

# Crop Profile for Impatiens in Ohio

Prepared: November, 2000

## General Production Information

- Area of production in Ohio: 1,739,000 sq. ft- 78% for wholesale market
- Percent of US Acreage/Rank: 11%/2<sup>nd</sup>
- Number of Growers: 199
- Wholesale Price Per Flat: \$6.15
- Value of Wholesale Production in Ohio: \$10,541,000

## Cultural Practices

Impatiens are propagated by seed. The seeds are sown with an automatic seeder or by hand in a light, moist artificial growth medium with a pH between 5.5 and 6.0. A high level of moisture is maintained in the seeding tray by covering each with a layer of clear plastic. Soil temperature is kept between 70-75° F and supplemental lighting is provided to ensure good germination. Germination occurs in 7-10 days. More growers are using growth chambers during germination and early growth because they offer better environmental control. The seedlings are transplanted when they have formed the first set of true leaves. If seedlings were grown in plugs they are transplanted later, 6-8 weeks after sowing. Seedlings are transplanted into a light, disease-free medium that has been thoroughly watered. As the plants grow they receive moderate amounts of water and fertilizer to avoid lush growth and reduced flowering. Greenhouse temperatures are kept between 60-65° F at night and 65-70° F during the day. Later in the season shading is necessary for optimal growth. In cell packs impatiens are ready for sale on average in 10 weeks. As with all ornamental plants, managing pests and diseases is a critical component of impatiens production since any damage usually renders a plant unsaleable.

## Insect Pests

## **Thrips**

Thrips are often the most serious insect pest in greenhouses. They are very difficult to control once a population becomes well established. Thrips feed on leaves and flowers of a wide variety of host plants. The feeding injury can render a plant unmarketable and the act of feeding by the thrips can transmit viruses to a susceptible host plant. The thrips lifecycle begins as an egg is deposited in plant tissue. After the larvae emerge they begin feeding on the plant. Thrips pass through 2 larval and transformation stages before becoming an adult. Feeding injury is done by the larvae and adults but only the adults can transmit viruses. The lifecycle of a thrips is temperature dependant with development occurring between 50 – 90° F. The egg to adult cycle lasts between 10-38 days at these temperatures. At temperatures below 50° F thrips can survive but no development occurs.

## **Aphids**

There are many species of aphids that can attack greenhouse plants but the two most common species are the green peach aphid (*Myzus persicae*) and the melon/cotton aphid (*Aphis gossypii*). Both of these species are green in color but it can vary from light to dark green for the melon aphid and from light green to nearly pink for the green peach aphid. Aphids have small soft bodies with piercing-sucking mouth parts which they use to insert into the phloem tissue of plants and remove fluid. Aphids cause problems from injury by feeding, the transmission of viruses and by spreading sticky honeydew over the surface of leaves and flowers. In the greenhouse most aphids are female and they produce live young called nymphs. An average female produces between 50 to 200 nymphs during her lifetime. The nymphs, which are all female, begin reproducing in 7-10 days. Adult aphids appear in 2 forms, winged and wingless, depending on population density and /or host plant conditions. Winged aphids are troublesome because they are able to disperse throughout the greenhouse and are also able to fly into the greenhouse from outdoors.

## **Fungus Gnats**

The fungus gnat is a common pest of greenhouse plants. The adults are tiny, dark, slender, fragile looking flies. They have long antennae and legs and a small head in relation to their bodies. The lifecycle of the fungus gnat is completed in 25-30 days. The adults live about one week and lay up to 200 eggs. The eggs hatch in about 4 days into larvae. The fungus gnat larvae are white and translucent with shiny black heads. The larvae live in the soil for two weeks and feed on the roots of plants. The pupal stage lasts 3-4 days before the adults emerge. Extensive damage can result from larval feeding, resulting in plants that show signs of wilting. The adult fungus gnat is primarily a nuisance pest.

