit to the EPA label is that it is available and consistent on a federal level
  - Product labels also differ by state; some farms operate in more than one state

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Time to search some labels!

- Each table is assigned SaniDate 15
- Use the PSA EPA-Labeled Sanitizers for Produce web tool to figure out the following key information
- First use your device to either scan the QR Code or visit:

https://resources.producesafetyalliance.cornell.edu/sanitizer/

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What Each Group Should Decide

- What is the EPA registration number?
- What page can you find the instructions for treatment of water and what do your instructions say?
- What ppm PAA is your target?
- What's the dosing per 25 gallons?
- What's the minimum contact time?
- Does water need to be at a certain pH?

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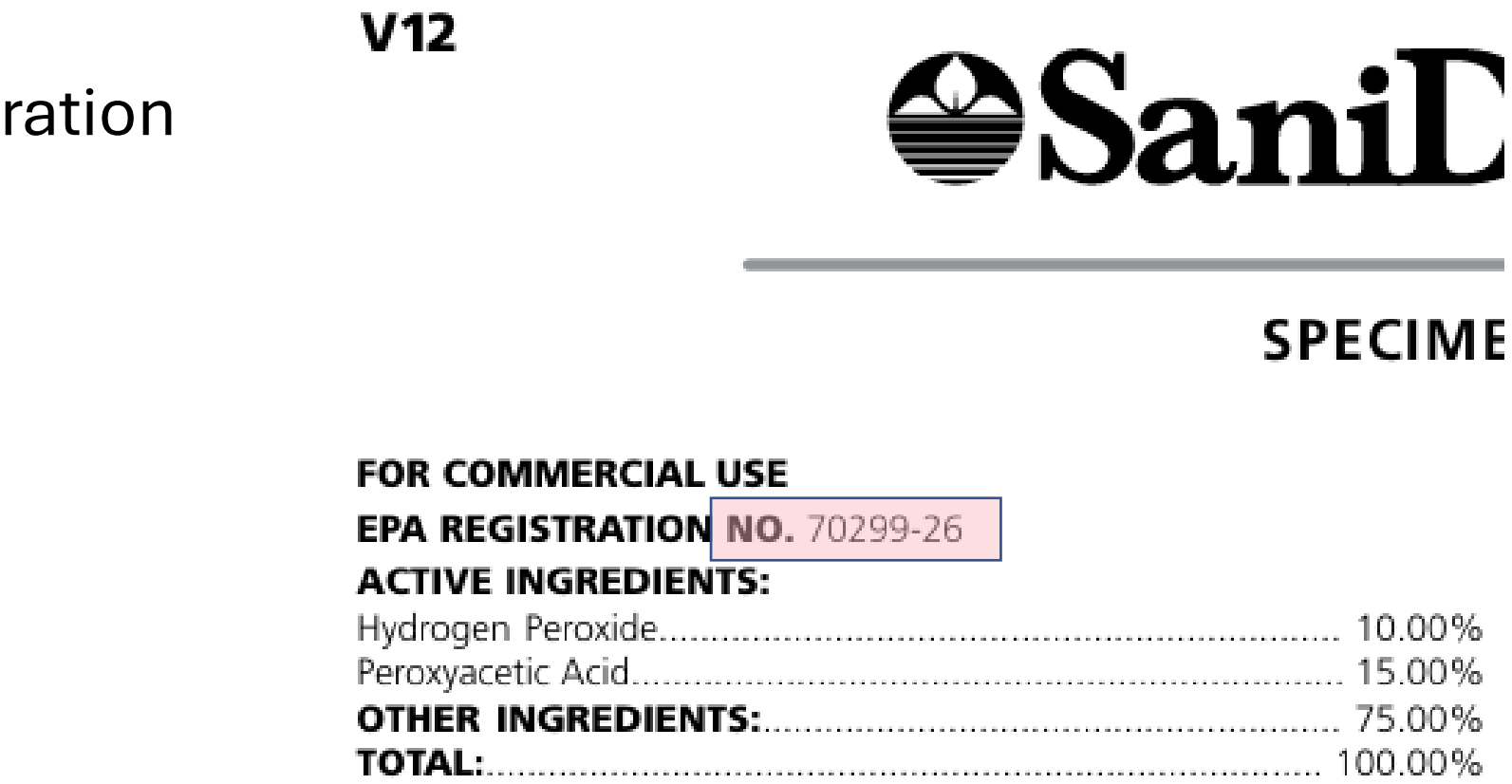
SaniDate 15 Label Hunt

- What is the EPA registration number?




