

HOT WATER TREATMENT FOR MEALYBUGS ON LIMES

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Introduction. Methyl bromide, which is scheduled to be banned as an ozone depleter, and ethylene dibromide, prior to being banned in 1984 as a carcinogen, have been used as fumigants to disinfest commodities of quarantinable hitchhiker pests. Methyl bromide is scheduled to be phased out as an ozone depleter by 2001. Mealybugs are major pests of many agricultural commodities. The Pink Hibiscus Mealybug is currently damaging crops on many Caribbean islands and threatens to reach the continental United States soon. *Pseudococcus odermatti* Miller & Williams, a recently described species of mealybug, is a pest of quarantine concern on limes which are imported into the United States from the Bahamas. These limes have been fumigated with methyl bromide in the past, but higher doses required during cold weather injure the limes. A quarantine treatment is required to prevent this unwanted pest from further spread in the United States.

A number of methods were considered. Several insecticidal coatings were tested on limes infested with mealybugs, including vegetable and mineral oils, and soap. A hot water treatment was also tested because it would fit in well as a rapid treatment on a packing line. It was proposed that a hot water treatment of 46-57°C for 5-20 minutes would disinfest the surface of the limes of pests. Shipments of limes were brought in from the Bahamas by the importer, treated on the dock, examined for insect mortality, then returned to the Bahamas.

Methods: Hot Water. A 200 liter stainless steel water tank water was heated to the desired temperature using a gas heater. Preliminary tests on the fruit indicated that limes would tolerate 49°C for up to 15 minutes without showing damage. Limes with feral insect populations were dipped in groups of 120 at times of 1,2,3,4,5,6,7,8,9,10, 12, 14, 15, and 16 minutes. After limes are removed from hot water they were held for 2-3 days and examined under a stereo-microscope and live and dead insects counted. One group of control limes was held without treatment and examined for insects. **Coatings:** Coatings were applied at a 3% rate in approximately 10 liters of water. Groups of 60 limes were dipped in coatings for 10 minutes, rinsed 10 minutes, then held for 2-3 days and live and dead insects counted. Two petroleum based oils, a vegetable oil, and a soap were tested.

Results: Hot Water. Five replications of 1200 fruits were dipped from different shipments until the total number of treated insects was greater than 500. Hot water treatment of limes showed little effect on mortality until 5 minutes, mortality increased until no survivors were recovered after 12 minutes of treatment. Data was analyzed using regression and probit analysis. Probit and linear regression gave 99.9968% mortality (probit 9) predictions of 21 and 13 minutes respectively. A large scale test at 20 minutes was initiated and batches of 1200 limes dipped and examined for live and dead insects. To date, 2400 limes have been dipped with no survivors and 202 insects killed.

Coatings: Some of the coatings have been tested with 5 replications, others 3 or 4 replications. The soap and vegetable oil coatings were ineffective with mortality of 21% and 40% respectively. The petroleum oil based coatings were more effective with no survivors found, but very low numbers of dead insects were recovered, suggesting that the coatings may have repelled the insects and caused them to leave the fruits. Further work with coatings will continue until larger numbers of insects allow a better evaluation of their effectiveness.

The treatment of 20 minutes at 49°C will probably give quarantine security for limes infested with mealybugs. More extensive phytotoxicity work is being conducted to ensure that the treatment will not damage the commodity. Further work is needed with coatings to determine their efficacy.