scaffolds Update on Pest Management and Crop Development
FRUIT JOURNAL
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DISEASES

POST-HARVEST PART II

USING CHLORINATED WATER IN APPLE HANDLING SYSTEMS

(Dave Rosenberger)

❖❖ Chlorine has long been recognized as an effective eradicant of bacterial and fungal contaminants. (That's why swimming pools are chlorinated and most cities chlorinate public water supplies.) Chlorine is effective at concentrations below 5 ppm. However, using chlorine as a decontaminant in fruit handling operations is complicated by a number of factors.

Chlorination presents the following problems when it is used in postharvest handling operations with apples:

1. Chlorine and diphenylamine (DPA) are not compatible. For fruit requiring DPA treatment, chlorination can be used only if fruit are first treated with chlorine, allowed to drain for at least five minutes, then treated with DPA in a second drench treatment. Most storage operators will find it impractical to operate two separate drenchers with a 5-minute wait between treatments.
2. Unlike fungicides, chlorine provides no systemic or residual protection. (The lack of residue can also be perceived as an advantage in today's anti-pesticide climate.) Chlorine treatment eradicates surface contaminants, which may cause postharvest decays, but it does not protect fruit against fungal spores the fruit may encounter after treatment. Thus, chlorination treatments are really useful only in conjunction with other sanitation measures, which ensure that fruit will not be re-exposed to inoculum after treatment.
3. Chlorine is "inactivated" by organic matter. As a result, chlorine must be added continuously to water flumes or drenches in order to maintain effective concentrations of chlorine.
4. If sodium hypochlorite (bleach) is used for chlorinating water, it will raise the pH of the treatment solution. Effectiveness of the treatment solution is greatly reduced if the pH is greater than 7. "Off-gassing" will also be noticeable at higher pH's. Off-gassing is the release of chlorine into the air and results in a typical "chlorine" or swimming-pool smell. In a packinghouse environment, off-gassing can lead to discomfort for, and complaints from, workers.
5. Sodium hypochlorite is corrosive and will speed rusting of dump tanks and nails in bins.

Although chlorination has limitations, it is very useful as a sanitizer for water dumps in apple packinghouses. Chlorinating water dumps on apple packing lines ensure that spores from any decayed fruit will be inactivated as soon as the fruit are immersed in the water. Furthermore, wooden bins immersed in the water dumps will also be decontaminated provided appropriate levels of chlorine are maintained and the bins are kept in the water for at least 4–5 minutes. Chlorinating water dumps also control populations of bacteria and yeasts that contribute to foul odors commonly noted after dump water has been used for several days.

Many different forms of chlorine are available. Household bleach is the most common form, but it is not labeled for food handling uses. (Possibly other forms of sodium hypochlorite are available with appropriate labels, but I am not aware of them.)

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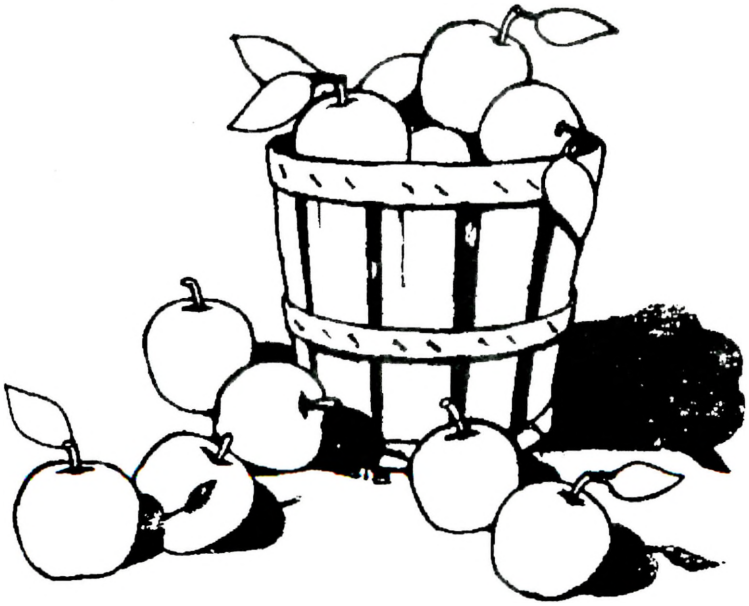
Researchers in Washington State are experimenting with injecting chlorine dioxide gas into their water flumes, but this method of chlorination requires a sizeable investment in equipment for generating the chlorine dioxide gas. Off-gassing is a problem, so the system requires precise regulation of the amounts of active chlorine in the water.

