Greenhouse disinfectants – ensuring clean tools for propagation

Dennis J. Lewandowski¹, Amanda Hayes¹, and Scott Adkins²

¹Department of Plant Pathology, The Ohio State University, Columbus, OH
²United States Department of Agriculture, Agricultural Research Service, Fort Pierce, FL

Introduction

The wholesale value of floricultural crops in 2008 was estimated at over $4.22 billion; petunias (Petunia × hybrida) were ranked third among floricultural crops (USDA, 2009). The movement of vegetatively propagated plant materials and the continuing introduction of new cultivars and plant species are important routes for the spread of TMV and other viruses. To minimize losses due to viral propagation, stock plants are routinely indexed for viruses and major propagators have strict standards in place to minimize the introduction and spread of pathogens.

The most commonly detected virus in petunias in the U.S. is Tobacco mosaic virus (TMV) (Nameth, 2002). TMV is transmitted mechanically through contact between infected and uninfected plants, by handling uninfected plants with contaminated hands, or through contaminated tools during propagation.

Disinfecting tools is a critical process in preventing spread during propagation. Only a limited number of products are labeled for use as disinfectants within commercial greenhouse facilities. This is a result of the lack of recent studies directly comparing materials for disinfecting hard surfaces or tools (Celar et al., 2007; Hayes and Lewandowski, 2009; Kamenova and Adkins, 2004; Lewandowski et al., in press).

Materials and Methods

Petunia sources

Rooted petunia cuttings were received from cooperating growers and were maintained in liner trays or transplanted into 3” or 4” pots and fertilized and watered as needed. Plants were assayed for infection by TMV (Table 5). Disinfectants

The following products were tested as disinfectants: (i) household bleach (The Clorox Co.), (ii) Brunett (Bunnell Chemical Mfg. Co.), (iii) Lysol Brand III Disinfectant Spray (Reckitt Benckiser), (iv) nonfat dry milk (NFDM, Nestlé USA), (v) swimming pool chlorine, (vi) MENNO Clean (MENNO-Chemie, Germany), (vii) Tri-Sodium Phosphate (T.S.P.)’ (DAP, Inc., Baltimore, MD), (viii) TSP Substitute (Custom Building Products, Seal Beach, CA), and (ix) TSP (Tri-Sodium Phosphate). The following products were tested as disinfectants: (i) household bleach (The Clorox Co.), (ii) Brunett (Bunnell Chemical Mfg. Co.), (iii) Lysol Brand III Disinfectant Spray (Reckitt Benckiser), (iv) nonfat dry milk (NFDM, Nestlé USA), (v) swimming pool chlorine, (vi) MENNO Clean (MENNO-Chemie, Germany), (vii) Tri-Sodium Phosphate (T.S.P.)’ (DAP, Inc., Baltimore, MD), (viii) TSP Substitute (Custom Building Products, Seal Beach, CA), and (ix) TSP (Tri-Sodium Phosphate).

Disinfectant Screening

Preliminary screens utilized 14-21 plants cut with razor blades contaminated by making cuts on a TMV-infected tobacco plant. Plants were assayed for infection by TMV (Table 3). Disinfectant screening was conducted with or without modifications. Modifications included changes in rate, time and/or the addition of a surfactant.

Materials and Methods

Petunia sources

Rooted petunia cuttings were received from cooperating growers and were maintained in liner trays or transplanted into 3” or 4” pots and fertilized and watered as needed. Plants were assayed for infection by TMV (Table 5). Disinfectants

The following products were tested as disinfectants: (i) household bleach (The Clorox Co.), (ii) Brunett (Bunnell Chemical Mfg. Co.), (iii) Lysol Brand III Disinfectant Spray (Reckitt Benckiser), (iv) nonfat dry milk (NFDM, Nestlé USA), (v) swimming pool chlorine, (vi) MENNO Clean (MENNO-Chemie, Germany), (vii) Tri-Sodium Phosphate (T.S.P.)’ (DAP, Inc., Baltimore, MD), (viii) TSP Substitute (Custom Building Products, Seal Beach, CA), and (ix) TSP (Tri-Sodium Phosphate). The following products were tested as disinfectants: (i) household bleach (The Clorox Co.), (ii) Brunett (Bunnell Chemical Mfg. Co.), (iii) Lysol Brand III Disinfectant Spray (Reckitt Benckiser), (iv) nonfat dry milk (NFDM, Nestlé USA), (v) swimming pool chlorine, (vi) MENNO Clean (MENNO-Chemie, Germany), (vii) Tri-Sodium Phosphate (T.S.P.)’ (DAP, Inc., Baltimore, MD), (viii) TSP Substitute (Custom Building Products, Seal Beach, CA), and (ix) TSP (Tri-Sodium Phosphate).

Disinfectant Screening

Preliminary screens utilized 14-21 plants cut with razor blades contaminated by making cuts on a TMV-infected tobacco plant. Plants were assayed for infection by TMV (Table 3). Disinfectant screening was conducted with or without modifications. Modifications included changes in rate, time and/or the addition of a surfactant.

