



Canada Thistle Control In Cropland



Drawing from WEEDS OF THE NORTH
CENTRAL STATES, University of Illinois
Urbana-Champaign, Bulletin 773

Canada thistle (*Cirsium arvense*) is a competitive perennial broadleaf weed with an extensive spreading root system. Canada thistle was introduced into North America in the late 1700s from Europe.

The aboveground portion of the plant commonly reaches heights of 2 to 5 feet. The roots can extend up to 17 feet horizontally from the stem and 20 feet below the soil surface, although most of the roots are in the top 15 inches of the soil. Canada thistle reproduces from seeds as well as from the root system.

The first true leaves from seed or root system are thick and covered with short, bristly hairs. Leaf margins are wavy and irregularly lobed. Each lobe ends in a sharp prickle. On older plants the leaf lobes become more pronounced and prickles become longer and thicker. Leaves are alternate on the stem, and the base of each leaf surrounds the stem. Stems do not have spines or prickles on them.

Canada thistle flower heads are flask-shaped; 0.5 to 0.75 inch in diameter, and contain many small tubular flowers. Plants have either male or female flowers, but not both. Flower color varies from white to purple; most flowers are purple to rose.

Each flower head produces about 50 seeds and an average stem bears 12 to 14 flowers. Each seed is attached to a whitish tuft of hairs called pappus, which aids in seed dispersal by wind. Flowering occurs from June through October. Seeds exhibit very little dormancy, which means they can germinate shortly after being dispersed.

Canada thistle seeds can germinate the year they are produced. Optimum temperature for germination is 86°F. Seeds can remain viable in the soil for 20 years. Canada thistle is adapted to a wide range of soil conditions.

Seven to nine weeks after seedling emergence, the root system can produce runner roots capable of producing new shoots. These new shoots develop from adventitious root buds. Tillage equipment can cut an established root system into several pieces, which can initially produce dense stands of Canada thistle.

Exposed Canada thistle roots are sensitive to freezing temperatures, which cause them to die.

Repeated cultivation exposes Canada thistle roots to drying or freezing and, more importantly, prevents the buildup of food reserves in the root system. In order to deplete food reserves in the root system, repeated and consistent cultivation is required. Decaying roots of Canada thistle release chemicals that can inhibit the growth of other plants.

PREVENTION

Moving equipment, primarily tillage equipment, can spread Canada thistle root pieces within a field or from field to field. Canada thistle is a prolific seed producer and these seeds can be spread by many means. Of particular importance is its spread by seeds carried in crop-harvesting equipment. Proper cleaning of equipment requires use of an air compressor, pressure hose, or sweeping. Letting the equipment run to clean itself out is not adequate.

Another important means of infestation is the planting of soybean or small grain seed from infested fields. Growers should always buy certified seed. Or if saving seed or buying from a neighbor, they should be familiar with the fields where the seed was grown. Be sure the crop seed is not contaminated with Canada thistle seed. Canada thistle in field edges and roadsides can be a source of seed. Make sure weeds in areas outside the field are controlled.

CONTROL IN CORN

Glyphosate may provide some suppression of Canada thistle when applied as a burndown in no-till corn if the Canada thistle is actively growing at the time of application. Use 1.5 to 2 qt/A of glyphosate. Thorough coverage of foliage is essential.

No preemergence corn herbicide programs are currently available that provide adequate season-long control of Canada thistle. Therefore, postemergence control programs are relied upon to control Canada thistle in corn.

Postemergence Control

The following herbicides can be used at labeled rates and according to label directions. Adequate control of top growth and/or underground root systems of Canada thistle may require multiple or split applications of some products or follow-up applications with other products. See labels for details.

Pursuant to the provisions of Title 3, Chapter 24 of Delaware Code, the Delaware Department of Agriculture under its Rules and Regulations has declared Canada thistle a noxious weed. Designation as a noxious weed requires that Canada thistle must be controlled.

