MICHIGAN STATE UNIVERSITY | Extension

E3462

Biology & Control of Canada Thistle (*Cirsium arvense*) in Michigan Christmas Tree Production

Canada thistle (*Cirsium arvense*) is a native of Europe that was most likely brought to North America with agricultural seed shipments in the 1600s (Minnesota Department of Agriculture [MDA], 2021). Today this rhizomatous and perennial weed is broadly distributed throughout the United States and Canada. It is a member of the Asteraceae (or Aster) family, which is one of the largest plant families with more than 24,000 member species. Other weeds in this family include bull thistle (*Cirsium vulgare*), dandelion (*Taraxacum officinale*), and common yarrow (*Achillea millefolium*) (Department of Crop and Soil Sciences, 2003–2021).

Canada thistle is a major problem in Michigan Christmas tree production. It spreads extremely quickly—10 ft–12 ft (3.0 m–3.6 m) in a single season—through its extensive root system and secondarily by seed (Washington State Noxious Weed Control Board, n.d.). This bulletin will help growers identify Canada thistle and develop management strategies for regulating it in their production systems.

BIOLOGY & IDENTIFICATION

HABITAT

Canada thistle can be found growing in disturbed areas such as roadsides, trails, fields, field margins, pastures,

AUTHORS & CREDITS

Greta Gallina, Graduate Research Assistant, Michigan State University Department of Horticulture

Debalina Saha, Assistant Professor, MSU Department of Horticulture & MSU Extension

This work was supported by the United States Department of Agriculture (USDA) National Institute of Food and Agriculture, Hatch Project number MICL02670.

Produced for Michigan State University Extension (www.extension.msu.edu) by the MSU Extension Educational Materials Team.

Photo this page by Jan Samanek, Phytosanitary Administration, Bugwood.org

forests, mining locations, waste areas, and unmaintained gravel pits. This weed species can establish rapidly after new road and home building, pasture overgrazing, forest clear-cutting, and flooding (MDA, 2021).

GROWTH HABIT

Canada thistle usually has a rosette growth habit (grows from a common center near to the ground with a cluster of leaves). The plant bolts when it flowers. It can grow and spread through rhizomes as well as from seed.

SEEDLINGS

Cotyledons are oval to oblong, around 0.2 inch–0.5 inch (5 mm–14 mm) long. They are thick, joined at the base, and smooth or somewhat glandular. The midvein on the ventral surface is shiny. The first true leaves are alternate to each other on the stem. The edges of the first leaves are wavy to unevenly toothed. The leaves are coated in tough hairs, but the lower parts are sometimes covered with soft, netlike hairs. The rosettes of seedlings are poorly developed (Figure 1) (Integrated Pest Management [IPM], 2016).

ROOTS

Canada thistle has both vertical roots and creeping horizontal rhizomes. While most roots occur in the top 18 inches (45 cm) of the soil, vertical roots 77 inches–118 inches (2 m–3 m) deep are normal (IPM, 2016). The root system can spread 10 ft–12 ft (3.0 m–3.6 m) in a single growing season (Washington State Noxious Weed Control Board, n.d.).

SHOOTS

Stems are slim and hairless. Leaves are oblong to lance shaped, mostly 2 inches–8 inches (5 cm–20 cm) long (Figure 2). The leaves are prickly and are alternate to each other on the stem. Occasionally leaf bases extend along the stem joints as prickly wings that are 0.4 inch (1 cm) long. Leaf edges vary from nearly smooth to shallow lobed and toothed. The top of the leaf is almost hairless, and the bottom of the leaf is occasionally slightly woolly. A few rosette leaves may be present (Figure 3) (IPM, 2016).

Figure 1. Close-up of a Canada thistle seedling.

Photo: Phil Westra, Colorado State University, Bugwood.org.

Figure 2. Mature Canada thistle leaves.

Photo: L.L. Berry, Bugwood.org.

FLOWERS & FLOWERING

Flowers bloom from June all the way through October. The flowers can be white, purple, or pink. Inflorescence is cylindrical or narrowly egg- to bell-shaped with a diameter of 0.2 inch–1 inch (0.5 cm–2 cm) (Figure 4). The flowers are made of numerous overlapping rows of spiny bracts. Male and female flowers are borne on separate plants (Ohio State University, 2021; IPM, 2016).