## **Spider Mites**

Spider mites are a persistent pest problem in the greenhouse. Many species of spider mites are found in the greenhouse, but the most common is the two-spotted spider mite (*Tetranychus urticae*). Spider mites

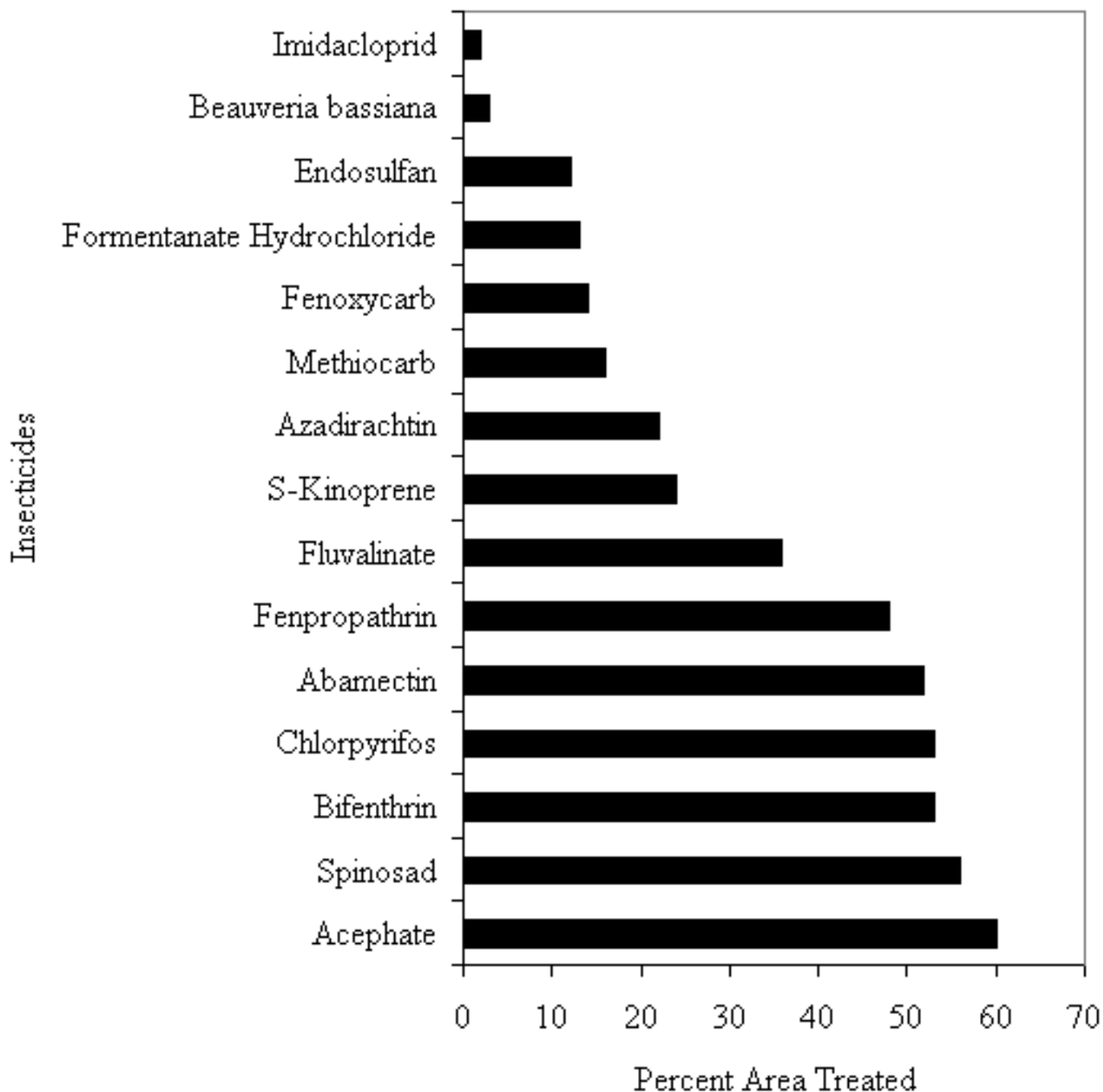
are very small arthropods that develop mostly on the undersides of leaves. Their lifecycle lasts between 7-14 days but varies considerably depending on temperature. An adult female spider mite can produce 100-200 eggs in her lifetime. The eggs hatch into tiny larvae in a few days. The larvae pass quickly through several nymph stages before becoming adults. Spider mites cause injury to plants while feeding. Using their piercing-sucking mouth parts, they extract plant fluids. Feeding injury often give the upper leaf surface a characteristic mottled or speckled appearance. Large numbers of spider mites produce a webbing that can completely cover leaves and flowers.

