Top FAQs about Produce Wash Water Management for Small-Scale and Direct Market Farms

September 21, 2012

Our sponsor:

pma
Housekeeping Items

- Attendee phone lines will remain muted for the duration of the webinar.
- Please use **Q&A** function to ask questions (your identity will only be visible to the panelists)
- Q&A items will be saved for review after the webinar.
Introduction: General Overview

• Thank you for joining us today
• PMA pleased to sponsor this webinar
• Genesis for event:
  – Wash process can be a cross contamination risk if not properly controlled
  – CPS research and funding focus
  – Industry questions about wash water and reducing the risks of cross contamination led to discussions
  – Session at 2012 CPS Research Symposium highlighted 4 projects
  – “Blocking and tackling” critically important
Introduction: Today

• Dr. Suslow’s approach to CPS:
  – “... getting a lot of questions from smaller-scale and direct market farms about product washing”
  – Same questions repeated
  – Consistent experience at PMA grower food safety training events
  – Webinar to get the information out more broadly

• Sometimes opportunities come along...
Introduction: Today

• Trevor has developed today’s content around those questions he is asked most frequently
• Not going to get into the weeds
• Focus on presenting information that you can use
  – Basic ideas and suggestions
  – Make improvements in your operation
  – Answer questions
• With that...
Top FAQs about Produce Wash Water Management for Small-Scale and Direct Market Farms

MODULE 1 – Measuring and Documenting Free Chlorine

“I am not going to spend $200 for a handheld pH tester and try to run a titration kit or some gizmo for total chlorination. I use the cheap paper strips so is that ok and how should I do it right?”
General Product Reference Disclaimer

- Images and Trade Names for commercial products are provided merely as examples and not intended to be comprehensive nor to intentionally exclude other viable options. Mention of a specific supplier is not necessarily an endorsement of the method or product.
pH and Free Chlorine Strips are the Practical On-farm Tools
Something done well is better than doing nothing or doing it poorly with more costly equipment

- For small operations, pH strips are acceptable
  - Good training and SOP sheet.
  - It is cheap ($0.17 to 0.20 ea for good ones)
  - Easy and accurate enough if done properly
  - Check periodically with low pH, neutral, and high pH ‘checking solutions’ to make sure the operator is doing it properly.

- Better to measure and record within the accuracy of multi-color paper strips than test with a non-calibrated hand-held sensor or try to do a titration properly

- pH and Free Chlorine paper from various suppliers should be fine
  - Omega, Weber, Pulse Instrument, Hach, Spectrum Tech, and others all carry the better ones
Multi-Test Color Strip Panels Vary Widely in Accuracy
Rule of Thumb:
You get the accuracy you pay for
Measuring and Documenting Free Chlorine

Step 1 – Assemble all test materials

• Clean, chlorine and oxidizer-free container
  o Non-glass, disposable
  o Verify container gives no reading with drinking water
• pH Test Strips
  o Accurate in range desired (pH 6 to 7)
• Free Chlorine Test strips
  o Right range for expected dose?
  o Low range to High range
  o Accurate range for Organic Integrity (≤ 4 ppm)
• Log Sheet and Ink pen
Typical Test Volume is 100 ml (about 4 oz.)

- Easier to be consistent
- Sufficient volume to minimize chlorine loss from any coatings
- Wide mouth for easy handling in field or packing area
- Flat bottom makes easier for single operator
pH Test Strips

• Pick source with clear difference between major ranges
• Handle with clean hands from one end
  – Long enough to dip about ½ inch into water and ½ inch remains dry
• 5 sec immersion with gentle swirl
• Read result within 10 sec
  – Color match to chart
  – Best if held against white background
  – Color looks most like 6 or 7
• Record on log sheet
• Rapid color bleaching at high pH can give false low reading
  - Shouldn’t be a problem with typical water sources
Free Chlorine Test Strips

