
Weed Management for Outdoor Cut Flowers

Introduction

Weeds compete for water, nutrients and light resulting in reduced flower yield and increased threat of serious insect and disease problems. A successful weed management program utilizes cultural practices such as cultivation and mulching, or a combination of cultural and chemical measures, taking into consideration labor costs and the cost and availability of materials.

Weed management begins with a survey of the site. Weeds should be identified and the level of weed pressure noted. Weeds can be classified according to their life cycles. Knowing the weed life cycle is important in determining the optimal timing for cultural management practices or herbicide applications. Summer annuals emerge in the spring, flower, and set seed before the first frost. In cultivated fields, summer annuals tend to predominate as the primary weed type. Winter annuals germinate at the end of the summer or early fall, overwinter, then flower and fruit in the summer. Biennials need at least two seasons to complete their life cycle and, like annuals, biennials die after flowering. Perennials, which survive more than two seasons, can propagate by seed or vegetatively. Vegetative reproductive organs such as tubers, rhizomes (underground stems), stolons (above ground creeping stems), bulbs and corms, are often resilient to both cultural and chemical control measures and should be targeted for control before planting the field. It is also important to scout weed populations during and after the growing season in order to assess the success of the weed control program.

Herbicides are available that may be safely used to control weeds in cut flowers. However, in many situations herbicides cannot be used or are not effective in controlling all the weeds. Even if effective herbicides are available, growers should utilize cultural practices that reduce weed infestations and spread. These practices will be especially important where herbicides cannot be used.

Cultural Practices

Field Preparation. Minimize weeds by preparing the field the year prior to planting. Begin by frequently tilling the soil, 2-3 times early in the season until mid-July. Frequent tillage reduces weed seed populations by bringing weed seeds to the surface where they will germinate, grow a little and then be tilled under. Allow weeds to germinate and grow from July until fall, then apply glyphosate (Roundup-Pro) over the area. This will kill many perennial weeds which are best controlled in the early fall when nutrients are being stored in the root system. The field is now ready for planting.

Cultivation and spacing. Some growers have minimized weed competition with a combination of early cultivation and narrow between-row spacing. This can be effective if the crop gets a head start on the competition. If the crop's growth is impeded in any way, the weeds will take over. Regular cultivation can limit weed competition between rows. However, cultivation can injure the roots of some cut flowers, contribute to erosion and result in some water losses due to increased evaporation. Also, deep cultivation tends to bring additional weed seeds to the surface where they will germinate, grow and compete with crops. In-row cultivation is particularly difficult and typically requires hand-hoeing or hand-weeding.

Mulches. Mulches can effectively control most annual weeds from seed.. According to Dr. Andrew Senesac of the Long Island Research Laboratory, black plastic or a geotextile fabric such as Weedblock can control most annual weeds around field grown herbaceous perennials. In some studies however, due to the physical restriction of the spreading shoots, these mulches reduced *Achillea* and *Stachys* flower production. Spreading perennials that do not produce adventitious roots did not show any significant yield differences from the controls. Organic mulches such as bark, straw, and composted yard wastes, effectively control many annual weeds. Some growers use rotted sawdust, wood chips, spoiled hay and straw. If not composted properly, sawdust and wood chips will rob the soil of nitrogen. Bark mulches can be used but are often too costly. Hay generally contains too many weed seeds and often increases the weed pressure. Clean, weed-free straw is often the most cost-effective mulch available, but locally some growers may find other economical alternatives. Organic mulches should be applied to weed-free, warm soil soon after planting. To be most effective, they should be applied in a layer two to three inches deep.

Chemical Control – Herbicides

Herbicides can be classified into two general use categories: preemergence and postemergence. Preemergence herbicides are applied before the weeds germinate but after the crop has been planted. Postemergence treatments are applied after the weeds have emerged. Herbicides may also be classified based on their selectivity. Non-selective herbicides will control any herbaceous plants that are contacted. Selective herbicides will control or suppress only certain types of plants or weeds.

Herbicides are available in several formulations. Usually, the sprayable formulations (emulsifiable concentrates, wettable powders, dry flowables, water-dispersible granules) are less expensive than granular formulations. But, granular formulations are often safer on transplanted cut flowers than are the sprays (due to reduced foliar absorption). Sprayable formulations can be applied through a tractor-mounted sprayer in field or by hand-held backpack sprayers equipped with a spray boom. With a backpack sprayer, maintain a constant foot pace, even spray pressure and uniform nozzle orifices. Regardless of the formulation or equipment used, it is important to apply herbicides as uniformly as possible.

When applying a herbicide the square footage of the area to be treated and the calibrated sprayer / spreader output (amount per area) should be known. Misapplication of the chemical can result in poor weed control or injury to the crop. Read and follow all label directions before applying any chemical. A sprayer that is to be used for herbicides should be labeled as such and used only for that purpose.

