



Home Lawn, Landscape and Garden
Weed Management

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MASTER GARDENER CORE COURSE

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HOME LAWN, LANDSCAPE AND GARDEN WEED MANAGEMENT

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WEED MANAGEMENT

It has been stated many times that a healthy, vigorous lawn is the best defense against weed invasion. Indeed, weakened lawns and bare areas in the lawn are the most common reasons for increased weed presence. Knowing and understanding a lawn's weaknesses is the first step to managing the encroachment of weeds into the lawn. Weakened and bare areas can be caused by many reasons. Some of the more common ones are listed below:

- Grass species and/or varieties not adapted to the particular site conditions or imposed maintenance program.
- Damage caused by animals, diseases, insects or people.
- Damage due to environmental stresses such as drought, shade, heat, cold, and poor drainage.
- Misuse of fertilizers and pesticides.
- Improper mowing height and/or frequency.
- Overuse of the lawn area resulting in severely compacted and poorly aerated soils.

It is important to determine the reasons behind increased weed encroachment into the lawn before reaching for a herbicide to kill the weeds. Killing the weeds without correcting the problem only invites continued and often increased weed problems. Sustainable lawn care practices revolve around good cultural practices that promote plant health. This helps create a vigorous lawn able to prevent any serious weed problems from becoming established.

In addition to having a working knowledge of sustainable lawn care practices and how they relate to weed management, it is good to know something about the weeds that may potentially invade a lawn. This becomes important when determining whether or not control measures are needed and when they need to be carried out. It is also important in determining the most appropriate herbicide product to use, should one be needed. Following is general information about the growth and habits of potential lawn weeds.

Weed Identification and Characteristics

Lawn weeds may be conveniently divided into two classes based on the way in which they emerge from the seed. Monocots emerge with a single seed leaf whereas dicots emerge with two seed leaves. Most monocot weeds found in lawns are termed weedy grasses. Examples include crabgrass, annual bluegrass, tall fescue, and quackgrass. Dicots, on the other hand, are broadleaf weeds and include such plants as dandelion, clover, ground ivy (creeping Charlie), knotweed, and plantain.

Grassy and broadleaf weeds are further divided into groups according to how long they live. Perennial weeds have a life of more than two years, though new seeds may be produced every year. Biennial weeds have a life span of two years, generally storing up food reserves in the leaves and roots the first year and producing flowers and seed the second. Annual weeds germinate from seed, grow, flower, and produce seed in less than one year. Summer annuals germinate in the spring and mature in the fall, whereas winter annuals germinate in fall or late winter and mature in late spring.

Effective control of weeds in turfgrass is based on correct identification. Many books and charts are available to help identify common lawn weeds. For additional help in weed identification you can visit “Is this plant a weed?” at www.extension.umn.edu/gardeninfo/weedid or contact your local county extension office. There are also a number of weed publications listed at the end of this section.

Methods of Weed Control

The most effective method of controlling lawn weeds is to maintain a dense and vigorously growing turfgrass cover. Weeds are often an indication of problems in the grass plant environment. Killing the weeds without correcting the underlying problem will lead to unsatisfactory results. For example, a problem with knotweed is usually an indication of increasing soil compaction. Control of knotweed without correcting the soil compaction will only lead to sparse grass cover until the area is again invaded by weeds that grow in compacted soil.

Often, turfgrass weeds can be controlled simply by altering the cultural practices to favor the grass plants rather than the weeds. Cultural controls may include raising (or lowering) the mowing height, changing the frequency of mowing, lengthening (or shortening) the period between irrigations, increasing (or decreasing) the application of fertilizer, or aerifying the soil.

Hand weeding or pulling weeds is also an effective way to eradicate weeds from small lawn areas. The best time to pull weeds is after a good rain or thorough irrigation. This control is very economical (but labor intensive). It avoids needlessly applying herbicides over the whole lawn for only a few weeds. There are several tools on the market that will aid in hand pulling weeds.

Chemical control

A combination of proper cultural practices plus prudent use of herbicides is sometimes necessary to control weeds effectively in turfgrass. **When herbicides are used, container labels must ALWAYS be read and carefully followed.** It is a violation of federal law to use them in any way that is inconsistent with the product label including the wearing of personal protective equipment when applying the product.

The first step in using any pesticide product responsibly, including herbicides, is to follow the label directions exactly as stated on the product container. The label provides necessary information regarding proper product application and container disposal procedures. Labels are legal documents which are enforceable by law should the product be used in a manner inconsistent with its label directions.

Herbicides are subject to a number of different fates once they are applied to a turfgrass area. Some of them may be broken down by sunlight, the action of soil microbes, chemical action, or a combination of these processes. Others may volatilize back to the atmosphere, be absorbed by the plants, or stick tightly to soil particles limiting further movement in the soil. Herbicides may be subject to several of these different processes but some may be more important than others. Break-down processes and plant absorption are particularly important because they account for removal of pesticides from the environment.

Types of herbicides

Preemergence herbicides affect germinating seeds. To be effective, the herbicide must be applied two weeks before you expect weed seeds to germinate. Consequently, preemergence herbicides are most effective against annual weeds. To control summer annuals such as crabgrass, apply preemergence herbicides between May 1 and May 15 in a typical year or once surface soil temperatures are consistently in the 55-60° F range. Depending on where you are located in the state, these dates may need to be adjusted earlier or later to be most effective.

Postemergence herbicides are used to kill weeds after the weed plants are up and growing. To be effective, most postemergence herbicides must be absorbed through the leaves. Postemergence herbicides are most

effective if applied when weeds are young and growing vigorously, or in the fall when perennial weeds are storing food in their roots for the next year.