1. Handle Properly
2. Verify Use by Date

Not Total Chlorine
High Range Typical 25-50 ppm
Low Range Method A

Method A
1. Handle Properly
2. Verify Use by Date
Free Chlorine Test Strips

Step 2
• Best Practice for Measurement
  – Develop your SOP from label
    • Get cold temperature impact on time of immersion from label or insert
  – Try to stick with one supplier
  – Avoid dilutions
  – Use ‘bracket strips’ if needed
• Pick source giving clear color breaks between key levels

Low range strips – 0.8 ppm
Free Chlorine Test Strips

• Typical Steps for **High Range** Measurement
  – Fill sample cup
  – Measure immediately
  – Dip for 1-2 sec maximum
  – Wait for 30 sec to color-match
    • Being in a rush leads to over-dosing
  – Record result within 15 sec of read

• Sources may vary in accuracy
• Expired Strips often read higher
Free Chlorine Test Strips

• Typical Steps for **Low Range** Measurement
  – Fill sample cup
  – Measure immediately
  – Dip for 10 sec with gentle swirl
    • Extend dip time in cold water
  – Wait for 30 sec to color-match
  – Record result within 15 sec of read

Need for Certified Organic Integrity
Step 3 - Maintain a Log Sheet

- Can add other information
  - Tends to get messy
  - Simplify to the needs of your farm
  - Tie-in to other logs by date and time
  - Tie in to other logs if multiple lines

- Product
  - Commodity
  - Special handling

- Chemistry used
  - pH adjustment (Source and lot code)
  - Chlorine (Source and lot code)

<table>
<thead>
<tr>
<th>Date and Time</th>
<th>Temp (F)</th>
<th>Measured pH</th>
<th>Corrective Action (amount added- ml)</th>
<th>Measured Free Chlorine</th>
<th>Corrective Action (amount added)</th>
<th>Initial</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>Acid to Lower pH</td>
<td>Base to Raise pH</td>
<td></td>
<td></td>
</tr>
<tr>
<td>7/24/12 06:00</td>
<td>59</td>
<td>6.7</td>
<td>50</td>
<td>50-100</td>
<td>L003</td>
<td></td>
</tr>
<tr>
<td>Re-measure</td>
<td>New Time</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7/24/12 09:10</td>
<td>56</td>
<td>7.8</td>
<td>10</td>
<td>50-100</td>
<td>L003</td>
<td></td>
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<tr>
<td>Re-measure</td>
<td>New Time</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Acceptable – No Corrective Action Needed
- pH – 6-7
- Free Chlorine – 25-50 ppm

Model Wash Water Log
Test Strips Available for other Water Disinfection Treatments

- Similar approaches with other oxidizers possible
- PAA low to high range available
  - Typically 30-50 ppm
- Small-scale ClO₂ generators available
  - No need to measure pH in most areas
- Titration kits better choice for both in our experience
Top FAQs about Produce Wash Water Management for Small-Scale and Direct Market Farms

Module 2 – Understanding Chlorine Demand; Part 1

“How am I supposed to know how much bleach to add to my spring mix wash tank? I have a clean well and make a fresh batch everyday and change after a few hours. Is there an easy way to know when the water is too dirty for chlorine to work? We also do mostly mixed baby squash, eggplant, and herbs.”
Understanding Chlorine Demand

• Peak Chlorine Demand
  – Maximum amount of chlorine in a batch of water that is “used up” by soil and organic materials added with product during washing
  – Determining Peak Cl Demand helps to;
    1. Minimize guess-work on dose
    2. Be more effective in preventing cross-contamination
    3. Predict frequency/timing of routine water turn-over
    4. Provide triggers for non-standard dose monitoring
What Interferes with Chlorine Demand and Stability?

