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Control of Perennial Broadleaf Weeds in Missouri Field Crops

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Perennials are the most difficult weeds to control in field crops. Perennial plants survive, by definition, for more than two years and usually live for many years. Most perennial plants reproduce by seeds and by structures such as runners, underground structures that are difficult to eliminate. Satisfactory control of perennials usually requires a combination of cultural practices, herbicides and patience.

While this publication discusses broadleaf weeds, other perennial pests such as perennial grass weeds also occur in Missouri. Information on controlling these pests, as well as detailed weed identification guides, is available in other publications at county MU Extension centers.

Perennial weed growth habits

All weed species discussed in this guide reproduce and spread by seed and vegetative reproduction from buds on their roots. Perennial weeds flower and produce seed if they are permitted to grow undisturbed throughout the summer. The roots of these plants also act as storage tissues for survival from season to season. Perennial weeds draw their persistence from this double mechanism of reproduction.

Perennial weed seedlings are herbaceous and relatively easy to control with cultivation or herbicides. However, after three to six weeks most of these weeds start perennial root structures and begin to store food reserves. The top growth of many of these weeds also begins to turn woody, with bark forming on the stem. The bark resists herbicide penetration and is difficult to remove by cultivation.

Root sections of honeyvine milkweed as short as 1 inch can produce a new shoot if a bud is present. Most other perennial weeds discussed in this guide also are likely to survive in this way. These weeds often have wide and deep root systems. Some perennial roots have been observed 20 to 30 feet deep in the soil.

The extensive root systems and ability of small pieces of chopped roots to survive make repeated cultivation and herbicide applications necessary to deplete plant roots of stored food reserves. These stored food supplies must be depleted to prevent regrowth after destroying top growth and roots with cultivation or herbicides. A minimum of two or three years of control measures usually are needed to deplete food stores and prevent regrowth.

Perennial vines

Perennial vines common to Missouri field crops are:

- Field bindweed
  (*Convolvulus arvensis* L.)
- Honeyvine, climbing
- Milkweed
  [*Ampelamus albidus* (Nutt.) Britt.]
- Redvine
  (*Brunnichia cirrhosa* Gaertn.)
- Trumpetcreeper
  [*Campsis radicans* (L.) Seem.]
- Bigroot, wild sweet potato vine
- Morning glory
  (*Ipomoea pandurata* L.)
- Hedge bindweed

(*Convolvus sepium* L.).

We have no data on hedge bindweed control, so we will not discuss it in this guide. Hedge bindweed, however, should be susceptible to control measures such as those required by field bindweed.

All these vines emerge in the spring and have a twining growth habit. This twining makes them particularly difficult to control with cultivation in row crops such as corn or soybeans. They can cause economic loss by reducing crop yields through competition and by interfering with harvesting operations.

Field bindweed reportedly can cause 30 percent yield reductions in wheat and 75 percent reductions in grain sorghum. The twining habit often causes the most trouble. Heavy weed infestations can cover crop plants and pull them to the ground, making mechanical cultivation and harvesting impossible.

Other perennial broadleaf weeds

The other common broadleaf perennial weeds in Missouri are:

- Hemp dogbane (*Apocynum cannabinum* L.)
- Carolina horsenettle (*Solanum carolinense* L.)
- Common milkweed (*Asclepias syriaca* L.)
- Canada thistle [*Cirsium arvense* (L.) Scop.]
- Swamp smartweed (*Polygonum coccineum* Muhl.)
- Smooth groundcherry (*Physalis subglabrata* Mack. et Bush.)
- Clammy groundcherry (*Physalis heterophylla* Nees.).

Fortunately, Canada thistle is rare in Missouri at this time. If you discover it, use quick and persistent control measures to prevent further spread. Data on groundcherries is unavailable.

These perennial weeds generally have a more upright (shrubby) growth habit. Like the vines, they compete with crops and cause considerable yield loss. Hemp dogbane reportedly can cause yield reductions of more than 40 percent in soybeans and grain sorghum. These weeds also interfere with mechanical cultivation and harvesting operations.

Cultural control

The easiest and most effective way to control perennials is to prevent their establishment. You can use cultivation or herbicides to control seedlings before vegetative buds are formed. Even a light tillage operation with a disk or field cultivator controls seedlings. Once a stand of perennial weeds becomes established, however, much more persistent and intensive tillage is required. In fact, a light tillage operation or cultivation actually helps spread established weeds by cutting the roots into segments that are transported by the cultivation implements. These root segments can then sprout in areas once free of the weed.