The following is a partial listing of herbicides that can be used in cut flower production. Because of the wide variety of cut flower species grown it is difficult to recommend any one herbicide that will cover all crops. Due to labeling restrictions, possibility of crop injury, limited market, and the difficulty in obtaining new labels many chemical companies do not actively pursue cut flower labels. It is the user's responsibility to follow label instructions. Herbicide labels can be obtained from the websites, www.cdms.net , www.bluebooktor.com/index.html, and www.greenbook.net . It is advisable to review labels prior to purchasing a product. Some labels provide scientific names and common names of plants, some list common names and some provide a combination.

Nonselective, post-emergence herbicides

Nonselective herbicides can be used to control weeds in a field prior to planting or to spot spray weeds growing between crop rows. Care should be taken in selecting a herbicide to insure that there will be no residual chemical present that could damage the crop. Chemicals that would be used for this purpose include glyphosate (Roundup-Pro), glufosinate (Finale), paraquat (Gramoxone), diquat (Reward), and pelargonic acid (Scythe). Do not apply these herbicides over the top of cut flowers; crop plants will be injured or killed.

Glyphosate (Roundup-Pro) is absorbed by green tissue and translocated to the root system of the plant. Since there is no residual soil activity, a crop can be seeded or transplanted into the field soon after application. Actively growing weeds are much more susceptible to the herbicide. Many perennial weeds are best controlled in the early fall when nutrients are being stored in the root system. Glyphosate is effective for field preparation to control perennial, broadleaf and grass weeds.

Glufosinate (Finale) is also a translocated herbicide, but not as well translocated as glyphosate in perennial weeds. Like glyphosate, it has no soil residual activity and can be used as a site preparation treatment or as a spot spray to control escaped weeds. Since glufosinate is not as well translocated as glyphosate, complete spray coverage is essential to obtain the maximum control.

Diquat (Reward), Paraquat (Gramoxone) and pelargonic acid (Scythe) are contact herbicides (i.e. they kill foliage on contact but are not translocated in the plant) and have no residual soil activity. They will suppress many species of annual grasses and some broadleaf weeds. Repeated applications may be needed to weaken and suppress perennial weeds. Complete coverage is essential.

Selective, post-emergence herbicides

Sethoxydim (Vantage), clethodim (Envoy) and fluazifop-p (Fusilade II) control most annual and perennial grasses; **fenoxaprop-p-ethyl (Acclaim Extra)** controls summer annual grasses. They can be applied over the top of many broadleaf crops when grasses are actively growing and before they reach maximum size. When applied to a labeled cut flower crop all open flowers should be harvested before application to avoid injury. Do not use spray adjuvants with Vantage. With Envoy and Fusilade II, use only the spray adjuvants specified on the labels. Use of non-labeled spray adjuvants may result in contact burn on cut-flower foliage and buds. Additionally, to avoid over-dosing and associated crop damage, these herbicides should be applied on an area-basis, not a spray-to-wet basis.

Some flowers on the Vantage label include, *Antirrhinum*, *Centaurea*, *Chrysanthemum*, *Dahlia*, *Dianthus barbatus*, *Dianthus deltoides*, *Gladiolus*, *Gypsophila*, *Iris*, *Physostegia*, *Rudbeckia* and *Tagetes*; plus some varieties of *Aster*, *Celosia*, *Coleus*, *Gerbera*, *Lavandula*, *Limonium*, *Salvia* and *Zinnia*.

Some flowers on the Fusilade II label include *Achillea*, *Ageratum*, *Alcea rosa*, *antirrhinum*, *Calendula*, *Campanula*, *Coleus*, *Coreopsis verticillata*, *Dianthus barbatus*, *Iris*, *Heuchera*, *liatris*, *Sedum*, *Statice sinuata*, *Tagetes* and *Zinnia*.

Envoy is labeled for over the top applications to *Achillea*, *Ageratum*, *Antirrhinum*, *Chrysanthemum*, *Coleus*, *Dahlia*, *Dianthus*, *Gazania*, *Heuchera*, *Iris*, *Pansy*, *Phlox*, *Salvia*, *Tagetes* and some varieties of *Zinnia*. Envoy is the only post-emergence selective grass herbicide that controls annual bluegrass (*Poa annua*).

Acclaim is more effective on young actively growing grassy weeds than on large grassy weeds. Some flowers on the Acclaim label include *Achillea*, *Antirrhinum*, *Aquilegia*, *Astilbe*, *Campanula*, *Centaurea*, *Chrysanthemum*, *Coreopsis*, *Cosmos*, *Delphinium*, *Dianthus*, *Dicentra*, *Doronicum*, *Echinacea*, *Gazania*, *Gypsophila*, *Iberis*, *Iris*, *Liatris*, *Oenothera*, *Paeonia*, *Papaver*, *Rudbeckia*, *Statice sinuata* and *Zinnia*.

Pre-emergence herbicides

To prevent seedling weeds from emerging in a crop, a preemergence herbicide may often be used. Several preemergence herbicides are available for controlling annual grasses and small-seeded broadleaf weeds, but large-seeded broadleaf weeds are not as easily controlled. Careful weed scouting can identify hard-to-control species and facilitate the selection of the most effective herbicide for the crop. If preemergence herbicides are to be used, be sure they are labeled for use on the crop plants to be grown. Also, in a mixed field of cut flowers all species being grown should be listed on the herbicide label.

