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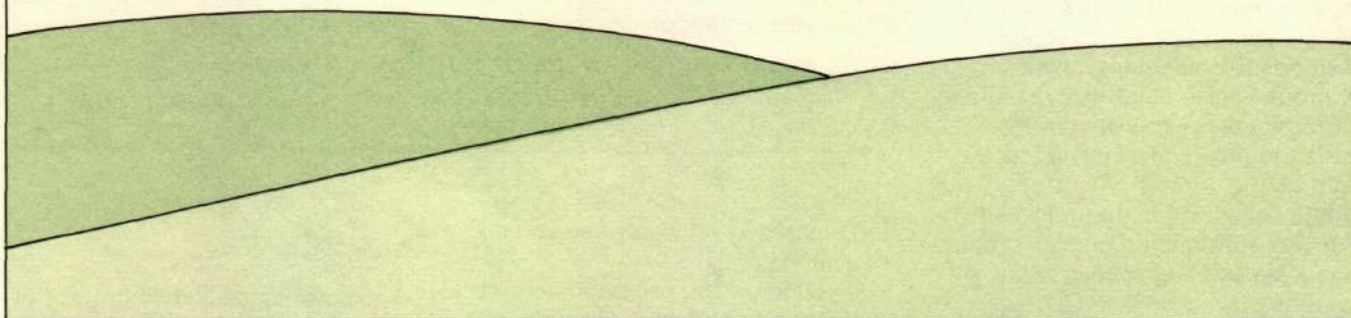
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Weed Control in Nurseries & Landscape Areas
Michigan State University Extension Service
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WEED CONTROL IN NURSERIES & LANDSCAPE AREAS



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EFFECTIVE WEED CONTROL in nurseries or landscaped areas requires timely and efficient use of biological, cultural, environmental and chemical means. Since the development of selective herbicides in the late 1940's, many growers have depended solely on chemicals. This may be a mistake. Selective herbicides should be used with caution. Too many plants have been injured by improper use of herbicides. Other means may be more effective and less costly.

Repeated use of one technique or chemical leads to development of tolerant plants or even resistant weed species. Integration of several strategies can prevent these problems. Before starting a weed control program, analyze your situation and then determine the best course of action. Use the weed control Checklist (p. 2) to identify your specific weed control program.

The goal of weed control is to reach optimum growth and survival of nursery and landscape plants. Weeds can restrict growth of trees and shrubs. They also provide habitat for rodents, and they act as host to many destructive diseases and insects.

1. Vulnerability

As outlined in the Weed Control Checklist, first consider how vulnerable the plant is to injury by various weed control measures. Vulnerability is highest at the seedling stage of both economic plants and weeds. Therefore, at that stage avoid any activity that would injure the economic plant. On the other hand, follow practices that could destroy weeds at the time of seed germination or kill them in the seedling stage. It is important to know at which stages of growth your plants are vulnerable to various weed control measures. Some plants (*Taxus* and *Arborvitae* are examples) are very sensitive to stem injury when young. They will often die if the stem is injured by hoeing or cultivating. Young plants with green stems are very susceptible to stem injury from contact herbicides, but are not affected by herbicides if the bark is brown and well developed.

2. Site

Weed control measures in nurseries are influenced by the production method. Plants in a broadcast seedbed cannot be cultivated. Fumigation is the best way to rid the soil of weed seeds prior to sowing

seeds of trees and shrubs. If the seed is sown in rows, it might be possible to cultivate or, in some situations, to kill germinating weeds by carefully flaming between the rows.

In the production of liners in nurseries, where space is greater than in seedbeds but not as great as in production blocks, it is generally economically feasible to incorporate a pre-emergence herbicide prior to planting. However, on a relatively weed-free site, this process can be skipped and the plants cultivated, hand hoed, or treated with herbicide, depending upon one or more of the other factors listed in the Checklist.

In extensive plantings on wide spacing, the best weed control is to apply a pre-emergence herbicide to weed-free soil and cultivate—or a combination of the two (herbicide in the rows and cultivation between the rows). If weeds are present, apply a post-emergence herbicide.