Perennial weed species are more likely to become established in minimum and no-tillage fields than in fields where frequent deep cultivation is practiced. This is because frequent cultivation eliminates seedlings and prevents the development of storage root structures by constantly forcing the weed to use its reserve food supply to produce new shoots.

In fields used to produce crops under no-tillage practices, it may be wise to deep-cultivate the field every third or fourth year to prevent establishment of perennial weeds. Once these weeds are established, you will need to apply herbicides for several years to control perennials in no-tillage fields. A limited cultivation program will not control established weeds and probably will increase their spread.

In pastures and forage crops, an intensive mowing or cutting program can reduce perennial infestations by slowly using up the plant's stored food reserves. You should cut alfalfa at least three times a year and maintain it as a thick and vigorous stand to reduce perennial infestations. Older, thin stands of alfalfa or other forage crops will not be able to compete with perennial weeds. If the weed infestation is severe, you probably will need to re-establish the forage. Use deep tillage combined with herbicides to reduce the perennial infestation before attempting to plant a new forage crop.

Chemical control

Only a few herbicides effectively control perennial weeds. The three herbicides available for use in field crops are 2,4-D, Banvel and Roundup. Table 1 lists the perennial weeds and herbicides that can be evaluated from data gathered at MU.

Table 1
Perennial broadleaf weeds and their response to herbicides

Use this table as a guide for comparing the relative effectiveness of herbicides on individual weeds. Herbicides may perform better or worse than ratings given in the table due to extreme weather conditions and other variables. These ratings are for top-kill only. Several years of re-treatment on new sprouts usually is required to obtain satisfactory control of below-ground storage root tissues.

Herbicide	Field bindweed	Honeyvine, climbing milkweed	Redvine	Trumpetcreeper	Bigroot morningglory, wild sweet potato vine	Hemp dogbane	Carolina horsenettle	Common milkweed	Swamp smartweed	Canada thistle
Spring										
2,4-D amine or ester	60 to 70 percent	40 to 50 percent	40 to 50 percent	40 to 50 percent	60 to 70 percent	40 to 50 percent	40 to 50 percent	40 to 50 percent	40 to 50 percent	40 to 50 percent
Banvel	60 to 70 percent	40 to 50 percent	40 to 50 percent	40 to 50 percent	40 to 50 percent	60 to 70 percent	60 to 70 percent	60 to 70 percent	60 to 70 percent	60 to 70 percent
Banvel + 2,4-D	40 to 50 percent	40 to 50 percent	40 to 50 percent	40 to 50 percent	40 to 50 percent	60 to 70 percent	60 to 70 percent	60 to 70 percent	60 to 70 percent	60 to 70 percent
Roundup	80 to 100 percent top-kill	60 to 70 percent	40 to 50 percent	40 to 50 percent	60 to 70 percent	60 to 70 percent	40 to 50 percent	60 to 70 percent	60 to 70 percent	No data available
Roundup + Banvel	60 to 70 percent	60 to 70 percent	40 to 50 percent	40 to 50 percent	No data available	60 to 70 percent	60 to 70 percent	60 to 70 percent	No data available	No data available
Roundup + 2,4-D	60 to 70 percent	60 to 70 percent	40 to 50 percent	40 to 50 percent	No data available	40 to 50 percent	60 to 70 percent	40 to 50 percent	No data available	No data available
Summer										
2,4-D amine or ester	40 to 50 percent	60 to 70 percent	40 to 50 percent	40 to 50 percent	60 to 70 percent	60 to 70 percent	60 to 70 percent	40 to 50 percent	40 to 50 percent	40 to 50 percent
Banvel	60 to 70 percent	40 to 50 percent	60 to 70 percent	60 to 70 percent	40 to 50 percent	60 to 70 percent	80 to 100 percent top-kill	60 to 70 percent	60 to 70 percent	60 to 70 percent
Banvel + 2,4-D	40 to 50 percent	40 to 50 percent	60 to 70 percent	60 to 70 percent	40 to 50 percent	60 to 70 percent	80 to 100 percent top-kill	60 to 70 percent	60 to 70 percent	60 to 70 percent
Roundup	80 to 100 percent top-kill	40 to 50 percent	40 to 50 percent	40 to 50 percent	60 to 70 percent	60 to 70 percent	80 to 100 percent top-kill	60 to 70 percent	60 to 70 percent	No data available
Roundup + Banvel	60 to 70 percent	40 to 50 percent	60 to 70 percent	40 to 50 percent	No data available	60 to 70 percent	80 to 100 percent top-kill	60 to 70 percent	No data available	No data available
Roundup + 2,4-D	60 to 70 percent	40 to 50 percent	40 to 50 percent	40 to 50 percent	No data available	60 to 70 percent	80 to 100 percent top-kill	40 to 50 percent	No data available	No data available
Fall										
2,4-D amine or ester	60 to 70 percent	40 to 50 percent	40 to 50 percent	60 to 70 percent	60 to 70 percent	80 to 100 percent top-kill	80 to 100 percent top-kill	40 to 50 percent	40 to 50 percent	40 to 50 percent
Banvel	60 to 70 percent	40 to 50 percent	60 to 70 percent	80 to 100 percent top-kill	40 to 50 percent	60 to 70 percent	80 to 100 percent top-kill	80 to 100 percent top-kill	60 to 70 percent	60 to 70 percent
Banvel + 2,4-D	60 to 70 percent	40 to 50 percent	60 to 70 percent	80 to 100 percent top-kill	40 to 50 percent	80 to 100 percent	80 to 100 percent	60 to 70 percent	60 to 70 percent	60 to 70 percent

