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Research and Extension

Sanitation Insect Pest Management in Greenhouse Production Systems

Sanitation is a component of a plant-protection program that involves maintaining a clean work environment by removing weeds and disposing of plant and growing-medium debris. When performed with insecticide applications or the release of biological control agents (parasitoids and predators), sanitation helps alleviate insect pest problems and prevent damage to ornamental and vegetable crops grown in greenhouse production systems.

This publication provides information on three sanitation practices that will help greenhouse producers minimize problems with insect pests: weed management, disposal of plant and growing medium debris, and algae management.

Weed Management

Weeds may harbor insect pests including aphids, leafhoppers, mealybugs, thrips, and whiteflies. Weed seeds can enter greenhouses via wind currents through vents, doors, and sidewalls. In addition, weed seeds can be transported on plant material, tools, equipment, and personnel. Weeds growing under benches (Figure 1) or in containers can



Figure 1. Weeds underneath bench in greenhouse. (Photo: Raymond Cloyd)

serve as hosts for insect pest populations that can damage crops. The weed species, growth stage (vegetative vs. flowering), and density of weeds in the greenhouse influence the types and numbers of insects present.

Weeds can harbor diseases such as viruses, which are transmitted by aphids, leafhoppers, thrips, and/or whiteflies. These pests feed on weeds before moving to the main horticultural crops. For example, weeds located under benches or in planting beds or containers may harbor the tospoviruses, *Impatiens necrotic spot virus* and *Tomato spotted wilt virus*, that are transmitted by western flower thrips, *Frankliniella occidentalis*, adults. Weeds that serve as a source of *Impatiens necrotic spot virus* are presented in Table 1.

Weeds should be removed from all areas within the greenhouse. In addition, weeds should be removed from around the greenhouse perimeter (at least five feet) to alleviate problems with insects that vector viruses. Removing weeds that serve as hosts for both insect pests and viruses reduces the potential for insect pests to migrate into a greenhouse, attack the main crops, and transmit plant viruses.

Table 1. Common name and scientific name of weeds that serve as a source of *Impatiens necrotic spot virus*.

Common name	Scientific name
Annual sow thistle	<i>Sonchus oleraceus</i>
Bittercress	<i>Barbarea vulgaris</i>
Burning nettle	<i>Urtica urens</i>
Chickweed	<i>Stellaria media</i>
Field bindweed	<i>Convolvulus arvensis</i>
Gill-over-the-ground	<i>Glechoma hederacea</i>
Jewelweed	<i>Impatiens capensis</i>
Common lambsquarters	<i>Chenopodium album</i>
Little mallow	<i>Malva parviflora</i>
Nettleleaf goosefoot	<i>Chenopodium murale</i>
Common purslane	<i>Portulaca oleracea</i>
Shepherd's purse	<i>Capsella bursa-pastoris</i>
Shortpod mustard	<i>Hirschfeldia incana</i>
Wood sorrel	<i>Oxalis spp.</i>

Practices that minimize weed problems in and around greenhouses include installing geotextile fabric barriers, hand weeding, mowing, and applying herbicides. Geotextile fabric barriers are woven materials that prevent weeds from growing in greenhouses when properly installed underneath benches (Figure 2). Although the installation cost may be substantial, concrete flooring (Figure 3) considerably reduces weed growth inside the greenhouse during the growing season, which results in fewer weed hosts for insect pests.

Hand weeding is quick and easy but is labor intensive in large greenhouses with soil floors. Weeds should be removed from the greenhouse before they flower and set seeds. Mowing weeds around the greenhouse perimeter before they flower reduces the potential for seeds to enter the greenhouse and germinate.

Using herbicides to manage weed hosts of insect pests can reduce populations. However, few pre-emergent herbicides (applied before weed seeds germinate) are registered for use inside greenhouses, and those that are labeled should only be applied when greenhouses are empty because of the potential to cause plant damage. In addition, post-emergent herbicides (applied after weeds germinate) should only be applied inside the greenhouse when crops are not present. Nonetheless, post-emergent herbicides can

be used outdoors to kill weeds around the perimeter of the greenhouse. Gravel placed around the greenhouse perimeter (Figure 4) discourages the establishment of weeds.