Another control method (e.g. in nursery shade trees) is to grow sod between the rows and cultivate or apply an herbicide in the rows. The sod allows access to the planting during wet periods and returns organic matter to the soil. The sod should not be highly aggressive. Quackgrass, for example, is a poor choice because it continually in-

vades the treatment band. Blue-grasses and ryegrasses have performed well.

Container production requires weed control both in the containers and in the container yard. Weeds in containers can be minimized by using a weed-free medium or by pasteurizing the medium prior to planting.

Control weeds in the container yard by setting the containers on a soil-free surface such as black top, crushed stone or plastic. Be sure to provide drainage for this surface. If herbicides are applied by topical methods to container-grown plants or ground cover plantings, use granular formulations followed by irrigation to insure effective weed control.

It is necessary to control weeds in the area surrounding nursery production sites and landscaped areas. All too often this area is neglected. Weed seeds blown into the nursery or landscape planting are a prime source of weeds.

3. Weed Species

The third consideration includes identification of the weed species, its vulnerability to control measures and the source of the weed problem. Too often, weed control measures, especially herbicides, result in little or no weed control or disaster to the economic plants. It is necessary to know the weed species to be controlled and the best means of controlling it without damaging the economic plants.

Annual weeds are easily controlled at or soon after germination. Therefore, you should start the control early; a delay of a few days can negate the control.

Selective herbicides are very specific as to the plants they will or will not kill; pre-emergence herbicides are of little value if applied as a post-emergence treatment. Cultivation is most effective when weed plants are small, and more difficult and often less effective on larger plants. Many perennial weeds (e.g., quackgrass) are impossible to control by cultivation; in fact, they are

Weed Control Checklist

1. *How vulnerable is the tree or shrub to injury from various control means—biological, chemical, environmental, cultural—?*
2. *What kind of planting site do you have—field or container, intensive or extensive management—?*
3. *What are your problem weeds—annual or perennial, vulnerable or resistant to controls, local or introduced sources—?*
4. *What are the features of your production environment—mineral (sandy, clay) or organic soil, wet or well-drained soil, high or low air temperature, windy or calm day—?*
5. *Which control(s) will work best for you—biological, chemical, environmental, cultural—?*

propagated vegetatively and spread by cultivation.

If you know the source of a weed problem, you can take measures to eliminate weeds from that source. Most weeds spread to the nursery or landscape from nearby sites. By controlling them in these sites, you can avoid many weed problems. Some weeds spread within an area (nursery and landscape) by equipment contaminated with seeds. Other weeds can be introduced in soil, peatmoss or plants from other sources. This problem, which is often overlooked, can become serious.

4. Environment

The fourth factor to consider is the effect of the environment—soil type, moisture, temperature and wind—on a weed control program. Many granular herbicides are most effective if they are cultivated into the soil or water-sealed into the soil or medium immediately following application. Sandy soils require less active ingredient per unit area than clay or organic soils. Do not cultivate when the ground is wet. Seldom, if ever, apply herbicides when it is windy. Herbicide effectiveness is often reduced if the temperature is below 50°F or above 85°F. Liquid applications are best applied on a calm day when the temperature is between 65 and 75°F, and when the humidity is moderate to high.

5. Controls

The advantages and limitations of the various weed control measures are the final consideration. Controls are biological, cultural, environmental and chemical.

Biological Controls

Biological measures require the use of people or animals. Hand weeding is very effective but is generally limited to small, intensive or high-value plantings since it is very costly. Geese are effective weed controllers, at least in nurseries, but they require proper management for optimum results—and they are messy.

Cultural Controls

Cultural or mechanical weed control has been successful for centuries. Hoeing is effective but expensive and is generally limited to intensive plantings. Mechanical means are used on extensive plantings but are costly since they require power equipment and an operator. They can be cost-effective if properly used.

Cultivation is best when weeds are small, and the soil is not too wet. Mechanical methods should seldom be used on weed species that grow by rhizomes (for example: quackgrass) since sectioning the rhizome is a means of propagating and spreading the plant over wide

label instructions had been followed. Remember, it is the manufacturer who warrants the product. If the material is used contrary to label instructions, the warranty is null and void.

Although herbicides can be classified in many ways, three of the most practical are: (1) emergence, (2) selectivity and (3) movement within the plant.