SaniDate 15.0
KEEP OUT OF REACH OF CHILDREN
STRONG OXIDIZING AGENT
DANGER – PELIGRO
Si usted no entiende la etiqueta, busque a alguien para que se la explique a usted en detalle.
(If you do not understand this label, find someone to explain it to you in detail.)
FIRST AID
If in eyes
• Hold eye open and rinse slowly and gently with water for 15–20 minutes.
• Remove contact lenses, if present, after the first 5 minutes, then continue rinsing eye.
• Call a poison control center or doctor for treatment advice.
If on skin or clothing
• Take off contaminated clothing.
• Rinse skin immediately with plenty of water for 15–20 minutes.
• Call a poison control center or doctor for treatment advice.
If inhaled
• Move person to fresh air.
• If person is not breathing, call 911 or an ambulance, then give artificial respiration, preferably mouth-to-mouth if possible.
• Call a poison control center or doctor for treatment advice.
If swallowed
• Call a poison control center or doctor immediately for treatment advice.
• Have person sip a glass of water if able to swallow.
• Do not induce vomiting unless told to do so by the poison control center or doctor.
• Do not give anything by mouth to an unconscious person.
Have the product container or label with you when calling a poison control center or doctor, or going for treatment. You may also contact 1-800-222-1222 for emergency medical treatment information.
NOTE TO PHYSICIAN
Probable mucosal damage may contraindicate the use of gastric lavage.
See inside booklet for additional precautionary statements and directions for use.
Net Contents:
2.5 5 30 55 275 330 gallons
1704-0
Sanitizer/Disinfectant
Water additive for pathogen reduction in fruit and vegetable processing
FOR COMMERCIAL USE
ACTIVE INGREDIENTS:
Hydrogen Peroxide 10.00%
OTHER INGREDIENTS: 75.00%
TOTAL: 100.00%
BioSafe Systems
Manufactured by: BioSafe Systems, LLC
22 Meadow Street East Hartford, CT 06108
1-888-273-3088
EPA Registration No. 70299-26
EPA Establishment No.
067441-IL-001 92957-AR-001
082521-GA-001 70281-NV-2
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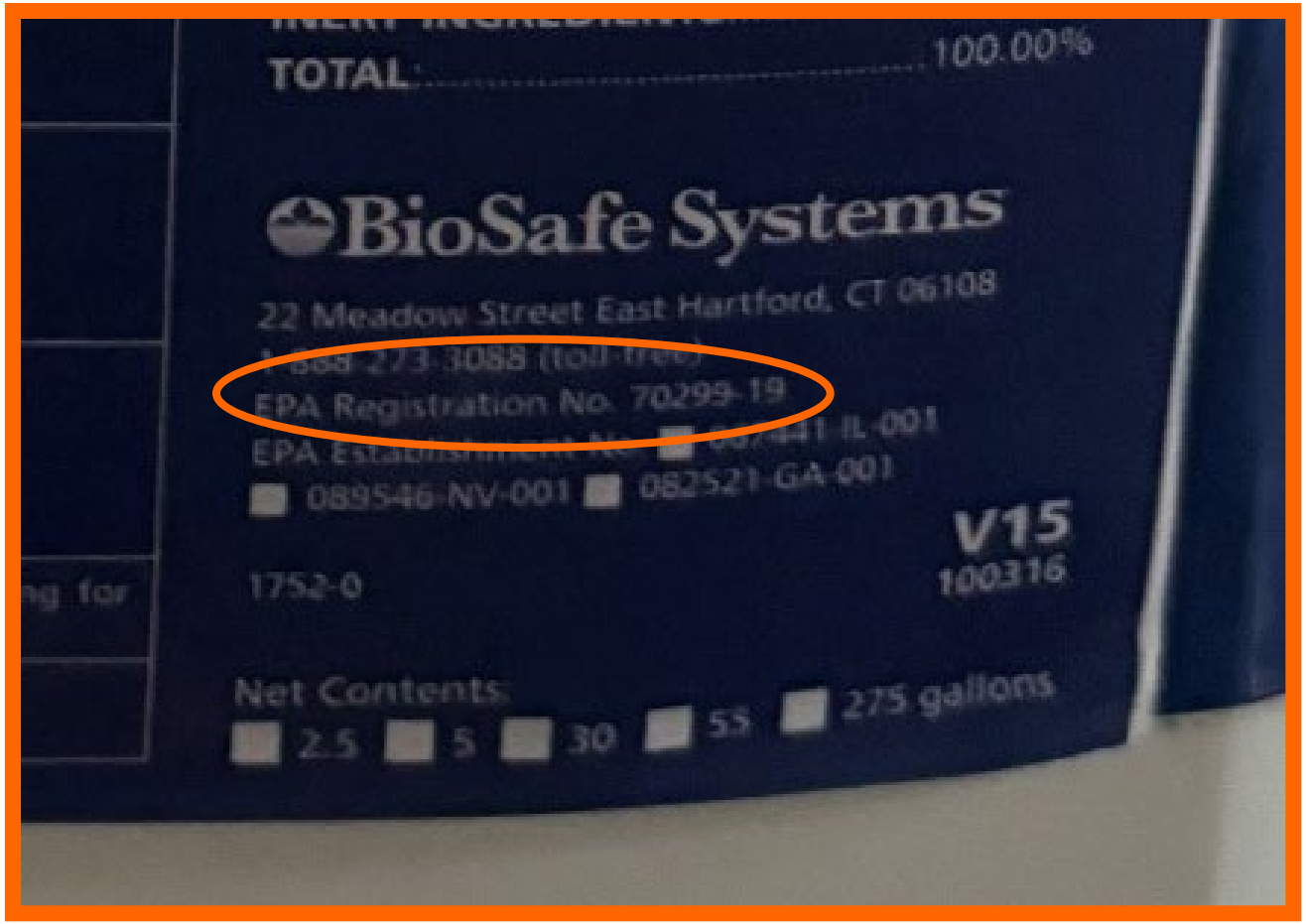
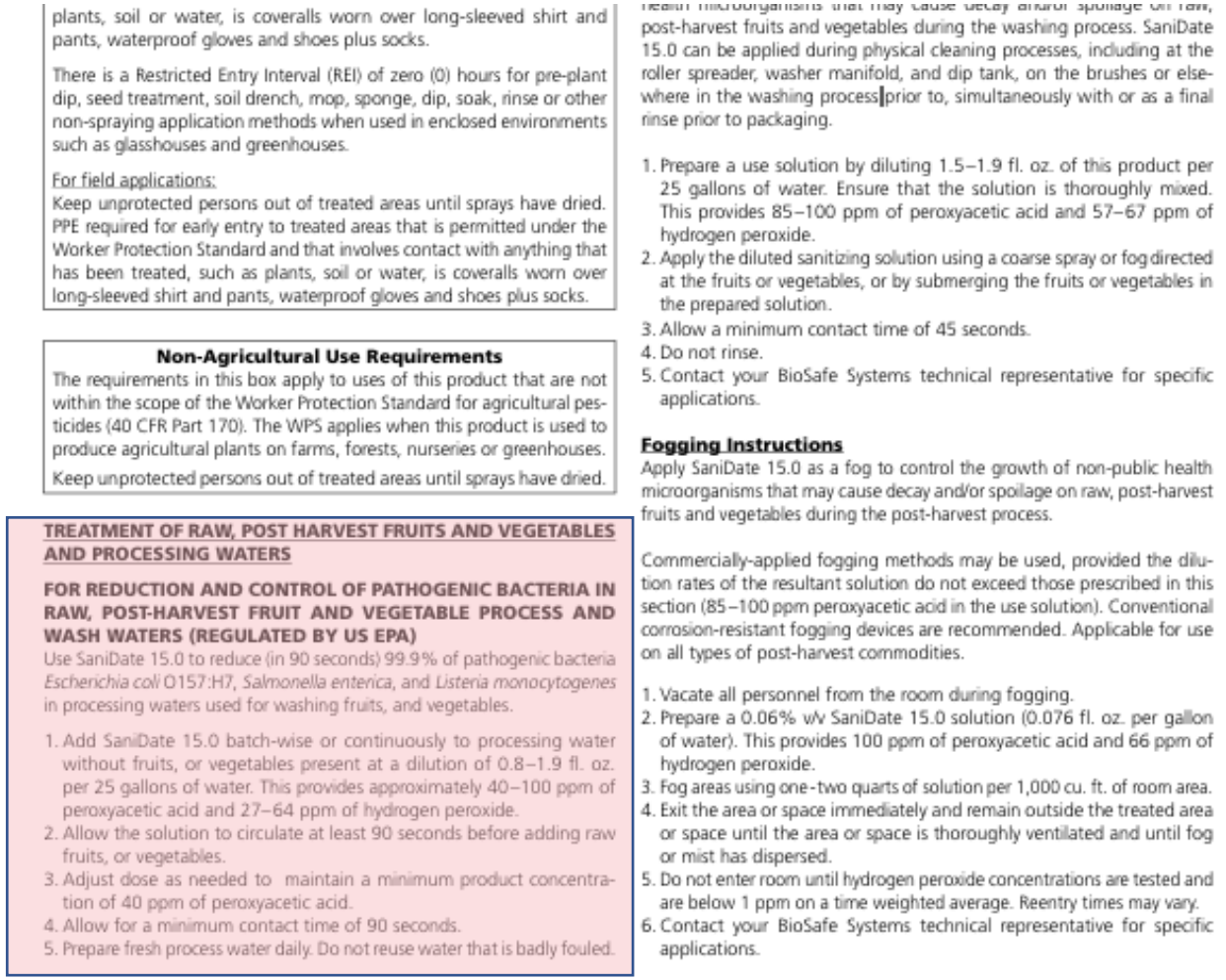

