

Weed Control

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(updated September 2008)

Weeds reduce crop yields because they compete with crops for water, light, and nutrients. Reductions in yields may be small if only a few weeds are present. In contrast, heavy infestations may cause complete crop failures. In some cases, when perennial weeds get established, the land cannot be used for crop production until the infestation has been controlled. Weed control is critical, especially during the early growth stages of a crop. Weeds may also harbour insects, diseases, and rodents that will increase the need for pest controls.

Integrated Weed Management

An integrated approach to weed management is a program that includes prevention as well as physical, cultural and chemical control methods. The following six processes are involved in maintaining a successful integrated weed management program:

- manage resources to prevent weeds from invading;
- proper identification and knowledge of invasive weed species;
- map and monitor weed populations and damage;
- make control decisions based on knowledge of potential crop damage and cost;
- use a combination of control methods to reduce weed levels to an acceptable level; and
- evaluate the effectiveness of methods used.

Prevention

Prevention is the most important but least used weed management method. Wind, water, wild animals, livestock and man are major agents of weed dispersal. When weeds are spread by these or other natural agents, control can be very difficult or even impossible. Limiting the introduction of weeds and weed parts and preventing existing weeds from going to seed are two important means of prevention.

Weeds have evolved very effective survival and dispersal mechanisms. Therefore, it is easier to

prevent or exclude weeds than to treat established populations. Seed production, particularly for annual weeds, is very high and the seeds can lie dormant in the soil for many years. Perennial weeds are equally insidious, since a new plant can arise from small root fragments. Weeds or weed parts are often introduced to the greenhouse or field inadvertently on growing media, planting stock, machinery, and contaminated seed or through improperly managed compost and manure.

Careful sanitation practices can go a long way to prevent the introduction and spread of weeds in a greenhouse or the field. Anything that enters the site potentially can carry weeds or weed parts. Machinery should be washed regularly and staff must be aware of the risk of bringing weed parts and seeds in with them on their clothing or other materials. Be sure that all composts and manures are well rotted, and always choose certified weed-free seeds for sowing.

Before purchasing soil and media from a new supplier, investigate the steps they take to keep the product clean. The media can be checked for weed seeds using a germination test. Media and plants brought onto a site should be visually inspected for weeds prior to use. If weeds are present, quarantine (if possible) the plants until the problem is corrected. Where weeds or weed seeds are seen or suspected, follow-up treatments will likely be required to prevent them from spreading at the site.

It is also important to keep media clean once it arrives at the site. The media should be kept dry and clean, not stored outdoors where it will be exposed to contaminants. If storage outdoors is the only option, then it is recommended to store media on an impermeable pad and to cover it with a tarp. It is important to not allow surface water run-off to contact the pile, since this water can contain weed seeds and plant pathogens.

Weeds and weed parts can also be avoided by keeping fence lines, irrigation ditches and farm roads weed free. It is recommended to keep a three to five meter strip around the greenhouse free of weeds to decrease the potential of weed parts being carried into the structure. Seeds from nearby weeds

can also be carried through greenhouse vents by wind making it important to control weeds on the entire site before they go to seed.

Physical Control

Physical methods can effectively reduce weed levels. Physical controls include mechanical removal, such as tillage, hand weeding, and mowing, or controlling weed growth through cover crops and mulching.

Mechanical Removal

Tillage can be an efficient way to remove weeds, although it is a laborious process and great care must be taken not to injure the lower stems and surface roots of desirable plants. This method involves discing or scuffing between planted rows to disturb weed growth. Tillage should be done in the spring or fall. Only the top 10 cm of soil should be worked. Tillage should be timed to catch the first flush of weeds before sowing the crop. Post seeding tillage, if possible, should be done on a dry warm day so that disturbed weed seedlings are not able to transplant themselves. Remember that weed seeds can germinate even after many years of burial, so while deep tillage buries weed seeds and temporarily minimizes problems, subsequent tillage can bring these weed seeds to the surface again. Keep in mind that poor cultivation practices can damage soil structure and tilth. Do not cultivate when the soil is too wet or too dry, and do not cultivate too often.

When weeds are too large or too many to control by hand, mowing and mechanical removal is another alternative control method. For this strategy, cultivation can simply consist of chopping off the tops with a hoe, or using a line trimmer to cut the weeds as low as possible. Food reserves in the root system are depleted following repeated treatments, or the weed is sufficiently stressed to succumb to a pest or environmental stress. Established perennial weeds will usually require several years of frequent cutting before the food reserves in the roots are exhausted. If only a single mowing is possible, the best time is just prior to blooming to prevent the formation and spread of seeds.