1. **Pre-emergence herbicides** control weeds by destroying seedlings as they germinate. Granular pre-emergence herbicides should be incorporated into the upper 2 inches of the soil or sealed in the water for best results. *Post-emergence herbicides* destroy weed growth after emergence.

2. **Selective herbicides** kill only selected species of plants but not others. (2,4-D was one of the early selective herbicides.) **Non-selective herbicides** kill all species.

3. **Translocated herbicides** move within the plant. Some are translocated following foliar application (i.e. glyphosate), others following soil application (i.e. simazine). **Non-translocated (or contact) herbicides** kill on contact and do not translocate (Paraquat).

Table 1 describes herbicides that can be used effectively to control weeds in plantings of woody species. **Read the label for details.**

Application Equipment

Many types of sprayers and spreaders are available for applying herbicides. You do not need expensive, high-gallonage, high-pressure spray equipment.

Sprayers

A weed-control sprayer should have the following features:

—**A low pressure pump**—It should be easily replaced, not subject to damage by wettable powders and have minimum capacity of 9 gallons per minute.

—**Solution agitation (stirring)**—It can be either mechanical or a bypass from the pump. If a power takeoff sprayer does not provide agitation, add a bypass to a galvanized tee between the pump and pressure gauge. To increase

Table 1-B—Post-emergence Herbicides

The following materials must be used with considerable caution around valuable plant materials. Avoid chemical contact with green tissue, including: the trunk of young trees and shrubs, basal shoots and small branchlets on the trunk since these are absorption sites for translocated herbicides.

PRODUCT	USES, CAUTIONS AND LIMITATIONS
Amitrol (<i>Amitrol-T</i>)	An excellent translocated herbicide that inhibits chlorophyll formation. Kills most perennial weeds, including poison ivy. (Union Carbide).*
Amizine	Combination of amitrol and simazine used to gain both post-emergence and pre-emergence weed control. (Union Carbide).
Dalapon (<i>Dowpon</i>)	Translocated herbicide effective in control of quackgrass, cattails and weeds in non-crop areas. Apply to actively growing weeds. Avoid applying just prior (6-8 hours) to irrigation or predicted rain, since the product needs time to be absorbed by the leaves of the weeds. (Dow Chemical Co.).
Glyphosate (<i>Roundup</i>)	Translocated herbicide useful in woody perennials. Direct spray to weed foliage, but avoid contact with stems of green or thin-barked economic plants. Apply proper concentration to avoid rapid killing of weed stem , since transport to the roots is via phloem (bark) tissue. Leaves no soil residue. Avoid multiple applications to the same crop to avoid possible injury. Accumulation in economic plants can cause chlorosis, dieback, witches-broom and death. (Monsanto).
Poast (<i>Sethoxydim</i>)	Selective, broad spectrum herbicide for control of annual and perennial grasses in a number of deciduous and evergreen nursery-grown species. Must be supplemented with an oil concentrate. Follow label instructions for concentrations, time and method of applications and species. (BASF Wyandotte).
Paraquat (Restricted Use Material)	Contact (nontranslocated) herbicide. Good for killing young, actively growing weeds; mature weeds are less likely to be killed since the chemical is not translocated. Handle with caution. Avoid contact with skin, eyes or clothing. Avoid inhaling spray drift. (Chevron).

*Company names in parentheses.

Suggested Chemical Weed Control Programs for Landscape Areas

Woody Ornamental Plants (evergreen and deciduous trees and shrubs).

A good control measure is a 3 to 4 inch mulch of bark, wood chips, etc. Many pre-emergence herbicides listed in Table 1 can also be used. **CAUTION:** Read the label and follow the directions. Avoid using on hillside plantings where herbicide may wash into turf areas on waterways.

Ground Covers

The following herbicides have limited registration for weed control in ground covers: Betasan, Dacthal, Devrinol, Enide, Eptam, Ronstar, Surflan, and Treflan. Check the label for details.

