

Protecting fresh-cut produce

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The convenience of fresh-cut produce, which includes packaged lettuces, has greatly increased sales despite multiple foodborne outbreaks associated with these products. To reduce these risks, strict hygiene programs and sanitizers are used for decontamination once the food is harvested. Preventing microbial contamination in the fields is equally important. Researchers from three institutions (Rutgers University, University of California, Davis and University of Arizona), lead by Jorge M. Fonseca at the University of Arizona's Yuma Agricultural Center, experimented with the use of harpin, a substance known to boost plants' resistance to disease, prior to harvest.

Their findings, published in the *Journal of the American Society for Horticultural Science*, support the need to treat produce.

The study was conducted in three states (California, New Jersey, and Arizona) using 'Sniper', 'Desert Queen', and 'Sahara' varieties of head lettuce. Three different strengths of harpin were applied to groups at each site 5 days before harvest. A control group at each site was treated only with [tap water](#). Immediately after harvest, six lettuce heads from each group were stored in coolers for 3 hours before being cut into pieces and stored in sealed plastic bags.

The quality of the lettuce was evaluated based on eight points: overall visual quality (OVQ), browning edges, color, decay/breakdown/sliminess, aroma, crispness, off odor, and total aerobic plate count, which determines microbial load. Evaluations were conducted every 5 days for 20 days, and subjective criteria were based

on the opinions of three judges.

Results varied by location. California's crops with the two lowest harpin levels had higher OVQ and lower microbial populations than the control. No difference in [microbial population](#) was noted in New Jersey, which may be attributed to the wet conditions following treatment and during harvest. Micro-organisms increase in inner and outer leaves of head lettuce with excessive moisture at harvest, according to previous research. Furthermore, natural plant reactions to extreme weather conditions, such as excessive moisture, may inhibit the response that harpin is intended to trigger. However, OVQ was higher in the two highest harpin levels than the control.

In Arizona, the two highest harpin levels had lower microbial populations than the control. The middle harpin level also had a higher OVQ than the control. Harpin improved the color and reduced browning in all locations, but decreased with time as lettuce continues to decay even in cold storage.

When treated with the two highest levels of harpin the day before harvest, inner leaves had 25% higher phenolic content. The lowest harpin level made no difference nor did applications 1 week before harvest at any harpin level. All three harpin levels increased phenolic levels 7% to 9% in outer leaves when applied 1 week before harvest. However, only the two highest harpin levels increased phenolic content when applied one day before harvest.

Phenolic compounds have been linked to plant chemical defenses against microbes. There may also be a connection between phenolics and reduced microbial population and improved post-processing quality, as observed in this study. Reduction of oxidation, which causes the browning and decay of cut product, may also be related to an increase of other antioxidants. In addition to phenolics, antioxidants also increased

by 40% or more in inner leaves treated with the two highest levels of harpin. The researchers indicated that additional research is needed on this topic.

The study shows potential for harpin use in the future both before and after harvest. Furthermore, the study encourages additional research on harpin and environmental conditions' effects on microbes and visual quality of fresh-cut produce.

More information: The complete study and abstract are available on the ASHS Journal of the American Society for Horticultural Science electronic journal web site: journal.ashspublications.org/content/abstract/134/1/141

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