**Moderate Impact**
- Iron
- Manganese
- Nitrites ($\text{NO}_2^-$)
- Hydrogen sulfide ($\text{H}_2\text{S}$)
- Sugars
- Starches

**Strong Impact**
- Ammonia
- Copper
- Nickel
- Cobalt
- Proteins
- Amino acids
- UV – direct sunlight
- Strong acidity (very low pH)

_from harvest wounds_
Simple Steps to Estimating Chlorine Demand for Small-Scale Wash Water Batches

1. Make up a typical wash volume with no bleach
2. Add typical harvested product and agitate
3. Add small amounts of bleach and mix for 15 sec
   • pH is not important to measure for this purpose
4. Measure Free Chlorine with test strip
5. Repeat until target Free Cl level hits 5 ppm
   • Repeat Free Cl measurement in 2 min with no added bleach
   • If still 5 ppm you're done; if not 5 ppm repeat Step 3-5
6. Repeat with ‘dirty’ product
   • Muddy conditions, if likely
   • Impact of turbidity
What would a Peak Chlorine Demand Determination Look Like?

Estimating Chlorine Demand in Batch Wash Water

Ounces of 5 % Bleach

ml of 5% Bleach (approx.)
What would a Peak Chlorine Demand Determination Look Like?

Estimating Chlorine Demand in Batch Wash Water

- **Free Chlorine**
- **Operating threshold**
- **Cl-demand threshold**
- **Break-point**

Ounces of 5% Bleach

ml of 5% Bleach (approx.)
Chlorine Dose Calculators available from many GAPs programs and Farm Extension Offices

- 5% liquid bleach
- 12% Agricultural bleach
- 65% Hypochlorite tablets

### Practical Guide for On-Farm Chlorination

#### 5% Hypochlorite (Bleach)

<table>
<thead>
<tr>
<th>Gallons of Water</th>
<th>10 ppm</th>
<th>25 ppm</th>
<th>50 ppm</th>
<th>100 ppm</th>
<th>200 ppm</th>
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<tr>
<td>200</td>
<td>2 cups</td>
<td>25 cups</td>
<td>50 cups</td>
<td>100 cups</td>
<td>200 cups</td>
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<tr>
<td>100</td>
<td>1 cup</td>
<td>25 cup</td>
<td>50 cup</td>
<td>100 cup</td>
<td>200 cup</td>
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<tr>
<td>50</td>
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<td>4 oz</td>
<td>4 oz</td>
<td>4 oz</td>
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<td>25</td>
<td>4 tsp</td>
<td>4 tsp</td>
<td>4 tsp</td>
<td>4 tsp</td>
<td>4 tsp</td>
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<tr>
<td>10</td>
<td>1 tsp</td>
<td>1 tsp</td>
<td>1 tsp</td>
<td>1 tsp</td>
<td>1 tsp</td>
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<tr>
<td>2</td>
<td>1/2 tsp</td>
<td>1/2 tsp</td>
<td>1/2 tsp</td>
<td>1/2 tsp</td>
<td>1/2 tsp</td>
</tr>
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</table>

#### 12% Hypochlorite (Bleach)

<table>
<thead>
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<th>Gallons of Water</th>
<th>10 ppm</th>
<th>25 ppm</th>
<th>50 ppm</th>
<th>100 ppm</th>
<th>200 ppm</th>
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</thead>
<tbody>
<tr>
<td>200</td>
<td>3 oz</td>
<td>25 oz</td>
<td>50 oz</td>
<td>100 oz</td>
<td>200 oz</td>
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<tr>
<td>100</td>
<td>2 tsp</td>
<td>2 tsp</td>
<td>2 tsp</td>
<td>2 tsp</td>
<td>2 tsp</td>
</tr>
<tr>
<td>50</td>
<td>5 tsp</td>
<td>5 tsp</td>
<td>5 tsp</td>
<td>5 tsp</td>
<td>5 tsp</td>
</tr>
<tr>
<td>25</td>
<td>5 tsp</td>
<td>5 tsp</td>
<td>5 tsp</td>
<td>5 tsp</td>
<td>5 tsp</td>
</tr>
<tr>
<td>10</td>
<td>2 tsp</td>
<td>2 tsp</td>
<td>2 tsp</td>
<td>2 tsp</td>
<td>2 tsp</td>
</tr>
<tr>
<td>5</td>
<td>1 tsp</td>
<td>1 tsp</td>
<td>1 tsp</td>
<td>1 tsp</td>
<td>1 tsp</td>
</tr>
</tbody>
</table>