Selective postemergence broadleaf herbicides are usually used to control annual, biennial, and perennial weeds because they will kill many broadleaf plants without damaging grass plants. These herbicides can severely damage or kill trees, shrubs, flowers, and vegetables; thus, they must be used with great care around these plants.

Postemergence broadleaf herbicides may be applied any time the weeds are actively growing, but most effective control is obtained when applied in early fall (September 15 to October 15) or in spring (late April to early June). Fall is preferred over spring due to the food storage process of plants and the reduced possibility of damage to flowers and other vegetation. Postemergence broadleaf herbicides should be applied when the air temperature is 60-80° F, when there is little to no wind, and when there is no rain in the forecast for 48 hours. For some weeds, repeated applications at 10 to 20 day intervals may be required for control. Table 1 shows the approximate timing of preemergence and postemergence herbicide application. Again, always follow specific application directions on the weed control container.

Table 1. Timing of pre-emergence and post-emergence herbicide application

	APR	MAY	JUN	JUL	AUG	SEP		
BARNYARD GRASS		•••••	•	—————				
CRABGRASS		•••••	•••••	—————				
FOXTAIL		•••••	•••••	—————				
GOOSEGRASS			•••••	•	—————			
SANDBUR		•••••	•	—————				
••••• Optimal time for pre-emergence control			————— Optimal time for post-emergence control					
— — — — — Active growth period								

In the case of postemergent broadleaf herbicides, it is usually unnecessary to thoroughly drench an area with the herbicide solution to achieve satisfactory weed control. This may be wasteful of both water and herbicide and moves the herbicide beyond the plants and into the soil where it may be more prone to leaching or affect non-target plants. Spraying only to wet the foliage is usually sufficient to be effective.

Where only a few scattered weeds exist, or where weeds are confined to small areas, hand removing or “spot” treating with an herbicide may be the most appropriate control measure. You may need to apply preemergent herbicide only in those areas where crabgrass was found last year. These might include areas bordering sidewalks, driveways, or curbs. Crabgrass may not be a problem in the remaining lawn area where it is cooler and the other lawn grasses are more competitive.

It is also important to remember that an occasional weed is not uncommon in lawns. Hand removal and tolerance of a few “weedy” plants, while maintaining an otherwise healthy lawn can significantly reduce weed

control inputs. Nonselective postemergence herbicides kill most green plants, both desirable and undesirable. These herbicides are used to control perennial grassy weeds that are not affected by selective broadleaf herbicides. Spot treat infested areas using only enough product to wet the foliage. It is not necessary to thoroughly drench the area for satisfactory control.

Herbicide selection

The following postemergence herbicides provide good to excellent control of most common broadleaf lawn weeds when used according to label directions. Note that repeat applications may be required to achieve the level of control desired. Early fall is the best time to apply these materials for control of winter annuals and perennials. Spring is the best time for summer annuals. Best results occur when the plants are actively growing and not under heat or drought stress. It is often beneficial to water thoroughly a day or two before applying these products to make sure the plants are actively growing.

A. 2,4D; MCPP; MCPA; 2,4-DP; dicamba. Two or three of these are often mixed together to make what is termed a two-way or three-way product. *Trimec* is a very common three-way product containing 2,4-D, MCPP and dicamba.

Dicamba is potentially dangerous to trees and shrubs because it can move in the soil and be taken up by tree and shrub roots. Therefore, use extreme caution when applying any herbicide mixtures containing dicamba near root systems of trees, shrubs and other landscape plantings. Also, avoid application where mulches have been used around trees and shrubs. The tiny feeder roots will be actively growing into the mulch and can readily take up dicamba and/or be directly killed by the herbicide. Compacted soils where there is extensive shallow root growth of trees as well as grass, is another area where unintended injury from the use of dicamba can result to trees, shrubs and other landscape plantings.

B. Triclopyr in combination with any of the above or triclopyr by itself. This product has good activity on some of the more difficult weeds such as wild violets, creeping Charlie, white clover, oxalis (yellow woodsorrel) and chickweed. Fluroxypyr is a similar product with similar effectiveness but not yet available in homeowner formulations.

C. Carfentrazone or sulfentrazone combined with one or more of the ingredients in group A above. These new products are often added to these other ingredients providing quicker effectiveness; currently their availability is limited in the homeowner market.

D. Quinclorac either by itself or in combination with products mentioned in group A. Quinclorac is a postemergence product particularly effective on crabgrass and other warm season annual grasses as well as some broadleaf weeds. It is most effective on smaller crabgrass plants or those nearing maturity. In the homeowner market it is only found in combination with products from group A.

The following preemergence herbicides provide good to excellent control of annual weedy lawn grasses and some annual broadleaf weeds. In general, these materials should be applied a couple of weeks prior to expected germination of annual weed seeds. Reseeding can follow siduron applications immediately while reseeding must be avoided for 2 to 3 months with all of the other products mentioned. **Usually the product label will provide information on how soon grass seeding can occur after application of the product.**

A. Because of their relatively consistent performance, the herbicides benefin, benefin + trifluralin (trade name 'Team'), pendimethalin, prodiamine have been the mainstay of home lawn preemergence herbicides for many years. They are available under many different trade names.

B. Other commonly available preemergence herbicides for home lawns include bensulide (trade name Betasan), dithiopyr (trade name Dimension) and siduron (trade name Tupersan).

C. A recent addition to the preemergent herbicide market is the natural organic material known as corn gluten meal (cgm). Researchers at Iowa State University determined that this material did have some preemergence herbicide properties on warm season annual grasses such as crabgrass.

CGM is a by-product of the corn processing industry containing 10% nitrogen. Therefore, its use is much like an organic weed and feed product. While its control is usually not at the level of many of those mentioned above, at least initially, it is one of the only known organic materials to have relatively good preemergence weed control properties. It is gradually becoming more available through retail garden product outlets. This material should not be used at the time of seeding as it will injure desirable grass seeds equally as well as weed seeds.