(Continued on page 5)

Suggested Chemical Weed Control Programs for Nurseries

FIELD PRODUCTION

Weeds	Suggested Control
<i>Summer Annual Weeds</i> —Barnyard grass, crabgrass, fall panicum, foxtails, lambs quarters, pigweed, purslane	<i>Pre-emergence herbicides</i> —Dacthal, Enide, Lasso, Princep, Ronstar, Surflan
<i>Perennial Weeds</i> —Bindweed, dandelion, dock quackgrass, mugwort, nutsedge	<i>Fall application:</i> Casoron or Kerb <i>Directed spray:</i> Roundup, Amitrol
<i>Winter Annual Weeds</i> —Annual bluegrass, chickweed, pennycress	<i>Herbicides:</i> Betasan, Casoron, Chloro IPC (Furloe), Devrinol or Princep

CONTAINER PRODUCTION

Preplant

- Pasteurization: 160-180°F for 30 minutes
- Fumigation: methyl bromide
- Herbicide: Treflan

Postplant

- Spring and summer: Dacthal, Devrinol, Enide, Lasso II, Princep or Ronstar
- Fall: Chloro 1pc. Devrinol, Princep

Slow-release formulations

Herbicides in granular or tablet formulation are easier to apply to container-grown nursery stock than are liquid formulations. For best results, use pre-emergence herbicides applied to a weed-free container medium and irrigate immediately following application.

agitation in the tank, place an agitator nozzle on the end of the overflow hose. In this case, a separate valve on the bypass line will regulate pressure. If the pump does not have enough capacity for agitation under specific spraying conditions, provide it by using both the next lower tractor gear and nozzle tips with a smaller orifice.

- 50-mesh screens for suction line and nozzles**—Wettable powders will not go through the 100-mesh screens, which are sometimes provided.
- A spray boom**—It should have nozzles adjustable for distance between nozzles on the boom and for height above the ground. This is especially important for band spraying.
- A pressure gauge**—It should measure pressure accurately up to 100 pounds per square inch.

- Flat fan nozzles**—The best nozzle size for general use is equivalent to an 8004 Teejet. For most work, a wide-angle nozzle—73 or 80 degrees—is best because the boom can be held close to the ground to reduce drift. This is most important when it is windy.

Sprayer Calibration

One of the most important factors in effective weed spraying is accurate calibration—determining the amount of spray material applied per acre. A range of 20 to 60 gallons per acre, at a pressure of 20 to 60 pounds per square inch is satisfactory.

Adjust the boom height so that the spray overlaps about a third of the spray pattern. For overall spraying, using 80-degree nozzles, this places the nozzles about 18 to 20 inches apart on the boom and 18 to 20 inches from the sprayed surface.

A Good Way to Calibrate a Sprayer:

- First check equipment for proper mounting, functioning of pump(s) and nozzle(s).
- Replace worn or defective equipment.
- Use only bristle brushes and wood match sticks or tooth picks to clean out plugged nozzles.
- Check the discharge of each nozzle for uniform pattern and quantity of discharge.
- Thoroughly rinse and test equipment prior to calibrating the sprayer.
- Fill the spray tank with water only.
- Spray a measured area, in a field if possible, at a fixed tractor speed and pressure gauge setting. Be sure to allow for partial coverage if bands are used.
- Measure the amount of water needed to refill the tank. Divide this amount by the fraction of an acre sprayed to get the gallons applied per acre.
- Mix the amount of chemical desired per acre with water to give this much spray material. **For example:** If 10 gallons were applied on one-fourth acre, the volume of spray material applied would be 40 gallons per acre. If you change the tractor speed or gear, pressure setting, nozzle size, or number of nozzles, the amount of liquid applied per acre will be different, and recalibration will be necessary.

Band Application in Row Crops

Since weeds in the crop row are usually the hardest to control, it may cost only 50 percent as much to spray herbicides in a band over the row rather than to cover the whole area.

For band applications, adjust for the area actually sprayed and not for the total acres in the field. For example: Suppose the recommendation for a chemical is 4 pounds per acre, and 12-inch strips are sprayed over 36-inch rows. Only one-third of the ground area will be covered with spray material, so only 1 1/3 pounds of chemical (one-third of 4 pounds) will be required per acre. Four pounds of

areas. Mechanical cultivation can injure stems of trees and shrubs if the operator is careless in using the hoe or operating certain types of equipment.