Materials and Methods

Petunia sources

Rooted petunia cuttings were received from cooperating growers and were maintained in liner trays or transplanted into 3” or 4” pots and fertilized and watered as needed. Plants were assayed for infection by TMV (Table 5). Disinfectants

The following products were tested as disinfectants: (i) household bleach (The Clorox Co.), (ii) Brunett (Bunnell Chemical Mfg. Co.), (iii) Lysol Brand III Disinfectant Spray (Reckitt Benckiser), (iv) nonfat dry milk (NFDM, Nestlé USA), (v) swimming pool chlorine, (vi) MENNO Clean (MENNO-Chemie, Germany), (vii) Tri-Sodium Phosphate (T.S.P.)’ (DAP, Inc., Baltimore, MD), (viii) TSP Substitute (Custom Building Products, Seal Beach, CA), and (ix) TSP (Tri-Sodium Phosphate). The following products were tested as disinfectants: (i) household bleach (The Clorox Co.), (ii) Brunett (Bunnell Chemical Mfg. Co.), (iii) Lysol Brand III Disinfectant Spray (Reckitt Benckiser), (iv) nonfat dry milk (NFDM, Nestlé USA), (v) swimming pool chlorine, (vi) MENNO Clean (MENNO-Chemie, Germany), (vii) Tri-Sodium Phosphate (T.S.P.)’ (DAP, Inc., Baltimore, MD), (viii) TSP Substitute (Custom Building Products, Seal Beach, CA), and (ix) TSP (Tri-Sodium Phosphate).

Disinfectant Screening

Preliminary screens utilized 14-21 plants cut with razor blades contaminated by making cuts on a TMV-infected tobacco plant. Plants were assayed for infection by TMV (Table 3). Disinfectant screening was conducted with or without modifications. Modifications included changes in rate, time and/or the addition of a surfactant.

Materials and Methods

Petunia sources

Rooted petunia cuttings were received from cooperating growers and were maintained in liner trays or transplanted into 3” or 4” pots and fertilized and watered as needed. Plants were assayed for infection by TMV (Table 5). Disinfectants

The following products were tested as disinfectants: (i) household bleach (The Clorox Co.), (ii) Brunett (Bunnell Chemical Mfg. Co.), (iii) Lysol Brand III Disinfectant Spray (Reckitt Benckiser), (iv) nonfat dry milk (NFDM, Nestlé USA), (v) swimming pool chlorine, (vi) MENNO Clean (MENNO-Chemie, Germany), (vii) Tri-Sodium Phosphate (T.S.P.)’ (DAP, Inc., Baltimore, MD), (viii) TSP Substitute (Custom Building Products, Seal Beach, CA), and (ix) TSP (Tri-Sodium Phosphate). The following products were tested as disinfectants: (i) household bleach (The Clorox Co.), (ii) Brunett (Bunnell Chemical Mfg. Co.), (iii) Lysol Brand III Disinfectant Spray (Reckitt Benckiser), (iv) nonfat dry milk (NFDM, Nestlé USA), (v) swimming pool chlorine, (vi) MENNO Clean (MENNO-Chemie, Germany), (vii) Tri-Sodium Phosphate (T.S.P.)’ (DAP, Inc., Baltimore, MD), (viii) TSP Substitute (Custom Building Products, Seal Beach, CA), and (ix) TSP (Tri-Sodium Phosphate).

Disinfectant Screening

Preliminary screens utilized 14-21 plants cut with razor blades contaminated by making cuts on a TMV-infected tobacco plant. Plants were assayed for infection by TMV (Table 3). Disinfectant screening was conducted with or without modifications. Modifications included changes in rate, time and/or the addition of a surfactant.

Materials and Methods

Petunia sources

Rooted petunia cuttings were received from cooperating growers and were maintained in liner trays or transplanted into 3” or 4” pots and fertilized and watered as needed. Plants were assayed for infection by TMV (Table 5). Disinfectants

The following products were tested as disinfectants: (i) household bleach (The Clorox Co.), (ii) Brunett (Bunnell Chemical Mfg. Co.), (iii) Lysol Brand III Disinfectant Spray (Reckitt Benckiser), (iv) nonfat dry milk (NFDM, Nestlé USA), (v) swimming pool chlorine, (vi) MENNO Clean (MENNO-Chemie, Germany), (vii) Tri-Sodium Phosphate (T.S.P.)’ (DAP, Inc., Baltimore, MD), (viii) TSP Substitute (Custom Building Products, Seal Beach, CA), and (ix) TSP (Tri-Sodium Phosphate). The following products were tested as disinfectants: (i) household bleach (The Clorox Co.), (ii) Brunett (Bunnell Chemical Mfg. Co.), (iii) Lysol Brand III Disinfectant Spray (Reckitt Benckiser), (iv) nonfat dry milk (NFDM, Nestlé USA), (v) swimming pool chlorine, (vi) MENNO Clean (MENNO-Chemie, Germany), (vii) Tri-Sodium Phosphate (T.S.P.)’ (DAP, Inc., Baltimore, MD), (viii) TSP Substitute (Custom Building Products, Seal Beach, CA), and (ix) TSP (Tri-Sodium Phosphate).