						top-kill	top-kill			
Roundup	60 to 70 percent	80 to 100 percent top-kill	60 to 70 percent	80 to 100 percent top-kill	60 to 70 percent	60 to 70 percent	80 to 100 percent top-kill	80 to 100 percent top-kill	40 to 50 percent	60 to 70 percent
Roundup + Banvel	60 to 70 percent	80 to 100 percent top-kill	60 to 70 percent	80 to 100 percent top-kill	No data available	60 to 70 percent	80 to 100 percent top-kill	60 to 70 percent	60 to 70 percent	No data available
Roundup + 2,4-D	60 to 70 percent	60 to 70 percent	60 to 70 percent	60 to 70 percent	No data available	60 to 70 percent	80 to 100 percent top-kill	60 to 70 percent	60 to 70 percent	No data available

MU does not specifically endorse or warrant herbicides or herbicide performance. Always refer to herbicide labels for the latest instructions for proper use.

In general, you will need to apply herbicides for at least two or three years and practice some tillage to reduce stands to acceptable levels. Complete control of perennial weeds with one herbicide application usually is not practical with technology currently available. The key to maximum herbicide performance is to apply the herbicide when the plant is transporting photosynthetic food supplies down to the roots. The more herbicide that can be moved into the roots, the better the long-term control will be.

Herbicide application timing

Perennial weed control with herbicides usually is most effective with early fall treatments when the weeds are transporting food supplies down to the roots before winter dormancy.

Applications in September are best. Treatments in late June through mid-July also are effective just before and during flower bud initiation. This also is a period of some downward transport into the roots. Spring treatments are least effective, since food reserves are being mobilized in the roots and sent upward to new shoot growth. However, this may be the only time herbicides can be applied in some situations, especially for no-tillage pre-plant treatments. Herbicides still will have some effect, but not as much as later treatments.

Environmental influence

Growing conditions also affect herbicide performance. Periods of drought or heat stress or application of herbicide to dormant plants have little effect, since transport to the roots is limited. Adequate foliage to intercept and absorb the herbicide also is important.

Apply herbicides before cultivation practices and allow at least one or two weeks for the herbicide to move into the roots as much as possible. If you cultivate and destroy the shoots before application, allow at least 8 to 12 inches of regrowth before spraying. The more mature the top growth, the more effective herbicides are likely to be, since mature shoots move food supplies downward, while young shoots move food supplies up and out of the roots.

Repeated herbicide treatment can be very expensive. Perennials tend to grow in limited patches. It may be most economical to limit spraying to heavily infested areas of a field and spot-treat isolated plants or infestations.

Drift and volatility

All herbicides mentioned in this guide can injure non-target vegetation if precautions are not taken. Drift can be controlled by not spraying on windy days. Banvel and 2,4-D amine or ester can injure non-target vegetation by volatility after application on hot days. Avoid spraying these herbicides near sensitive crops or other desirable vegetation on hot or windy days. Fall applications offer maximum herbicide performance and minimize drift and volatility problems due to cooler temperatures and maturity or dormancy of nearby vegetation.