Environmental Controls

Weeds can be controlled environmentally by manipulating light and temperature. Mulching the soil or medium around woody plants effectively reduces weed growth, since it restricts light and imposes a physical barrier to the germinating weed seedling. Bark, wood chips, ground corn cobs, rice hulls, stone, plastic, and similar materials can be used. However, use mulches with caution on clay sites and in areas subject to frequent irrigation (e.g., planting beds adjacent to irrigated turf).

The mulch (especially plastic) restricts evaporation of water from the soil, which in turn can result in excess moisture and too little oxygen in the root zone. If the condition persists, it can result in the decline, if not death, of valuable trees and shrubs. It is seldom desirable to use plastic barrier mulch on clay soils.

High temperature obtained by controlled burning from various burning devices can be used to kill weeds and destroy weed seeds. It can be used effectively within and around the perimeter of nurseries, especially container production nurseries.

Pasteurization of soil and potting media can also effectively reduce weed problems. Soil or media heated to 160°F (82°C) for about 30 minutes will destroy most weed seed. Pasteurized media are used primarily in the production of container-grown plants.

Chemical Controls

If used properly, herbicides can effectively control weeds in nurseries and landscape plantings. If improperly used (the wrong chemical, repeated use of one chemical, errors in calculation or application, improper timing, drift and carelessness) herbicides can produce devastating and costly results.

Always read the label and follow label instructions. Many herbicide disasters could have been avoided if

Table 1-A—Pre-emergence Herbicides

PRODUCT	USES, CAUTIONS AND LIMITATIONS
Casoron (<i>Dichlobenil</i>)	Controls most annual and perennial grasses and broadleaved weeds. Good control of bindweed, thistle and quackgrass. Soil-incorporate in spring or fall. Avoid on sensitive species: fir, hemlock, spruce. (Thompson-Hayward).*
Dacthal (<i>DCPA</i>)	Can be used in plantings of most woody perennials, including ground cover plants. Provides weed control for about 6 to 8 weeks. Does not control ragweed, smartweed, velvet leaf and wild mustard. (S.D.S. Bio Tech Corp).
Devrinol (<i>Napropamide</i>)	Controls annual grasses and broadleaved weeds including chickweed and groundsel. Soil-incorporate or water seal for best results. (Stauffer).
Dual 8E (<i>Metolachlor</i>)	Selective pre-emergence herbicide that controls a number of broadleaved weeds. Can be used as pre-plant treatment. Chemical must be soil-incorporated for best results. (Ciba-Geigy).
Enide 90W (<i>Diphenamid</i>)	Selective pre-emergence herbicide that controls most annual grasses and many broadleaved weeds. Soil-incorporate by water in cultivation for best results. (UpJohn).
Furloe Chloro-IPC (<i>Chlorpropham</i>)	Control chickweed and other winter annual weeds. Apply when economic plants are dormant. (PPG Industries).
Kerb (<i>Pronamide</i>)	Controls perennial grasses and winter weeds, including chickweed. Best applied in the fall. DO NOT use on organic soils, boxwood and myrtle or near turf-grass. (Rohm & Haas).
Goal 2E (<i>Oxyfluorfen</i>)	Selective pre- and post-emergence herbicide that gives a wide spectrum control of broadleaved weeds and grasses. Cleared for use on conifer seedbeds prior to seed germination. (Rohm & Haas).
Ornamental Herbicide 2	Granular herbicide. Combination of oxyfluorfen and pendimethalin which gives broad spectrum control of many weeds, both container and field-grown. Do not use in closed structures (polyhouses, etc.) (Scotts).
Lasso (<i>Alchlor</i>)	Controls annual grasses and a number of broadleaved weeds, including purslane. Wash foliage of economic crops immediately following topical application to avoid injury. (Monsanto).
Princep (<i>Simazine</i>)	Broad spectrum weed control in nurseries; use with caution in landscape planting. Euonymus and lilac are sensitive. NOT effective against bindweed; controls oxalis. (Ciba-Geigy).
Surflan (<i>Oryzalin</i>)	Good control of grasses, chickweed, lambsquarters, pigweed and purslane. Does not require soil incorporation but water is necessary to trigger herbicide activity. (Elanco).
Ronstar (<i>Oxadiazon</i>)	Broad spectrum weed control in a wide range of trees, shrubs and ground covers in the field or in containers. For best results, seal-in with water following application. (Rhone-Poulenc).
Treflan (<i>Trifluralin</i>)	Best used as a pre-plant treatment, incorporate into the soil. One of the safest materials for use in nursery and landscape planting. (Elanco).

