Tomato Packing House Managers Workshop

Ritz Carlton Hotel, Naples Florida
September 5, 2006

(notes by Craig Mowrey)

The workshop was held in the Ritz-Carlton in Naples, the day before the Tomato Committee meeting, just like last year. After the welcome by Reggie Brown, there were 5 speakers, with 6 topics. A CD was provided that was supposed to include all of the presentations, but several slides differed from what was shown, and several of Keith Schneider's slides were blank on the CD. I will email any or all of the PowerPoint presentations to anyone who asks.

Dr. Steve Sargent spoke first on **"Sources of Contamination During Harvest & Packing."** He pointed out that pathogen growth is favored by hot, rainy weather, and that overhead sprinkling results in a wet canopy, also conducive to pathogen growth. He spent considerable time discussing water infiltration into tomatoes, and showed slides of tomatoes rotting from the inside. Both of these issues highlight the need for high quality water for irrigation and spray. He also discussed recent changes to improve food safety and reduce contamination risks: from wooden to plastic bins, cleanable surfaces on packing lines, elimination of stagnant spots in dump tanks and flumes, better handling of recycled water, changeover from manual to automatic chemistry control, moving hand wash stations outside restrooms, use of hands-free wash stations, use of supplemental hand sanitizers, better animal control.

Dr. Jerry Bartz spoke next on **"Controlling Postharvest Decays: the old and the new."** His presentation was fairly technical, and provided a good refresher on how chlorine acts as a sanitizer. He made some interesting points about two common sources of chlorine:

1. Drums of liquid sodium hypochlorite should never be left in direct sunlight. The half life of a 10% solution in a drum at 140 degrees is 3.5 days! **Scouts – if you see a client storing drums of chlorite in the sun, please ask them to get it under cover, and to monitor its use closely as it has probably lost a good deal of its effectiveness.**
2. Calcium hypochlorite is usually in pellet or flake form; if the pellets or flakes are visible in the dump tank (not dissolved), the chlorine in them is not available to the water.

Dr. Bartz also discussed some research IFAS is doing with chlorine dioxide gas. ClO_2 is an effective sanitizer. It was used to kill anthrax in the Senate Office Building. It was used to stop mold growth on books in the Oklahoma State University library, after a ceiling leak soaked a large number of them. IFAS successfully demonstrated its use on a very small scale, but could not replicate the effectiveness on a scale-up attempt. ClO_2 may be a viable method for sanitizing field-packed tomatoes, if they can get the process to work better on a larger scale. The problem appears to be that cardboard absorbs ClO_2 so well that it doesn't get a chance to work as a sanitizer. Use of higher concentrations, longer exposure times, and forced air are being investigated.

Dr. Keith Schneider presented the next two topics. First he spoke on **"Food Safety: Pathogens & Alternate Sanitizers."** Two sets of interesting statistics:

1. More than 75% of foodborne illnesses from fruits and vegetables come from domestic produce, and 17% from unknown sources. Only 7.5% comes from imported produce. So growers who claim that it's the food from overseas causing the illnesses that are driving their costs up, are not accurate.
2. 35.4% of the produce-driven outbreaks were caused by salad bars where the specific source couldn't be identified; 2.1% were caused directly by tomatoes.

The most useful part (for me) of Dr. Schneider's presentation was a comparison of four different sanitizers: chlorine, ClO_2, Peroxy compounds (hydrogen peroxide, peracetic acid, peroxyoctanoic acid, Tsunami [Ecolab product]), and Ozone. Chlorine is the most widely used and the best understood, but has problems – pH sensitive, sunlight sensitive, ineffective against biofilms and mold spores. Each of the others has similar pro's and con's.

The second presentation was a **"*Salmonella* & Tomato Research Update."** Six topics were reviewed:

- Sanitizers
- Chlorine Levels
- Effects of Ethylene
- Infiltration
- Storage
- Round vs. Roma

