Apples

Fire Blight Free and Headed to Japan

Once in 5,000 years of shipping.

Those are the odds that U.S. apples could carry *Erwinia amylovora* and spread fire blight disease to Japan, according to the risk assessment conducted by Agricultural Research Service plant pathologist Rodney Roberts. Estimating this likelihood was an essential part of a process that led to the recent crumbling of Japan's trade barriers to U.S. apples after decades of bargaining and arbitration.

"Actually, that estimate was made in 1998 and has since been modified as new data has become available. The range of likelihood is really between 5,000 and 750,000 years," says Roberts, who is with the ARS Tree Fruit Research Laboratory in Wenatchee, Washington. "That is probably as close to 'not going to happen' as a scientist is ever going to say."

That risk assessment was a major element in more than 20 years of ARS research, and it supported the Office of the U.S. Trade Representative (USTR) and the U.S. apple industry in their successful dismantling of the Japanese trade barriers. Not only did Roberts perform several important research projects, but he also put together stacks of material about his data and analyses in plain language so that it would be accessible to lawyers and international trade regulators.

PEGGY GREB (K10805-2)

Gala apple branch with "scorched" leaves after a severe fire-blight infection.

Trading Talks

Discussions with Japan about opening their market to U.S. apples first began in the early 1980s. But the push began in earnest in 1985.

Bilateral trade discussions in the late 1980s and early 1990s mostly focused on devising ways to ensure that codling moth would not be spread from the United States to Japan by apple shipments. But the United States anticipated that the fire blight issue would be resolved as well.

While fumigation of apples with methyl bromide took care of the codling moth problem, Japan continued to refuse U.S. apples on the basis of perceived danger from fire blight.

Fire blight is a serious New World disease. Its spread to New Zealand was reported in 1919, most likely through infected budwood. The disease, which is caused by the bacterium *E. amylovora,* affects plants in the rose family, such as apples, pears, quince, blackberries, raspberries, pyracantha, mountain ash, and hawthorn. The name "fire blight" comes from the blackened leaves that give trees a scorched look.

Blossoms, leaves, and fruit can all develop fire blight disease. But answering whether mature, unblemished apples could carry *E. amylovora* and pass it on was Roberts's first project when he came to work for ARS in 1986.

"On my way to the Wenatchee laboratory to take up my research duties, I stopped by ARS headquarters to discuss what research I would be doing. They said

there was this little problem that needed to be investigated about *E. amylovora* and apple fruit," Roberts says. "For the next 20 years, fire blight and Japanese trade barriers kept me busy."

After 2 years of testing, he had data that demonstrated that unblemished, mature, ready-to-eat apples—the kind that would be shipped from the United States to Japan—do not harbor *E. amylovora.* "We never did find the bacteria inside or on the surface of mature, unblemished apples in Washington State," explains Roberts.

But Japan was not satisfied with the scientific evidence Roberts and other researchers accumulated.

In 1994, Japan did change its trade regulations to be officially open to U.S. apples. But the phytosanitary restrictions for fire blight were so onerous that few growers could afford to meet them.

"And these regulations, as burdensome as they were, only applied to U.S. Red Delicious and Golden Delicious apples. The Japanese required separate testing to show that any other varieties would not harbor the bacterium, when a treatment that works on one variety really works on all varieties," explains National Program Leader for Postharvest Entomology Kenneth W. Vick, who also provided ongoing scientific support to bring down the apple trade barrier.

"It was too expensive and time consuming, so apples were only exported a few times under these regulations before U.S. growers figured it just wasn't worthwhile," Vick adds.

Strictly Science

In the meantime, the Uruguay Round of the General Agreement on Tariffs and Trade—"GATT"—had set international ground rules that phytosanitary regulations be based solely on science. This offered a new opportunity to revisit the fire blight issue and to remove trade-restrictive Japanese import regulations.

The following year, Roberts went to Auckland, New Zealand, to work with his counterpart there in fire blight research, Chris Hale, then with HortResearch, at the Mt. Albert Research Centre. New Zealand also has a strong interest in the apple-fire blight issue, and it has sought market access to Japan and Australia, which maintains the same prohibitive fire blight restrictions against both New Zealand and U.S. apples.