#### 65% Calcium Hypochlorite

<table>
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<th>Gallons of Water</th>
<th>10 ppm</th>
<th>25 ppm</th>
<th>50 ppm</th>
<th>100 ppm</th>
<th>200 ppm</th>
</tr>
</thead>
<tbody>
<tr>
<td>200</td>
<td>2 tsp</td>
<td>2 tsp</td>
<td>2 tsp</td>
<td>2 tsp</td>
<td>2 tsp</td>
</tr>
<tr>
<td>100</td>
<td>1 tsp</td>
<td>1 tsp</td>
<td>1 tsp</td>
<td>1 tsp</td>
<td>1 tsp</td>
</tr>
<tr>
<td>50</td>
<td>3 tsp</td>
<td>3 tsp</td>
<td>3 tsp</td>
<td>3 tsp</td>
<td>3 tsp</td>
</tr>
<tr>
<td>25</td>
<td>3 tsp</td>
<td>3 tsp</td>
<td>3 tsp</td>
<td>3 tsp</td>
<td>3 tsp</td>
</tr>
</tbody>
</table>

Instructions for Use: Select the desired parts per million (ppm). Determine the strength of hypochlorite available. Typical upgrades are provided. Calculate the number of gallons to be chlorinated. Read across to obtain the amount of liquid or granular hypochlorite to add. Doses are approximate for the target Total Chlorine dose to simplify measurement. Water quality will affect disinfection. Actual target should always be verified with Free Chlorine strips or other method. Remember, recommended maximum disinfection activity occurs at pH 6.5 to 7.0. Adjust pH with citric acid, or other approved material, and verify with pH strips.
Sourcing Issues – Part 1

“I have been buying cheap bleach at our local XXX but was told in a GAPs workshop it has to be EPA labeled. The FDA one they recommended was only for a maximum of 25 ppm but I need to control mold rots too, is there one I can get for 100 ppm?”
EPA Approved Bleach Source for Small-Scale Growers

THE CLOROX COMPANY
Consumer Services Department
Oakland, California 94612-1888

ULTRA CLOROX® BRAND REGULAR BLEACH (EPA Reg. No. 5813-50)
Approved Label May Limit Dose for Fruits and Vegetables

ULTRA CLOROX® BRAND REGULAR BLEACH (EPA Reg. No. 5813-50)
[REGISTERED AS Clorox® Regular-Bleach]
FOR FRUIT & VEGETABLE WASHING
It is a violation of Federal law to use this product in a manner inconsistent with its labeling.

Thoroughly clean all fruits and vegetables in a wash tank. Prepare 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.
Where can I find suppliers for smaller quantities of water treatment chemicals?

http://postharvest.ucdavis.edu/yellowpages/?maincat=31
Links to Suppliers of Multiple Scales

Water Treatment Chemicals

- Advanced Biotech, Inc.
- Aquasafe Systems
- BioSafe Systems
- Bonanza Technologies & Services, Inc.
- CH2O International
- Fit Fruit & Vegetable Wash
- K2CO, Inc.
- Michigan Orchard Supply Co.
- New Leaf Food Safety Solutions
- DESCO, Inc.
- Pace International, LLC (Calif.)
- Pace International, LLC (Headquarters)
- Pulse Instruments
- Purifresh, Inc.
- Seaco
- Stranco, Inc.
- UAP Loveland Products, Inc.