TOTAL 100.00%
BioSafe Systems
22 Meadow Street East Hartford, CT 06108
EPA Registration No. 70299-19
089546-NV-001
082521-GA-001
V15
100316
1752-0
Net Contents
2.5
5
30
55
275 gallons

SaniDate 15 Label Hunt

What page can you find the instructions for treatment of water?

Page 2 Specimen Label



plants, soil or water, is coveralls worn over long-sleeved shirt and pants, waterproof gloves and shoes plus socks.

There is a Restricted Entry Interval (REI) of zero (0) hours for pre-plant dip, seed treatment, soil drench, mop, sponge, dip, soak, rinse or other non-spraying application methods when used in enclosed environments such as glasshouses and greenhouses.

For field applications:
Keep unprotected persons out of treated areas until sprays have dried. PPE required for early entry to treated areas that is permitted under the Worker Protection Standard and that involves contact with anything that has been treated, such as plants, soil or water, is coveralls worn over long-sleeved shirt and pants, waterproof gloves and shoes plus socks.

Non-Agricultural Use Requirements

The requirements in this box apply to uses of this product that are not within the scope of the Worker Protection Standard for agricultural pesticides (40 CFR Part 170). The WPS applies when this product is used to produce agricultural plants on farms, forests, nurseries or greenhouses.

Keep unprotected persons out of treated areas until sprays have dried.

TREATMENT OF RAW, POST HARVEST FRUITS AND VEGETABLES AND PROCESSING WATERS

FOR REDUCTION AND CONTROL OF PATHOGENIC BACTERIA IN RAW, POST-HARVEST FRUIT AND VEGETABLE PROCESS AND WASH WATERS (REGULATED BY US EPA)

Use SaniDate 15.0 to reduce (in 90 seconds) 99.9% of pathogenic bacteria *Escherichia coli* O157:H7, *Salmonella enterica*, and *Listeria monocytogenes* in processing waters used for washing fruits, and vegetables.

1. Add SaniDate 15.0 batch-wise or continuously to processing water without fruits, or vegetables present at a dilution of 0.8–1.9 fl. oz. per 25 gallons of water. This provides approximately 40–100 ppm of peroxyacetic acid and 27–64 ppm of hydrogen peroxide.
2. Allow the solution to circulate at least 90 seconds before adding raw fruits, or vegetables.
3. Adjust dose as needed to maintain a minimum product concentration of 40 ppm of peroxyacetic acid.
4. Allow for a minimum contact time of 90 seconds.
5. Prepare fresh process water daily. Do not reuse water that is badly fouled.

health microorganisms that may cause decay and/or spoilage on raw, post-harvest fruits and vegetables during the washing process. SaniDate 15.0 can be applied during physical cleaning processes, including at the roller spreader, washer manifold, and dip tank, on the brushes or elsewhere in the washing process prior to, simultaneously with or as a final rinse prior to packaging.

1. Prepare a use solution by diluting 1.5–1.9 fl. oz. of this product per 25 gallons of water. Ensure that the solution is thoroughly mixed. This provides 85–100 ppm of peroxyacetic acid and 57–67 ppm of hydrogen peroxide.
2. Apply the diluted sanitizing solution using a coarse spray or fog directed at the fruits or vegetables, or by submerging the fruits or vegetables in the prepared solution.
3. Allow a minimum contact time of 45 seconds.
4. Do not rinse.
5. Contact your BioSafe Systems technical representative for specific applications.

Fogging Instructions

Apply SaniDate 15.0 as a fog to control the growth of non-public health microorganisms that may cause decay and/or spoilage on raw, post-harvest fruits and vegetables during the post-harvest process.

Commercially-applied fogging methods may be used, provided the dilution rates of the resultant solution do not exceed those prescribed in this section (85–100 ppm peroxyacetic acid in the use solution). Conventional corrosion-resistant fogging devices are recommended. Applicable for use on all types of post-harvest commodities.