A simpler and safer alternative is calcium hypochlorite. Calcium hypochlorite has several advantages over sodium hypochlorite (or bleach). It is less corrosive than sodium hypochlorite and therefore less damaging to equipment and bins. It is not caustic like sodium hypochlorite and therefore does not damage the fruit cuticle and epidermis. Calcium hypochlorite has no effect on pH, and therefore treatment solutions will emit less "swimming pool" odor. Calcium hypochlorite and an inexpensive dispenser system are available from at least one commercial vendor (Klorman Industries, Alexandria VA, 1-800-925-8745). The Klorman product is labeled for postharvest use on fruits and vegetables. In the Klorman system, dry calcium hypochlorite is added to the system by continually circulating water through a chlorine dispenser. (Other vendors may have similar systems.)

Where chlorination is used in apple water dumps, operators should attempt to maintain a chlorine concentration of 100 ppm. Although concentrations of 25 ppm can effectively kill fungal spores, researchers on the west coast have found that a concentration of 100 ppm is generally required for best results.

To acheive maximum benefit from the chlorination of water dumps, packinghouse operators should also implement other sanitation measures to minimize exposure of treated fruit and bins to spores of decay fungi. Cull bins should be emptied every day to keep fruit from sporulating within the packinghouse. The packinghouse itself should be cleaned periodically to eliminate dust and the airborne spores of decay fungi that will accumulate along with dust. Floors should be washed down regularly. Combining all of these measures is essential for minimizing inoculum of decay fungi in apple packinghouses. ❖❖



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This newsletter available on CENET, in the Tree Fruit News bulletin board under FRUIT.

INSECT TRAP CATCHES (Number/Trap/Day)

Geneva NY

	8/27	8/30	9/2	9/7
Redbanded Leafroller	2.3	2.3	1.7	2.1
Spotted Tentiform Leafminer	848	741	310	62
Oriental fruit moth (apple)	3.3	1.8	9.2	6.4
Oriental fruit moth (peach)	0.8	0.8	2.5	1.5
Lesser appleworm	0.5	0.8	1.8	1.4
Codling moth	5.6	3.3	9.8	6.2
Obliquebanded leafroller	1.5	3.3	2.7	2.4
Lesser peachtree borer (cherry)	1.5	0.7	0.8	0.1
Lesser peachtree borer (peach)	0.6	0.5	0.2	0
American plum borer (plum)	0.3	0.2	0	0
American plum borer (cherry)	0.1	0.2	0.3	0
Peachtree borer	0.4	0	0	0
Apple maggot	0.4	0.2	0.2	0.08
San Jose scale	3.0	3.5	0.7	0.4

HVL, Highland NY

	8/15	8/22	8/30
Redbanded Leafroller	0	0	0
Spotted Tentiform Leafminer	20.4	18.6	9.8
Sparganothis Fruitworm	0.3	0.2	0.2
Oriental fruit moth	1.2	1.9	1.5
Fruittree leafroller	0	0	0
Lesser appleworm	0	0	3.3
Codling moth	1.3	0.4	1.3
Variegated leafroller	0.05	0.6	0.5
Obliquebanded leafroller	0.5	0.6	0.4
Apple maggot	0.07	0.05	0.1
Tufted apple budmoth	1.0*	1.0	–

* 1st catch

(Dick Straub, Peter Jentsch)

UPCOMING PEST EVENTS

	43°F	50°F
Current DD accumulations (Geneva 1/1 - 9/7):	3136	2268

Coming Events:	Ranges:	
Spotted tentiform leafminer 3rd flight subsiding	3253–3471	2228–2472
Redbanded leafroller 3rd flight subsiding	3114–3433	2013–2332
Obliquebanded leafroller 2nd flight subsiding	2809–3433	1930–2332
Codling moth 2nd flight subsiding	2782–3433	1796–2332
Oriental fruit moth 3rd flight subsiding	2987–3522	2018–2377
Lesser appleworm 2nd flight subsiding	3182–3277	2047–2211

NOTE: Every effort has been made to provide correct, complete and up-to-date pesticide recommendations. Nevertheless, changes in pesticide regulations occur constantly, and human errors are possible. These recommendations are not a substitute for pesticide labelling. Please read the label before applying any pesticide.

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