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Control of Arthropods in Harvested Chrysanthemum Cuttings

Elizabeth Mitcham[1], Tiffanie Simpson[1], Veronique Bikoba[1], and Michael Parrella[2]
[1]Department of Pomology, [2]Department of Entomology
University of California, Davis, One Shields Ave. Davis, CA 95616

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Phone: 618/692-0045
Fax: 618/692-4045
E-mail: afe@endowment.org
Website: www.endowment.org

Background

Interstate and international shipment of chrysanthemum cuttings and other ornamental products requires effective control of insects and mites. Methyl bromide is widely used as a postharvest pre-shipping treatment for floral commodities, including chrysanthemum cuttings. In many cases, the dose necessary to provide complete control of target pests is at the upper limits of commodity tolerance and it often results in damage. Many uses of methyl bromide are scheduled to be phased out due to environmental concerns. The impending loss of this standard control method of disinfestation necessitates the development of alternative methods that provide not only quarantine security but also are compatible with floriculture commodities.

Our objective was to develop an alternative disinfestation treatment for harvested chrysanthemum cuttings. The major pests of field grown chrysanthemums are: (1) melon aphid, (2) silverleaf whitefly, and (3) the agromyzid leafminer, *Liriomyza trifolii*. In addition, two-spotted spider mite and Western flower thrips can be incidental pests.

Elizabeth Mitcham
ejmitcham@ucdavis.edu
530-752-7512

Methods and Results

Hot Air Treatments

A series of experiments using forced hot air (118, 122, or 126°F) were conducted with unrooted chrysanthemum cuttings and several target pests. Initial results indicated that Western flower thrips and melon aphid were susceptible to hot air treatments that appeared to be tolerated by chrysanthemum cuttings; however, two-spotted spider mites did not respond to any of the temperatures or exposure times utilized.

Chrysanthemum cutting damage was rated on a scale of “none”, “slight”, “moderate”, or “severe”. Preliminary data indicated that chrysanthemum cuttings tolerated exposures of 122°F or 126°F for up to 80 or 40 minutes, respectively. Preliminary data also indicated that these temperatures and exposure times would be effective against adult leafminer and adult whitefly. Subsequently, rooting trials were initiated to confirm earlier quality evaluations.

Although early results with hot air treatments indicated that chrysanthemum cuttings were tolerant of high temperatures for long periods of time with little or no damage, rooting experiments proved that to be false. When rooting trials were initiated with chrysanthemum cuttings exposed to the most promising combinations of temperature and exposure time for insect control, greater than half of treated cuttings exhibited damage rated higher than “slight”.

For some treatment combinations the percentage of chrysanthemum cuttings showing more than “slight” damage was 100% across all cultivars of chrysanthemums utilized. Thus, we now know that damage to heat treated chrysanthemum cuttings may not manifest itself until cuttings are placed in the stressful environment of the greenhouse.

Warm Air/ Low Oxygen

Data from previous tests with *Dendrobium* orchids indicated that exposure to 1.5% O_2 at 95°F for 36 h resulted in 98.8% mortality for Western flower thrips. Preliminary results indicate that aphids respond similarly to Western flower thrips when exposed to these treatments. Chrysanthemum cuttings were exposed to 1.5% O_2 at 95°F for 24 hours, then placed in growing media and held in the greenhouse at _______________ (what conditions) for 3 days. These cuttings exhibited very little damage. We are currently in the process of testing target pests with these treatments. In addition, we are conducting further evaluations on the tolerance of chrysanthemum cuttings to these conditions. Based on the positive results from our studies with orchids, we view this combined treatment of warm air and low O_2 to be a research approach that should be pursued.

Conclusions/Impact to the Industry

Due to phytotoxicity from hot air treatments that provide complete control of immature leafminers, thrips, and aphids, forced hot air treatments do not appear feasible for chrysanthemum cutting disinfestation. However, for at least two of the target pests, aphids and thrips, significant mortality (>95%) can be achieved by a combined treatment of warm air and low O_2. Phyto-sanitary requirements (be specific) could be met by a treatment that provides significant, although less than complete control. However, requirements for quarantine level control are more stringent. The results of our preliminary studies indicate this area of combined treatments must be researched in more detail.