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Ornamentals

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Preventing Weed Introduction in Greenhouse Production Systems

Manjot Kaur Sidhu
manjot.sidhu@maine.edu

Debalina Saha
sahadeb2@msu.edu

Prevention is the first line of defense against weeds and is often overlooked in greenhouse production. Implementing preventive practices can improve long-term weed management.

Unlike open-field agricultural systems, greenhouses offer ideal temperature, moisture, and light conditions (Fig 1.) that allow weed species to reproduce rapidly, harbor insect vectors, and compete for resources with high-value horticultural crops. Therefore, weed management in greenhouse production systems represents a critical operational challenge. A single flowering bittercress plant can explosively discharge over 5,000 seeds up to several feet, quickly infesting an entire bay. Once established, weeds harbor major greenhouse pests including thrips, whiteflies and spider mites, while acting as reservoirs for plant viruses like Impatiens Necrotic Spot Virus (INSV) and Tomato Spotted Wilt Virus (TSWV) (1). Implementing an effective weed exclusion program is the primary line of defense for controlled environment operations.

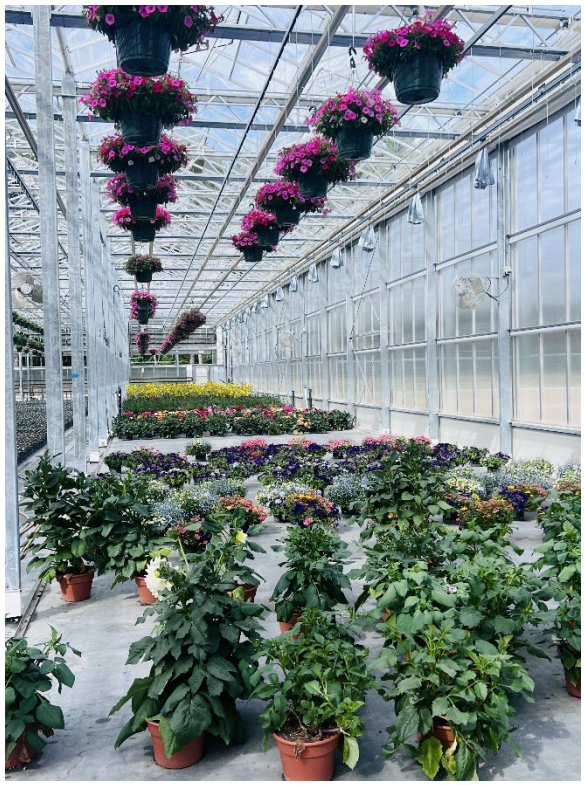

Figure 1. Greenhouse offers ideal temperature, moisture, and light conditions for ornamentals as well as weed growth. Photo credits: Manjot Kaur Sidhu, University of Maine.

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1. Growing Media & Substrate Contamination Management

Growing media serves as a major point of entry for weed seed introduction if raw ingredients or pre-mixed formulations are improperly handled, stored, or processed. Bulk soil amendments such as field soil, aged bark, compost, and coarse sand frequently contain viable weed seeds, stolons, and rhizomes. Even clean, commercial peat moss and perlite can become contaminated during storage if exposed to outdoor weed seed rain. To mitigate this risk, all bulk media components must be stored on covered, poured-concrete

pads equipped with retaining walls. Outdoor piles should be tightly covered with heavy-duty, UV-stabilized tarping or contained within covered bays to block windblown seed rain from opportunistic species like dandelion and horseweed. Additionally, facilities should maintain a minimum 30-foot weed-free perimeter around all substrate storage zones. When using native topsoil, unsterilized compost, or recycled potting media, pasteurization is mandatory to eliminate dormant weed seed banks and soil pathogens. Heat moist substrate using aerated steam to maintain a core media temperature of 180°F (82°C) for at least 30 minutes. It is critical to avoid exceeding 212°F (100°C), as extreme heat destroys beneficial soil microbes and induces manganese toxicity or phytotoxic ammonium build-up in organic mixes (2).