1. Vacate all personnel from the room during fogging.
2. Prepare a 0.06% v/v SaniDate 15.0 solution (0.076 fl. oz. per gallon of water). This provides 100 ppm of peroxyacetic acid and 66 ppm of hydrogen peroxide.
3. Fog areas using one-two quarts of solution per 1,000 cu. ft. of room area.
4. Exit the area or space immediately and remain outside the treated area or space until the area or space is thoroughly ventilated and until fog or mist has dispersed.
5. Do not enter room until hydrogen peroxide concentrations are tested and are below 1 ppm on a time weighted average. Reentry times may vary.
6. Contact your BioSafe Systems technical representative for specific applications.

SaniDate 15 Label Hunt

- What ppm PAA is your target?
- What's the dosing per 25 gallons?
- What's the minimum contact time?
- Does water need to be at a certain pH?

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2. Allow the solution to circulate at least 90 seconds before adding raw fruits, or vegetables.
3. Adjust dose as needed to maintain a minimum product concentration of 40 ppm of peroxyacetic acid.
4. Allow for a minimum contact time of 90 seconds.
5. Prepare fresh process water daily. Do not reuse water that is badly fouled.

Turning the label into an SOP

The label should set the basics for the SOP critical limits

- Concentration
- Time
- Rinse

What other aspects of usage are not mentioned in the label?

- Temperature, turbidity, pH, etc.

Critical Limits

A maximum and/or minimum value to which a parameter must be controlled to prevent, eliminate, or reduce to an acceptable level the occurrence of the identified hazard

Human pathogen	Microbial indicator

Critical limits should relate to a process that can be easily measured

Critical Limits – There May Be More Than One!

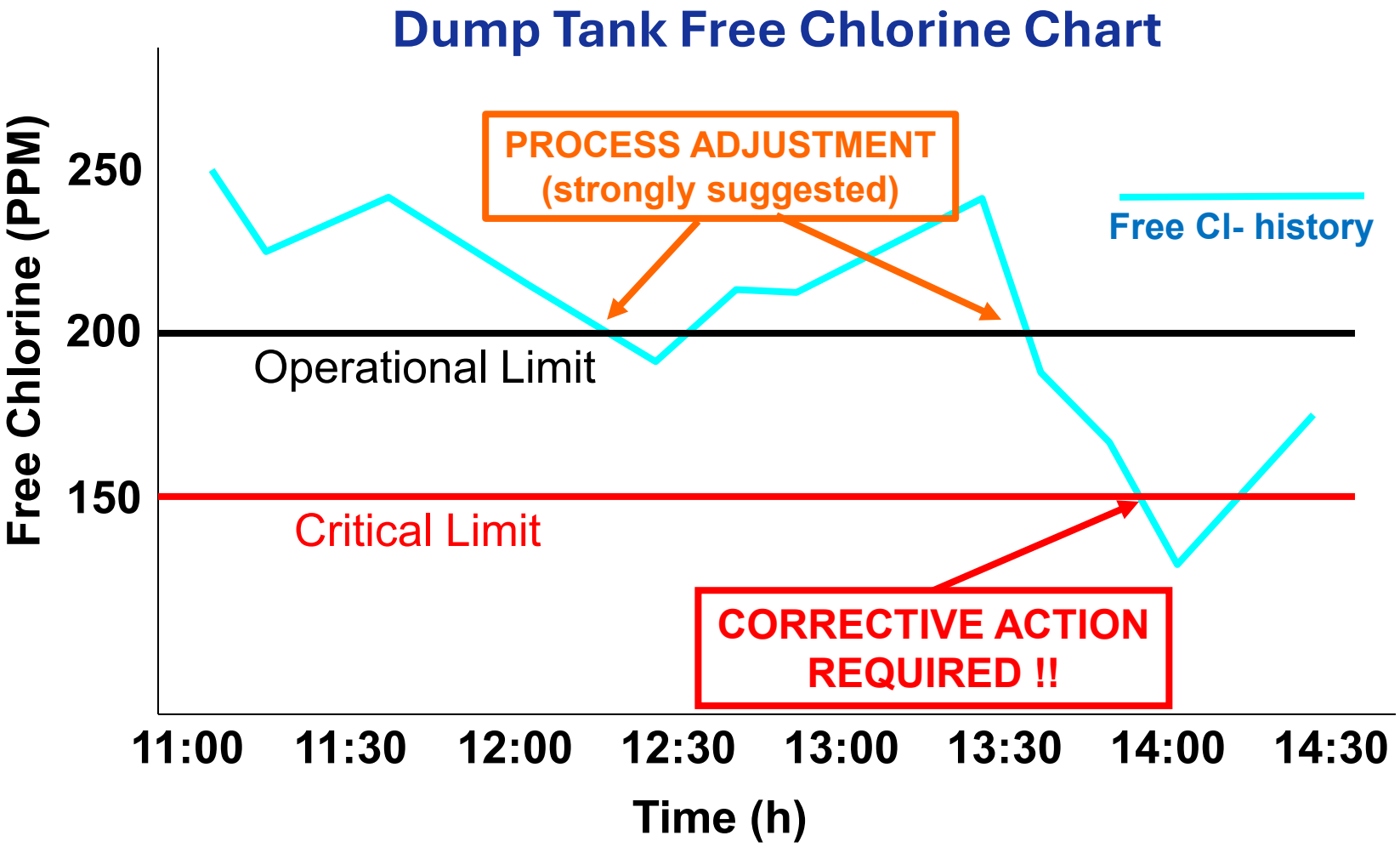
- Antimicrobial pesticide products
  - Chemical concentrations
  - Contact times
  - pH
  - Turbidity
- Antimicrobial devices
  - Temperatures
  - Membrane pore size
  - UV dose
  - Contact times
  - Turbidity