Waxes and Other Surface Coatings

- DECCO US Post-Harvest, Inc.
- HDH Agri Products, LLC
- M&T Food Tech
- Michigan Orchard Supply Co.
- MMC, Inc.
- NatureSeal
- Niro Technologies Ltd.
- DESCO, Inc.
- Pace International, LLC (Calif.)
- Pace International, LLC (Headquarters)
- SC Johnson Wax
- Syngenta Corporation
Examples of Suppliers Broadly Active with Fresh Produce Wash Water Management
Example of Hypochlorite Labeled for Ag-use with Higher Doses

DECCO  Cerexagri Inc.

AGCLOR 310

A solution of Sodium Hypochlorite for control of organisms causing decay of apples, asparagus, cabbage, carrots, cauliflower, celery, cherries, citrus, cucumbers, lettuce, mushrooms, nectarines, onions, peaches, pears, peppers, potatoes, prunes, quinces, and radishes after harvest.

ACTIVE INGREDIENT: Sodium hypochlorite ........................................ 12.5%
OTHER INGREDIENTS ........................................ 87.5%
TOTAL ........................................ 100.0%

1.2 lbs Available Chlorine/Gallon

Net Contents: 06 Gallons (19 liters)
55 Gallons (209 liters)
53 Gallons (201 liters)
330 Gallons (1249 liters)

DANGER
KEEP OUT OF REACH OF CHILDREN

STATEMENT OF PRACTICAL TREATMENT

FIRST AID: In case of eye contact, immediately flush eyes with plenty of water for at least 15 minutes and get medical attention. If contact with skin occurs, wash with plenty of soap and water. Remove contaminated clothing and shoes. Wash clothing before re-use.

IF SWALLOWED: Drink large quantities of water. Do NOT give vinegar or other acids. Do NOT induce vomiting. Get prompt medical attention. If inhaled, remove to fresh air.

See additional precautions on side panel.

EPA EST. NO.-s
6785-KY-1  550-SC-1
6785-FL-2  37982-WA-1
550-NJ-1  1744-CA-1

EPA REG. NO. 2792-62
PRECAUTIONARY STATEMENTS

5 gal sales unit

Recommended Use Rates

DIRECTIONS FOR USE CONTINUED:
Recommended levels of chlorine:

<table>
<thead>
<tr>
<th>Commodity</th>
<th>ppm of available chlorine to use</th>
</tr>
</thead>
<tbody>
<tr>
<td>Apple</td>
<td>150-200</td>
</tr>
<tr>
<td>Artichokes</td>
<td>100-150</td>
</tr>
<tr>
<td>Asparagus</td>
<td>125-150</td>
</tr>
<tr>
<td>Brussels Sprouts</td>
<td>100-150</td>
</tr>
<tr>
<td>Carrots</td>
<td>100-200</td>
</tr>
<tr>
<td>Cauliflower</td>
<td>300-400</td>
</tr>
<tr>
<td>Cherry</td>
<td>75-100</td>
</tr>
<tr>
<td>Celery</td>
<td>100-110</td>
</tr>
<tr>
<td>Chopped Cabbage</td>
<td>80-100</td>
</tr>
<tr>
<td>Chopped Lettuce</td>
<td>80-100</td>
</tr>
<tr>
<td>Cucumbers</td>
<td>300-350</td>
</tr>
<tr>
<td>Green Onions</td>
<td>75-120</td>
</tr>
<tr>
<td>Lemon and Grapefruit</td>
<td>40-50</td>
</tr>
<tr>
<td>Melons</td>
<td>100-150</td>
</tr>
<tr>
<td>Mushrooms</td>
<td>100-120</td>
</tr>
<tr>
<td>Oranges (in drencher)</td>
<td>20-30</td>
</tr>
<tr>
<td>Peaches, Nectarines &amp; Plums</td>
<td>50-100</td>
</tr>
<tr>
<td>Pears (without buffer)</td>
<td>200-300</td>
</tr>
<tr>
<td>Peppers</td>
<td>300-400</td>
</tr>
<tr>
<td>Potatoes</td>
<td>65-125</td>
</tr>
<tr>
<td>Radishes</td>
<td>100-150</td>
</tr>
<tr>
<td>Stone fruits (Hydrocooler)</td>
<td>30-75</td>
</tr>
<tr>
<td>Tomatoes</td>
<td>300-350</td>
</tr>
</tbody>
</table>

