POSTHARVEST TREATMENT ALTERNATIVES FOR FLOWERS AND FOLIAGE

Arnold Hara, Marcel Tsang, Trent Hata, Benjamin Hu and Victoria Tenbrink

Methyl bromide fumigation is widely used by many countries as a standard quarantine treatment for various arthropod-infested flowers and foliage. However, some plant species are sensitive to its use with damage characterized by reduced vase life, burning of leaves and petals, and failure of the flower buds to open. Therefore, methyl bromide can be safely used only on certain cultivars of flowers and foliage at specific temperature and dosage.

There are two crucial and interconnected aspects of developing alternative insect disinfestation treatments: 1) effectively disinfesting flowers and foliage of insect pests, and 2) maintaining product quality and vase life. Because of numerous problems associated with chemical pesticides, postharvest disinfestation treatments that emphasize nonchemical control tactics must be developed for floriculture crops. One of the most promising nonchemical alternatives for disinfesting many tropical flowers and foliage is hot-water immersion treatment. In small-scale tests, hot-water immersion was effective as a quarantine treatment for bird of paradise; exposure to 49°C water for 6 min resulted in 100% mortality of adults, nymphs, and crawlers of magnolia white scale (Pseudaulacaspis cockerelli). Simulated shipping and vase life studies show no significant effects on the quality and vase life of bird of paradise. In addition, water at 49°C for 10 min was >99.7% effective against green scale (Coccus viridis) on propagative cuttings of cape jasmine (Gardenia jasminoides) with no detrimental effects on root development and a positive effect on shoot development. Hot-water immersion at 49°C for 14 min eliminated >98% of ants, aphids, and mealybugs in red ginger (Alpinia purpurata); however, quality and vase life were reduced under certain preharvest environmental conditions.

The commercial use of hot-water immersion to disinfest cut flowers and foliage is very promising. We recently

developed a prototype commercial scale hot-water treatment system. This system, both affordable and practical for use by the floriculture industries, was developed to disinfest flowers and foliage of insect pests. The hot-water immersion unit, which accommodates 150 cm stem lengths and over 150 flower stems, successfully maintains water temperature at the set point with a uniform temperature profile throughout the tank. Advantages of water over other heat systems are that water is inherently more efficient than water-saturated air (vapor heat) as a heat transfer medium and treatment systems based on hot water can be built for less than $4,000 compared with over $55,000 for vapor heat or forced hot-air treatment systems.

Each postharvest treatment, including hot-water immersion, has its advantages and disadvantages with no single effective treatment for the various pest species and floral crops. A procedure or treatment for quarantine security will have to be tailored to a particular pest species and host plant. In addition, a single postharvest treatment may not provide the level of security demanded by certain countries and states (zero tolerance or probit 9 mortality for insects); this will require both before harvest pest management measures and after harvest treatments in a systems approach to quarantine security. Presently, most quarantine protocols require evidence that a probit 9 level of security can be achieved by a treatment or procedure. However, as suggested by several U.S. Department of Agriculture researchers, quarantine treatments based on the probability of an actual introduction in a noninfested geographical area will more realistically relate to a given treatment for quarantine security. Consequently, some of the discussed postharvest disinfestation treatments or procedures may not meet the stringent probit 9 level of security but meet a realistic "negligible pest risk". This translates to a low probability of introducing a pest into a noninfested area based on infestation level of the commodity and on survival, feeding, dispersal, mate-finding, and host-finding of the pest. Finally, quarantine officials should recognize that the probability of introducing a pest on cut flowers for retail consumption by business establishments or home residences is much lower than the probability of introducing a pest on propagative materials for use by commercial nurseries or farms.