

# Weed Control in Herbaceous Perennial Container Production

KEEPING CONTAINER CROPS WEED FREE CAN BE A CHALLENGE. READ ON TO LEARN ABOUT SUCCESSFUL CONTROL STRATEGIES.

By James Atland

Container-grown herbaceous perennials have serious weed problems with few or no weed management tools. This article will discuss some cultural, chemical and non-chemical methods for controlling weeds in herbaceous perennial production.

## Start Clean, Stay Clean

This is the mantra of Auburn University weed scientist, Dr. Charles Gilliam. It is especially relevant in perennial plant production. Container crops have an enormous advantage over field-grown crops, in that they usually lack a seed bank. In field soils, weed seeds accumulate and lie dormant for years or even decades until the right conditions exist for germination. Short of soil fumigation, it is almost impossible to eradicate weed seeds from soil, so they must be dealt with continuously each time a crop is planted. Container crops are different. Containers are filled with a nearly weed-free soilless substrate, and thus almost always begin their production cycle free of weeds. The challenge for greenhouse and nursery managers is to keep them free of weeds.

There is one perceived, and two real sources for weeds in containers. Due to the sometimes sudden explosion of weed populations, many growers blame the container media for being a source of weeds. However, peatmoss and pine bark are generally



Weeds growing on gravel, such as pearlwort shown here, are one of the primary sources for weeds in containers.



1. Liverwort gemmae (a type of spore) are splashed and spread from the mother plant with rain or irrigation water drops.

2. Bittercress germinating around the edge of this used pot originate from seed sticking to the sidewall.

3. Herbicide granules should be dislodged from foliage to minimize injury.

4. Herbicide granules funneling to the base of this hosta caused injury at the base of the plant.

weed-free when they are initially delivered from the supplier. They are harvested from areas where weeds, at least those prevalent in container production, are rarely found. Substrates amended with field soil can have very large weed populations. A recent survey found that more than 50 percent of growers are using field soil as part of their container mix. Field soil should be steam-sterilized to kill the ubiquitous weed seed present. Assuming field soil is sterilized when used, substrates composed primarily of peatmoss or pine bark should be weed-free initially.

The gravel beneath containers is a major source for weeds in container crops. Whether indoors or outdoors, container-grown perennials are almost always placed over gravel or weed fabric. A common characteristic of container weeds is their ability to project their seed several feet from the mother plant. Bittercress (*Cardamine* spp.) and creeping woodsorrel (*Oxalis corniculata*) are two of the most common and problematic weeds in containers. Both have cigar-shaped seed pods, which when ripened explosively dehisce and project their seed from the mother plant. Pearlwort (*Sagina procumbens*) and liverwort (*Marchantia polymorpha*) are two more weeds in which their seeds (or spores

in the case of liverwort) are spread when rain or irrigation water drops splash the propagules away from the mother plant. Any of these four species can easily spread from the gravel floor up into a nearby container.

Weed control on the gravel or weed fabric beneath containers is extremely important for preventing weeds in containers. In the ebb and flow of typical nursery production, each section of the nursery is emptied of one crop, then filled with another. The time between crops, when the space is empty, must be used to remove existing weeds and prevent establishment of new weeds.

There are two basic steps for cleaning a production area between crops. First, as best you can, remove all organic matter including spilled substrate, dropped leaves and flowers, etc. If practical, refresh the area with a new layer of gravel. Second, following all pesticide labels, apply a cocktail of herbicides to kill existing weeds and prevent the establishment of new weeds. There are many very effective products to choose from. Use a broad-spectrum post-emergence herbicide, such as glyphosate, to kill existing weeds. Use a combination of pre-emergence herbicides to prevent the establishment of new weeds. Products effective for pre-emergence

control of weeds on gravel include those containing flumioxazin, oxyfluorfen and diuron.

The second most common source for container weeds are weeds hidden in the liners used for potting. Weed management in propagation is extremely difficult. Weeds often establish in liners while they are in the propagation stage, and these weeds are then potted along with the liner into larger containers. Although most good nurseries take considerable effort to remove weeds from liners prior to selling or shifting up to larger containers, many weeds are difficult to hand-remove completely and will grow back quickly once potted into larger containers.

If you are buying liners for your containers, check with your source producers and ensure they are growing weed-free plants. If you are producing your own liners, there are some steps you can take to improve weed control in propagation. Use new or clean propagation pots. Weed seeds often cling to plastic pots and trays and can survive storage for many years. Reusing old pots (especially dirty pots) is a sure way to inoculate new propagation crops with weeds.

The three primary mechanisms for weeds spreading in container propagation systems are

splashing of seed or propagules, explosive dehiscence (as described for bittercress and oxalis) and the blowing of weed seed in the air. Document the weed species in your propagation area, and consider cultural practices that will limit the spread of those species. Use screens to prevent weed seed from blowing in through vents. Adjust irrigation systems to limit splashing of propagules. Aggressively suppress bittercress and oxalis weeds growing in and around the production area before they set seed pods. And always use new (or at least clean) pots.