Hand weeding and hoeing are possible control options, but the size of commercial operations often limits the practicality of these methods. Hand pulling, burning and even steaming of emerged weeds can be effective but must be done when weeds are

young (prior to flowering and seeding) and can be easier when the soil is moist. Keep in mind that hand pulling established weeds must be done very carefully as leaving any seeds and/or weed parts in the soil will permit the weeds to re-establish.

Mulching and Cover Cropping

Mulches control weeds by creating a relatively dry surface that is inhospitable for weed seed germination and by smothering small weeds. Mulches can exclude light from the tops of the weeds until the reserve food supply is depleted and the weeds starve. In addition to weed control, they moderate soil temperature and retain soil moisture.

Mulching materials include clean straw, hay or manure, tar paper, sawdust, landscape fabric and black plastic. Organic mulches have the additional benefits of providing nutrients and organic matter to the soil. Always remember that plant roots and the inner bark are living tissues. Anything that restricts gas exchange from these tissues will stress and perhaps kill them.

Mulches can be effective in controlling weed growth in container-grown plants. There are a number of drawbacks that limit the use of mulches in containers. Mulches can be difficult and expensive to apply uniformly and efficiently, they do not all hold up well with heavy irrigation, and their effectiveness is dramatically reduced if the integrity of the layer is disrupted by shrinkage or shifting of the layer. At times the mulch can even be phytotoxic. Toxic levels of boron have been found in some nursery mulches (*American Nurseryman*, February 15, 2001). Some mulching material may provide a home for rodents. Sawdust requires extra nitrogen fertilizer for breakdown or plant growth is slowed; about 0.5 kg nitrogen per cubic meter of sawdust must be added to off-set the nitrogen tie-up.

The need for weed control can be reduced for winter annual weeds by sowing a fall cover crop between the rows. Cover crops also provide erosion control and increase trafficability. More information on cover crops is provided in Chapter 2.

Cultural Control

Modifying habitat is an effective but often overlooked method of weed control. Creating growing conditions that favour the crop relative to weeds can provide a successful and long-term solution to a weed problem. Weeds have evolved particular adaptations to environmental conditions.

Changing soil conditions (e.g. correct drainage, pH or compaction problems) and cultural practices (e.g. fertilization, irrigation and pest control) can provide an effective solution to a weed problem, since healthy and vigorous plants are better able to compete against weeds. The advantage of cultural methods, relative to herbicides, is they provide a longer-term solution to weed problems.

Chemical Control – Herbicides

At the time of writing, no herbicides were registered for use inside greenhouses. This section applies only to herbicide use on outdoor, field-grown ornamentals.

If herbicides are used, they must be applied accurately, under the correct climatic conditions, and at the right stage of weed growth for maximum effect. Always read and follow label instructions. Equipment must be correctly used and adjusted to make accurate and thorough applications. The spray pattern must be even and uniform. **Never use the same sprayer for herbicides and other pesticides.** Always use clean water. Dirty water can reduce herbicide effectiveness. Salty or hard water may result in gumminess or precipitates which cause plugged nozzles and an uneven spray pattern. Tables 8.1 and 8.2 categorize the various herbicides that are registered for use in field ornamentals.

Class	Description
Preplant	Apply before a plant is planted or transplanted into the treated soil.
Postplant	Apply after planting or transplanting.
Preemergent to Weeds	Herbicides that are used on weed-free growing media or soil to destroy weed seedlings as they germinate. They do not control established weeds.
Postemergent to Weeds	Herbicides that are applied to young, actively growing weeds.
Selective	Controls specific weeds without injuring the ornamental crop. The tolerance of a plant to a specific herbicide formulation is listed on the label.
Nonselective	Kills any plant or plant part on which the application is made. They are usually only used on noncrop areas, such as ditch banks, roadsides, and fence lines. Some products are registered as directed sprays in established field stock. Spray contact on foliage and bark must be avoided to prevent severe plant injury.
Directed Spray	The spray is directed to cover the weeds but not the established crop.