* Company names in parentheses

chemical will then cover 3 acres of the crop.

To adjust the sprayer for band application, place the boom so that there is one nozzle over each row, and plug the nozzles between rows. This is not always easy with standard booms, but you can buy adjustable booms, adapters, or use an off-set 45° nozzle for use with taller plant materials.

Cleaning Herbicide Sprayers

Keep weed control sprayers clean, especially if you use them to spray more than one crop or to apply fungicides and insecticides.

Do not use a sprayer to apply insecticides or fungicides if the sprayer has contained 2,4-D type herbicides.

When cleaning, thoroughly rinse the whole sprayer with water, inside and out, including boom, hoses and nozzles, both before and after cleaning. Partially fill the sprayer with water before you add the cleaning agent. Keep the pump running so that the cleaning solution will circulate throughout the sprayer. Do not leave corrosive cleaning agents in the tank or spray system more than 2 hours.

When you are using only pre-emergence sprays, a good rinsing with water is enough. For other spraying purposes, remove weed-killers from sprayers by adding 1 gallon of household ammonia or 5 pounds of sal soda to 100 gallons of water. Allow this solution to stand in the sprayer for at least 2 hours. Drain it out through the boom and nozzles, and rinse the sprayer with water. Do not let spray solutions stand in the tank overnight. Do not allow solutions to run into streams or other water sources.

Granular Spreaders

Granular herbicides are applied with some form of spreader, which must be calibrated for accurate application of herbicides. Some spreaders are adjustable for rate of delivery, others are not; it is best to utilize adjustable spreaders.

After setting the delivery mode, fill the bin with a known weight of the herbicide and apply the material to a measured area, for example, 440 square feet (1/100 of an acre). Re-weigh the remaining herbicide; the difference in weight \times 100 will equal the rate being applied per acre. Adjust the delivery mode as needed to increase or decrease the rate, and recalibrate. Repeat as necessary until the proper rate of application is attained.

For example: You wish to apply Devrinol 2-G at a rate of 5 pounds per 1,000 square feet (220 pounds per acre) to a group of 1-gallon container-grown junipers that occupy an area of 20,000 square feet. You need to apply 100 pounds of the product to the area. If the bin of the spreader has a capacity of 25 pounds, you will need to apply that amount to 5,000 square feet or 2½ pounds to a 500 square feet test application area. If the spreader is not delivering close to this rate, you will have to adjust the delivery mode.



Caution

As the name implies, herbicides are plant killers (*herb* = plant; *cide* = killer). Used properly, they are an excellent tool. Used improperly, they

can seriously injure or kill economic plants as well as weeds. Some herbicides, like paraquat, are toxic to animals and are available only for restricted use. In all cases, the objective of the weed control program will determine which method is best for effective, efficient control of weeds with minimum damage to the economic plants.

Always follow the label instructions; know and understand the limitations imposed by the manufacturers. Any stated warranty is null and void if the product is improperly applied. Also be sure to calibrate all sprayers and spreaders to insure uniform distribution of herbicides. Avoid applying on windy days, and be aware of any terrain (slopes) or biological limitations of the product.

Extension Publications

Weed Identification

- Weeds of the North Central States NCR—281. \$2.50**
- Problem Perennial Weeds in Michigan E-791. \$1.00
- Annual Broadleaf Weed Seedling Identification NCR-90. \$0.20
- Annual Grass and Perennial Weed Seedlings NCR-91. \$0.20
- Annual Grass and Perennial Weed Identification NCR-92. \$0.20

Herbicide Injury

- Diagnosis and Prevention of Herbicide Injury E-809. \$1.30

*Available from County Extension office or Bulletin Office, P.O. Box 231, East Lansing, MI 48823-0231

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