

Project seeks science-based methods to validate pistachio pasteurization

Although pistachio processors may use pasteurization methods they believe achieve an appropriate reduction of *Salmonella*, they will soon have to scientifically validate these processes, under the Food Safety Modernization Act.

That's where a two-year research project led by Bradley Marks, Ph.D., a professor in the Department of Biosystems and Agricultural Engineering at Lansing-based Michigan State University, will help. He and colleagues are working to better understand the variability inherent to roasting, brining and other processing techniques used by the pistachio industry and how they affect *Salmonella* inactivation.

Part of the research will look at developing and testing modifications to existing processing equipment, such as flat-bed or rotary roasters, that could improve preventive controls.

The end result will be a user-friendly guide applicable to both large- and small-scale processors that will provide the steps needed to scientifically validate that their preventive control measures meet or exceed the reduction target.

Marks said he also hoped the research will yield low-capital ways processors can modify their methods or equipment to achieve the preventive control target if they're not able to initially meet it.

Also involved in the research are Elliot Ryser, Ph.D., a professor in Michigan State University's Department of Food Science and Human Nutrition, and Linda J. Harris, Ph.D., a Cooperative Extension specialist in microbial food safety at the University of California, Davis.

The Fresno-based California Pistachio Research Board is an industry partner in the project, providing partial financial support.

Nearly 100 percent of the pistachios sold domestically are roasted, said Bob Klein, Ph.D., manager of the Pistachio Research Board.

"The roasting process for pistachios is an important part of maintaining food safety," Klein said. "And we want to make sure we have adequate scientific support that we're doing the best job possible."

Marks' research focuses on the pistachio partway through the supply chain, and he credited Harris with providing data on naturally-occurring background populations of *Salmonella* and transference that may occur during harvest, hulling, washing and storage.

One of the challenges with the project is the high degree of variability among processing operations, Marks said. Some processors may use a flat-bed roaster, whereas others use rotary roasters. Some dry roast; others brine the nuts before roasting them.

Klein agreed, noting the industry has about seven large-scale processors and another seven smaller-scale processors.

"As many processors as we have, we have different roasting styles and different roasting configurations. And some of them have multiple roasters and different configurations," he said. This first year, Marks and colleagues are conducting laboratory experiments with nuts inoculated with *Salmonella*, in order to evaluate the effect of nut and processing conditions on *Salmonella* inactivation.

A lab-scale oven provided uniform thermal treatments that approximate those occurring in a flat-bed roaster. Thin wire sensors were inserted between the shell and nut at the base of the crack to measure pistachio temperature.

After nuts were placed in the oven, samples were periodically removed to measure pathogen survival, process humidity and nut water activity. For each treatment, the roasting/heating time corresponded to a predicted 5-log reduction in *Salmonella*.

The data are being used to develop a model for *Salmonella* inactivation based on temperature, water activity and process humidity.

Next year, Marks said they will conduct *Salmonella*-inoculated, pilot-scale experiments that more closely simulate what occurs on nuts as they go through a flat-bed roaster. Again, treatment length will correspond to a predicted target reduction in *Salmonella*. The goal is to validate the lethality model and quantify the repeatability and uncertainty tied to validating the thermal processes.

Marks, Harris and the project team also are working with two industry cooperators a large-scale and a small-scale processor to ensure that the lab and pilot-scale experiments are industrially relevant.

"They've been extremely helpful in helping us to understand the typical operating conditions and the typical constraints," Marks said.

In addition, he will send the industry cooperators samples of treated pistachios to make sure quality is still within an acceptable range.

Next year, the project team also plans to take the lab and pilot plant test results and apply them to commercial runs at one of the cooperators for a field-scale demonstration of the validation process.

Key Takeaways

- Project will yield a user-friendly guide to scientifically validating preventive controls
- Research seeks low-capital corrective measures, should pasteurization processes not meet target
- California Pistachio Research Board is an industry partner

California Pistachio Research Board is a CPS industry partner

View the research summary: Improving pasteurization validation methods for pistachio processing

[http://www.centerforproducesafety.org/researchproject/380/Improving_pasteurization_validation_methods_for_pistachio_processing.html]

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