### Herbicide Use in Perennials

There are two broad categories of herbicides: post-emergence herbicides and pre-emergence herbicides. Post-emergence herbicides are applied to existing weeds to kill them. Pre-emergence herbicides are primarily applied to clean, weed-free soil in order to prevent the establishment of new weeds.

There are very limited applications for using post-emergence herbicides directly on containerized crops. Some post-emergence herbicides can be used on the gravel within enclosed structures. There may be very specific label instructions for this application. For example, some herbicide labels dictate that the greenhouse must be empty of crops prior to application, while others do not. Read pesticide labels carefully before application. When



*Research at USDA-ARS in Wooster, Ohio, is evaluating the efficacy of rice hulls for weed control in nursery and greenhouse crops.*



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possible and safe, use post-emergence herbicides to suppress all weeds in enclosed structures.

Pre-emergence herbicides can be used directly on container-grown perennials grown outside. However, there are currently no pre-emergence herbicides labeled for use on any crop grown inside an enclosed

structure. Even when applying pre-emergence herbicides outside, there are no broad generalizations that can be stated about which herbicide products are safe for the enormous variety of perennial crops. In general, granular herbicides are safer than sprayed herbicides if the granules can be successfully dislodged

from foliage. Products containing the following herbicide compounds should be used with extreme caution due to high risk of contact injury (flumioxazin, oxyfluorfen and oxadiazon). Two chemistries that have among the largest selection of perennials listed on their labels include those with pendimethalin or isoxaben + trifluralin. Read labels carefully before applying pesticides to crops.

When using pre-emergence herbicides, especially granular products, use caution when applying to crops with foliage that might cause the granules to funnel to the crown of the plant. Hostas, among many other crops, have this type of plant architecture. Funneling of the herbicide to the plant crown can exacerbate potential injury.

### Mulches in Perennials

An alternative to pre-emergence herbicides is the use of mulches. Mulches for container crops should have a combination of the following properties: they provide little or no available nutrients, they dry quickly after irrigation, and they resist decomposition. Weed seeds require available nutrients to establish successfully. They may germinate in the absence of nutrients, but they will fail to develop much past the cotyledon stage without sufficient nutrition. This is especially true for container weeds. Nitrogen is the key nutrient that must be available for successful seedling establishment. Thus, compost materials often make poor mulches (especially in landscape situations). The high nutrient content of many compost materials will actually increase weed growth. Only consider mulch products that have an inherently low nitrogen content.

An effective mulch will not retain water. This seems contradictory to what we have learned about mulches in the past. To be clear, it is acceptable, and even desirable, for a mulch to reduce evaporation and thus preserve water in the substrate. However, the mulch itself should not retain water. Weed seeds require water to trigger germination. A mulch that does not retain water itself will make weed germination and establishment unlikely.

It almost goes without saying that mulches must resist decomposition. If the mulch decomposes too quickly, the barrier is lost and weeds are more likely to germinate. Unfortunately, abundant fertilization and irrigation used in typical container production



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are conducive to organic matter decomposition. Use coarse mulch products that decompose slowly over time.

### Rice Hulls for Weed Control

I have evaluated many mulch materials for

weed control in containers. One of the most effective materials for controlling container weeds is rice hulls. Our research has shown that rice hulls provide excellent control of bittercress, creeping woodsorrel, willowherb, and common groundsel. In our experiments, rice hulls at ½ to 1 inch depth

provided effective weed control through 16 weeks. We found that rice hulls dry very quickly after irrigation. Quick drying time makes weed germination and establishment extremely difficult. We also found that rice hulls decompose very slowly, providing an effective weed control barrier for months.

We have found, and have heard anecdotally, that wind can be a problem in blowing the rice hulls out of the container. We are currently planning research to determine factors that affect the blowing of rice hulls. Until then, it seems the greatest utility for rice hulls is at indoor production sites. This actually complements herbicide use, as indoor sites are where pre-emergence herbicides cannot be used.

A horticultural grade of parboiled rice hulls is available for the greenhouse and nursery industry, and sold through several greenhouse supply companies. Availability is an important factor in selecting a mulch. Many highly touted mulch products have limited availability. For example, it has been shown that hazelnut shells provide very effective weed control. But since more than 95 percent of hazelnut production occurs in the state of Oregon, it is unlikely that hazelnut shells will be available (cost effectively) for growers outside of the Pacific Northwest. Rice hulls are available nationally for use in horticultural crops.

Keys for successful weed control in herbaceous perennials:

- As much as you can, ensure propagated liners are grown weed-free.
- Control weeds growing on gravel beneath containers.
- Document weed populations in your operation, and develop strategies to limit the spread of those weeds.
- Use pre-emergence herbicides in outdoor production areas, according to label directions, and where evidence shows they are safe.
- Use mulches that inhibit weed germination by drying quickly or by reducing nitrogen on the mulch surface. 

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