Control practices for crops

The following suggestions for perennial weed control are organized by crop.

Corn
You can apply Banvel and 2,4-D amine or ester pre-plant, post-emergence or in the fall. Use drop nozzles with 2,4-D or Banvel into

corn before the crop exceeds 36 inches in height. You may only use Roundup pre-plant or in the fall. You can use spot treatments of a 2 percent Roundup solution in the standing crop, but any plants contacted will be severely injured or killed. Delay cultivation at least one week after spraying to allow time for herbicides to move into the plant and down to the roots. You can make a preharvest application of 2,4-D amine or ester after the hard dough or dent stage.

The best way to apply herbicides in the fall to maximum weed foliage is to keep the corn header as high as possible when harvesting to avoid cutting off the weeds at the ground. There must be at least 8 to 12 inches of actively growing weed shoots to obtain good herbicide contact. In addition, you must apply the herbicide at least two weeks before a killing frost or weed dormancy to assure adequate uptake and movement of the herbicide into the plant. Daytime temperatures of at least 60 degrees Fahrenheit are preferred.

Grain sorghum
Roundup may be used pre-plant for spring applications. Banvel or 2,4-D may be used post-emergence and should be applied before the grain sorghum exceeds 15 inches in height. Between 8 and 15 inches, use drop nozzles to avoid excessive contact with the grain sorghum and to obtain adequate coverage of the weeds. You can spot spray a 2 percent Roundup solution for selective control. Any crop plants that you spray will be killed. Allow at least one week (two weeks for Roundup) before cultivating to obtain maximum uptake and downward movement of the herbicides into the plant and roots.

Fall treatment of 2,4-D, Banvel or Roundup is most effective if weed foliage is kept as intact as possible by keeping the combine header high when harvesting. Apply to shoots at least 8 to 12 inches tall and allow at least two weeks before a killing frost or dormancy to allow the herbicides to move into the plant.

Soybeans and cotton
Soybeans and cotton are very sensitive to 2,4-D, Banvel and Roundup. You can use Roundup pre-plant to soybeans or cotton in the spring to control emerged perennial weeds. Do not use 2,4-D or Banvel before planting cotton. Nothing available as a post-emergence herbicide for soybeans or cotton is effective for control of perennial weeds. You can use a 2 percent Roundup solution as a spot spray for light infestations or isolated plants, but any crop plants that come in contact with the spray will be severely injured or killed.

Selective application equipment such as ropewicks, recirculating sprayers or roller applicators work well with Roundup on hemp dogbane or common milkweed that is at least 6 inches taller than the soybean or cotton canopy. This height differential is likely to occur only briefly early in the growing season, if at all. Again, do not cultivate for at least two weeks after application to allow the Roundup time to move down to the roots.

Fall sprays usually are not possible in Missouri following soybeans unless you use an ultra-short season variety. The combine cuts the weed shoots at the ground and there is not enough time in the fall to obtain the 8 to 12 inches of regrowth and have at least another two weeks before frost for the herbicide to move into the plants. It may be possible to spray in the fall following cotton if the weed foliage is not stripped too badly or if picking is completed early enough to allow weed regrowth. If perennial weeds become a serious problem in cotton or soybeans, it may be necessary to rotate to corn, grain sorghum or winter wheat to allow the use of a more intensive herbicide control program.

Small grains
Good stands of winter small grains (especially wheat) are very competitive with many perennial species in the spring and early summer. You can apply 2,4-D as a preharvest treatment when wheat is in the hard dough stage. Use 1 quart per acre (1 pound per acre of a 4 pound per gallon formulation) of 2,4-D amine or ester if perennial growth is at least 12 inches tall or in the flower bud formation stage. This also is a good time to control perennials before planting double-crop soybeans.

Pasture and forage crops
Repeated mowing or cutting of pastures or forage crops is effective for perennial weed control. In grass pastures, you can use 2,4-D, Banvel, combinations of the two, and Crossbow almost any time during the growing season. Mid-summer applications to weeds in the flower bud initiation stage and fall treatments are still best. Do not mow or cut perennials for at least one week after application to allow the herbicide to move into the roots. Allow at least two weeks following a spot treatment of 2 percent Roundup solution. You also can use Tordon 22K to spot treat many of these perennial weed species in grass pastures. Follow label directions for grazing and hay cutting interval restrictions on all of these herbicides.