Postemergent herbicides are usually not recommended for annual grasses because they're only effective when plants are very small. Typically these weeds are too large for good control by the time they're obvious in the lawn. If there are only a few grassy annual weeds they may be pulled when the soil is moist. Dithiopyr also has some postemergence activity against very small, newly emerged grass seedlings. This can provide some additional control for plants that may have already emerged just before a preemergent herbicide was applied.

Perennial weedy grasses such as creeping bentgrass, quackgrass, brome grass or tall fescue are frequently found in home lawns. Since these grasses are biologically similar to the lawn grasses, there is no way to selectively remove them from the lawn without also killing the desirable grasses. When it is desirable to control these weeds regardless of whether the other lawn grasses are killed, one must use a non-selective herbicide such as glyphosate (trade names include Round-up or Kleenup) or glufosinate-ammonium (trade name Finale). Treat only the weedy areas to minimize the amount of other grasses killed by the application. These materials are usually most effective with air temperatures between 50 degrees F to 80 degrees F, little to no wind, and weeds are actively growing. With either of these two materials, reseeding or resodding can usually be done within a week or two after application as neither product leaves a soil residue to interfere with new seed or sod establishment. For specific requirements regarding length of time to wait, always consult the product label.

The information given in the article listed below is for educational purposes only. References to commercial products or trade names are made with the understanding that no discrimination is intended and no endorsement by the University of Minnesota Extension is implied. Pesticide products should always be used in accordance with all label directions.

Pesticide label directions can and do change over time. Therefore, when a pesticide product is purchased, it is the responsibility of the user to read and follow label directions exactly as printed. Any use inconsistent with its label is a violation of Federal law.

A list of herbicide products available to homeowners can be found in Extension article:
***Review and Update of Lawn and Landscape Weed Control
Products Available to Homeowners – 2008****

www.extension.umn.edu/.../YGLNews/images2/May152008/homeownerherbicideupdate_textREV2008.pdf

* Article is also at the end of this manual

Application timing

To minimize adverse environmental impacts while effectively eliminating weeds, proper timing of herbicide application is crucial. When weeds are quite large and mature, greater amounts of herbicide are usually needed and may not be effective. For example, it is relatively easy to control small, first-year dandelion rosettes with a minimal amount of herbicide. Larger, older dandelion plants have a greater capability to outgrow, and hence recover from small doses of herbicides. Where appropriate, small dandelion rosettes can be effectively hand removed and eliminated if most of the root system is removed.

Fall is the best time to control perennial broadleaf weeds. At this time of year (mid-September through mid-October), these plants are storing carbohydrates for winter, are actively growing, and will readily take up the herbicide. Often, a one-time, application of an appropriate herbicide will be effective. Since much of the other landscape plant material is either going dormant for the winter or has been removed from the garden and flower beds, there is less chance for off-target plant injury. However, that does not give one license to be careless.

Post-application irrigation

Preemergent herbicides, typically used for controlling crabgrass and other annual weedy plants, must be watered into the soil to be effective. They affect the seed as it begins to germinate, before the plant emerges from the ground. Depending on the soil type, 1/4 to 1/2 inch of moisture should be applied following application of these products. This not only puts the product where it will be the most effective, but moves the material far enough into the soil so it will not be carried away in run-off. Do not water for several days or as specified on product label after postemergence applications. It may wash the herbicide off the weeds usually reducing its effectiveness.

Remember after weed problems have been reduced, proper lawn care practices will encourage vigorous, healthy grass plants, making future herbicide applications minimal or even unnecessary.

Managing Weeds in Home Fruit and Vegetable Gardens

Whether growing fruits and vegetables on 400 square feet or 40,000 square feet the importance of weed control is the same, weeds need to be controlled. Weeds compete with desired plants for available soil moisture, sunlight, space, and plant nutrients. Weeds may also serve as an alternate host for insect pests. For example, weeds in the nightshade family serve as a host for Colorado potato beetle (5). In addition to insects, some weeds also serve as an alternate host for certain diseases. For example, pigweed is a host for Verticillium wilt of tomato (8). Besides potentially being alternative hosts for insects and diseases, weeds can also decrease air circulation around fruits and vegetables creating a humid environment conducive for disease development. Weeds prevent dusts and sprays used for pest control to thoroughly cover desired plants, thus resulting in poor pest control. When sufficient in quantities, weeds will reduce quality and yield of fruits and vegetables while making harvest difficult. Last, but certainly not least, a weedy garden is an unattractive garden.

Managing weeds before planting

Weeds can be effectively managed prior to planting any fruits or vegetables by using a combination of cultural controls such as garden location, tilling, and soil solarization. In some instances the use of herbicides may be warranted. If possible, gardens should be located in an area free of perennial weeds. Tilling used in seed bed preparation is very effective at controlling annual weeds but generally does little to control perennial weeds (2). Perennial weeds such as quackgrass and Canada thistle will increase in number when they are tilled (both have rhizomes that when broken can grow into new plants), therefore the use of an herbicide to control such weeds is generally warranted. If perennial weeds, such as the ones listed above, are present in the garden apply a non-selective herbicide such as glyphosate over the entire area. If perennial weeds are

located only in isolated patches the non-selective herbicide may be applied to those areas only. Check the product label to determine the length of time needed from spraying until the area can be tilled and planted. Gardens containing only annual weeds can be tilled for seed bed preparation to effectively control the emerged annual weeds. It is important to note however, weed seeds still in the soil will need to be controlled once they germinate and emerge. If a garden area is known to be heavily infested with weed seed, a control option known as soil solarization may be useful. Solarization is the use of clear polyethylene plastic sheeting (two to six mils thick) to capture the radiant energy of the sun, thereby raising the soil temperature to levels lethal to many weed seeds (6). This is implemented during a summer fallow period and the plastic is left in place for several weeks. Generally this will eliminate weed seeds in the top two or three inches of the soil (6). It is important that the soil not be tilled deeper than one to two inches after solarization or viable weed seed may be brought to the surface.

