Fabulous Fruit—Without Fumigation

Today's bountiful supply of picture-perfect fruit—luscious cherries, apples, mangoes, grapefruit, avocados, papayas, carambola, and bananas—overflows the produce shelves of supermarkets often as a direct result of Agricultural Research Service efforts.

While nature makes possible a wondrous bounty, the diseases and insect pests that attack crops after harvest are also part of nature. That's why one facet of the ARS research mission is to find ways to protect susceptible fruits on their way to consumers.

For decades, chemical fumigation has been the primary means of protection. But many chemicals have been taken off the market because of health and environmental concerns. So ARS scientists have been working on alternatives—treatments like irradiation, heat, cold, traps, and biological controls in the field.

They're also looking at the host status of particular fruits and at insect-free zones, cultural practices, and management systems that could eliminate the need for fumigation. For example, if it can be shown that a fruit is not host to a specific pest, then it won't need treatment for that pest.

Fly-free zones designate particular areas uninhabited by fruit flies and from which fruit can be shipped. One such area is in northwest Mexico along the border of Sonora, where sterile flies have been released and the area has been sprayed with chemicals to rid it of the Mexican fruit fly. USDA's Animal and Plant Health Inspection Service (APHIS) has certified this area free of the quarantine pest, thereby lifting restrictions on citrus movement.

Effective pest control is essential not only for fruits slated for U.S. export and import markets, but also for internal quarantines between growing areas in different parts of the country. An example of an internal quarantine is the recent discovery of Mediterranean fruit flies in Florida, which restricted movement of citrus from a medfly-quarantined growing area of Polk County.

We cannot import any product that may be host to a pest that is not found in the United States, unless it first receives an approved treatment to eliminate the risk of accidental introduction. We must also have an approved treatment for any crop that we export to a country that doesn't already have some of our pests.

Only two chemicals are currently available for postharvest fumigation: methyl bromide and phosphine. Phosphine can be used on stored products like grains, almonds, and raisins, but it is harmful, or phytotoxic, to fresh commodities. This leaves methyl bromide, which will be banned in the United States, effective January 1, 2001—only three crop seasons away.

This impending ban has stepped up the pace to find alternatives.

Take cherries, for instance. In 1996, we exported 13,136 metric tons of fresh cherries to Japan, worth $8 million. Japan required the U.S. cherries to be treated with methyl bromide to rid them of codling moth, a pest that Japan doesn't have and doesn't want.

ARS scientists are investigating four alternative ways to protect cherries: irradiation and three heat treatment protocols, two of which are combined with controlled atmospheres (modified oxygen, humidity) during storage. Industry has selected irradiation and a heat with controlled atmosphere treatment for commercial use.

Other ARS scientists are studying the side-effects of these alternatives. To be approved, a treatment must not only kill codling moths, but it must do so without affecting the quality of the cherries.

Apples, which also are plagued by the codling moth, are currently being shipped to Japan after methyl bromide fumigation. We're now testing a heat treatment followed by cold storage. It has proved very effective for apples, as well as for pears, which have never before had a quarantine treatment because of their perishability.

Hawaii is under a federal fruit fly quarantine that prohibits shipment to the U.S. mainland of fresh fruits and vegetables that are fruit fly hosts. But ARS is collaborating with the University of Hawaii to use irradiation and heat treatments to make these fruits eligible for mainland markets.

The Food and Drug Administration approved use of irradiation on fruits and vegetables in April 1986. Trial shipments of Hawaii-grown exotic fruits have been sent to a plant in Illinois where they were irradiated and then sold in Chicago, Indiana, and Ohio. Consumer acceptance was excellent.

APHIS has approved the irradiation treatment for papaya, carambola, and lychee and has written appropriate regulations. But these cover only fruit flies, because scientists haven't yet learned what irradiation doses would be effective for other pests.

We're testing irradiation on blueberries to rid them of quarantine pests like the blueberry maggot, apple maggot, and plum curculio. Currently, methyl bromide is the only approved treatment for these pests.

ARS' ongoing quest for effective replacements for fumigation should ensure the steady movement of fresh, quality agricultural produce into international markets while keeping a steady supply at home.

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