A noxious weed is a plant that has adverse effects on or threatens agricultural production. A plant is designated as "noxious" by the U.S. or Delaware Departments of Agriculture. An attribute of a noxious weed is that it is difficult to control with many 'standard' weed control programs. Often fields infested with a noxious weed need special attention and require different management than non-infested fields.

Growers who have noxious weeds can call Todd Davis, noxious weed specialist, at Delaware Department of Agriculture to sign a compliance agreement. Failure to control this weed can result in fines of \$25 per acre (\$100 minimum).

Noxious weeds can be reported to Mr. Davis at 1-800-282-8685. He will contact the owner or agency to work on developing a control program. Noxious weeds also must be controlled on right-of-ways, lots and undeveloped lands as well as farmland.

Herbicide	Herbicide Group	Corn growth stage maximum size or range		Maximum size Canada thistle	Rate/Acre	Efficacy rating ^a
		Broadcast	Directed			
Stinger	4	24 in		4-12 in, pre-bud	0.5 pt	E
Banvel or Clarity	4	16 oz: 5 lvs or 8 in <8 oz: 36 in or 15 day pre-tassel	n/a	*	0.5 to 1 pt	P-F
Status	4 + 4	24 in at 4oz 4-10 in at 6 oz	up to 36 in at 4 oz	*	4 to 6 oz	G
Marksman	4 + 5	5 lvs or 8 in	n/a	*	2 to 3.5 pt ^c	F
Yukon	2 + 4	spike - 36 in	n/a	1-6 in	4 to 8 oz	F
Northstar ^b	2 + 4	V6 or 4-20 in	20-30 in	6 in	5 oz	F-G
Glyphosate products ^d	9	V8 or 30 in	n/a	through bud	1 qt	G
Liberty ^e	10	through V5	n/a	*	22 to 32 fl oz	F
Callisto ^b +atrazine	27 + 5	V8 or 30 in	n/a	5 in	3 oz	G

* Indicates Canada thistle is listed on the label, but no size information is given.

^aE = Excellent (>90% control) G-E = Good to Excellent G = Good (80-90% control)

F-G = Fair to Good F = Fair (60-80% control) P-F = Poor to Fair P = Poor (20-60% control)

^bCallisto and NorthStar labels all contain restrictions concerning soil insecticide use. Follow label restrictions carefully or serious crop injury may occur.

^cMarksman labeled rates vary by soil type, 2 pts for coarse-texted soils and 3.5 pts for medium- and fine-textures soils.

^dGlyphosate is the active ingredient in all Roundup and Touchdown formulations. Glyphosate is also available under many other names and as part of numerous prepackaged mixtures. The rate given in the table is for glyphosate with a formulation of 4 lb ai (3 lb ae) per gallon. Adjust the rate for other formulations. All glyphosate products require the use of glyphosate-resistant corn hybrids. Using these products on corn hybrids that are not glyphosate resistant will seriously injure or kill the crop.

^eLiberty requires the use of glufosinate-resistant corn hybrids. Using this product on corn hybrids that are not glufosinate resistant will seriously injure or kill the corn crop. Sequential applications are recommended.

Always consult herbicide labels for the proper adjuvants to use. When tank-mixing products, different adjuvants may be required. Consider whether tank-mixes, split applications or follow-up applications that are recommended on the label would be preferred to using a single product or timing. Other important considerations are crop variety, soil insecticide interactions, environmental conditions, herbicide volatility or drift to sensitive crops, crop health and stage, crop rotation, and grazing and feeding intervals. This information is available on the herbicide labels.

Corn should not be cultivated prior to herbicide applications or 7 to 10 days after applications to allow for thorough translocation of the herbicides.

CONTROL IN SOYBEANS

Preplant Control

Glyphosate can be used before planting but at least 10 days prior to tillage in conventional tillage soybeans or grain sorghum, or as a burndown in no-till systems. For best control, Canada thistle should be allowed to grow to early bud stage before treatment, which may delay soybean or sorghum planting to the middle of June. Use 1.5 to 2 qt/A of glyphosate. Thorough coverage of foliage is essential.

