Weed Control inside Greenhouses and Enclosed Structures

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Weeds of containerized crops in enclosed structures are often more problematic in nursery than greenhouse crops, primarily because most greenhouse crops are grown with higher quality media that is relatively free of weed seed. However, weeds still cause problems in floriculture crops often due to poor cultural practices. Gravel and fabric mulch can reduce weed germination, but in some cases gravel will become filled with potting media and crop debris, negating their initial benefits. Weeds easily germinate along edges, and at tears and worn areas of weed block fabric. Scouting is critical to determine if weed seeds are germinating in pots. Weeds under benches or in walkways may not directly impact plant growth but they do harbor pests (aphids, whiteflies, thrips, and mites). The most cost-effective weed control is prevention and using both chemical and non-chemical methods for a truly integrated pest management (IPM) program.

Sanitation and Prevention

Sanitation and prevention are critical first steps in all IPM programs. The greenhouse environment does reduce the amount of weed seeds that enter but weed seeds can still be blown into greenhouses or carried by water. They are also sometimes introduced on plant material, tools, equipment, animals, and people. Use weed-free plant materials, new growing media, and clean equipment. Carefully inspect shipments of plants for small weeds or other pests before placing them inside the greenhouse. Keep walkways and aisles leading into the greenhouse entrance free of vegetation. Screening on vents may also decrease the amount of wind-borne seed that enters the greenhouse. Areas under benches must be free of media and plant debris. Concrete floors or weed barrier fabrics placed over gravel will help prevent weed germination and are far easier to maintain weed-free than soil or badly contaminated gravel. Wash containers for reuse with pressurized water and chemical disinfectants to remove any dirt, pathogens and weed seeds.

Hand Weeding

Some of the most common greenhouse weeds (at least in Florida) include spurge, bittercress, and oxalis. These weeds produce thousands of seeds that germinate quickly. Continual scouting and removal is critical to stop flowering and seed production. Leaving weeds on the greenhouse floor will allow some of them to re-root and seeds left on these weeds can still germinate and contaminate the greenhouse with a new crop of seedlings. *It is not uncommon for pulled weeds to continue to flower and produce new seeds under the benign greenhouse conditions.*

Cultural Control Practices

Algae, moss, and liverworts thrive in wet environments that are common in greenhouses throughout the US. Unfortunately, overwatering greenhouse crops is also common and leads to many problems including diseases on the crops and ideal conditions for the growth of these green pests. They can quickly cover surfaces of potting media, concrete, gravel, and ground cloth floors as well as bench surfaces. They become a serious problem for safety of workers when they cover the floor surface making the floors slippery.

Avoid overwatering and over-fertilizing crops and maintain irrigation equipment to ensure efficient and uniform applications. *Equipment that creates variable areas of wet and dry zones inevitably leads to overwatering to make sure the plants in the dry zones do not die from lack of water.* Limit the amount of standing water by increasing drainage, using coarse gravel, and recover gravel floors that have become choked with potting media and other crop debris. Concrete floors must be graded when originally laid to allow water to leave the greenhouse. Sometimes, increasing greenhouse ventilation and spacing plants properly reduces humidity and may reduce weed seed germination.

Many different disinfectants are available to control algae, moss and liverworts, but all of these products generally require frequent re-application for continual control.

Chemical Control Methods

There are very few herbicides labeled for use inside greenhouses due to the potential for crop injury from volatilization. It is best to use non-chemical methods when possible, but herbicides can be used to control escaped weeds.

Most herbicide labeled for use inside greenhouses are postemergent herbicides, which control weeds after they germinate. It is important to note that thorough coverage is needed to get adequate control with contact herbicides and all post emergent herbicides work best when weeds are small and actively growing.

A new herbicide, indaziflam, (Marengo® OHP, Inc) is currently the only preemergent (with residual) herbicide labeled for use inside greenhouses and other enclosed structures. Marengo® can be applied to greenhouse floors when no crops are present. Greenhouses should be ventilated for 24 hours after application before placing plants back inside. Marengo® can be tank-mixed with many different postemergent herbicides to control existing weeds. Any time that a greenhouse is empty, such as periods before, in between, or after crop cycles are excellent times to apply herbicides to control existing weeds while avoiding potential crop damage.

A partial list of herbicides labeled for use inside greenhouses is available on the next page. Be sure to check labels for target weed pests. When using herbicides (or any other pesticide), always follow the manufacturer's label recommendations in order to achieve the best weed control and avoid crop injury.

Figure 1. Weeds growing under benches or in walkways or aisles can produce seed that germinates inside containers or harbor other pests such as insects or diseases.

Figure 2. Close up of white flies on mulberry weed (*Fatoua villosa*).

Figure 3. Inspect new liners and plant shipments for small weeds. Above, small oxalis (*Oxalis stricta*)

Table 1. Herbicides labeled for use inside greenhouses and enclosed structures.

Trade name	Active ingredient(s)	Mode of action	Weeds controlled	Use with crop in house	REI[1]
Axxe®	ammonium nonanoate	Contact (Postemergent)	Non-selective	YES	24 hrs.
Envoy® Plus	clethodim	Systemic (Postemergent)	Grasses	YES	24 hrs.
Finale®	glufosinate	Systemic[2] (Postemergent)	Non-selective	YES	12 hrs.
Fusilade® II	fluazifop-butyl	Systemic (Postemergent)	Grasses	YES	12 hrs.
GreenMatch® EX	lemon grass oil	Contact (Postemergent)	Non-selective	YES	0 hrs.
Marengo®	indaziflam	Residual (Preemergent)	Annual[3]	NO	12 hrs.

Reward®	diquat	Contact (Postemergent)	Non-selective	YES	24 hrs.
RoundUp® Pro	glyphosate	Systemic (Postemergent)	Non-selective	NO	4 hrs.
Scythe®	pelargonic acid	Contact (Postemergent)	Non-selective	YES	12 hrs.
TerraCyte®	sodium carbonate peroxyhydrate	Contact (Postemergent)	Moss, algae, liverwort	YES	0 hrs.
WeedPharm, other vinegar herbicides[4]	acetic acid	Contact (Postemergent)	Non-selective	YES[4]	48 hrs.[4]

[1]REI = Restricted entry interval which is the period of time after a pesticide is applied when employees may not enter the pesticide treated area without required personal protective equipment.

[2]Glufosinate is only minimally translocated and may act more as a contact herbicide. Thorough coverage is needed.

[3]May also control or suppresses some perennial weeds.

[4]Check specific product labels for use directions. Only products labeled as herbicides are legal to use for weed control.