Tilling is an effective way to control emerged annual weeds. It is important to note that tilling may bring additional weed seed to the soil surface. Once these seeds germinate and emerge they will need to be controlled. If a garden is known to be heavily infested with weed seed, a control option known as soil solarization may be useful. Soil solarization is the use of clear polyethylene plastic sheeting (two to six mils thick) laid over the soil surface to capture the radiant energy of the sun, thereby raising the soil temperature to levels lethal to many weed seeds (6). This is implemented during a summer fallow period and the plastic is left in place for several weeks. Generally this will eliminate weed seeds in the top two or three inches of soil (6). It is important that the soil not be tilled deeper than one or two inches after solarization or viable weed seed may be brought to the surface.

Another option, less time consuming than soil solarization, would be to use a preemergent herbicide. Preemergence herbicides are applied to weed free soil and incorporated by light tillage and/or rainfall (sprinkler irrigation). Some preemergence herbicides may be applied before seeding plants, after seeding but before plants emerge, after plants have emerged, or after plants are established. Before selecting any herbicide make sure to read the label to find out what crops it can be used on, when, and how it should be applied. The most common preemergence herbicides available to the home gardener are trifluralin and corn gluten meal. Corn gluten meal is a natural organic and is a by-product of the corn processing industry.

Once the garden is ready to plant, follow the recommended guidelines for appropriate planting time and spacing for vegetable and fruit plants. Doing so will help ensure quick canopy closure which will aid in reducing weed emergence. It is important to note that every effort should be made to remove all existing weeds prior to planting.

Weed control after planting

Once fruits and vegetables have been planted weeds can be effectively managed by using a combination of cultural controls such as mulching, tilling, hoeing, and hand pulling. In some instances the use of herbicides may be warranted. One of the best ways to suppress the growth of weeds in the garden is to apply a layer of mulch, either organic or inorganic, around fruit and vegetable plants. Mulching, if done correctly, will suppress weed emergence by preventing light from reaching the soil surface, which is needed by the germinating weed seedlings. Mulch also provides a barrier that weeds must grow through; emerged weeds are generally easy to pull because their roots are closer to the soil surface. Mulching also slows evaporation of soil moisture, eliminates root damage from deep cultivation, prevents soil from splashing onto plant foliage improving cleanliness of both foliage and fruit, and minimizes the severity of some diseases while influencing soil temperature by providing a warming or cooling effect.

As mentioned earlier, there are two forms of mulch, organic and inorganic. All organic mulch decomposes overtime adding nutrients and organic matter back into the soil as well as improving soil structure. As organic mulch decomposes, some of the soil nitrogen in contact with the mulch will be tied up by soil microorganisms as they slowly decompose the mulch; once decomposition is done the nutrients are released into the soil where plant roots can absorb them. If enough nitrogen is tied up by this process nitrogen deficiency may be noticeable. Plants deficient in nitrogen generally have yellowing of the lower leaves. Nitrogen deficiency can be easily corrected by adding additional nitrogen to the affected plants.

There are several kinds of organic mulch available to the homeowner, some more readily available than others. Some types of mulch break down in one growing season such as leaves, straw, hay, and compost (fully and partially decomposed). Other organic mulch may persist for more than one growing season such as wood chips, shredded bark, and pine needles. Organic mulch that breaks down in one growing season is generally used in vegetable gardens. While organic mulch that persists for more than one growing season is generally used around perennial plants such as rhubarb, asparagus, and raspberries since longer lasting mulch is desired. If wood chips or shredded bark is used around annual vegetable plants it should be removed by raking before the soil is tilled since neither will break down in a single season and will tie up soil nitrogen the following year until sufficiently decomposed.

Organic mulch is generally applied to the surface of the soil to a depth of three to four inches. Some types of mulch such as straw and leaves break down relatively fast and need to be added to throughout the growing season to maintain a three to four inch layer. Since organic mulch acts like insulation by keeping soils cool, it should be applied around warm season crops after soils have sufficiently warmed. Organic mulch applied before this will delay soil warming which may have a negative impact on the growth of warm season crops. Organic mulch may be applied earlier around cool season vegetables such as radish, chard and broccoli. Mulch may be applied to fruits such as raspberries immediately after planting. Always try to remove all the existing weeds prior to applying mulch.

In addition to organic mulch, homeowners may also consider using synthetic. The most common synthetic mulch is polyethylene plastic film, also known as plastic mulch film. Plastic mulch film is available in a wide variety of colors such as black, clear (transparent), blue, red, white, olive green, yellow, brown, and reflective aluminum. Not all colors may be readily available for home gardeners. Plastic mulch film has the ability to reflect, absorb, and transmit light (3). Clear plastic mulch film has the highest soil warming capacity, but does not inhibit weed growth because it allows visible light to penetrate. Clear plastic will generally warm the soil during the daytime, 8 – 14°F higher compared to bare soil at a depth of two inches (4). Black plastic mulch film will prevent weed growth, but does not warm the soil as well as clear plastic. Black plastic generally warms the soil 5°F higher during the daytime compared to bare soil at a depth of two inches (4). White plastic mulch film can reduce soil temperatures by about a 0.5°F compared to bare soil at a two inch depth (1). Another kind of plastic mulch film known as Infra-Red Transmitting (IRT) mulch warms the soil intermediate to clear and black plastic. IRT plastic mulch film is pigmented to reduce amount of visible light transmitted, therefore, weed growth beneath plastic is reduced (1).

