Success with Irradiation Treatment for Hawaiian Sweetpotatoes Seems to Leads to New Regulatory Approach

By Michelle Marcotte

Summary: The approval and commercial adoption of irradiation as a quarantine treatment for the unique Hawaiian sweetpotato, eliminated methyl bromide, increased shipments of sweetpotato to the U.S. mainland, decreased grower costs, and improved product handling. Hawaiian growers have doubled their acreage in planting and because the irradiation treatment also delivers sprout control, growers' unique seed is protected. Approximately 900 pounds of methyl bromide have been replaced each year since the new regulation allowed the use of irradiation as an alternative treatment.

In retrospect, this project seems to have represented a shift in thinking by the USDA Animal and Plant Inspection Service (APHIS), away from an insistence on a pest by pest and product by product treatment requirement for irradiation. The success of this regulatory action seems to have been an important contributor to the recent USDA – APHIS publication of a generic rule for irradiation as a quarantine treatment for all arthropod pests (except Lepidoptera adults and pupae). The new regulation could significantly enhance the use of irradiation as a quarantine treatment.

Hawaiian agriculture - One of the biggest challenge facing Hawaii's farmers is the many pests that infest fruit and vegetables -- preventing shipment to the mainland United States unless the produce is treated. Hawaii has an unusual sweet potato; the Hawaiian Okinawan sweetpotato has a white skin, but is deep purple on the inside. Its deep purple color persists even after boiling, becoming an extraordinary deep violet. The texture is a bit drier than yellow sweetpotatoes, but the flavor, especially after irradiation, is sweeter (Wall, 2004).

The pest quarantine problem - Unfortunately, Hawaiian sweetpotato can be infested with three pests that are not present on the mainland: West Indian sweetpotato weevil (Euscepes postfasciatus) (referred to as sweetpotato scarabee in the Federal Register); Fijian ginger weevil (Elytroteinus subtruncatus); and sweetpotato vine borer (Omphisa anastomosalis) (referred to as sweet potato stem borer in the Federal Register). Additionally, the sweetpotato weevil (Cylas formicarius elegantulus) is not a federal quarantine pest, but it is a quarantine pest for California.

Research basis -USDA-ARS research scientist Dr. Peter Follett studied the potential for irradiation as a quarantine treatment at the USDA–ARS Pacific Basin Research Center in Hilo. Follett has now determined that an irradiation treatment (dose) of 150 Gy kills all of these pests if they are present in the sweetpotatoes. His earlier research suggested a dose of 250 to 300 Gy (25 to 30

krad) appeared to be sufficient and included a margin of safety (Follett, November 2003).

Regulatory Action - Using this research and a review by Dr. Peter Follett and Dr. Guy Hallman of USDA –ARS Weslaco Texas, USDA - APHIS proposed an irradiation treatment dose at 400 Gy (40 krad) (Federal Register, June 26, 2003). APHIS adopted this dose based Follett's "toughest insect" concept and in view of the groups of insects being targeted. Follett's concept involves setting a dose high enough to kill the most radiation-tolerant insects known to infest the product. AHIS followed the Proposed Rule with a Final Rule within six months (Federal Register, February 18, 2004). This thinking is both scientifically valid and represented a paradigm shift in APHIS consideration of irradiation quarantine treatment approvals.

Commercial success - Hawaii Pride, a Hawaiian owned small company, opened its electron beam irradiation facility in August 2000. Hawaii Pride lobbied for approval to resolve the quarantine problem with irradiation and was actively involved in the research and regulatory process. APHIS new regulatory approach has been successful; in early July 2003, in the first week after publication of the interim rule that allowed irradiation treatment, growers brought Hawaii Pride 40,000 pounds of sweetpotatoes. Growers have delivered from 40,000-50,000 pounds/week in the low season to 100,000-120,000 pounds/week in early August.

Regulatory advances - Recently, USDA –APHIS published a Proposed Rule that will allow a 400 Gy minimum dose as a quarantine treatment for any product infested with arthropod pests, except Lepidoptera adults and pupae (Federal Register, June 10, 2005). The success of the Hawaii project seems to have encouraged USDA – APHIS to propose a regulatory approach that could significantly enhance the use of irradiation as a quarantine treatment.

Federal Register. February 18, 2004. Volume 69, Number 32. Page 7541-7547. 7 CFR Part 318. Irradiation of Sweetpotatoes from Hawaii.

Federal Register. June 26, 2003. Volume 68, Number 123. Page 37931-37936. 7 CFR Part 318. Irradiation of Sweetpotatoes from Hawaii.

Federal Register. June 10, 2005. Vol 70. Number 111. Page 33857 – 33873. 7 CFR Part 301, 305, 318, 319. Treatments for Fruits and Vegetables.

Follett, Peter A. Irradiation as a methyl bromide alternative for sweetpotato from Hawaii. Presented to the 8th Annual International Conference on Methyl Bromide Alternatives and Emissions Reduction, Orlando, FL, November 2003.

Wall, Marisa M. Compositional and sensory analysis of sweetpotatoes after X-ray irradiation quarantine treatment. HortScience 39(3) 574-577, 2004.