## **Whiteflies**

Whiteflies are a very common pest in greenhouse production. The most common species are the greenhouse whitefly (*Trialeurodes vaporariorum*) and the silverleaf white fly (*Bemisia argentifolii*). The adult silverleaf whiteflies are smaller, more yellow and active than the greenhouse whiteflies. In the pupal state the silverleaf whiteflies are flat without spines or fringes whereas the greenhouse whitefly pupae have vertical sides with spines. The adult whitefly lifecycle lasts from 21-36 days. Each female produces 60 to 100 eggs that hatch in 7-10 days. The newly emerged crawlers move for a short distance before settling down to feed. After molting 3 times the pupae emerge and in 6 days will grow into adults. During development whiteflies are usually found on the underside of leaves. The adult and immature stages of whiteflies use their piercing-sucking mouth parts to extract fluid from plant tissue. A few adult whiteflies on plants are a nuisance. However, feeding by a large number of adults and especially immatures can weaken or kill a plant. Whiteflies also produce a sticky honeydew that can be a growth medium for lack sooty fungus.

## **CHEMICAL INSECT CONTROLS**

(all chemicals applied at an average rate of 200 gal/A unless otherwise noted)



**Acephate (Orthene)**

**Percent of total area treated:** 60%

**Target pests:** Aphids, Thrips, Whiteflies

**Average rate and frequency of application of most common formulations:**(2)

Orthene TT&O – 11 oz/100 gal, twice

**Application method:** High Volume Spray

**REI:** 24 hours

**Efficacy rating:** Good

**Spinosad (Conserve)**

**Percent of total area treated:** 56%

**Target pests:** Thrips

Average rate and frequency of application of most common formulations: (2)

Conserve SC – 6 oz/100 gal, twice

**Application method:** High Volume Spray

**REI:** 4 hours

**Efficacy rating:** Very Good

### **Bifenthrin (Talstar)**

**Percent of total area treated:** 53%

**Target pests:** Thrips, Aphids, and Whiteflies

Average rate and frequency of application of most common formulations: (2)

Talstar F – 20 oz/100 gal, twice

**Application method:** High Volume Spray

**REI:** 12 hours

**Efficacy rating:** Good

### **Chlorpyrifos (DuraGuard)**

**Percent of total area treated:** 53%

**Target pests:** Thrips, Aphids, Whiteflies and Fungus Gnats

Average rate and frequency of application of most common formulations: (2)

DuraGuard ME – 39 oz/100 gal, twice

**Application method:** High Volume Spray

**REI:** 12 hours

**Efficacy rating:** Good

### **Abamectin (Avid)**

**Percent of total area treated:** 52%

**Target pests:** Thrips, Aphids, and Mites

Average rate and frequency of application of most common formulations: (2)

Avid 0.15 EC – 8 oz/100 gal, 3 times

**Application method:** High Volume Spray or Fogger

**REI:** 12 hours

**Efficacy rating:** Good to Very Good

### **Fenpropathrin (Tame)**

**Percent of total area treated:** 48%

**Target pests:** Thrips, Aphids and Whiteflies

Average rate and frequency of application of most common formulations: (2)

Tame 2.4 EC – 9 oz/100 gal, 2-3 times

**Application method:** High Volume Spray

**REI:** 24 hrs.

**Efficacy rating:** Good

Used with Orthene TT&O for best results.