In addition to warming or cooling the soil, plastic mulch film also changes the quality of light reflected into the plant canopy. Research has shown that the color of plastic mulch film can influence plant growth, development, and yield. For example, some research has shown that growing tomatoes using red plastic mulch film will increase fruit yield (3).

Plastic mulch film should be applied as soon as possible in the spring especially if soil warming is a priority. To ensure good plastic to soil contact be sure the seed bed is as smooth as possible with a slight crown in the middle. Lay plastic mulch film over moist soil, preferably during the warmest part of the day. Secure all the edges of the plastic by digging a three to six inch trench around the perimeter of the bed and place the edges of the plastic in the trench and bury. By laying plastic mulch film during the warmest part of the day it will tighten as it cools pulling the plastic tighter against the surface of the soil. Cut slits or holes in the plastic for seeding or transplanting. Best results are achieved when plastic mulch film is used with a drip irrigation system installed below the plastic. If drip irrigation is not used be sure to monitor soil moisture closely since plastic does not allow water to penetrate. If water is needed it should be applied through the seeding or transplanting hole that was cut in the plastic. One disadvantage of plastic mulch film is that it needs to be removed at the end of the season and discarded. In some instances, plastic mulch film may be reused

the following season if it is removed in a careful manner. If removal is not desired there are types of plastic mulch film that are biodegradable.

Inevitably some weeds will come up through organic mulch or through the planting hole in the case of inorganic mulch. Also, if mulch is only applied to the planting row, weeds will need to be controlled between rows. These weeds can be controlled by hand pulling, hoeing, or tilling. To be successful, these practices need to start when weeds are young, preferable when they are around the two leaf to four leaf stage. Weeds that are growing near fruits and vegetables need to be removed with caution. If hoeing or tilling is to be used, avoid digging deeper than two inches since most of the roots of fruit and vegetable plants grow near the soil surface and would be harmed by such deep tillage.

It is very important that all weeds be removed throughout the growing season. Doing so will prevent weeds from producing seed, thus eliminating future weed problems. Some weed species are capable of producing thousands of seed, for example redroot pigweed can produce 10,000 – 30,000 seeds per plant when competing with a crop; under ideal growing conditions up to 100,000 seeds per plant (7). If weeds ever get out of hand and they can not all be pulled at once, the most important thing to do is cut off all the immature seed heads and remove them from the garden.

In some instances the use of herbicides may be necessary to compliment cultural weed control practices. Unfortunately there are very few herbicides available to the homeowner for selective postemergence weed control, especially for broadleaf weeds. Therefore, if broadleaf weeds need to be controlled non-selective herbicides may be the only option. It is important to remember non-selective herbicides must only be applied to the targeted weed(s); extreme caution must be exercised during application. Refer to product label for recommended application timing, rates, and appropriate areas of use. If grasses need to be controlled a selective postemergent grass herbicide such as sethoxydim may be used. Refer to product label for recommended application timing, rates, and specific vegetables and fruits on which it can be used.

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Review and Update of Lawn and Landscape Weed Control Products Available to Homeowners - 2008

By Bob Mugaas, Extension Educator

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At some point in caring for yards and landscape plantings, there usually comes a time when there is a need for weed control. While plucking a few weeds by hand is sometimes all that is needed, there are other times when the aid of a weed killer (herbicide) may be more practical and effective. However, going to a local retail outlet for those weed killers often confronts one with a staggering array of herbicide choices. Not only are there a lot of choices, the extremely fine print on most labels can make it very difficult to determine whether or not this is the right product for your weeds. Following is some practical information to help navigate the herbicide options.

The label on a herbicide container by law must provide the active ingredients and their concentrations (among other information). The active ingredients are usually listed by the *chemical* name derived from their chemical structure, (e.g., (±)-2-(4-chloro-2-methylphenoxy) propanoic acid). For most of us, the chemical name is of little help in knowing what is actually in the product. The *common* chemical name (e.g., dithiopyr) or an abbreviation (e.g., MCPP) is often listed below the active ingredient list, following the chemical name, or by itself. The common chemical name can be more helpful in knowing what's in the product. The active ingredient is very important as we search for products that meet our needs. No matter what herbicide brands are being carried at our local garden center, if we know for instance that 2, 4-D is very effective at controlling dandelions in lawns, we can find products that contain it and are labeled for that weed and be confident we are getting what we need regardless of the brand name. Nonetheless, most of the time, people pay little attention to the active ingredients and depend on the label to tell them whether or not the weed in question is something the product will control AND how to use it in a manner that will kill the pest and avoid injury to other desirable plants, ourselves and the environment.

The remainder of this article will briefly discuss some of the old standby products as well as some of the newer items for weed control in home lawns and landscapes. Common chemical names (e.g., dithiopyr, balan, MCPA) will be used throughout the article. This article does not specifically include lawn fertilizer products that also contain an herbicide, often known as 'weed-and-feed' products. Nonetheless, the herbicides mentioned in the article are common to many of the weed-and-feed products. Check the 'weed-and-feed' product label to find out what herbicide(s) it contains. In addition, herbicides used for complete vegetation control with long residuals to keep areas clean of all vegetation during the year are not included. Materials not available for homeowner use but accessible to the commercial lawn care industry are also not included.

Following this article is list of the more commonly available lawn and landscape weed control products in the Twin Cities area. Not all of the materials would necessarily be offered at one retail outlet. Rather these are the more commonly available materials offered for sale by various garden centers and stores in the Twin Cities area. It is not intended to be a complete list of all products available by a particular manufacturer or that may be carried by any particular retail outlet.