Preemergence Control

No preemergence soybean herbicide programs are currently available that provide adequate season-long control of Canada thistle. Therefore, preplant or postemergence control programs are relied upon to control Canada thistle in soybeans.

Postemergence Control

The following herbicides can be used at labeled rates and according to label directions to control emerged Canada thistle plants. Adequate control of top growth and/or underground root systems of Canada thistle may require multiple or split applications of some products or follow-up applications with other products. See labels for details.

Herbicide	Herbicide Group	Soybean growth stage maximum size or range	Max. size Canada thistle	Rate/Acre	Efficacy rating ^a
Glyphosate products ^b	9	through full flowering	through bud	1 qt	G
Liberty ^c	10	70 days before harvest	not specified	29-36 fl oz	F
Engenia, FeXapan, or XtendiMax ^d	4	45 days before harvest (pre-bloom)	not specified	12.8 / 22 fl oz	G
Basagran	6	all stages	8" to bud	2 pt	P-F

^aE = Excellent (>90% control) G = Good (80-90% control) F-G = Fair to Good F = Fair (60-80% control) P-F = Poor to Fair P = Poor (20-60% control)

^bProducts containing glyphosate require the use of glyphosate-resistant soybean varieties. The glyphosate rate given is for a formulation of 4 lb ai (3 lb ae) per gallon. Adjust the rate for other formulations. Using these products on soybean varieties that are not glyphosate resistant will seriously injure or kill the soybean crop. If annual grasses are present, a product containing glyphosate is the preferred choice. Otherwise, a postemergence grass herbicide should be included.

^cLiberty requires the use of glufosinate-resistant soybeans. Two postemergence applications of Liberty can be used; max rate per application is 36 fl oz and total application cannot exceed 65 fl oz.

^dEngenia, XtendiMax, FeXapan all contain dicamba and must be used only with dicamba-resistant soybeans. Only approved formulations of dicamba are allowed by label to be applied to dicamba-resistant soybeans. Refer to product label for application requirement, restrictions, and precautions, including allowed tankmix partners.

Always consult herbicide labels for the proper adjuvants to use. When tank-mixing products, different adjuvants may be required. Consider whether tank-mixes, split applications or follow-up applications

that are recommended on the label would be preferred to using a single product or timing. Other important considerations are crop variety, environmental conditions, crop health and stage, and crop rotation.

Basagran kills only the aboveground vegetation. It is not translocated to the root system. A second application 7 to 10 days later at 2 pt/A may be necessary for complete kill of the top growth. Always use crop oil concentrate with Basagran on soybeans. Basagran has no residual weed control activity.

CONTROL IN GRAIN SORGHUM

No preemergence grain sorghum herbicide programs are currently available that provide adequate season-long control of Canada thistle. Postemergence herbicides can provide suppression of Canada thistle and are therefore the only broadcast treatment options available. Atrazine plus dicamba (Marksman), atrazine plus Basagran, dicamba (Banvel or Clarity), Basagran, Peak plus dicamba, or Sandea plus dicamba (Yukon) can provide suppression. Spot treatment with glyphosate, Stinger, dicamba, or 2,4-D may be the best option for small or localized Canada thistle patches (see spot treatment section below).

Always consult herbicide labels for the proper adjuvants to use. When tank-mixing products, different adjuvants may be required. Other important considerations are seed treatment, soil insecticide interactions, environmental conditions, herbicide volatility or drift to sensitive crops, crop health and stage, crop rotation, and grazing and feeding intervals. This information is available on herbicide label.

CONTROL IN SMALL GRAINS

Preemergence Control

Glyphosate can be used as a burndown in no-till small grain crops. Apply 2 qt/A anytime after the Canada thistle has recovered from the prior crop's harvest damage but at least 10 days before a killing frost.

