

## Principles of Nursery Weed Management

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Weeds are plants that compete for water, nutrients and sunlight, or reduce the aesthetic quality or marketability of ornamental plants. In container nursery crops as few as one weed per pot can significantly reduce the growth and quality of the crop. In field nursery crops, weeds are not as competitive but are capable of reducing growth and (perhaps more importantly) marketability of your crop. Additionally, weeds can attract arthropod pests, serve as alternate hosts for plant pathogens, and create microenvironments more conducive to disease and insect damage. In order to develop an effective weed management program you must first understand the basics of weed identification and biology, then select the most appropriate management option(s), and correctly implement management strategies.

### Weed identification and biology.

The first step in any pest management program is to correctly identify the pest. The following weed identification guides are recommended for North Carolina. Contact the vendors before ordering to ensure item availability, current price and shipping costs.

Weed Guide	Comments
Identifying Seedling and Mature Weeds Publications Office, Box 7603 North Carolina State University Raleigh, NC 27695-7603 \$10.00	Covers most weeds of field nurseries. Particularly useful in the Piedmont and coastal plain. Color pictures of several growth stages and seeds of each weed, detailed taxonomic descriptions and a key are included.
Weeds of Southern Turfgrass Publication Distributions Center IFAS Building 664, P. O. Box 110011 University of Florida Gainesville, Florida 32611 (352-392-1764) \$8.00 + \$3.00 shipping	Particularly useful for weeds of turf and landscapes in the Coastal Plain. Includes many weeds common to container nurseries. Color photographs and brief descriptions of each species. No key is included.
Weeds of the Northeast Cornell University Press P. O. Box 6525, Ithaca, NY 14851 607-277-2211 \$29.95 plus \$5.00 shipping	Full color guide to most weeds of field and container grown nursery crops. Most appropriate to the mountains and Piedmont of NC. Several color photographs and line drawings for about 300 species, descriptions, and identification keys are included.
Weeds of Container Nurseries in the United States NC Nurserymen's Association Trinity Rd., Raleigh NC 919-816-9119 \$5.00 + shipping	A full color guide to common and newly introduced weeds of container nurseries. Does not include weeds common to field nurseries.

## Weed Life Cycles

There are four basic life cycles: winter annual, summer annual, biennial and perennial. Each life cycle has “weak links” which can be exploited in control programs. Seed-propagated weeds can be controlled by preventing germination or survival of young seedlings. Perennial and biennial weeds are more susceptible to control procedures at certain times of year. Understanding life cycles and the “weak links” will result in more effective weed management programs.

**Annual weeds** - germinate from seeds, grow, produce seeds and die in one season. There are two types of annual weeds. **Winter annuals** germinate in the fall or early spring when soil temperatures are cool, then usually flower and die in late spring or early summer. Common winter annual weeds include annual bluegrass, chickweed, bittercress, vetch and cutleaf evening primrose. **Summer annuals** are adapted to warm temperatures of spring and summer; they set seed and die in late summer or fall. Common summer annuals include crabgrass, spurge, pigweed, ragweed and many others. As with any rule there are exceptions, horseweed is a winter annual which may germinate in the fall or spring, grows throughout the summer then goes to seed in late summer or early fall. In shady, moist sites, soil temperatures stay cool allowing some winter annual weeds such as chickweed, groundsel and bittercress to germinate and grow during the summer.

**Biennial weeds** - germinate and produce a cluster (or rosette) of leaves near the soil surface during the first year of growth. During the second year biennial weeds flower, produce seeds and die, e. g. wild carrot (Queen Anne’s Lace) and common mullein. Biennial weeds are most easily controlled preemergently.

**Perennial weeds** - grow for many years and usually produce seeds each year. Perennial weeds which reproduce exclusively by seed are called “simple perennials”. Examples of simple perennials include dandelion, plantain, and dogfennel. Simple perennials usually die back to the ground during the winter and resprout from the hardy crown or root system in the spring. Many other perennials also have vegetative reproductive organs: tubers, bulbs, stolons, rhizomes, or fleshy roots. These are often referred to as tuberous, bulbous, stoloniferous, or rhizomatous or creeping perennials, respectively. The most common bulbous perennial is wild garlic. Common creeping perennial weeds include nutsedge, bermudagrass, johnsongrass, horsenettle and mugwort..