Getting started

When the determination is made that an herbicide is needed to control a population of weeds, it is always best to get the weeds properly identified such that an appropriate herbicide can be selected that will kill the weed at hand and is safe for surrounding vegetation. During the identification process, notice how the weed grows and spreads from one area to another. That information along with knowing the name of the plant is an important first step in choosing the correct product.

For lawn weed control applications, there are 2 major categories of herbicides: preemergence and postemergence. **Preemergence** products are directed at controlling the germinating weed seed **before** it emerges from the ground. These products are applied in either a liquid or granular form and usually require a small amount of watering-in (1/4 to 1/2 inch) following their application to be effective. These products set up a "barrier" at the soil surface that kills the weed seedling as it contacts this barrier but before emergence.

It is important to remember that these materials do not kill seeds that do not germinate. The seed must begin to grow and come in contact with the material before it is killed.

Postemergence products are directed at controlling those weeds fully emerged from the ground and are easily visible. This group of materials is further divided into two other categories: **selective and non-selective**. **Selective** materials are able to 'selectively' remove certain weeds while not harming others in the same area. Examples include the ability to remove broadleaf plants (e.g., dandelions, white clover) from lawn grasses, or remove grass plants from broadleaf plants such as shrub borders or flowering perennial beds. Another form of selective control would be the use of preemergence herbicides to selectively remove annual weedy grasses (e.g., crabgrass) from existing lawns. **Non-selective** materials are used to destroy all of the vegetation in an area. Examples of non-selective control include killing off all of the weeds from an area prior to seeding or sodding or doing the same strategy but where a new perennial bed or shrub border is to be located.

Postemergence products can also be divided into **contact or systemic herbicides**. Contact herbicides elicit their effect at the point of contact with the plant. Hence, it is very important to get thorough coverage of the plant such that all of the plant will ultimately be affected and destroyed. Contact products are usually non-selective as they do not discriminate between desirable and weedy plants. Systemic herbicides have the capability to be moved around in the plant to particular sites of activity. It is the effects produced by the herbicide at those sites that ultimately results in the death of the plant. Systemic products can be both selective and non-selective.

With weeds identified and an initial idea as to how weed control is to be approached, (i.e., preemergence, post emergence – selective, etc.), we are now ready to face the task of selecting an appropriate product(s) to use.

Preemergence Herbicides

Preemergence herbicides are most commonly utilized for warm season annual grass control, such as crabgrass in lawns. In recent years, most of the herbicides used for this purpose came from a family of herbicides with similar chemical structures but varying levels of longevity and effectiveness. Some of the commonly available homeowner products include balan, trifluralin, and pendimethalin. For lawns, balan and trifluralin are combined together under the trade name of *Team*. This trade name is often listed prominently on the product label. Trifluralin is also packaged by itself under the trade name *Preen* but is not labeled for lawn use.

This family of preemergence herbicides (i.e., dinitroanilines) has provided many years of successful crabgrass control in home lawns. However, they must be applied prior to any emergence of crabgrass seedlings. Once crabgrass seedlings poke through the soil these products are ineffective in killing the emerged seedlings. Hence these materials have a very narrow window of effectiveness. If you miss that window of application time, you will have missed the chance at control.

The product dithiopyr is a preemergence herbicide that also has some very early postemergence effectiveness as well. That is, even if the crabgrass seedling has emerged from the soil but only has 1 to 2 leaves, dithiopyr (e.g., trade name: *Dimension*) would still be able to destroy the seedlings. While this gives a little bigger window of control, it too must be applied before the seedlings get beyond the 1 or 2 true leaf stage. For homeowners, dithiopyr is usually packaged with granular lawn fertilizers and sold as a 'weed and feed' product.

None of the above mentioned products can be used at the time of seeding a new lawn or overseeding an existing lawn. The problem is that they do not discriminate between the seeds of weedy grasses or the seed of desirable lawn grasses. These products will kill either one equally well. However, there is a product that will control crabgrass and other weedy summer annual grasses but will not affect seeds of our bluegrasses, fine fescues or perennial ryegrass. The product's chemical name is known as siduron and is sold under the

trade name of *Tupersan*. This is the only preemergent that homeowners can access and be used safely at the time of seeding our cool season lawn grasses. Thus, if you need to do some seeding during the mid-May through mid-July period, using siduron will help provide some short term control of the annual weedy grasses while not interfering with lawn grass establishment. It is sold separately, but is more commonly sold in combination with a lawn starter fertilizer similar to a 'weed and feed' product.

Another newcomer to the preemergence scene is that of a natural organic known as corn gluten meal (CGM). This is a by-product of the corn processing industry and is used as a feedstock for some animals. This material destroys the seedling root system shortly after it emerges from the seed. Once the root system is damaged and it encounters a period of drier conditions the plant cannot continue to supply the water necessary to sustain growth and consequently dies. Control is generally more effective when the material is watered in following application. This material is available under several different trade names and is becoming more readily available for homeowner use. In addition, this product acts much like a traditional 'weed and feed' material as it contains about 10% nitrogen, all in an organic form. Its one downside is that control can be somewhat variable, especially the first year it is used. Therefore, it is important to have a little patience with this product as control usually continues to improve each year that it is used.

Postemergence, selective herbicides

This is the largest group of herbicides that homeowners will have to choose from as they range from products to control dandelions in bluegrass lawns to controlling bluegrass encroachment into flower beds. Most of these liquid formulations are available in one or more of the following forms. First, they may be sold as '**concentrates**,' which need to be diluted with water prior to spraying. Second, they may be in a **ready-to-spray** concentrate in which the container is attached directly to the end of a garden hose and sprayed out through the container's nozzle. Proper dilution of the product occurs as the herbicide is mixed with water passing through the nozzle. Third, there are the **ready-to-use** (often abbreviated RTU) products that can be hand applied directly from the container in which they are purchased. The hand trigger ready-to-use sprayers are best for spot treating individual or small groups of weeds whereas the hose-end sprayer is designed to cover larger areas.