NOTE:
1. Concentration given for use in flow through washer systems only.
2. After treatment, the adhered moisture must be removed by a centrifugation process.
3. After treatment with the chlorinated water, the mushrooms must be treated with an approved anti-oxidant to prevent browning.
4. For treating peppers in a dump tank use 100-135 ppm Cl₂:
   For treating potatoes in a pit system use 100-150 ppm Cl₂;
   For treating tomatoes in a dump tank system use 70-120 ppm Cl₂.
5. For Hydrocooler use 10 ppm.
Look for More in the Future

• Local Extension Programs
• Produce Safety Alliance
• National Center for Appropriate Technology
• CPS/PMA Webinar Series Resource Database
Top FAQs about Produce Wash Water Management for Small-Scale and Direct Market Farms

Module 2 – Understanding Chlorine Demand; Part 2

“How am I supposed to know how much bleach to add to my spring mix wash tank? I have a clean well and make a fresh batch everyday and change after a few hours. Is there an easy way to know when the water is too dirty for chlorine to work? We also do mostly mixed baby squash, eggplant, and herbs.”
Turbidity Interferes with Chlorine Dose and Microbial Control Goals

FAU = NTU
The unit of measure for water clarity (dissolved and suspended solids)
At moderate levels of Turbidity good quality test strips give accurate results.
Very high turbidity wash water can interfere with accurate color matches
The More Dissolved and Suspended Solids, the Longer it takes to Kill

**How long does it take to kill one million Salmonella Newport cells in wash water?**

<table>
<thead>
<tr>
<th>Turbidity (FAU)</th>
<th>25 ppm</th>
<th>50 ppm</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>10 25 40 °C</td>
<td>10 25 40 °C</td>
</tr>
<tr>
<td>0</td>
<td>15 10 &lt;5</td>
<td>15 &lt;5 &lt;5</td>
</tr>
<tr>
<td>20</td>
<td>&gt;120 15 5</td>
<td>45 5 &lt;5</td>
</tr>
<tr>
<td>40</td>
<td>&gt;120 30 5</td>
<td>&gt;120 5 &lt;5</td>
</tr>
<tr>
<td>160</td>
<td>&gt;120 &gt;120 &gt;120</td>
<td>&gt;120 120 75</td>
</tr>
</tbody>
</table>
These types of test strips weren't designed for and don't work in high turbidity water...period

In this test it should be reading 3 ppm
A practical way to help determine when to change wash water based on turbidity

- Response to requests for simple tool
- Crop will influence your decision of how to use this tool
  - Leafy greens different than hard squash
Low cost method for deciding when to change water: Modified Secchi Disk
Low cost method for deciding when to change water: Modified Secchi Disk

FAU = NTU
Modified Secchi Disk

Clear Polycarbonate Pasta Storage Cylinder
($ 4.39 at Target)

Clean Transfer Vessel

OK

OK - But Time to Check

Time to Change
Want to Learn More?

- CPS/PMA Webinar Series Resource Database
- Produce Safety Alliance – http://producesafetyalliance.cornell.edu/psa.html
Top FAQs about Produce Wash Water Management for Small-Scale and Direct Market Farms

Module 3 – Oxidation Reduction Potential (ORP) Basics

“I just got certified for GAPs to get approved for a supermarket chain and just had a mock audit to see where we were in this. The auditor mentioned getting an ORP probe but I heard it doesn’t really work. Can you send some extension information on this or if it is better than paper.”
Handheld ORP Sensors Can be an Easy Verification Tool
Are there uncertainties about using ORP as a single dosing value?