**Weed Management** -- A comprehensive nursery weed management program will include exclusion, sanitation, preemergence and postemergence herbicides, and hand weeding.

### Exclusion and sanitation.

Preventing weed introduction and spread is an important part of any weed management program. Weed seed and other propagules are introduced into nurseries by wind-blown seed, washed in by rain runoff, deposited by birds, in the potting substrates, and (most importantly) in the root balls of plant materials.

- Inspect potting substrate sources for weeds.
- Inspect new shipments of liners before potting. If you observe weeds that are not currently present at your nursery you have two choices – (1) refuse the shipment or (2) remove the top ½ inch of potting substrate from the liners and dispose of that contaminated substrate.
- Closely monitor new plants in the nursery to prevent introduced weeds from going to

seed.

- Scout newly planted nursery blocks early spring (after weeds have had a chance to emerge) to identify new weed infestations before they become established and spread.
- Cull containers from the nursery that are infested with perennial weeds.
- In field nurseries control the perennial weeds with postemergence herbicides before they can spread.
- After hand weeding containers, remove the weeds from the property.
- Recycled potting media tends to be loaded with weeds. Use it only in crops on which you can use broad-spectrum herbicides.

### Preemergence Herbicides.

The most commonly used preemergence herbicides control a broad spectrum of weeds and are safe on most woody plants. In Table 1 and Table 2 are a few of the most commonly used preemergence herbicides. Preemergence herbicides must be applied to the surface of the soil and incorporated by rain or irrigation into the zone of weed seed germination. Consequently, preemergence herbicides must be applied before weeds germinate. Apply herbicides as soon as possible after planting or potting. In established field nurseries, standard timings for preemergence herbicide applications are late winter and late summer. Where hard to control weeds such as morningglory are present, a third application in early summer may be necessary. In container nurseries, preemergence herbicides will need to be reapplied about every 10 weeks. Hand weed containers before herbicides are applied.

Table 1. Preemergence herbicides commonly used in container nurseries.

Trade Name	active ingredients	Comments
Scotts OH2	oxyflurorfen + pendimethalin	Broad spectrum. Safe on most woody ornamentals but burns tender plants.
Rout	oxyfluorfen + oryzalin	Broad spectrum. Safe on most woody ornamentals but burns tender plants.
Snapshot TG	isoxaben + trifluralin	Broad spectrum but a bit weak on bittercress. Safe on most woody ornamentals. Does not burn.
Ronstar	oxadiazon	Broad spectrum but does not control chickweed. Burns tender plants.
Regal O-O	oxadiazon + oxyfluorfen	Broad spectrum. A bit weak on spurge. Burns tender plants.

Note: several other herbicides are labeled for use in container nurseries but are used on less acreage or for certain crops or sites.

Table 2. Preemergence herbicides commonly used in field nurseries.

Trade Name	active ingredients	Comments
Barricade	prodiamine	Similar to oryzalin but a bit weaker on broadleaf weeds.
Gallery	isoxaben	Preemergence broadleaf weed control. Narrower spectrum than simazine but safer on new plantings.
Pendulum	pendimethalin	Similar to oryzalin but a bit weaker on broadleaf weeds.
Pennant Magnum	s-metolachlor	Preemergence control of yellow nutsedge, annual grasses, a few broadleaf weeds. Shorter residual than oryzalin, pendimethalin & prodiamine.
Princep	simazine	Preemergence broadleaf weed control. Can damage newly planted deciduous trees & shrubs. Typically used after crops have established for one growing season.
Sureguard	flumioxazin	Preemergence and early postemergence broadleaf weed control. Particularly effective for morningglory control.
Surflan	oryzalin	Annual grass and small-seeded annual broadleaf weed control. Safe on most woody ornamentals but not hemlock.

Note: several other preemergence herbicides are labeled for use in field nursery crops but are used on less acreage or for certain crops, weeds or sites.

