DEVELOPMENT OF MB ALTERNATIVE TECHNOLOGIES FOR POSTHARVEST FRESH COMMODITIES

Louis H. Aung*, J. F. Jenner, J. G. Leesch, F. R. Ryan, D. M. Obenland and L. Zettler
USDA, ARS 9611 S. Riverbend Avenue, Parlier, CA 93648

Postharvest endeavors to develop methyl bromide (MB) alternatives for fresh fruit commodities rest essentially on two basic requisites: (a) any chemical or non-chemical alternative treatment must be efficacious against a targeted quarantine pest resulting in 100% mortality; and (b) the alternative regulatory treatments must not injure or reduce the postharvest quality of fresh commodities for sale and consumption. Thus, in principle, an acceptable MB alternative would be realized if the above requisites are met. In practice, however, the complexity of the varied nature and biochemical composition of fresh commodities, and the kind of pests encountered preclude a ready solution. Here, we report results of some potential MB alternative treatments on selected fruit commodities.

Postharvest methyl iodide (MI) fumigation and forced aeration investigations conducted in cooperation with entomologist James Leesch on lemon quality/phytotoxicity was continued using coastal lemons. Forced aeration at 3.5 liters per minute for 24 hours reduced phytotoxicity of early-season coastal lemons fumigated with MI (24, 28, 32mg/l) by >90%, and that of mid-season coastal lemons by >60%. These favorable results confirm previous work. The influence of MI on other major fresh fruit commodities will also be determined.

Cold (0^{o} - 2.2^{o}C) is a recognized quarantine treatment of certain insect pests (Anon., 1985), but tropical & subtropical fruit-hosts suffer cold injuries under these regulatory treatment conditions. In order to help minimize cold induced citrus rind injury, determination of volatile compounds was made to detect early signs of fruit injury. The ability to detect volatile compounds emissions related to rind injury would assist in a more accurate prediction of the potential impact of a selected cold treatment on a commodity.

The basis for the measurement of antioxidant levels in fruit subjected to various MB alternative treatments is twofold: 1. To provide an indication of nutritional/biochemical quality of the fruit commodity, and, 2. As a biochemical gauge of tissue phytotoxicity. Fumigation with methyl iodide reduced glutathione content to 13% of the control immediately after the 2 hour aeration and this recovered to 55% of the control after a 24 hour aeration. After 5 weeks cold storage, glutathione concentrations were at pre-treatment levels for both methyl iodide fumigated and control samples. Injury after

storage was apparent on 99% of the lemons with the 2 hour aeration but on only 13% of the fruit with the 24 hour aeration

The use of hermetic vacuum technology (HVT) for eliminating storage insect pests of durable commodities has been reported (Navarro *et al*, 2001). The application effect of HVT on fresh postharvest fruit, however, is lacking. In cooperation with entomologist Larry Zettler, preliminary studies of HVT on selected fruit were conducted. When apples *cv* Fuji and Gala were subjected to vacuum between 30-100 mm Hg at 30^{o}C for 24-48 hrs, the quality of the apples as indexed by firmness, brix and phytotoxicity was not significantly altered. The ethanol content of the HVT-treated apples was increased, however, but declined subsequently in storage at 1^{o}C. Overall, the apples withstood the HVT treatment quite well without major quality change or loss. The HVT work continues.

Reference:

Navarro, S., S. Finkelman, E. Donahaye, R. Dias, M. Rindner and A. Azrieli. 2001. Laboratory and Field Tests on Vacuum or CO_2 for the Control of Storage Insects. Annual International Research Conference on Methyl Bromide Alternatives and Emissions Reductions, San Diego, CA; 68-1

Anon. 1985. APHIS Manual. USDA – Animal and Plant Health Inspection Service, Washington, D.C.