None of these herbicides can be safely used in legume forages. Cutting alfalfa three times a year, combined with maintaining a dense, vigorous stand, should prevent or reduce perennial stands in two or three years. If forage stands are thin, re-establishment may be necessary.

Fallow land
Any of the three herbicides can be used to control perennials on fallow land. A combination of tillage and herbicide applications is most effective. Use 2,4-D or tillage to control seedlings. Depending on the rate used, there are crop rotation restrictions with Banvel. Banvel rates for control of perennials should be 2 to 4 pints per acre. Use 1 to 2 quarts per acre of 2,4-D for perennial weed control.

A mix of Banvel plus 2,4-D at 1 pint plus 1 quart also is effective and reduces the carryover potential of Banvel.

Remember, these herbicides or cultivation practices are not likely to provide satisfactory control in one application or even one year. Several years of persistent cultivation and herbicide application are required to obtain significant reduction in perennial weed infestations. You must use a carefully planned program of crop rotation, tillage (even tillage rotation) and herbicides to control these weeds.

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Table 2
Herbicide rates and use instructions. Information in Table 1 is based on these labeled rates unless otherwise noted

Herbicide	Rate	Weeds	Comments
2,4-D amine or ester (4 or 3.8 EC)	1 to 2 quarts per acre	All perennials listed	Rate depends on crop and timing. Use higher rate when used for non-crop or between-crop application
Banvel 4EC	2 to 4 pints per acre	All perennials listed	Rate depends on crop and timing. Use higher rate if used for non-crop or between-crop application. See label for crop rotation restrictions.
Banvel + 2,4-D amine or ester or Weedmaster (Banvel + 2,4-D amine package-mix)	1 pint + 1 quart per acre or 1 to 2 quarts per acre	All perennials listed	Between crop applications.Lower rates must be used in cropping situations.
Roundup 3EC	2 quarts per acre	Canada thistle	Use prior to spring planting and tillage, after harvest in fall, or on fallow land. Spot treating will help to reduce costs.
Roundup 3EC	3 quarts per acre	Common milkweed, trumpetcreeper, honeyvine milkweed	Use prior to spring planting and tillage, after harvest in fall, or on fallow land. Spot treating will help to reduce costs.
Roundup 3EC	4 quarts per acre	Hemp dogbane, field bindweed, Carolina horsenettle, redvine[1]	Use prior to spring planting and tillage, after harvest in fall, or on fallow land. Spot treating will help to reduce costs.
Roundup 3EC	2 percent solution	Bigroot morningglory, and all above	Use prior to spring planting and tillage, after harvest in fall, or on fallow land. Spot treating will help to reduce costs.
Roundup + Banvel	2 quarts + 1, 1 pint per acre	Canada thistle, field bindweed and others	
Roundup + 2,4-D	1 pint + 1 quart per acre	Suppression of perennials	Label rate of 1 pint +1 amine or ester quart per acre will only suppress some perennials. Data is based on rates of 2 to 3 quarts per acre Roundup plus 1 to 2 pints per acre 2,4-D.

[1]Not labeled. This research data is presented for informational purposes only. Use of Roundup on redvine is at the user's discretion. Performance is not warranted by the manufacturer or MU.

Always refer to label for the latest information on rates and application instructions and restrictions.

Be warned
The herbicide performance ratings in the table are based on the amount of top-growth kill observed within a few months of one herbicide application. These ratings do not necessarily reflect control of the underground roots. Even the herbicides rated as good on a given weed usually have some new shoot regrowth within a few months, or at least by the next growing season.

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Related MU Extension publications

- IPM1014, Noxious Weeds of Missouri
  http://extension.missouri.edu/publications/DisplayPub.aspx?P=IPM1014
- IPM1015, Thistles and Thistle-like Plants of Missouri
  http://extension.missouri.edu/publications/DisplayPub.aspx?P=IPM1015
- IPM1021, Vine Weeds of Missouri

http://extension.missouri.edu/publications/DisplayPub.aspx?P=IPM1021

- MP581, Weed and Brush Control Guide for Forages, Pastures and Noncropland
  http://extension.missouri.edu/publications/DisplayPub.aspx?P=MP581
- NCR33, Vine Weeds of the North Central States
  http://extension.missouri.edu/publications/DisplayPub.aspx?P=NCR33

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