2. Container & Equipment Sanitation Protocols

Reusing plastic pots, seed trays, carry flats, and plug sheets without adequate sanitation transfers microscopic weed seeds, moss spores, and liverwort gemmae directly into fresh growing media. Chemical disinfectants cannot penetrate dried organic matter, soil residue, or root fragments left behind from previous production cycles. Therefore, sanitation must follow a mandatory two-step protocol (Fig 2). First, power-wash containers with high-pressure water and industrial detergents to strip all organic debris prior to chemical dipping. Second, submerge the clean pots in an approved chemical disinfectant to eliminate remaining pathogens and dormant seeds. Use a solution of 1 part household bleach to 9 parts water for at least 10 minutes, then rinse clean and allow them to air dry. Alternatively, for single pots, you can wipe or spray all surfaces with undiluted 70% isopropyl alcohol (3).

3. Incoming Plant Material Inspection & Quarantine

Purchased plant material including unrooted cuttings, tissue-cultured plugs, bare-root stock, and finished pre-potted starters, is one of the fastest avenues for bringing invasive greenhouse weeds onto a facility. Establish a strict inspection procedure at the receiving dock prior to integrating incoming stock into main production bays. Inspect the container surface and upper substrate layer of incoming shipments for small cotyledons or seedlings of weed species such as creeping woodsorrel, bittercress, and common chickweed. Also, examine moist plug surfaces closely for early establishment of liverwort thalli or moss protonema, which form dense biological crusts that

Figure 2. A well-maintained greenhouse production with good ventilation. Photo credits: Manjot Kaur Sidhu, University of Maine.

Figure 3. Proper spacing of plants and maintaining clean ground and benches are important for reducing weed pressure. Photo credits: Manjot Kaur Sidhu, University of Maine.

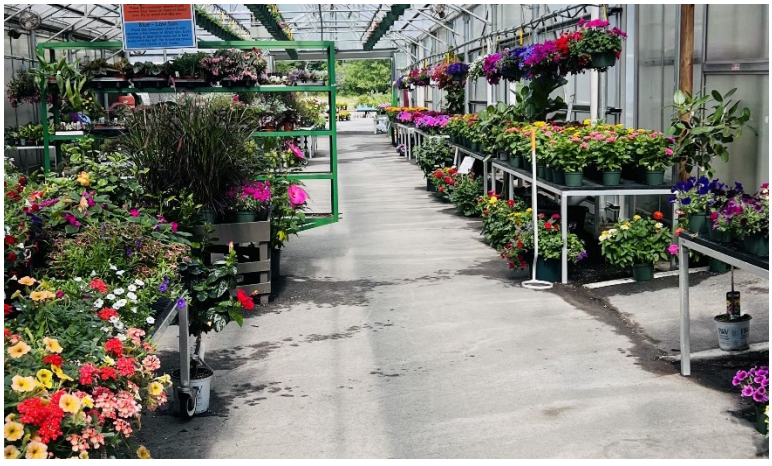

Figure 4. Concrete greenhouse walkways can reduce incoming weed propagules. Photo credits: Manjot Kaur Sidhu, University of Maine.

inhibit water penetration. Hold incoming plant shipments in a designated, physically isolated quarantine house or holding zone for 7-14 days before distribution across production ranges. Hand-weed minor infestations immediately before seeds mature.

4. Water Supply & Irrigation System Management

Irrigation water derived from surface ponds, retention basins, or recycled runoff can also introduce weed seeds and biological propagules into the production systems. Recycled runoff and surface pond intake lines collect floating weed seeds, liverwort spores, and algae. To prevent distribution, install multi-stage disc or mesh filtration units down to 100-200 mesh (75-150 microns) to catch floating seeds prior to water entering greenhouse drip lines or overhead booms. High-volume deep-bed sand filters can also be utilized to effectively trap microscopic weed spores, fine organic debris, and liverwort gemmae from surface water supplies. Managing the perimeter of irrigation sources is equally vital to prevent weed seed rain from surrounding fields into irrigation holding ponds. Maintain a 20-to-30-foot steep vegetative buffer of desirable perennial grass or install a 10-foot-wide clean gravel collar around retention pond banks.