In addition, *Weed-B-Gon MAX* and *Weed-B-Gone MAX plus Crabgrass Control* are now available in **singles** packaging. In other words, each container is enough material for one 2 gallon tank sprayer. Hence, there is no measuring, storing of excess product, etc. It is another effort by manufacturers to simplify homeowner herbicide application, handling and storage. The non-selective herbicide *Round-up Weed and Grass Killer* concentrate is also available in the **singles** containers.

Postemergence broadleaf weed control products

Over the past several decades, products containing one or more of the chemicals 2,4-D, MCPP, MCPA, 2,4-DP(also known as diclorprop) and dicamba have been very popular and effective at controlling many different broadleaf weeds. One very popular combination is 2,4-D, MCPP and dicamba and is known as a three-way product for its three different ingredients. A common product name for a particular combination of these three ingredients is *Trimec*.

Amines & Esters

When reading the active ingredients portion of the product label, the long chemical name will often be followed by, or contained in its name, the term amine or ester. For example, *butoxyethyl ester of triclopyr* would be an ester formulation of triclopyr. These terms have to do with the actual chemical structure of the ingredients. The important difference for weed control is that the amine formulations are much less volatile than the ester formulations. That is, they are not as prone to volatilize (vaporize) back into the air thereby increasing their risk of injury to non-target plants. This is especially true as temperatures rise. The trade-off is that the ester formulations have better penetration into the plant and can be more effective in their control, especially of some of our more difficult weeds to control. If you are wary of using any ester formulation, you can restrict their use to the cooler spring and fall periods and use amine formulations during warmer spring and summer conditions. Or, simply use amine formulations for all of your weed control needs.

Some newcomers

Within the last few years, three new postemergence herbicides have been added to the typical three-way mixes available for homeowners. They are carfentrazone, sulfentrazone and quinclorac. All three products broaden the range and/or enhance the overall effectiveness of weeds controlled by the product. Quinclorac has excellent postemergence control of crabgrass (along with other warm season annual grasses and some broadleaf weeds) and hence allows for both broadleaf and crabgrass control to be contained in a single product. Carfentrazone and sulfentrazone are broadleaf herbicides.

Stubborn broadleaf weeds

When it comes to some of the more difficult weeds to control such as creeping Charlie, clover, chickweed, oxalis or violets in lawns, most of the homeowner products will contain a chemical known as triclopyr. This material is frequently combined with other weed control chemicals like 2,4-D or MCPP to give an even broader range of control. If you are having difficulty controlling some of those tougher weeds with products not containing triclopyr you may want to consider using one that does. It may just be the ingredient needed to obtain better control.

What about grasses?

There are also postemergence products to control crabgrass and other warm season annual grasses selectively in an existing home lawn. Early emerging crabgrass can usually be observed in the home lawn by its light green color and generally wider blade. These will be visible in mid to late June. Postemergence control is usually easier when crabgrass is still quite young. In addition to the herbicide quinclorac mentioned above, most homeowner products for postemergence control of crabgrass contain one of the methanearsonates and work quite well when applied to young actively growing plants. The most common one of these is MSMA (monosodium methanearsonate). Any of the methanearsonates can cause some temporary yellowing of the bluegrass and fine fescue plants. Treatment should be avoided when lawn grasses are experiencing stressful weather conditions such as during periods of drought stress and/or high temperatures.

Like quinclorac, the methanearsonates are frequently combined with other postemergence broadleaf herbicides thereby avoiding having to handle two separate products. However, only purchase the product for the weeds they intend to control. If the lawn is essentially free of crabgrass but has a few broadleaf weeds, then there is no need to include a crabgrass herbicide since the target weeds are broadleaf weeds. This avoids unnecessary applications of herbicides when target plants are not present.

Postemergence Nonselective Weed Control

In many instances it is often desirable to control all of the vegetation in an area when preparing a site for a new lawn or to remove perennial grassy weeds such as quackgrass from an existing lawn followed by seeding or sodding. This kind of weed control is termed non-selective as the desire is to eliminate all vegetation regardless of whether it is a grassy or broadleaf weed. One of the most common non-selective ingredients over the last several decades has been glyphosate. While originally developed by the Monsanto Corporation as the product *Roundup* there are now many other formulations of this material available from other manufacturers. Other recent additions to the homeowner non-selective arsenal include glufosinate – ammonium (e.g., trade name Finale), diquat dibromide and pelargonic acid.

Glyphosate 'plus'

Another new twist to glyphosate has been combining it with a selective postemergence herbicide (e.g. glyphosate + triclopyr) or a second non-selective postemergence herbicide such as diquat dibromide or pelargonic acid. In either case, it would appear that the additions are either to improve glyphosate's effect on some difficult to control weeds and/or to create a somewhat more rapid injury/killing effect on the target weeds. Always read label precautions regarding how long to wait after applying these materials before reseeding, resodding or replanting can safely be done. When only glyphosate is used, reseeding or resodding can occur within several days following application. **Again, always check the particular product label for specific directions.**

Non-selective organic products

The area of non-selective control has been the one area where “organic” alternatives have shown some promise as weed control products. Ingredients include materials such as acetic acid, citric acid, garlic extracts, clove oil, potassium salts of fatty acids or soaps among others. Most of them affect cell membrane integrity which is responsible for controlling the movement of materials into and out of the plant cell.