Roberts, Hale, and plant pathologists Edward Miller and Scott C. Redlin, from USDA's Animal and Plant Health Inspection Service (APHIS), collaborated to complete the first formal risk assessment for fire blight spread by apple fruit.

"We considered all the steps that would have to occur for long-distance transmission through commercial apple fruit. For some steps, the data indicated that transmission has never occurred, either experimentally or in the real world. This would have resulted in an assessment of zero risk, because the way a risk assessment works is that you multiply all the risks together—and any time you have a zero in a multiplication…," Roberts says.

But the team took the most conservative position by assigning some risk to each step, even if the data indicated that no transmission was possible at a specific point.

"Based on that model, even the riskiest scenario showed that fire blight spread from apple shipments was not likely to happen in many thousands of years," Roberts says.

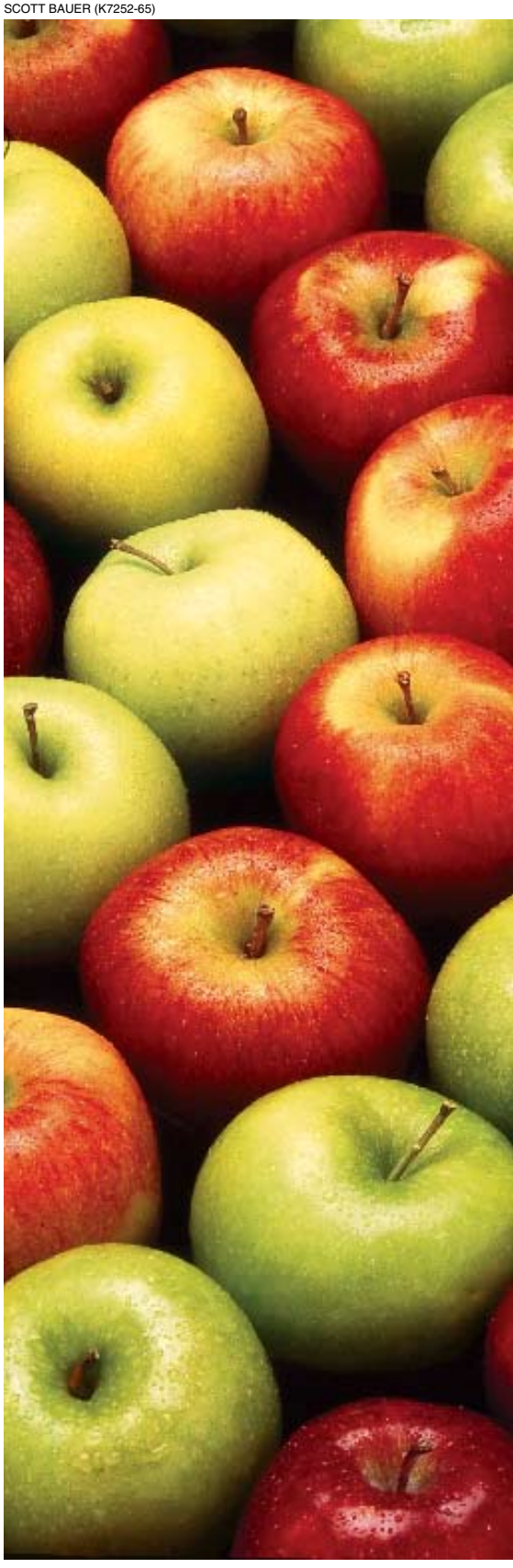
Unfortunately, Japan maintained its regulatory position.

By 1999, the Pacific Northwest apple industry was very frustrated by Japan's position, and the USTR became involved.

In an attempt to reach resolution, Roberts hosted a team of scientists from Japan's Ministry of Agriculture, Forestry, and Fisheries in the early spring of 2000, and again at apple harvest, in an effort to build consensus with the Japanese on the very low risk of U.S. apples' spreading fire blight.