1. Six sanitizers were compared in their ability to reduce *Salmonella*. Hydrogen peroxide and acidified sodium chlorite (ASC) were the most reactive, each achieving at least a 5-log reduction in 30 seconds of contact time.
2. Chlorine at 50, 100, and 150 ppm, at 25, 35, and 45 degrees C, at 6.5, 7.5, and 8.5 pH were all evaluated for their efficacy in reducing *Salmonella*. The only surprise was that pH did not have as much effect as anticipated. No conclusion was drawn to explain the surprise.
3. The effect of ethylene gas on *Salmonella* growth was evaluated at time=0, 24, 48, and 72 hours, as compared to *Salmonella* growth on a control (no gas). No significant difference was noted.
4. The effect of chlorine (150 ppm, 6.5pH, 25°C) on reducing *Salmonella* on various wound types was evaluated: stem scar, puncture wound, surface scrape, and no wound (whole). Chlorine achieved a 2-3 log reduction in 30 seconds, and a >6 log reduction in 2 minutes, on whole tomatoes. With any of the 3 wounds, chlorinated water was no better than plain water. The conclusion was that bacteria can infiltrate any wound site, and cannot be removed.
5. Studies of survival of *Salmonella* on tomato surfaces at typical ripening room conditions (60-90% RH, 20-30°C) indicate that *Salmonella* can survive up to 28 days. *Salmonella* could also be recovered from stainless steel and conveyor belt surfaces for at least 3, and up to 28 days... Another study seems to indicate that, when *Salmonella* and Erwinia are both growing on a tomato surface, lower concentrations of each are recoverable; apparently they compete with each other, most likely for nutrients.
6. Several recent outbreaks have been associated with Roma tomatoes, rather than rounds. Several physical characteristics were compared: compressive load, extension, pH, and *Salmonella* survival on surface and in puncture wounds of each type; the only notable difference is that Romas have a higher pH at all stages of ripeness.

Dr. Jeff Brecht gave the last technical presentation, entitled, **"Temperature Management for Tomato Handling: how "good enough' can lead to disaster."** Some general conclusions:

1. Tomatoes actually heat up after harvest and sitting outside the packinghouse, especially when exposed to the sun. Pulp temperatures of 110°F have been measured.
2. Tomato temperatures don't drop during packing with heated dump tanks and open packinghouses. Pulp temperatures depend on ambient temperature.
3. Tomatoes do not cool down to ripening room temperature. With pulp at 84°F, and the ripening room at 68°F, pulp temperature actually rose 2-3°F during the first few hours, then slowly cooled over 18-24 hours to a nearly stable temperature. After 2.5 days, the **lowest** pulp temperature was still 72°F!
4. Tomatoes should be force-cooled to 54°F and 95%RH, and then held in ripening rooms, in order to get the best quality. When compared to this process, tomatoes left to cool by themselves, even under best conditions, may not make grade.

Conclusions:

- Not cooling tomatoes to the optimum ripening temperature (68°F) and shipping temperature (54°F) is fine when the weather is mild and the fruit pulp temperatures start out near 68°F.
- Not cooling tomatoes to the optimum temperature when the fruit start out warm is risky business!
- What works at the beginning of the season may well not work at the end.

Dr. Martha Roberts gave the last presentation, entitled, **"Tomato Best Management Practices for Packinghouses."** She presented some background on the federal government's concerns about tomatoes and food safety, and the failed attempt to amend the Tomato Marketing Order (7CFR966.723) to include food safety practices. Now a set of Tomato Good Agricultural Practices (T-GAPs) and Tomato Best Management Practices (T-BMPs) have been generated. The hope is that the Florida Tomato Committee will adopt these standards as voluntary practices this week, and that the Florida Department of Agriculture and Consumer Services (FDACS) will adopt them as regulatory requirements in 1-2 years. Some highlights:

- The standards will apply to all tomatoes grown in Florida.
- The only exceptions will be (1) charitable donations, (2) tomatoes sold on premises (roadside stand), and (3) sales of no more than two 25 pound boxes per customer. This (and other portions) will pretty well preclude pin hookers.
- Field packing will not be allowed unless/until a process is developed and proven which will result in a 3-log reduction in *Salmonella* and Erwinia (Chlorine dioxide gas is so far the only potential possibility). The process must be approved by a Methods Evaluation & Research Committee.
- FDACS will provide a list of the approved chemical agents permitted to be used in facility sanitation (Note: this list is not readily available. Believe me, I've looked – CLM)
- The only approved method of dump tank sanitation is 150 ppm free chlorine, at a pH of 6.5-7.5, with water temperature 10°F above pulp, and a maximum immersion time of 2 minutes. No other method is allowed without prior approval from the MER Committee.
- These parameters must be monitored by hand, every hour, or every 2 hours if electronic monitoring is used.
- All records must be kept for 3 years.
- All producers/growers must complete a GAPs course annually.
- All packers and repackers must complete a Workshop on Sanitation of Dump Tanks and Packing Lines annually (like this one).
- All producers, packers, and repackers shall require their workers to complete training on worker hygiene and field and plant sanitation, annually.
- Packinghouses will be inspected at least once a year by a regulatory agency. Presently, this is in addition to any third party audits.
- Legislation must be changed to allow the Ag Commissioner to impose fines for violations by tomato packinghouses.