Cutflowers are usually started from transplants, divisions or tubers, but sometimes are grown in the field from seed. Generally, preemergence herbicides should be applied after transplanting. Research has shown that most direct-seeded flowers are more susceptible to damage from preemergence herbicides than transplanted seedlings. To achieve the same level of safety, the herbicide usually should not be applied until after plants emerge and are established. Each of the herbicides described below should be watered-in to "activate" or move the herbicide into the soil where it can be absorbed by germinating weed seeds.

Bensulide (Bensumec 4LF) controls crabgrass, annual bluegrass, other annual grasses and a few broadleaf weeds for 3 to 4 months.. Ornamentals need to be well established before the application of bensulide. Some labeled flowers include *Asters*, bachelor's bustton, *Calendula*, *Campanula*, coral bells, *Daffodil*, *Dahlia*, daisy, *Freesia*, *Gazania*, *Gladiolus*, marigold, *Pansy*, primrose, *Ranunculus*, stock, *Sedum*, sweet pea, *Tulip*, wallflower and *Zinnia*.

Dithiopyr (Dimension) is a preemergence herbicide, primarily used to control crabgrass in turf, but is labeled for annual grass and small-seeded broadleaf weed control in several flowers including *Achillea*, *Antirrhinum*, *Aquilegia*, *Celosia*, *Centaurea*, *Coleus*, *Coreopsis*, *Delphinium*, *Dianthus*, *Iberis*, *Iris*, *Monarda*, *Narcissus*, *Osteospermum*, *Pansy*, *Rudbeckia*, *Salvia*, *Sedum*, *Tagetes*, *Tulip*, *Zinnia* and others.

Napropamide (Devrinol) will control certain annual grasses and annual broadleaf weeds. Flowers on the label include African daisy, *Aster*, *Chrysanthemum*, *Dahlia*, daisy, *Gladiolus*, *Narcissus* and *Zinnia*. In field trials, high rates caused yield reductions in zinnia and marigold. For effective control the chemical must be watered in after application.

Oryzalin (Surflan) controls most annual grasses and many annual broadleaf weeds and should be applied only to established plants. One-half inch of rainfall or irrigation is needed to activate oryzalin. Flowers on the label include *Achillea*, *Antirrhinum*, *Aster*, *Callistepheus chinensis*, *Campanula*, *digitalis*, *Coreopsis*, *Dianthus*, *Dicentra*, *Doronicum*, *Echinacea*, *Gaillardia*, *Gladiolus*, *Gypsophila*, *Heuchera*, *Hyacinth*, *Iberis*, *Iris*, *Liatris*, *Limonium*, *Narcissus*, *Osteospermum*, *Ranunculus*, *Rudbeckia*, *Sedum*, *Salvia*, *Tagetes*, *Tulip* and *Zinnia*. However, severe injury has been observed on transplanted celosia, begonias, gomphrena, salvia, phlox and several other species. XL is a granular formulation containing oryzalin + benefin that, in research trials, has been safer to transplanted herbaceous ornamentals than spray-applied Surflan.

Trifluralin (Treflan) controls annual grasses and a few broadleaf weeds for about 6 to 8 weeks. It is volatile and must be incorporated by irrigation immediately after application. The granular formulation is more often used to reduce vapor losses. Treflan is probably the safest herbicide on transplanted cut flowers discussed herein; however, it is the weakest on broadleaf weeds. Flowers on the Treflan label

include: *Achillea*, *Ageratum*, *Antirrhinum*, *Aster*, *Calendula*, *Centaurea*, *Chrysanthemum*, *Coreopsis*, *Dahlia*, *Dianthus*, *Dicentra*, *Digitalis*, *Echinacea*, *Gaillardia*, *Gypsophila*, *Heuchera*, *Iris*, *Lavandula*, *Liatris*, *Limonium*, *Matthiola*, *Monarda*, *Oenothera*, *Papaver*, *Phlox*, *Rudbeckia*, *Salvia*, *Scabiosa*, *Sedum*, *Tagetes* and *Zinnia* and more.

metolachlor (Pennant MAGNUM) is another preemergence herbicide that controls annual grasses but its main use is for preemergence control of yellow nutsedge (*Cyperus esculentus*) from tubers. Pennant does not control purple nutsedge. Pennant is currently only available as an emulsifiable concentrate formulation that can burn tender foliage. Pennant is labeled for use on *Achillea*, *Allium*, *Antirrhinum*, *Aquilegia*, *Artemesia*, *Aster*, *Campanula*, *Chrysanthemum*, *Coreopsis*, *Delphinium*, *Dianthus*, *Gaillardia*, *Gladiolus*, *Hyacinthus*, *Iris*, *Lillium*, *Lythrum*, *Oenothera*, *Ornithogalum*, *Phlox*, *Physostegia*, *Sedum*, *Statice sinnata*, *tagetes*, *Tulipa*, *Zinnia* and a few other species. Injury to gladiolus and zinnia has been reported.