"We harvested 30,000 apples at various distances from trees known to have fire blight and even some from the trees that had fire blight. We assayed 900 immedi-

SCOTT BAUER (K7252-65)



ately after harvest and checked the rest after they had been stored until December, essentially the way exported apples would be treated," Roberts says. "No fire blight bacteria were found in any of the apples, and no fire blight developed during storage, confirming the earlier work from the late 1980s.

"The apple industry's cooperation with this project was incredible. They were willing to leave fire blight-infected branches in place instead of pruning them immediately so we could be sure we were collecting from orchards that had the disease," Roberts adds.

Of course, industry was willing to cooperate in hopes of opening a major new market, explains Bill Bryant, who was then vice president of the Northwest Horticultural Council, which handles the apple industry's international interests. Today, Bryant is chairman of Bryant Christie, Inc. in Seattle, Washington.

"But what was most important was that ARS was willing to do this work. We knew the Japanese would not ever have accepted the science if it had come from industry-funded research," says Bryant. "It was a real team effort. I can't compliment Rodney Roberts and Ken Vick enough for all their efforts."

THOMAS WAHL (D743-1)

Washington State apples ready for shipment.

Patience Is a Virtue

Despite the data from 30,000 apples, Japan did not change their regulations.

So in 2001, the USTR went to the World Trade Organization (WTO) to request that a dispute-settlement panel review Japan's restrictions on U.S. apples for not being based on science.

"Dr. Roberts's work was the scientific foundation for the WTO case. When we initiated the WTO dispute, Dr. Roberts served as technical advisor to the U.S. litigation team. In this role, he constructed the scientific case against the Japanese restrictions and explained, both for the U.S. team and the WTO panel, the scientific and technical issues relating to fire blight and apple fruit in a way that could be understood by nonscientists," explains one of the USTR lawyers involved in the case. "It is difficult to imagine how we could have resolved this issue without someone of Dr. Roberts' persistence, scientific knowledge, and analytical and communications skills."

The WTO panel called in expert scientists from around the world to review the scientific merits of the case, and in 2003, the panel concurred that Japan's objections were not scientifically based and that U.S. apples were unlikely to spread fire blight disease.

Bryant points out, "This final success would not have been possible if we hadn't had a very good scientist in Dr. Roberts who was incredibly patient with his scientific peers and the Japanese; who had an appreciation for the political and policy issues that needed to be answered with research; and who could be an advocate for his work in an international tribunal that was made up of trade wonks like me. Dr. Roberts had to make his work understandable to them."

In response to the 2003 WTO ruling, Japan put new regulations in place: Import would be allowed only if orchards and surrounding areas were inspected for fire blight three times a year by USDA and Japanese inspectors; fruit and storage facilities were to be subjected to chlorine treatment; and apples were to be kept separate from other fruit. These rules were still burdensome and expensive.

USTR asked the WTO to review the revised protocol, which found the new regulations not compliant with the panel's earlier decision. In August 2005, the United States and Japan agreed on a new protocol that eliminated the burdensome regulations and truly opened the Japanese market to U.S. apples.

U.S. apple exports to Japan could easily increase by an average of $144 million per year, according to a report by USDA's Economic Research Service.

Use of the ARS research goes on. Australia is considering it while writing new fire blight requirements for importation of apples from New Zealand. Analogous requirements would be expected for U.S. apples. The draft Import Risk Assessment prepared by BioSecurity Australia for public comment includes orchard inspections, which presupposes the danger that mature, symptomless apples could carry fire blight disease.

Both New Zealand and the United States have countered with the internationally recognized scientific evidence supporting the WTO panel decision that indicates that such restrictions are not needed.

"The scientific evidence that ARS helped develop is critical to our efforts to open the Australian market to U.S. apples," said Karen Z. Ackerman, the APHIS phytosanitary manager for this trade issue.—By **J. Kim Kaplan,** ARS.

This research is part of Plant Diseases (#303) and Crop Protection and Quarantine (#304), two ARS National Programs described on the World Wide Web at www.nps.ars.usda.gov.

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