Abstract

Tomatoes are an important economic product of the United States, with Florida production accounting for 47% of the total fresh market winter crop. Microbial contamination can lead to decays or consumer health hazards. Combating either type of contamination in water handling systems currently relies on chlorination; experience has shown that potential hazards may not be controlled in this system. This research involves determining the capability of plant pathogens to survive biocidal treatments and screening of some potential alternative treatments to chlorination.

Determining a biocide's usefulness should be based on product availability, ease of use, known biocidal activity and safety. Five biocides were selected for testing here: chlorine (from sodium hypochlorite), acidified sodium chlorite (ASC); peroxyacetic acid (PAA); and chlorine dioxide (ClO_2), as an aqueous solution ($ClO_{2(aq)}$) or a vapor ($ClO_{2(g)}$). The biocides were tested for efficacy against three common postharvest pathogens of tomatoes: the soft rot bacterium, *Erwinia carotovora* subsp. *carotovora* ; the watery soft rot/nest inducing fungus, *Rhizopus stolonifer* ; and the sour rotting yeast, *Geotrichum candidum* pv. *candidum* . Biocides were tested against each pathogen in vitro and in fruit, as either protective or curative agents.

ASC was shown to be more effective than chlorine in curing fruit of bacterial or yeast infections, while both were equivalent against fungal infections. ASC was slightly better than chlorine in protecting fruit from cross contamination. Concerns about the application and cost of ASC exist. As a protective agent, PAA had efficacy equal to chlorination against all organisms, but neither were sufficient curative agents. Aqueous ClO_2 showed some efficacy against bacteria and yeast, but its instability made it less desirable. Gaseous ClO_2 showed great efficacy against bacterial and yeast inoculations and some efficacy against fungal infections. Unlike the other biocides, the method of application of gaseous ClO_2 involves dry delivery after, or prior to, packinghouse water handling procedures.

Based on the results of this study, maintaining current recommendations of chlorination in tomato packinghouse flume systems is effective and economic for minimizing cross-contamination. However, as chlorination will not cure infested fruit, a ClO_2 vapor treatment may be an effective pre-dump treatment for reducing the initial pathogen load.