Choosing the most appropriate herbicide for your nursery requires some knowledge of the weeds and the crop species to be grown. Table 3 compares the efficacy of preemergence herbicides on a few common nursery weeds. Each preemergence herbicide has a fairly broad spectrum of weeds controlled; however, no herbicide controls all weeds. A common practice in field nurseries is to combine “grass” herbicides (such as Surflan, Pendulum, Barricade or Pennant) with a “broadleaf” herbicide (Princep or Gallery). Such combinations provide better weed control while avoiding excessively high doses of the herbicides.

Another factor in herbicide selection is safety to the ornamental crops. Herbicides containing oxyfluorfen can burn tender foliage of ornamentals. If the crop has a leaf architecture that catches herbicide granules (such as hosta or daylily), severe injury can result. An alternative is to use a herbicide that contains isoxaben. Princep can cause yellow leaves and stunting in Euonymus, Lilac, Mock Orange, Privet and young Maples. Similarly, Surflan is known to be injurious to hemlock but Pendulum and Pennant are safe on Hemlock. The best source for

information on herbicide safety is NC Cooperative Extension Publication #AG427 “Weed Control Suggestions in Christmas Trees, Woody Ornamentals and Flowers”, available from NC Cooperative Extension.

Table 3. Relative effectiveness of preemergence herbicides on common nursery weeds.

Herbicide	Grasses	Chick-weed	Spurge	Morning-glory	Bittercress	Yellow Nutsedge
Barricade	Good	Good	Good	Fair to Poor	Fair	Poor
Gallery	Poor	Good	Good	Fair	Fair	Poor
Pendulum	Good	Good	Fair	Poor	Fair	Poor
Pennant Magnum	Fair	Fair	Poor	Poor	Poor	Fair
Princep	Poor	Good	Good	Good	Good	Poor
Regal O-O	Good	Good	Fair	Fair	Good	Poor
Ronstar	Fair	Poor	Fair	Fair	Good	Poor
Rout	Good	Good	Good	Fair	Good	Poor
Scotts OH2	Good	Good	Good	Fair	Good	Poor
Snapshot	Good	Good	Fair	Fair	Fair	Poor
Sureguard	Fair	Good	Good	Good	Good	Poor
Surflan	Good	Good	Fair	Fair	Fair	Poor

Regardless of which herbicide is selected, in order to achieve the maximum level of weed control the herbicide must be applied uniformly at the recommended dose before weeds germinate. Irrigate immediately after application to wash the herbicide off the foliage and to incorporate the herbicide into the surface of the potting substrate or soil where weeds will germinate. Preemergence herbicides persist in potting media for about 8 to 10 weeks, after which time, the pots must be hand weeded and preemergence herbicides reapplied. In field soils

preemergence herbicides persist 3 to 4 months. In field nursery crops a typical preemergence program will include applications in late summer for winter annual weed control plus late winter for spring germinating weeds. In fields where high populations of summer germinating weeds are present, a third preemergence application in late spring or early summer may be required.

### Postemergence Weed Control.

No preemergence herbicide program controls all weeds. There will be some annual weeds not controlled by the herbicides and there will be perennial weeds that encroach into the crop rows. As previously stated, there are few postemergence herbicides labeled for use in container nurseries. Grasses can be controlled with Vantage, Fusilade, or Envoy. However, broadleaf weeds cannot be selectively controlled. In field nurseries, a common practice is to control perennial weeds with spot or directed applications of glyphosate, avoiding contact with the foliage or green stems of crop plants.

Many field nurseries have moved to a totally postemergence weed control program, applying a postemergence herbicide on a regular schedule. Gramoxone and Finale do not work as well as glyphosate on perennial weeds. Therefore, herbicide applications will have to be more frequent if Gramoxone or Finale are chosen. A typical program would be to apply the postemergence herbicide every 6 to 8 weeks depending upon how rapidly weeds are growing. In such a system, care must be taken to avoid crop injury from these non-selective herbicides.

### **Start Clean – Stay Clean!**

Once you are behind in your weed management program, it often seems impossible to catch up. The old adage of “Start Clean – Stay Clean” is a very functional motto for a nursery weed management program.