Herbicide	Preemergent to Weeds	Postemergent to Weeds	Selective	Nonselective
acetic acid		X		X
amitrole		X		X
chlorthal	X		X	
dichlobenil	X		X	
diquat		X		X
fluazifop-p-butyl		X	X	
glyphosate		X		X
napropamide	X		X	
paraquat		X		X
propyzamide		X	X	
simazine	X	X	X	
s-metolachlor	X	X	X	
trifluralin	X		X	

Nonselective, Postemergent

The five non-selective herbicides described in this section are registered for use on non-crop land only. Do **not** apply them to crops or use them in a greenhouse. Application to crop plants may result in serious plant injury.

Amitrol 240 (amitrole) – Registered for spot treatment on non-crop land to control Canada thistle, dandelion, sow thistle, hoary cress, milkweed, poison ivy, and toadflax. Apply at 165-460 mL in 10 liters of water per 100 m². It is most effective when sprayed on foliage of actively growing weeds. Use the high rate to control horsetail, leafy spurge, and quackgrass. It will also control annual seedlings. Good coverage is necessary; thoroughly wet all leaves and stems of the weeds. Spray weeds to point of run-off. Do not disturb or mow treated plants for at least three weeks after treatment. Refer to the label for the appropriate stage of growth for the most effective control. Repeat applications when new growth appears. Heavy rainfall within 10 to 12 hours of application may reduce effectiveness. Do not apply to crops and do **not** use in a greenhouse.

EcoClear (acetic acid) - To control herbaceous broadleaf and grassy weeds on non-crop land areas of nurseries and around greenhouses. Do **not** use in a greenhouse. Foliar contact results in rapid burn down of annual weeds and suppression (top growth reduction) of herbaceous perennial weeds. Retreatment is required for complete control of established perennial weeds. For early season annual weed control (3-5 leaf stage) use 1 L of product for every 3 L of water. To control larger annual weeds and suppress perennial weed growth use 1 L of product for every 2.25 L of water. Rainfall within 1 hour of application will reduce effectiveness. Avoid contact of desirable plants. Do not apply to reactive metals, such as aluminum, tin or iron to prevent staining or mottling of the metal surface.

Gramoxone ⚠ (paraquat) - See label for rates and weeds controlled. It is effective for controlling emerged grasses and broadleaf weeds. Use as a directed spray on non-crop areas. Do **not** use in a greenhouse. The number of applications required for control varies with the weed. Foliage must be thoroughly covered to obtain good results because the product is not translocated within the plant. It is best applied on cloudy days, during dull sunlight or just prior to or during the evening. It does not have to be incorporated. Do not apply to crops. *This herbicide has no known antidote.*

Reglone (diquat) – Registered for weed control in non-crop land areas. Apply at 2.3-4.6 L of product in 550-1,100 litres of water per ha. Use the higher rates and higher volume of water for dense weed growth. Thoroughly wet foliage. It is a nonvolatile, fast acting product. It kills green foliage rapidly after application. Annual weeds are generally killed with one application. Repeat application may be needed to achieve control of perennial weeds. It is inactivated on contact with the soil and therefore has no residual effect. It is most effective when applied in the evening or on dull days. It does not have to be incorporated. Do not apply to crops and do **not** use in a greenhouse.

Roundup (glyphosate) - See label for rates and weeds controlled. Use as a directed spray or in non-crop areas to control emerged annual and perennial weeds. It does not have to be incorporated. Do not apply to crops and do **not** use in a greenhouse.

Selective Postemergent

Kerb 50 WSP (propryzamide) – Use on established ornamentals, including iris and peony, to control quackgrass, most annual grasses, and chickweed. Apply in the fall at the rate 30 g per 100 m² (1 pouch will treat 1,500 m²). Do **not** use in a greenhouse.

Venture L (fluazifop-p-butyl) - A systemic herbicide that is translocated from the treated foliage to the growing points of shoots and roots. It is registered to control grassy weeds in newly transplanted or established non-grassy species of field ornamentals. Do **not** use in a greenhouse. See the label for a complete list of crops. It does not control broadleaf weeds. Use at a rate of 0.6-2.0 L in 100-300 L of water per ha. Refer to the label for the recommended application rate for different grassy weeds. Apply to thoroughly cover grass foliage but not to run-off. Best results are achieved when applied at the correct stage of grassy weed development and when the weeds are actively growing. *Women in child-bearing age should use this product with extreme care.*