**Fluvalinate (Mavrik Aquaflow)**

**Percent of total area treated:** 36%

**Target pests:** Aphids, Thrips, and Whiteflies

Average rate and frequency of application of most common formulations:

Mavrik Aquaflow – 9 oz/100 gal, twice

**Application method:** High Volume and Low Volume Spray

**REI:** 12 hours

**Efficacy rating:** Good to Very Good

**S-Kinoprene (Enstar)**

**Percent of total area treated:** 24%

**Target pests:** Thrips, Whiteflies, Aphids

Average rate and frequency of application of most common formulations: (2)

Enstar II – 7 oz/100 gal, twice

**Application method:** High Volume spray

**REI:** 4 hours

**Efficacy rating:** Good to Very Good

**Azadirachtin (Azatin)**

**Percent of total area treated:** 22%

**Target pests:** Thrips, Whiteflies and Fungus Gnats

Average rate and frequency of application of most common formulations: (2)

Azatin XL – 12 oz/100 gal, twice

**Application method:** High Volume Spray or Fogger

**REI:** 12 hours

**Efficacy rating:** Good to Very Good

**Methiocarb (Mesurol)**

**Percent of total area treated:** 16%

**Target pests:** Thrips

Average rate and frequency of application of most common formulations: (2)

Mesurol 75W – 2lb/A in 50 gals, twice

**Application method:** High Volume Spray

**REI:** 24 hours

**Efficacy rating:** Very Good

**Fenoxycarb (Precision)**

**Percent of total area treated:** 14%

**Target pests:** Thrips

Average rate and frequency of application of most common formulations: (2)

Precision – 4 oz/100 gal, twice

**Application method:** High Volume Spray

**REI:** 12 hours

**Efficacy rating:** Good to Very Good

### **Formentanate Hydrochloride (Carzol)**

**Percent of total area treated:** 13%

**Target pests:** Thrips

Average rate and frequency of application of most common formulations: (2)

Carzol – 16 oz/A, once

**Application method:**

**REI:**

**Efficacy rating:** Good

### **Endosulfan (Thiodan)**

**Percent of total area treated:** 12%

**Target pests:** Thrips, Aphids and Whiteflies

Average rate and frequency of application of most common formulations: (2)

Thiodan 50 WP – 16 oz/100 gal, twice

Thiodan 3EC – 48 oz/A, twice

**Application method:** High Volume Spray

**REI:** 24 hours

**Efficacy rating:** Good to Very Good

### **Beauveria bassiana (Naturalis-O)**

**Percent of total area treated:** 3%

**Target pests:** Aphids, Thrips and Whiteflies

Average rate and frequency of application of most common formulations: (2)

Naturalis-O – 31 oz/100 gal, twice

**Application method:** High Volume Spray

**REI:** 4 hours

**Efficacy rating:** Good

### **Imidacloprid (Marathon)**

**Percent of total area treated:** 2%

**Target pests:** Aphids and White Flies

Average rate and frequency of application of most common formulations: (2)

Marathon 1% - ½ tsp (2 grams)/10 inch pot, once

**Application method:** top dress for 1% and drench for 60 WSP

**REI:** 12 hours

**Efficacy rating:** Very Good

## **CULTURAL CONTROLS (2,3,5)**

Quarantine new plant material for at least one week. Use screens on ventilation system and doors to exclude pests. Practice proper sanitation and weed control in and around the greenhouse. Avoid excessive fertilization since some pests thrive on plant tissue high in nitrogen.

## **BIOLOGICAL CONTROLS (2,3,5)**

Some new and effective biological control products are available for the greenhouse grower. Most growers are taking a cautious approach to these new products and only applying them to small portions of their operations.