• Simply stated – YES

• Hand-held sensors can be used effectively in smaller-scale systems
  – We do need broader ‘real world’ validation tests
  – Don’t use if a ppm-target is required or desired

• Rinse-off after each use

• Buy the best quality sensor you can afford
ORP (mV) reflects antimicrobial status of water …up to a point

Relationship between ORP and ppm in Low Turbidity Water

Approx. $150.00

Approx. $750.00

ORP (mV)

pH 6

pH 7

pH 8

pH 9

Fast kill

Very slow kill

Measured Free Chlorine (ppm)
Have to Match ORP values to Disinfection Goals of Wash Water, not Drinking Water

- Common Free Cl needed for control

- TIME OF CONTACT IS IMPORTANT

- Graph shows the relationship between Measured Free Chlorine (ppm) and ORP (mV) for different pH levels (pH 6, pH 7, pH 8, pH 9):
  - E. coli
  - Salmonella
  - Molds
  - Tough Mold Spores
  - Listeria

- ORP values for different organisms and pH levels:
  - ORP values range from 350 to 950 mV.
  - Measured Free Chlorine values range from 0.5 to 100 ppm.

- The graphs indicate that higher ORP values are needed for the control of tougher organisms like Tough Mold Spores and Listeria at pH levels of 6 and 7.
Variance in ORP Readings with Different Hand-held Meters

Accurate to Technical Quality ORP Sensor

Sample Sequence

ORP (mV)

Orion Pocket
OakTon
PRC 650
Orion 250A
Variance in ORP Readings with Different Hand-Held Meters

Two sensors of the same model read differently but consistently.
Key Practical Issues for ORP Systems

- ORP is a “window” of performance
- Probe maintenance is critical
  - Cleaning with distilled water
  - Daily Mild Acid soak
  - Calibration solution reset
- Overshooting with Cl needs recovery
- Add acid and chlorine separately
- Cross-check with Free Chlorine strips
  - At least weekly
Want to Learn More?

- CPS/PMA Webinar Series Resource Database
- Produce Safety Alliance
Want to Learn More?

- CPS/PMA Webinar Series Resource Database
- Produce Safety Alliance
In search of a legal (labeled) post-harvest water sanitizer for Hawaiʻi-grown produce

Jim Hollyer, Agricultural Economist & GAPs Coach

CTAHR – Farm Food Safety Coaching Program
College of Tropical Agriculture and Human Resources
University of Hawaiʻi at Mānoa
What you will hear

• Who we are
• The challenge of finding a postharvest water sanitizer for small-scale growers
• What we have found so far
• Grower experiences with putting a water treatment process in place
Univ. of Hawaii GAPs Coaching

• Started our GAPs education program in mid-1999 after Safeway audit letter went out
• Four faculty attended three Primus auditing classes and one USDA-AMS auditing class
• We also provide Worker Protection Standard training on pesticides to GAP clients because of audit questions
• Part of the Cornell-based Produce Safety Alliance
• Coached on 220 farms to date: conventional or organic; land, hydroponic or aquaponic, greenhouses and roof-tops.
Why we are looking for a post-harvest water sanitizer

• 7500 farms of all types in Hawaii
  – ~1200 are produce growers
  – ~ 70-80% are involved in ‘direct-to-consumer-marketing’, others to wholesalers & Chinatown vendors

• Water sources for postharvest rinse include:
  – City/municipal
  – Well
  – Open flowing ditch (from mountains to ocean)
  – Hillside reservoirs (well or ditch water)
  – Roof top catchment (farms that are “off the grid”)

Why we need water sanitizers - 1

• Quality of source water can impact sanitizer effectiveness
• Labeled usage requirements may state the need for a particular quality of water, including final produce rinse
• The time from rinse contact–to-consumption can be within 2-4 hours for some of our fresh products
  – Research clearly shows pathogen die-off won’t happen naturally
  – Pathogen growth is possible on a diverse number of fresh produce
Why we need water sanitizers - 2

