SAFETY & SECURITY

Food Logistics

Phytosanitary, Logistics Communities Converge on Food Safety Issues

BY LARA L. SOWINSKI ON APR 7, 2017

Shown from left to right, Food Logistics editorial director Lara L. Sowinski joined Jaymie Forrest, CCO of ScanTech Sciences, Murray Lynch, CEO of Steritech; and Alberto Diaz, managing director of Spring Valley Fruitson a logistics panel during the seventh annual Chapman Phytosanitary Irradiation Forum in March.

In March, *Food Logistics* was invited to present at the seventh annual Chapman Phytosanitary Irradiation Forum, held at Chapman University in Orange, California The forum is organized in cooperation with the U.S. Department of Agriculture (USDA) with the goal of increasing understanding of the use of irradiation as a phytosanitary treatment to enhance global trade and prevent invasive pests.

The forum's organizer Anuradha Prakash, professor and program director, food science, at Chapman University, and Jaymie Forrest, chief commercial officer of ScanTech Sciences, also a presenter (and *Food Logistics* editorial advisory board member), are keen on raising awareness among USDA officials, phytosanitary experts and others in the academic community about the role logistics plays in supporting a safe food chain, and how cold chain best practices also can contribute to extending the shelf life for fresh, perishable foods.

Study demonstrates viability of phytosanitary irradiation

In 2016, Chapman University's professor Prakash and three colleagues published the results of a study, "Effect of Phytosanitary Irradiation and Methyl Bromide Fumigation on the Physical, Sensory, and Microbiological Quality of Blueberries and Sweet Cherries," which aimed to assess whether irradiation could serve as a suitable phytosanitary treatment alternative to methyl bromide (MB) fumigation for blueberries and sweet cherries, and also to determine the effect of phytosanitary irradiation treatment on survival of Salmonella spp. and Listeria monocytogenes on these fruit.

According to the study, "Methyl bromide (MB) fumigation is a common phytosanitary treatment that meets most countries' export requirements. However, it is a potent greenhouse gas and is scheduled to be phased out under the Montreal protocol."

MB fumigation has other drawbacks. For instance, when fruit undergoes MB fumigation, it must be kept at a minimum temperature of 10-16°C for several hours. It takes another several hours for the gas to be exhausted once the fruit is fumigated, "thus exposing the fruit to warm temperatures for an extended period," the study states.

Moreover, "Little information is available on the effect of MB fumigation on blueberry quality or shelf-life. However, on cherries, fumigation can increase bruising and pitting."

By contrast, "Irradiation treatment results in minimal temperature increase, and fruit can be maintained cold if the facility is refrigerated," the study notes.

Aside from assessing the impact of irradiation on shelf life, "growers are interested in knowing if the dose levels used for phytosanitary purposes can also enhance safety of berries. In general, berries are not common carriers of bacterial pathogens, but there have been incidents of foodborne illnesses linked to fresh berries."

The study cites two examples: "In 2003, an outbreak of Salmonella enterica in California was linked to strawberries, resulting in 13 illnesses and two hospitalizations. In June 2009, there was a multistate outbreak of Salmonella Muenchen, which caused 14 illnesses, and was linked to blueberries."

While Listeria has not been associated with berries, the study noted that "recent outbreaks related to cantaloupes and apples suggest that contamination can occur in packing houses." In addition, "While cherries are hydrocooled with chlorinated water, blueberries are not washed prior to packing, and neither fruit receives a lethal treatment to kill microorganisms. Thus, it would be beneficial if phytosanitary irradiation treatment could also effectively reduce pathogen counts."

Mold growth was one aspect measured by the study. It found that fumigated fruit showed earlier signs of mold growth compared to the control and irradiated fruit samples.

"MB can act as a fungicide," acknowledges the study, "but at the treatment levels for phytosanitary purposes, it was not only insufficient to control mold, but seemed t enhance mold growth, most likely as a result of the high temperature exposure."

The study also evaluated damage to the fruit and firmness. In both cases, the irradiated blueberries and cherries fared better than those that were subjected to MB fumigation.

Ultimately, the study concluded that, "Irradiated blueberries and cherries were not different than control fruit for any quality attribute other than firmness, and irradiation did not improve or reduce shelf life." And, while MB fumigation did not impact quality attributes initially, "shelf life was compromised due to development o sliminess and mold."

Prakash and her colleagues added that, "In our study, the fruit was allowed to warm up to 21.1°C, a process that took about 12 hours. Fumigation at that temperature took two hours, and aeration required another four hours, resulting in an 18-hour break from the cold chain. In contrast, the irradiated fruit were exposed to ambient temperatures for approximately two hours. The extended exposure to higher temperatures for fumigation most likely is the cause of the greater damage, decay and shorter shelf life observed in the fumigated berries compared to the control. At 0.4 kGy the modest reduction in Salmonella and Listeria counts will not contribute significantly to improving safety. Our results show that irradiation at a target dose of 0.4 kGy does not adversely or positively impact blueberry or sweet cherry quality or shelf life, and can serve as a good alternative to methyl bromide fumigation."

In a recent call with *Food Logistics*, Prakash mentioned that, "The fact that irradiation is a cold treatment makes it particularly suitable for fresh produce. The volumetric treatment helps with the irregular geometry of fruits and vegetables, and treatment can be done within the final package."

Ensuring food safety throughout the global supply chain

My presentation to the forum attendees, entitled: "Follow the Food: Opportunities for Phytosanitary Irradiation in the Global Food Supply Chain," highlighted a handfu of fundamental changes that are impacting the global food supply chain, which in turn could present new opportunities for the application of phytosanitary irradiatior

While I am far from a phytosanitary expert, what I've learned has convinced me that phytosanitary irradiation technology is superior compared to methyl bromide fumigation—it's more effective, more environmentally friendly and more expedient to apply/treat perishable foods, which prolongs shelf life and reduces food waste.

In short, the promising news is this: the United States is experiencing a steady rise in food imports and exports, with fresh fruits and vegetables among the top imports. Ocean carriers are transporting large volumes of perishable foods via reefer containers through key gateway ports along the U.S. west, east and Gulf Coasts, while trucks likewise transport significant volumes between the U.S. and its NAFTA (North American Free Trade Agreement) partners.

Meanwhile, niche ports like Port Hueneme in Southern California and the Port of Philadelphia are handling more perishable food shipments too, due in part to new service offerings from SeaLand and other ocean carriers.

At the same time, I think third-party logistics and cold storage providers that continue to look for value-added services to provide their customers would be wise to look into phytosanitary irradiation as one possibility.

Another trend—the increased production and demand for locally grown food, as well as vertical and hydroponic farming—could also translate into future opportunities for phytosanitary irradiation.

Overall, there is real value in bringing food safety experts and logistics providers together to advance the conversation on how the two groups can work cohesively. A truly integrated global cold chain promotes efficiency and safety, as well as sustainability and food security—and all of us play a role in achieving this goal.