FRUIT & SEEDS

The fruits are single-seeded, egg- to football-shaped, tan, and 0.08 inch–0.2 inch (2 mm–4 mm) long. They end in a prolonged cluster of fluffy bristles that are 0.5 inch–0.8 inch (12 mm–20 mm) long (IPM, 2016). The seeds are around 0.2 inch (4 mm) long and have tufts of bristles to help them disperse (Figure 5, p. 4). An average plant will produce 1,500 seeds a year, but some can produce up to 5,300 seeds (Washington State Noxious Weed Control Board, n.d.). Seeds can survive in the soil for up to 22 years, providing for a long-lived seed bank (Beck, 2013).

PROPAGATION

Canada thistle can propagate through seeds and vegetatively through rhizomes. The plant tends to put more energy into propagation by rhizome. New shoots may emerge from anywhere on the extensive root system. Tillage encourages new shoot formation from the segmented root pieces. Root segments can survive up to 100 days without photosynthetic energy (Beck, 2013).

SIMILAR SPECIES

It can be hard to differentiate between Canada thistle and bull thistle (*Cirsium vulgare*). Bull thistle is a biennial weed that forms a rosette in the first year of growth and flowers and sets seed in the second year. Bull thistle stems have spiny wings that Canada thistle lacks (Ohio State University, 2021; IPM, 2016). Other invasive thistles that are easy to confuse with Canada thistle include:

- **Scotch thistle** (*Onopordum acanthium*) stems appear to have wings and its floral bracts are coated in spines.
- **Plumeless thistle** (*Carduus acanthoides*) has floral bracts covered with sharp spines.
- **Musk thistle** (*Carduus nutans*) has wide, prickly tipped floral bracts.

Figure 3. Canada thistle rosettes.

Photo: Howard F. Schwartz, Colorado State University, Bugwood.org.

Figure 4. A close-up of Canada thistle flowers.

Photo: "*Cirsium arvense*" by Joan Simon (https://bit.ly/3ALnDDg) is licensed under CC BY-SA 2.0 (https://bit.ly/3dVb6D6).

Some native thistles can also be confused with Canada thistle:

- **Wavyleaf thistle** (*Cirsium undulatum*) flower bracts often have a prominent white ridge.
- **Leafy thistle** (*Cirsium foliosum*) has leaves bordering its pink to white terminal flowers.
- **Yellowspine thistle** (*Cirsium ochrocentrum*) flower bracts are wrapped with hairs and have spreading yellow spines at the tip (Colorado Weed Management Association, 2021).

MANAGEMENT STRATEGIES

Canada thistle control is important in Christmas tree production because the thistles compete with Christmas tree for nutrients, water, space, and light, and can harbor pests and pathogens. Effective control of Canada thistle is essential during the first three years after transplanting Christmas trees into the field to help ensure a good stand and vigorous growth. Competition during the year after establishment, in particular, may suppress tree growth and can even kill trees.

A successful Canada thistle control program may include combining nonchemical strategies such as mowing and hand weeding with chemical strategies such as applying residual preemergence or postemergence herbicides (or both) with different modes of action. This section will discuss Canada thistle control strategies.

NONCHEMICAL CONTROL

Mowing or cutting the stems in late June before the plants flower is an important step in nonchemical control of Canada thistle. The plants will continue flowering after being mowed so they must be mowed repeatedly through late summer. Growers must carefully inspect and clean all equipment used in fields with Canada thistle before moving the equipment to avoid carrying seeds or plant fragments to other fields (MDA, 2021).

Figure 5. Greatly enlarged Canada thistle seeds.

Photo: Steve Hurst, USDA-NRCS PLANTS database, Bugwood.org.

Table 1. Preemergence herbicides that have demonstrated some control over Canada thistle and are labeled for use in Christmas tree production in Michigan 2021.

Common name	Trade name & formulation	Efficacy	Application timings
Flumioxazin	Sureguard 51WDG	Good	In spring before budbreak or in late summer after growth has hardened.
Hexazinone	Velpar 2L	Fair	In spring by broadcast before budbreak or by directed spray after budbreak.
Hexazinone + sulfometuron methyl	Westar 75 DG	Good	In spring to dormant trees before budbreak. Only apply to trees that have been established for at least 1 year and are at least 4 years old.
Flazasulfuron	Mission 25 WG	Fair	In spring before budbreak or in late fall.

