PHYTOTOXICITY TO CITRUS FRUIT FROM POSTHARVEST HEAT AND COLD INSECTICIDAL QUARANTINE TREATMENTS USED AS ALTERNATIVES TO METHYL BROMIDE FUMIGATION

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Citrus fruit given quarantine treatments for control of insect pests often are injured because of these treatments. Minor cosmetic injuries to fruit peel might be tolerated by consumers, but major blemishes and fruit decay cannot be tolerated. Even if such treatments are efficacious against target insects and approved by regulatory agencies, they would not be used in commercial situations.

The response determination of citrus fruit to approved (APHIS Plant Protection and Quarantine Manual) and candidate quarantine treatments are continuing. Tests with citrus fruit harvested from different geographic growing areas, at different seasons of the year and of different maturities have produced variable results (Houck, 1967, Phytopath. 57:99; Houck, et al. 1990, J. Hort. Sci. 65:611). Injury to fruit can range from slight to severe, including injury that predisposes the fruit to decay.

Tests are in progress to determine variability in response, how to predict the response, and to index and understand the biochemical basis of the injury.

Volatile emanations from lemon fruit following hot water or cold treatments were used to assess the phytotoxicity of these treatments. Due to its relative higher abundance (>42% on a fresh weight basis), d-limonene was determined to be a volatile that could be used as an index of treatment effect. Lemon fruit exposed to increasing temperature treatments showed increasing severity of rind injury. As the degree of injury increased, there was a corresponding enhanced emanation of d-limonene. Cold treatment at 1°C for 4-5 weeks followed by storage of 1 week at 20°C caused development of chilling injury lesions on the rind and a greater release of d-limonene than from non-chilled fruit. Overall, injury due to hot water or cold treatments was associated with increased d-limonene release.

Respiration rates for fruit given stress treatments, whether the stress is due to cold, heat or MB fumigation have shown that stressed fruit always have higher respiration rates. Respiration provided a useful index to monitor the general physiological health/condition of lemon fruit after harvest and after various hot water treatments or methyl bromide fumigation. Coastal-grown lemons exhibited higher respiration rates than desert-grown lemons. Coastal lemons fumigated with MB showed up to a 40% increase in respiration

rate than in untreated fruit. In desert lemons, MB fumigation or 5-minute hot water immersions at 50, 52.5, 55 or 57.5°C increased the respiration rate of the fruit, with respiration becoming higher with increasing temperature. Respiration response to treatment showed a similar trend in desert lemons harvested in September, October and February. However, injury to desert lemons by MB and hot water treatments was lowest in September lemons and greatest in February lemons.