Abstract

Salmonellae have been increasingly identified as a cause of outbreaks of infections associated with raw produce. However, lack of information on sources of contamination before and after harvest, location of cells on or in raw fruits and vegetables, and sensitive detection techniques make it difficult to develop efficient intervention steps.

A PCR assay derived from *hilA* , a positive regulator of *Salmonella* invasive genes, was developed for detecting the pathogen on tomatoes. The assay was tested on eighty-three *Salmonella* and twenty-two non- *Salmonella* strains, and validated for detecting *Salmonella* Montevideo in and on inoculated tomatoes; 102 and 101 CFU/g, respectively, were detected, using a 6-h enrichment at 37°C. Results indicate that the *hilA* -based PCR assay is sensitive and specific.

To investigate the establishment of *Salmonella* in tomato plants through different routes before harvest, a five-serotype mixture of *Salmonella* was used to inoculate plants, either by injecting stems or brushing flowers. Microbiological analysis of ripe fruits showed that 43 and 40% of stems inoculated before and after fruits set, respectively, were positive for *Salmonella* ; 25% of fruits produced from inoculated flowers were positive.

Uptake of *Salmonella* by roots of tomato seedlings grown hydroponically was also studied using *Salmonella* tagged with green fluorescent protein. The pathogen was detected in cotyledons, stems, and leaves within 9 days of inoculation of nutrient solution in which cut and intact roots were submerged.

Salmonella survived for at least 45 days in inoculated moist soil. The population of *Salmonella* on tomatoes in contact with soil increased by 2.5 log 10 CFU/tomato during storage at 20°C for 4 days, and remained constant for an additional 10 days. The pathogen decreased by ca. 4 log 10 CFU/tomato during storage for 14 days at 70% relative humidity. Imaging of cut tomatoes revealed that more cells were in the stem scar and subsurface areas of tomatoes as the time of storage in contact with inoculated soil increased. PCR fingerprinting showed that among five serotypes tested, *S* . Montevideo was the most persistent serotype detected on tomatoes.

This investigation demonstrates that tomato roots, stems, and flowers are possible sites at which *Salmonella* may establish and remain viable during plant growth and fruit development.