# **Diseases**

## **Botrytis Gray Mold**

The most common disease of greenhouse floral crops is gray mold. Gray mold is caused by the fungus *Botrytis cinerea*. It is a common fungus, with a very wide host range and can persist in the greenhouse year-round. The fungus produces a large amount of spores that move throughout the greenhouse via air currents. Under environmental conditions of relative humidity at or above 85%, little or no air circulation and free water on the leaf surface, the fungal spores land on plant surfaces, germinate and penetrate the host. The symptoms of gray mold vary depending on the host and the environmental conditions associated with the host. In most cases the disease is characterized by the production of leaf spots, flower blight, bud rot, stem canker, stem and crown rot, cutting rot, damping off and in extreme cases, plant death. The fungal growth is characterized by the presence of fluffy gray/brown mycelium that produces a cloud of spores if disturbed. Affected tissue is soft and brown, and sometimes has a water soaked appearance. This disease can be anything from a common nuisance to an economic disaster depending on the host and the conditions under which the crop is grown.

## **Alternaria**

*Alternaria* is a widespread fungus that attacks the leaves, stems and flowers of a wide variety of plants. The fungus survives on infected plant debris or on seeds. Spores are produced from these or other hosts and can spread by air currents to neighboring plants. Under warm and humid conditions the spores germinate on the leaves causing spots of various sizes and colors. Leaves may wither and die.

## **Anthracnose**



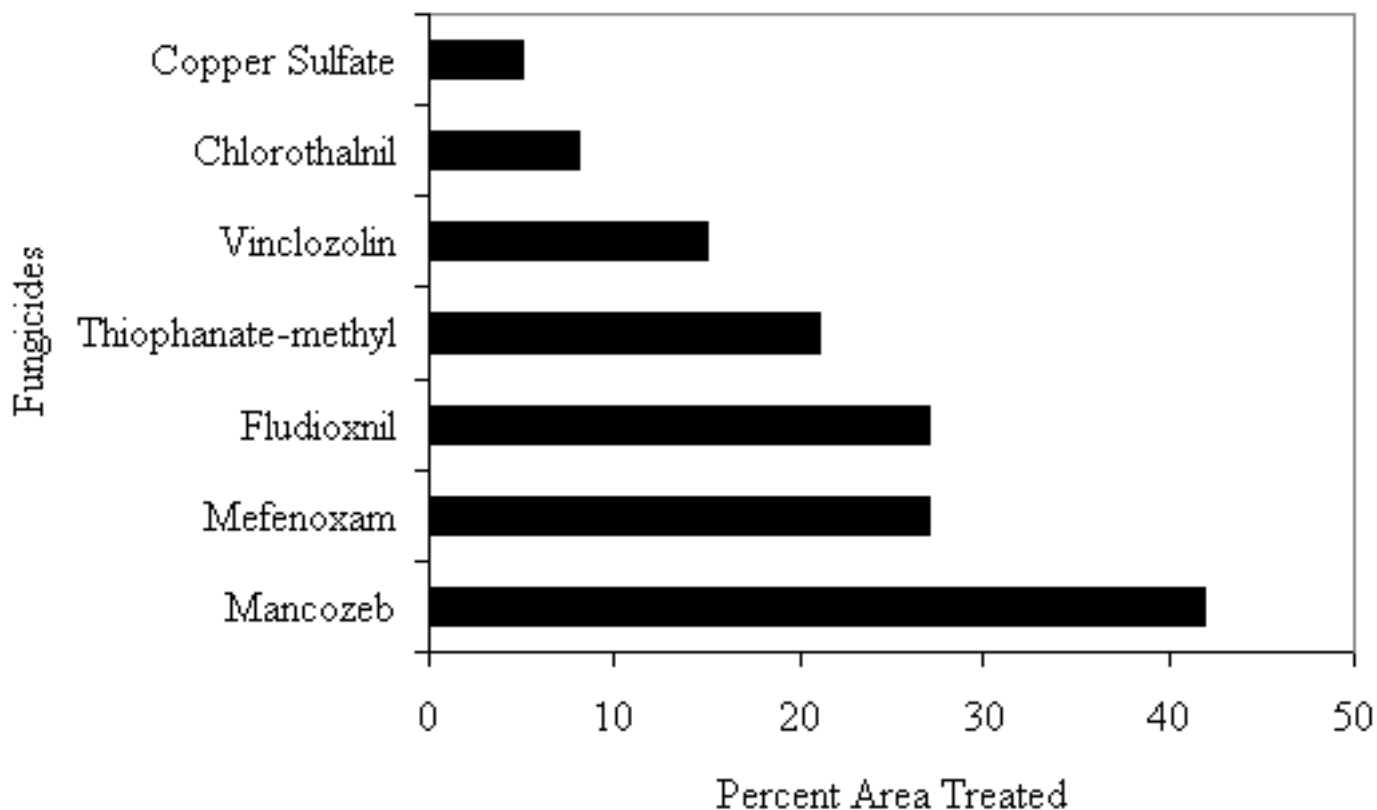
Anthraco nose appears as necrotic, sunken, gray to black lesions on the stem and leaves of the host plant. The lesions may start out as black spots. Ooze may come from the center of the lesion but eventually small black pepper spots will appear in the lesion. Severe infections can cause leaf fall and the stems to partially collapse and be dark in color. The disease is carried on infected seed or plant debris. It spread up the plant, usually by rain splashes. The disease spreads faster in cool to warm moist conditions. Spores are not spread great distances by wind.