Disposal of Plant and Growing Medium Debris

Plant debris (Figure 5) may harbor insect pests and should be removed from the greenhouse to prevent insect pests from infesting the main crop(s). Removal of growing medium debris (Figure 6) may alleviate problems with fungus gnats, *Bradysia* spp., western flower thrips, and other insects that pupate in growing medium debris.

Plant and growing medium debris should be placed into refuse containers with tight-sealing lids (Figure 7) or immediately removed from greenhouses. Plant and growing medium debris that may harbor insect pests such as fungus gnats, western flower thrips, and whiteflies should be placed into sealed refuse containers to prevent winged adults from migrating out of containers and onto the main crop(s).

Algae Management

Moist conditions or water accumulation often leads to the growth of algae on containers, growing media, benches,



Figure 2. Geotextile fabric barrier installed underneath benches in greenhouse. (Photo: Raymond Cloyd)



Figure 3. Concrete flooring can mitigate problems with weeds during the growing season. (Photo: Raymond Cloyd)



Figure 4. Gravel placed on the outside of a greenhouse. (Photo: Raymond Cloyd)



Figure 5. Plant debris needs to be removed from the greenhouse immediately. (Photo: Raymond Cloyd)

floors (Figure 8), walkways, cellulose pads (Figure 9), and underneath benches (Figure 10) during the production of greenhouse-grown horticultural crops. The presence of algae may lead to problems with shore fly, *Scatella* spp., and fungus gnat populations because algae provides a favorable habitat for both insect pests.

Algae can be managed by not overwatering and/or over-fertilizing plants and using well-drained growing media. Disinfectants containing hydrogen peroxide or quaternary ammonium chloride salts (Figure 11), or copper-based algaecides can be applied to greenhouse flooring to mitigate algae growth. Floors covered with geotextile fabric barriers or concrete flooring may have less algae growth because they are easier to clean, resulting in fewer problems with shore flies and fungus gnats than in greenhouses with soil floors.



Figure 8. Algae can accumulate on greenhouse flooring that is constantly moist. (Photo: Raymond Cloyd)



Figure 9. Algae accumulation on cellulose pads. (Photo: Raymond Cloyd)



Figure 10. Algae can accumulate in areas with inadequate drainage such as underneath greenhouse benches. (Photo: Raymond Cloyd)



Figure 6. All plant and growing medium debris needs to be removed from the greenhouse. (Photo: Raymond Cloyd)



Figure 7. All plant and growing medium debris must be placed into refuse containers with tight-sealing lids. (Photo: Raymond Cloyd)

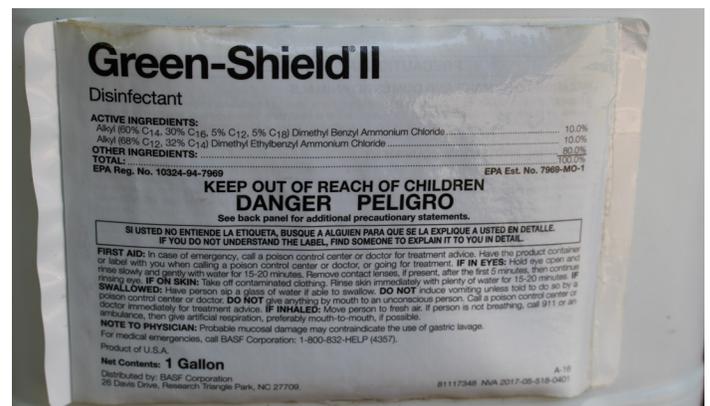


Figure 11. Commercially available disinfectant containing ammonium chloride as the active ingredient. (Photo: Raymond Cloyd)

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