• We have a visitor-based economy that’s fragile
  – Visitors want to try Hawaii products
  – Farmers want the money visitors bring

• We have a general desire to support and consume more locally-grown produce
  – Driven by consumers and local government
  – Retailer support (like to promote that they are buying locally-grown) and culinary-supported farms

• We have a general desire to get more locally-grown produce into Hawaii public and private school lunches and snacks
The challenge of sourcing ‘approved’ water sanitizers for small volume users and niche crops

• Sometimes unclear when use is “post-harvest antimicrobial” or “processing aide”
  – Confusion created by difference between EPA & FDA and where in the farm-to-packer continuum the sanitizer is used
• Increasing regulatory pressure and inspections (e.g. FSMA)
• Commercial buyer requirements are starting to include GAPs and sanitizer rinses
• Audit ‘alerts’ or failures on the Mainland on the types of crops we grow (e.g. papaya, melons, mango, green onions, tomatoes, etc.)
• Dozens of niche and ethnic crops not on sanitizer labels – though for us, they can be contributors to Hawaii agriculture (e.g. choi sum, diakon leaf, Chinese spinach, etc.)
What we have found - #1

Production side

• EPA rules apply – Registration Number
• Crop name **MUST** be on the label of a water sanitizer product because it is considered a “pesticide” by EPA FIFRA
• Sanitizer must be registered for use in the state (state allowed list)

Processing side

• Processing aide
• FDA rules apply
• Do not have to have an EPA Registration Number
• Needs to be “approved” by FDA or USDA
• Maybe listed in the “NSF Whitebook”
What we have found - #2

• Scientific research often talks about “active ingredients”, such as chlorine, in a water sanitizer. But, whether or not there is really a legal – i.e., labeled – sanitizer on the market, is not guaranteed.

• For example, simple chlorine bleach currently cannot be used in contact with produce or used in water on a “regular” basis. The current label does not allow produce contact and it can only be used in an “emergency” for sanitizing water.
  – Also, the typical 25ppm limit is not very effective against some pathogens and spoilage microorganisms.
Active ingredients/products

- Sodium hypochlorite
- Regular bleach
- Ultra Clorox bleach
- Clorox Germicidal
- Pioneer Ag Sanitizer 12.5%
- Calcium hypochlorite
- Arch Chemical Cal-Hypo
- Chlorine dioxide
- Safe Ox
- Zep Dominion
- Sodium chlorite
- Selectrocyde 2L500
- Hydrogen peroxide
- StorOx
- Oxidate
- Peroxyacetic acid & Hydrogen peroxide
- Ecolab Tsunami 100
- StorOx 2.0
What’s on the sanitizer label?

- Hydrogen peroxide – generic F&V use
- Chlorine products
  - Most grocery store bleach formulations can **NOT** be used on F&V per their current label
  - Commercial ag versions have only about 20 common F&V listed
  - Other commercial products vary, but nothing really effective, really inexpensive, really safe to handle, does not cause phytotoxic effects on produce at effective doses, and has all F&V on the label (this is our goal)
Key issues in wash water use

• Proper use can be a training challenge
• Testing & documentation can be inconsistent
• Contact time in a spray system may be limited and thus not entirely effective
• Users need to be aware of “grey water” discharge laws and requirements (local and federal)
  – Substantial fines are possible for improper discharge
• Need to be mindful of National Organic Program rules, especially on chlorine use and discharge
Grower Example 1 –
The current reality; simple rinse tubs
Closing

• Thank our presenters
• Thank you all for participating and a special thanks to those who provided questions
• Stay tuned:
  – PMA Fresh Summit – Anaheim, CA, October 26-28, 2012
  – Deeper look at wash water management
  – Website
• Resources – extension, trade groups, CPS
http://cps.ucdavis.edu

- Wash Water webinar slides will be posted
- CPS funded research
- CPS global data base
- CPS Campaign for Research Contributors
- More information: cpsinfo@cps.ucdavis.edu
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