Critical vs. Operating Limits

Operating limit: a criterion that is more stringent than a critical limit and that is used by an operator to reduce the risk of deviation above or below your critical limits

Process adjustment: an action taken by an operator to bring the process back within operating limits

Example of Operating and Critical Limits, and Corrective Action- Example Only!



Date: 7/17/2002

Operator: Donald Tropimaid Duck

HACCP Coordinator Dewey Care

What is the rule requirement?

- How much sanitizer needs to be present?
- Can you meet this requirement without sanitizer in a recirculated or batch system?
- Using FSMA non-detect *E. coli* metric for water quality assurance is not in the grower's best interest for quality reasons

§ 112.44 What requirements apply to agricultural water used as sprout irrigation water and in harvesting, packing, and holding covered produce?

(a) *Microbial quality criterion.* When you use agricultural water for any one or more of the following purposes, you must ensure there is no detectable generic *Escherichia coli* (*E. coli*) in 100 milliliters (mL) of agricultural water, and you must not use untreated surface water for any of these purposes:

(1) Used as sprout irrigation water;

(2) Used during or after harvest activities in a manner that directly contacts covered produce (for example, water that is applied to covered produce for washing or cooling activities, water that is applied to harvested crops to prevent dehydration before cooling, and water that is used to make ice that directly contacts covered produce during or after harvest activities);

(3) Used to contact food contact surfaces or to make ice that will contact food contact surfaces; and

(4) Used for washing hands during and after harvest activities.

Sanitizer use in Pre-Harvest Agricultural Water

SaniDate® 12.0

SPECIMEN LABEL

FOR COMMERCIAL USE

EPA REGISTRATION NO. 70299-18

ACTIVE INGREDIENTS:

Hydrogen Peroxide	18.5%
Peroxyacetic Acid	12.0%
OTHER INGREDIENTS:	69.5%
TOTAL:	100.0%

FOR THE REDUCTION AND CONTROL OF FOODBORNE BACTERIAL PATHOGENS IN PREHARVEST AGRICULTURAL WATER

Use SaniDate 12.0 to reduce and control foodborne pathogens in pre-harvest agricultural water. To control Shiga-toxin producing *Escherichia coli*, including O157:H7 and *Salmonella enterica*, apply this product through sprinkler or drip irrigation systems, including flood irrigation systems. Use SaniDate 12.0 at a minimum dilution rate of 1:22,069 up to 1:13,196 (5.8-9.7 fl. oz. per 1,000 gallons of water); equivalent to approximately 6-10 ppm of peroxyacetic acid, with a minimum contact time of 5 minutes. Confirm residual ppm throughout the distribution system during treatment. It is recommended to use current AOAC and/or Standard Methods (https://www.epa.gov/dwanalyticalmethods) for confirmation of residual PAA in water post treatment (e.g. test strip, titration, or other method.) Do not irrigate with untreated irrigation water after treatment. Use this product on any crop during all phases of crop production including pre-plant irrigation and throughout the crop cycle. **Contact your BioSafe Systems Technical Representative for additional support.**

Produce Safety ALLIANCE

PSA Resources: Basic Video Tutorial

A second short tutorial is currently in development

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PSA Resources:
EPA-Labeled Sanitizer Factsheet

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Introduction to Selecting an EPA-Labeled Sanitizer

Donna Pahl Clements, Gretchen Wall, Don Stoeckel, Connie Fisk, Kristin Woods, and Elizabeth Bihn