Note. See manufacturers' label for application method and timing, dose, safety recommendations, restrictions, and storage of herbicides. Adapted from *Weed Control in Christmas Trees* (E3237), by B. Zandstra & J. O'Donnell, 2018, p. 4 (https://bit.ly/2TM1Nib).

Table 2. Postemergence herbicides that have demonstrated control over Canada thistle and are labeled for use in Christmas tree production in Michigan in 2021.

Common name	Trade name & formulation	Efficacy	Application timings
2,4-D	Defy Amine 4	Good	In spring before budbreak or in late summer after growth has hardened.
Triclopyr	Garlon 3A	Good	In late summer or early fall after growth has hardened and weeds are still growing.
Glyphosate	Roundup Ultra 4L	Fair	In fall after new growth has hardened.
Clopyralid	Stinger 3L	Good	When plants have three to five leaves; apply the high labeled rate before weed bud stage.

Note. See manufacturers' label for application method and timing, dose, safety recommendations, restrictions, and storage of herbicides. Adapted from *Weed Control in Christmas Trees* (E3237), by B. Zandstra & J. O'Donnell, 2018, p. 4 (https://bit.ly/2TM1Nib).

CHEMICAL CONTROL

Nonchemical control methods can be time consuming, laborious, and expensive—and may not be very effective. Integrating nonchemical and chemical controls methods is suggested for the most effective Canada thistle control. Chemical control methods are generally more effective, faster, and less laborious than nonchemical methods.

Preemergence and postemergence herbicides are the two main options for chemical control. In general, preemergence herbicides need to be applied before or just after the seeds have germinated and the seedlings are very small. Postemergence herbicides are effective when they are applied to actively growing Canada thistles before they have begun the reproductive cycle. This section discusses the preemergence and postemergence herbicides that are labeled for Christmas tree production in Michigan and provide effective Canada thistle control.

Preemergence Control

Only a few preemergence herbicides are labeled for use in Michigan in 2021 to control Canada thistle in Christmas trees, including flumioxazin (Sureguard 51WDG), hexazinone (Velpar 2L), hexazinone + sulfometuron methyl (Westar 75 DG), and flazasulfuron (Mission 25 WG). Growers must check the labels and application timing of these preemergence herbicides to avoid chemical damage to their Christmas trees. Table 1 (p. 5) lists preemergence herbicides that can be used in established Christmas tree stands and have demonstrated some control over Canada thistle (Zandstra & O'Donnell, 2018).

Postemergence Control

Zandstra & O'Donnell (2018, p. 4) note that postemergence herbicides that are labeled for use in Christmas tree production and have shown control of Canada thistle (Table 2, p. 5) include 2,4-D (Defy Amine 4), triclopyr (Garlon 3A), glyphosate (Roundup Ultra 4L), and clopyralid (Stinger 3L). These herbicides will not cause much damage to the root system of Canada thistle and therefore do not provide long-term control. Applying spot treatments directly to the thistle is recommended to avoid damage to Christmas trees. Be cautious, too, with the application timings of these postemergence herbicides to prevent damage to Christmas trees. In general, conifers will be most susceptible to herbicide damage if they are exposed during the active shoot growth phase (early to midsummer).

REFERENCES

Beck, K. G. (2013). *Canada thistle* (Fact Sheet 3.108). Colorado State University Extension. https://bit.ly/3wtO5xS

Colorado Weed Management Association. (2012-2021). *Canada thistle*. https://bit.ly/3r4kZ7b

Department of Crop and Soil Sciences. (2003–2021). Canada thistle (P)—*Cirsium arvense*. In *MSU turf weeds.net*. Michigan State University. https://bit.ly/2UvEucx

Integrated Pest Management. (2016). *Canada thistle* (Cirsium arvense). University of California, Agriculture and Natural Resources. https://bit.ly/3hLxZtN

Minnesota Department of Agriculture. (2021). *Canada thistle*. https://bit.ly/3jS0FnS

Ohio State University. (2021). Canada thistle (*Cirsium arvense*). In *Ohio perennial and biennial weed guide*. Author. https://bit.ly/3AE1JS4

Washington State Noxious Weed Control Board. (n.d.). *Canada thistle*. https://bit.ly/2UwBigt

Zandstra, B., & O'Donnell, J. (2018). *Weed control in Christmas trees* (E3237). https://bit.ly/2TM1Nib