Postemergence Control

An application of Harmony Extra at 0.6 oz/A plus surfactant is effective on Canada thistle in small grains. However, if heavy infestations of Canada thistle are present, an additional control measure may be required in double-crop soybeans.

If no crop is planted after small grain harvest, then a postharvest control program (described later) can be used for control of Canada thistle regrowth. Harmony Extra is not a single application eradication program, but is effective as part of an integrated approach to the ultimate elimination of Canada thistle from cropland.

For best results apply 0.6 oz/A Harmony Extra plus surfactant in the spring when all Canada thistle have emerged, are actively growing, and are 4 to 8 inches tall with 2 to 6 inches of new growth. Canada thistle control will be improved by using Harmony Extra in combination with $\frac{1}{2}$ to $\frac{3}{4}$ pt/A of

2,4-D ester (3.8 lb/gal). 2,4-D must be applied after tillering of small grains but before jointing.

Most glyphosate products can be applied pre-harvest at 1 qt/A. The small grains must be at the hard dough stage or later for this application. Allow a minimum of 7 days between application and harvest. Be sure spray coverage reaches the Canada thistle plants.

CONTROL IN PASTURE AND FORAGE

An excellent opportunity to control Canada thistle is during pasture renovation. Apply glyphosate at 2 qt/A and wait 7 to 10 days before any primary tillage. Thorough coverage of foliage is essential. Higher glyphosate rates may be required to control other weeds or sod present.

Postemergence control of Canada thistle in permanent pasture is possible with Crossbow (3 to 4 qt/A), dicamba (3 pt/A Banvel or Clarity), dicamba (1 pt/A) plus 2,4-D (3 pt/A), Overdrive (6-8 oz/A), or Stinger (0.67 pt/A). Stinger is the most effective of these products on Canada thistle. Be sure to read the Stinger label regarding use of treated grasses as compost or mulch. All of these products will injure or kill desirable legumes. Spot treatment with one of the previously mentioned products may be the best option for small or localized Canada thistle patches (see spot treatment section below).

Glyphosate may provide some suppression of Canada thistle when applied prior to establishment of alfalfa, ladino clover, and red clover if the Canada thistle is actively growing at the time of application. Apply glyphosate at 2 qt/A. Thorough coverage of foliage is essential. Higher glyphosate rates may be required to control other weeds or sod present.

Pursuit at 6 fl oz/A or Buctril at 1.5 pt/A may provide some suppression of Canada thistle in seedling alfalfa or in the fall or spring to dormant stands. Pursuit may also be applied postemergence to established stands after dormancy or after cutting but before excessive alfalfa growth. Gramoxone will also suppress Canada thistle in fall or spring dormant alfalfa stands or after cutting. Apply 1 pt/A within 5 days of cutting. The suppression provided by these products is primarily to top-growth and will have little or no effect on the root systems.

Always consult herbicide labels for surfactants to use, appropriate weed and crop stages, grazing, feeding, haying, and slaughter intervals, and other restrictions.

CONTROL IN VEGETABLES

Postemergence Control in Sweet Corn

Basagran at 1 qt/A can be broadcast applied from 8 inches tall to bud stage to suppress Canada thistle growth. If the sweet corn is tall enough to canopy Canada thistle, post-direct to achieve good coverage. Mix with 1 qt/A crop oil concentrate for best results. Basagran kills only the aboveground vegetation. It is not translocated to the root system. A second application 7 to 10 days later at 0.75 to 1 qt/A may be necessary for complete kill of the top growth. Basagran has no residual weed control activity.

Postemergence Control in Peas

Apply 1 qt/A of Basagran when thistle is from 8 inches tall to the bud stage to suppress Canada thistle growth. Make a second application at the same rate 7 to 10 days later. Peas must have 3 pairs of leaves. Do not use crop oil with Basagran on peas. Temporary injury (bronzing, speckling, yellowing) may occur, but the peas will usually grow out of it without delay of podset, maturity, or reduction in yield.