October 2018

The use of properly labeled sanitizers (i.e., antimicrobial pesticides) in water that comes in contact with fruits and vegetables at or after harvest is highly encouraged to reduce the risk of cross-contamination by human pathogens. The use of sanitizers that have a United States Environmental Protection Agency (EPA) label are encouraged since these products have been evaluated by the EPA to limit the product's impact on the environment and human health. Sanitizers are employed as a water treatment to prevent the spread of contamination in harvest and postharvest systems, such as dump tanks (or high volume tanks) and flumes. Sanitizers also can be used as part of a multi-step cleaning and sanitizing routine to reduce the level of pathogens on food contact surfaces to acceptable levels (see 'sanitizer' in Produce Safety Alliance glossary)[1]. Once

number. Additionally, EPA must review any statements made on the product's label; this information may include efficacy statements describing the organism(s) that the sanitizer will control if used according to label instructions, and directions for use, storage, and disposal. More information can be found in the EPA FIFRA summary document[3]. Though the FSMA PSR does not expressly require growers to use an EPA-labeled sanitizer, it is one way to determine if a sanitizer will be effective. If a grower uses a sanitizer that does not have an EPA label, the grower should be able to prove that the product is suitable for the intended use (such as washing fresh produce) and for reducing contamination risks.

What should a grower look for in a sanitizer label?

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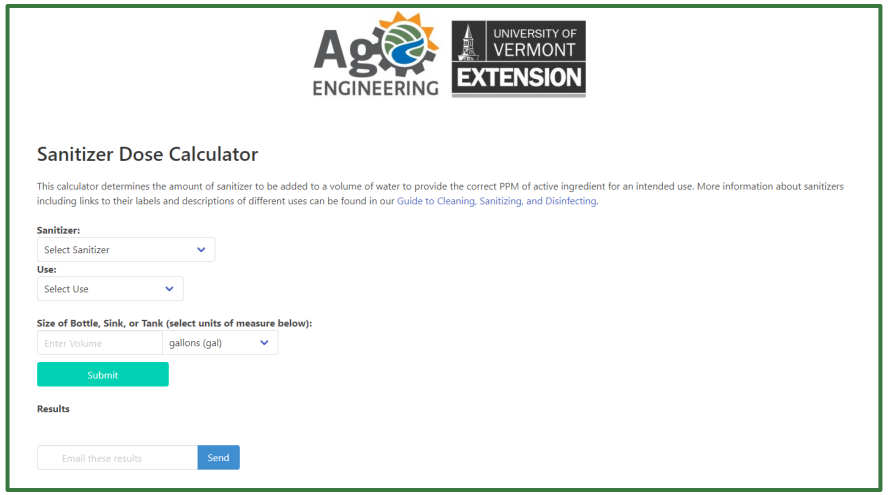
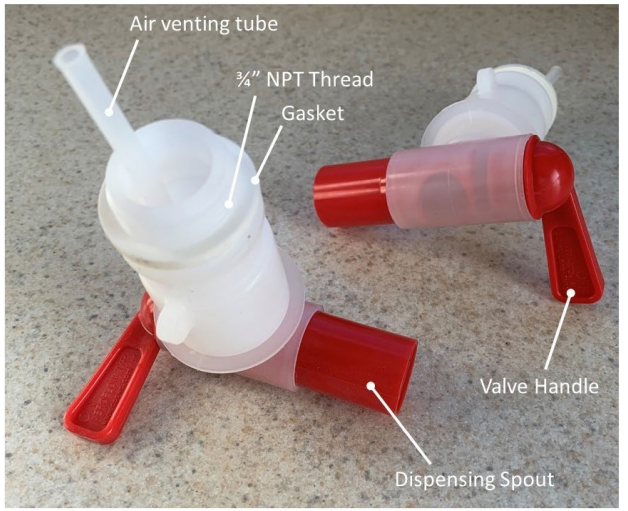
Highlight of Sanitizer Resources: Dosing and Dispensing