5. Facility Perimeter & Outdoor Buffer Zone Control

The outdoor area surrounding a greenhouse complex is a major source of windborne weed seeds entering through side vents, roof openings, and roll-up curtains. Maintaining a clean, managed barrier prevents these seeds from blowing directly into production zones. Establish and maintain a 15-to-30-foot weed-free barrier strip with a thick layer of coarse gravel or crushed stone laid directly over woven geotextile fabric, avoiding any bare ground adjacent to sidewalls. If a grass buffer is maintained instead, keep it tightly mowed before any broadleaf or grassy weeds can flower and set seed. Always ensure mower decks are set to discharge away from air intake louvers to prevent sending seed debris toward ventilation systems.

6. Floor, Bench & Structural Sanitation

Greenhouse floors, bench tops, and walkway joints provide ideal microclimates for weed survival (Fig 3, 4). To secure ground surfaces, lay high-density, UV-stabilized ground cloth over a compacted, smooth subgrade. Care must be taken to eliminate low spots where water pudders, as silt accumulation on top of fabric creates a viable seedbed for windblown seeds. Poured concrete floors with central drainage slopes provide an effective weed exclusion surface, allowing rapid sweeping, high-pressure washing, and chemical disinfection. Furthermore, seal expansion joints, wall footings, and floor cracks to eliminate moist crevices where species like oxalis can root.

7. Environmental & Physical Exclusion Measures

Physical barriers prevent airborne seeds, wind-assisted seed structures, and small insect vectors from invading through ventilation openings. Covering side-vent louvers, ridge vents, and fan intakes with fine mesh screening serves a dual role by excluding windborne seeds while simultaneously blocking insect pests.

8. Cultural Protocols & Staff Sanitation Standards

Human activity within the greenhouse is another route for moving weed seeds between outdoor field areas, production bays, and clean propagation houses. Establishing strict hygiene habits for employees prevents accidental seed transport. Field staff working outdoors in field plots or container yards must change footwear and outer garments before entering sterile greenhouse propagation areas, as seeds easily attach to hook-and-loop fasteners, shoelaces, and fleece fabrics. Inside the facility, keep aisles, benches, and under-bench zones free of growing media spills. Finally, practice a ‘scout and pull’ strategy in the greenhouse to pull and bag weeds immediately upon discovery prior to flowering or seed pod development. Pulled weeds must never be left on floors or under benches, as roots and seed pods can continue to mature even after detachment.

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CONTRIBUTORS

Dr. Nora Catlin
Floriculture Specialist
Cornell University
nora.catlin@cornell.edu

Dr. Chris Currey
Assistant Professor of Floriculture
Iowa State University
ccurrey@iastate.edu

Dan Gilrein
Entomology Specialist
Cornell Cooperative Extension
Suffolk County
dog1@cornell.edu

Dr. Chieri Kubota
Controlled Environments Agriculture
The Ohio State University
kubota.10@osu.edu

Heidi Lindberg
Floriculture Extension Educator
Michigan State University
wolleage@anr.msu.edu

Dr. Roberto Lopez
Floriculture Extension & Research
Michigan State University
rglopez@msu.edu

Dr. Neil Mattson
Greenhouse Research & Extension
Cornell University
neil.mattson@cornell.edu

Dr. W. Garrett Owen
Sustainable Greenhouse & Nursery
Systems Extension & Research
The Ohio State University
owen.367@osu.edu

Dr. Alicia Rihn
Agricultural & Resource Economics
University of Tennessee-Knoxville
arihn@utk.edu

Dr. Debalina Saha
Horticulture Weed Science
Michigan State University
sahadeb2@msu.edu

Dr. Beth Scheckelhoff
Extension Educator – Greenhouse Systems
The Ohio State University
scheckelhoff.11@osu.edu

Dr. Ariana Torres-Bravo
Horticulture/ Ag. Economics
Purdue University
torres2@purdue.edu

Dr. Brian Whipker
Floriculture Extension & Research
NC State University
bwhipker@ncsu.edu

Dr. Jean Williams-Woodward
Extension Plant Pathologist
University of Wyoming
jwilwood@uwyo.edu

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