## **Leaf Spots**

A number of leaf diseases that occasionally damage ornamental plants can be caused by fungi or bacteria. Most of these pathogenic organisms require a wet leaf surface for an extended time, usually 24 hours. The wet leaf surface allows the fungal spores to swell, germinate and penetrate the plant and the bacteria to swim to a natural opening in the leaf surface such as a stomate. Bacterial leaf spots are initially light green and look water soaked. Later these leaf spots turn brown or black and may have definite margins. Fungal leaf spots are characterized by brown or black spots randomly scattered across the leaf. The spots may have the appearance of concentric rings. The margins of the spot can be a different color than the center of the spot.

## **CHEMICAL DISEASE CONTROLS (4)**

(all chemicals applied at an average rate of 200 gal/A unless otherwise noted)



**Mancozeb (Protect T/O)**

**Percent area treated:** 42%

**Target pests:** Botrytis and Leaf Spots

Average rate and frequency of application of most common formulations:

Protect T/O 80 WP - 1.5 lbs/100 gal, once

**Application method:** High Volume Spray

**REI:** 24 hours

**Efficacy rating:** Good to Very Good

**Mefenoxam (Subdue MAXX)**

**Percent of total area treated:** 27%

**Target pests:** Damping off

Average rate and frequency of application of most common formulations:

Subdue MAXX – ¼ oz/100 gal, once

**Application method:** High Volume Spray

**REI:** None

**Efficacy rating:** Very Good

**Fludioxonil (Medallion)**

**Percent of total area treated:** 27%

**Target disease:** Botrytis and Alternaria

Average rate and frequency of application of most common formulations:

Medallion – 1 oz/100 gal, once

**Application method:** High Volume Spray

**REI:**

**Efficacy rating:** Good

### **Thiophanate-methyl (Cleary's 3336, Fungo)**

**Percent of total area treated:** 21%

**Target pests:** Botrytis

Average rate and frequency of application of most common formulations:

Cleary's 3336 4.5F - 18 oz/100 gal, twice

Fungo Flo 50WP – 20 oz/100 gal, twice

**Application method:** High Volume Spray

**REI:** 12 hours

**Efficacy rating:** Good

### **Vinclozolin (Ornalin)**

**Percent of total area treated:** 15%

**Target pests:** Botrytis

Average rate and frequency of application of most common formulations:

Ornalin – 18 oz/100 gal, once

**Application method:** High Volume Spray

**REI:** 12 hours

**Efficacy rating:** Very Good

### **Triflumizole (Terraguard)**

**Percent of total area treated:** 13%

**Target pests:** Leaf Spots

Average rate and frequency of application of most common formulations:

Terraguard 50WP – 12 oz/100 gal, once

**Application method:** High Volume Spray

**REI:** 12 hours

**Efficacy rating:** Very Good

### **Chlorothalnil (Daconil)**

**Percent of total area treated:** 8%

**Target pests:** Botrytis

Average rate and frequency of application of most common formulations:

Daconil Ultrex 82.5 WDG – 20 oz/100 gal, once

Daconil 2787 Flo 4F – 32 oz/100 gal, once

Exotherm Termil 20 Fum – 1 smoke can (3.5 oz)/1500 sq. ft, once

**Application method:** High Volume Spray and fogger

**REI:** 12 hours

**Efficacy rating:** Good

**Copper Sulfate (Phyton-27)**

**Percent of total area treated:** 5%

**Target pests:** Leaf Spots

Average rate and frequency of application of most common formulations:

Phyton-27 5.5EC – 16 oz/100 gal, one to two times

**Application method:** High Volume Spray

**REI:** 12 hours

**Efficacy rating:** Good

**CULTURAL CONTROLS (2,3,5)**

Buy resistant varieties whenever possible. Quarantine new plant materials for at least a week. Screen the greenhouse doors and vents. Plant disease free cuttings and seeds. Keep growing area clean. Remove all diseased plants as soon as they have been detected. Periodically disinfect the hose end, especially after touching the growing mix or the contaminated water on the floor or benches. Benches should also be disinfected at the end of each crop cycle. Eliminate all weeds and algae. Fertilize plants judiciously. Adjust the pH of the growing medium appropriately. Control relative humidity of the greenhouse, especially during the evening hours. This can require simultaneously ventilating and heating the greenhouse during critical hours. Providing adequate air circulation will also help. The use of well draining growth mediums will help reduce the incidence of root diseases.

## Weeds

Weeds are a persistent problem in greenhouse production. Weeds are unsightly and can harbor insect pests and diseases. Therefore, weed management in and around the greenhouse is important to assist with pest and disease control and well as to improve aesthetics.

**CHEMICAL CONTROLS (4)**

(all chemicals applied at a rate of 200 gal/A unless otherwise noted)

**Glyphosate (Roundup)**

**Percent of total area treated:** 46%, primarily used as a spot spray in the work area.

**Target pests:** Annual and Perennial Weeds

Average rate and frequency of application of most common formulations:

Roundup Pro – 1.4 oz/gal, as needed

**Application method:** High Volume Spray

**REI:** 4 hours

**Efficacy rating:** Good to Very Good

### **Glufosinate-ammonium (Finale)**

**Percent of total area treated:** 13%

**Target pests:** Annual and Perennial Weeds

Average rate and frequency of application of most common formulations:

Finale – 1.5 gal/100 gal, once

**Application method:** High Volume Spray

**REI:** 12 hours

**Efficacy rating:** Very Good

### **Oryzalin (Surflan)**

**Percent of total area treated:** 5% (used on the exterior of the greenhouse)

**Target pests:** Annual Grasses and Broadleaf Weeds

Average rate and frequency of application of most common formulations:

Finale – 2 oz/gal, once

**Application method:** High Volume Spray

**REI:** 12 hours

**Efficacy rating:** Very Good

### **CULTURAL CONTROLS (2,3,5)**

Use weed block fabric to cover the floor and remove any weeds that grow in along the edges of the fabric. Hand weeding and solarization can also be used to control weeds. Managing weeds outside the greenhouse is important to eliminate the major source of air borne weed seeds and to prevent perennial weeds from growing in under the foundation. Regular mowing can help prevent the most weed seed formation. However, maintaining a weed-free barrier around the greenhouse may be more effective. Adding lime to soil can help too.

## **Contacts**

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## References

1. Ohio Floriculture Report, [www.nass.usda.gov/oh](http://www.nass.usda.gov/oh)
2. Tips on Managing Floriculture Crop Problems, The Ohio Florists' Association, 1998.
3. Ohio Floriculture OnLine, [www.ag.ohio-state.edu/~flori/](http://www.ag.ohio-state.edu/~flori/)
4. 1999 Survey of Ohio Floriculture Growers, Ohio Pesticide Impact Assessment Program.
5. Commercial Bedding Plant Production, William H. Carlson (ed.), 1994, Michigan State University Department of Horticulture.

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