- UVM Sanitizer Dose Calculator
- UVM Safely Dispensing Sanitizers





Credit:
'Safely dispensing sanitizers' factsheet

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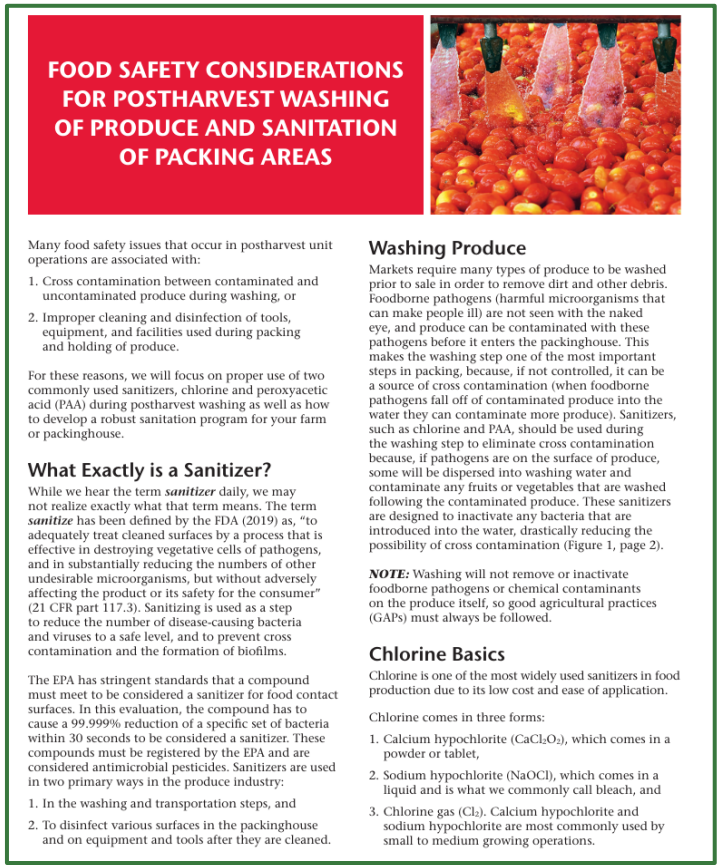
Highlight of Sanitizer Resources: Postharvest Sanitizer Use

- WSU Food Safety Considerations for Postharvest Washing of Produce and Sanitation of Packing Areas



FOOD SAFETY CONSIDERATIONS FOR POSTHARVEST WASHING OF PRODUCE AND SANITATION OF PACKING AREAS

Many food safety issues that occur in postharvest unit operations are associated with:

1. Cross contamination between contaminated and uncontaminated produce during washing, or
2. Improper cleaning and disinfection of tools, equipment, and facilities used during packing and holding of produce.

For these reasons, we will focus on proper use of two commonly used sanitizers, chlorine and peroxyacetic acid (PAA) during postharvest washing as well as how to develop a robust sanitation program for your farm or packinghouse.

What Exactly is a Sanitizer?

While we hear the term ***sanitizer*** daily, we may not realize exactly what that term means. The term ***sanitize*** has been defined by the FDA (2019) as, "to adequately treat cleaned surfaces by a process that is effective in destroying vegetative cells of pathogens, and in substantially reducing the numbers of other undesirable microorganisms, but without adversely affecting the product or its safety for the consumer" (21 CFR part 117.3). Sanitizing is used as a step to reduce the number of disease-causing bacteria and viruses to a safe level, and to prevent cross contamination and the formation of biofilms.

The EPA has stringent standards that a compound must meet to be considered a sanitizer for food contact surfaces. In this evaluation, the compound has to cause a 99.999% reduction of a specific set of bacteria within 30 seconds to be considered a sanitizer. These compounds must be registered by the EPA and are considered antimicrobial pesticides. Sanitizers are used in two primary ways in the produce industry:

1. In the washing and transportation steps, and
2. To disinfect various surfaces in the packinghouse and on equipment and tools after they are cleaned.

Washing Produce

Markets require many types of produce to be washed prior to sale in order to remove dirt and other debris. Foodborne pathogens (harmful microorganisms that can make people ill) are not seen with the naked eye, and produce can be contaminated with these pathogens before it enters the packinghouse. This makes the washing step one of the most important steps in packing, because, if not controlled, it can be a source of cross contamination (when foodborne pathogens fall off of contaminated produce into the water they can contaminate more produce). Sanitizers, such as chlorine and PAA, should be used during the washing step to eliminate cross contamination because, if pathogens are on the surface of produce, some will be dispersed into washing water and contaminate any fruits or vegetables that are washed following the contaminated produce. These sanitizers are designed to inactivate any bacteria that are introduced into the water, drastically reducing the possibility of cross contamination (Figure 1, page 2).

NOTE: Washing will not remove or inactivate foodborne pathogens or chemical contaminants on the produce itself, so good agricultural practices (GAPs) must always be followed.

Chlorine Basics

Chlorine is one of the most widely used sanitizers in food production due to its low cost and ease of application.

Chlorine comes in three forms:

1. Calcium hypochlorite ($CaCl_2O_2$), which comes in a powder or tablet,
2. Sodium hypochlorite (NaOCl), which comes in a liquid and is what we commonly call bleach, and
3. Chlorine gas (Cl_2). Calcium hypochlorite and sodium hypochlorite are most commonly used by small to medium growing operations.

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Summary

- Sanitizer label, while complex, are key to establishing effective postharvest water control
- Key elements of SOPs come from labels
- More than one parameter may be established per critical limit
- Operating limits, set at higher values than critical limits, can be used to ensure safety of the product and the washing process
- Growers may have critical and operating limits that exceed the requirements of the Produce Safety Rule for quality reasons