While weed control is always better done when weeds are small and immature, this may be particularly true for these organic non-selective products as their damage is usually confined to the tissue where the product is applied (contact herbicides). These materials are not moved within the plant and hence their damage is to the immediate local area of tissue contact. Therefore, it is easier to control smaller plants as it is usually easier to get thorough coverage of a smaller plant than a large mature plant. Their control is likely to be less successful on weedy plants with the capacity to regenerate from underground structures such as crowns, roots or rhizomes. In that case, repeat applications may be necessary to achieve control. These products are generally not effective on larger more mature weeds, especially those of perennial nature. As with various glyphosate formulations, always check for any time interval restrictions before seeding, sodding or replanting is done.

Other items

Sometimes, weed control is not so much a function of the chemical product itself as it is the ability to contact the tissue long enough for absorption into the immediate plant tissue. One of the major stumbling blocks to getting herbicides to ‘stick’ on a plant surface is the presence of a waxy surface layer on stems and leaves. This waxy layer tends to repel water droplets as they land on the surface ultimately running off with much of the weed control product carried along with it. Hence, very little weed control material may actually stick to the leaves and stems long enough to cause their intended effect. It can also make the material more vulnerable to washing off should a rain occur too soon after application.

In order to get around that problem, manufacturers have begun to add “stickers” to their products to help the product stick to the surface and also provide protection against runoff during rainstorms. These stickers have a more formal name in horticulture called surfactants, short for **surface acting agents**. You will often see the term ‘rainfast’ or ‘rain proof’ in a predetermined number of hours after application on the container and/or label. This usually means the formulation has included some means of helping the material stick to the foliage more efficiently thereby increasing its effectiveness. If given the choice, it is usually better to select those products known to have better ‘sticking’ capability than those that do not. Most products will indicate their ability to be rainfast as that is clearly an advantage. Stickers can also be purchased separately and added to a spray mixture prior to being applied.

The addition of foams and colorants to liquid weed control products helps improve tracking of where the product has been applied and where it has not. This can also be very helpful when using ready-to-use products to spot treat individual weeds or small areas in a lawn or garden bed. Even though spraying a plant will leave it looking wet rather than dry, there are times where better detection may be required to avoid skips or over application of an herbicide. In those situations, foams and colorants can be very helpful. There is a formulation of the product *Roundup* that comes as a foam aerosol to help control drift and improve precision of where the material is applied. Recently, ready-to-use **gel** formulations of broadleaf mixtures have been introduced. According to the manufacturer’s label, these thicker solutions are still able to be applied with a hand applicator but their ability to stick to the foliage is much better thereby increasing control potential of the product.

Remember, it is against the law to dispose of any product or product container that is inconsistent with its label directions. Any unused product in a ready-to-use applicator can be stored in that container until needed again. In most cases, these materials have a relatively good shelf life. Always follow label directions for proper storage of the product. In general that means in a locked storage unit in a cool dry area. *Never allow these products to freeze as it will usually render them ineffective.*

The information given in this table is for educational purposes only. References to commercial products or trade names are made with the understanding that no discrimination is intended and no endorsement by the University of Minnesota Extension is implied. Pesticide products should always be used in accordance with all label directions. Pesticide label directions can and do change over time. Therefore, when a pesticide product is purchased, it is the responsibility of the user to read and follow label directions exactly as printed. Any use inconsistent with its label is a violation of Federal law.

RESOURCES

Websites

University of Minnesota Extension Publications

Publications are available on Garden Information website:
<http://www.extension.umn.edu/gardeninfo>.

Sustainable Urban Landscape Information Series (SULIS)
<http://www.sustland.umn.edu>

Turfgrass Science and Management Program
<http://www.turf.umn.edu>

Is this plant a weed?
<http://www.extension.umn.edu/gardeninfo/weedid/>

What's wrong with my plant?
<http://www.extension.umn.edu/gardeninfo/diagnostics/index.html>

Insect journal
<http://www.extension.umn.edu/projects/yardandgarden/EntWeb/Ent.htm>

Plant Disease Diagnostics
<http://www.extension.umn.edu/projects/yardandgarden/diagnostics/>

Extension publications on lawns and lawn care
<http://www.extension.umn.edu/topics.html?topic=5>

Virginia Tech Weed Identification Guide
<http://www.ppws.vt.edu/weedindex.htm>

University of Illinois – Midwestern Turfgrass Weed Identification and Control
http://www.turf.uiuc.edu/weed_web/index.htm

University of Illinois – Turfgrasses for the Midwest
http://www.turf.uiuc.edu/NCR-192/turf_midwest/default.htm

Non-University site but excellent photography
<http://www.missouriplants.com/>

University of Minnesota Oliver Strand Herbarium
<http://appliedweeds.coafes.umn.edu/app/herbarium/>

Books

Color Atlas of Turfgrass Weeds. McCarty, L.B., Everest, J.W., Hall, D.W., Murphy, T.R. and Yelverton, F. Ann Arbor Press. 2001. 269 pages.

Weeds of Nebraska and the Great Plains. 2nd Ed. Stubbendieck, J., Friiso, G.Y. and Bolick, M.R. Nebraska Department of Agriculture. 1995. 589 pages

Weeds of the Northern U.S. and Canada, Royer, F. and Dickinson, R., University of Alberta Press and Lone Pine Publishing, 1999, 434 pages.

Weeds of the Northeast, Uva, R.H., Neal, J.C., DiTomaso, J.M., Cornell University Press, 1997, 397 pages.

Weeds of the North Central States, North Central Regional Publication No. 281, Reprinted 1992, 303 pages.

Integrated Turfgrass Management for the Northern Great Plains. University of Nebraska Cooperative Extension Publication EC97-1557.

Software

Weed Science Society of America: *1000 Weeds of North America: An Identification Guide*. To order: Contact WSSA at 1-800-627-0629 Ext. 297 or go to <http://www.wssa.net/>