Selective Preemergent

Bonanza 400 and Rival EC (trifluralin) - To control certain annual grasses and broadleaf weeds in transplanted herbaceous perennial and woody stock. Apply and incorporate prior to transplanting ornamental plants. Apply from three weeks before planting up to the time of planting. For established woody stock, apply as a directed spray to the soil

surface. Incorporate immediately after application. Incorporate carefully, as closely as possible to the crop. Do not cause damage to the roots. See the label for information on application rates. Incorporation is an essential part of application. If the field is too wet, crusty or lumpy to permit proper incorporation of the herbicide, poor control or crop damage could occur. To incorporate, work into the soil in two different directions. The first incorporation should be done within 8 hours of application. Use a tandem disc or field cultivator for the first incorporation, set to work 8 to 10 cm deep. The second incorporation should be done anytime prior to planting in a cross direction at the same depth. Do not apply to wet soils that are subject to excessive flooding. Do not apply to soils that contain less than 1% or greater than 15% (e.g. peat and muck soils) organic matter. Do **not** use in a greenhouse.

Casoron 2G and 4G (dichlobenil) - To control annual grasses, broadleaf weeds, and certain perennials in established plantings of woody ornamentals. See label for rates and a list of crops. Apply to prepared weed-free soil either in early spring or in late fall before annual weed seeds germinate, or after cultivation has removed weeds. Early spring treatment is preferred in coastal areas. Do not apply on sandy soils or soils with less than 2-3% organic matter. Do not apply when temperatures are above 16°C. Do not use on gladiolus, certain hollies, or herbaceous perennials. Do **not** use in or near greenhouses.

Dacthal W-75 (chlorthal) – Registered for use on ornamental plantings, such as baby’s breath, forsythia, gladiolus, holly, peony, salvia, and willow. Apply at lining out, in late fall or early spring at the rate of 17 kg/ha in 340 litres of water (150 grams/100 m²). Apply to soil that has been recently cultivated to a uniform texture. Application can be made immediately following lining out of stock. For established plantings, cultivate to remove existing weeds prior to application. Weed control up to 4 months or more may be expected following proper application. The label recommends to not use Dacthal on certain ornamentals, including celosia, phlox, and snapdragon. Do **not** use in a greenhouse.

Devrinol 2-G, 10-G and 50-DF (napropamide) - To control certain annual grasses and broadleaf weeds of field and container ornamentals. See label for plant species and application rates. It does not control established weeds. It must be applied to freshly weeded soils before weeds germinate. It

needs mechanical incorporation (such as power tiller), adequate irrigation or natural moisture (rainfall or snow) for optimum results. The treatment must reach the zone of weed seed germination. If there is inadequate rainfall following application, the product should be incorporated mechanically (to a depth of 2.5 to 5 cm) or by irrigation. Sufficient water should be applied to wet the soil to a depth of 5 to 10 cm. Do not apply to soils high in organic matter. Do not apply more than once per growing season. Do **not** use in a greenhouse.

Dual II Magnum (s-metolachlor) – Registered to control nightshade, annual grasses, and redroot pigweed (suppression only) in plantings of outdoor ornamentals (woody and herbaceous). Do **not** use in a greenhouse. Apply prior to weed emergence or when weeds are young (1 to 2 leaf stage). Apply at a rate of 1.25–1.75 L/ha. To avoid plant injury, do not apply to seedbeds, cutting beds, or uprooted cuttings before transplanting. Do not apply until the soil has firmly settled around the roots of the crop. To reduce the risk of plant injury when applied over-the-top of plant foliage, irrigate following application to wash the herbicide off the foliage.

Princep Nine-T, Simazine 480, Simadex Simazine F, or Simanex (simazine) - To control certain annual and perennial broadleaf weeds and grasses in field-grown holly, peony, and rose. Do **not** use in a greenhouse. Refer to the label for application rates. Apply only to dormant stock that has been established for one year or more. Apply in the fall or in spring prior to weed emergence and bud-break. Irrigation or rainfall is required to move it into the soil. If weeds have emerged, hoe or cultivate before application. Use the low rate for sandy or low organic matter soils. Use the high rate for clay or high organic soils. Control in muck soils may be minimal due to chemical adsorption. Do not use treated areas for seedbeds for at least 12 months after treatment. If application was uneven, or if rates were in excess of those recommended, a longer period should elapse before such use. See label for a complete list of weeds controlled.