Postemergence Control in Snap Beans and Lima Beans

Apply 1 qt/A of Basagran from 8 inches tall to bud stage to suppress Canada thistle growth. Make a second application at the same rate 7 to 10 days later. Basagran application should be made after the first trifoliolate leaf has fully expanded. Snap bean injury can be very pronounced. This injury, however, is generally temporary and usually does not cause delay in maturity or yield reductions. Crop oil may be used on snap and lima beans. The risk of injury, however, is increased.

Cultivation

Cultivation in combination with herbicide application can increase the overall level of control. When cultivating, care must be taken to avoid bringing soil not treated with an herbicide near the soil surface, thereby reducing the opportunity for seeds to germinate and seedlings to emerge.

SPOT-SPRAY CONTROL (Crop and Non-crop)

Spot treatment can be made in corn, soybeans, wheat, barley, oats, sorghum, forage, pasture, and non-crop areas. For small or localized areas, use the chart below and apply the recommended concentration on a spray-to-wet basis (1 gal/1000 ft²) to provide thorough coverage. For larger areas, refer to the herbicide label for rates to apply on a per-acre basis. Mowing may be an appropriate alternative to chemical control, particularly in pastures and non-crop areas. Allowing the plants to regrow between mowing helps to deplete the root reserves, and mowing should take place before the plants produce seed. To deplete root reserves enough to reduce Canada thistle stands, mowing should take place every three weeks. Several other products are labeled for spot-spray applications in grass forage.

Amount of herbicide to mix with various volumes of water

Gallons of water	Glyphosate ^a	Stinger ^b	2,4-D ^c	Crossbow ^d	Metsulfuron ^{d,e}
100	2 gal	3 pt	3.1 gal	1.6 gal	1 oz
25	2 qt	12 oz	3.1 qt	1.6 qt	¼ oz
1	2.6 oz (5 Tbsp)	0.5 oz (1 Tbsp)	4 oz (8 Tbsp)	2 oz (4 Tbsp)	0.01 oz

^aAdd a surfactant as required by the label. Amount is based on a 4 lb/gal formulation of glyphosate.

^bA surfactant is not necessary with Stinger. The Stinger rates in this table are for non-cropland and permanent grass pasture. Consult the label for rates to use in specific crops.

^c2,4-D can be used in non-cropland and in crops labeled for postemergence 2,4-D application.

Amount is based on a 3.8 lb/gal formulation of 2,4-D.

^dFor use in pastures and non-cropland only.

^eAdd a surfactant as required by label.

NOTE: Glyphosate will kill non-glyphosate resistant crops in the treated area. Take care to avoid drift outside the target area. Glyphosate does not provide residual weed control; therefore, Canada thistle arising from seeds or unaffected underground rootstock will continue to grow.

Stinger, 2,4-D, and Crossbow can volatilize or drift to sensitive crops or plants and cause serious injury. Consult herbicide labels for precautions and application procedures that will minimize the potential for volatility or drift. Alternatives to these products are preferred when high value sensitive plants such as ornamentals, fruit trees, vines, or flowers are nearby.

POST-HARVEST CONTROL

An excellent time to control Canada thistle is after corn harvest while the thistle is still actively growing. When harvesting corn, keep the combine header high to minimize damage to the Canada thistle. Apply glyphosate at 2 qt/A. Allow 7 to 10 days after treatment before any soil tillage. Treatment must be applied before a killing frost.

Glyphosate can also be utilized following small grain harvest. This program will control the top growth and provide some activity on the root system. At small grain harvest, the patches of Canada thistle should be cut around and left standing. Spot spray with glyphosate, as described above, and wait for a minimum of 7 days before spraying with no-till burndown and residual soybean herbicides.

Between double-cropping of vegetables is a good opportunity for glyphosate application to actively growing Canada thistle. Harvest operations must leave thistle standing so it is actively growing when sprayed.

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Revised Feb. 2019

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