

Canada Thistle, *Cirsium arvense* (L.) Scop.

Compositae

Robert J. Hill

I. **Nomenclature:** A) *Cirsium arvense* (L.) Scop. B) Canada thistle, creeping or field thistle; chardon des champs, chardon aux anes (Fr.); Die Ackerdistel (Ger.) (Fig. 1). C) Synonyms; *C. setosum*, *C. arvense* var. *mite*, *Cnicus arvensis*, *Serratula arvensis*, *Breea arvensis* Less., *Carduus arvensis*.

The name *Cirsium* is derived from the word *Cirsos*, a swollen vein, for which thistle is a reputed remedy dating from the time of Dioscorides.

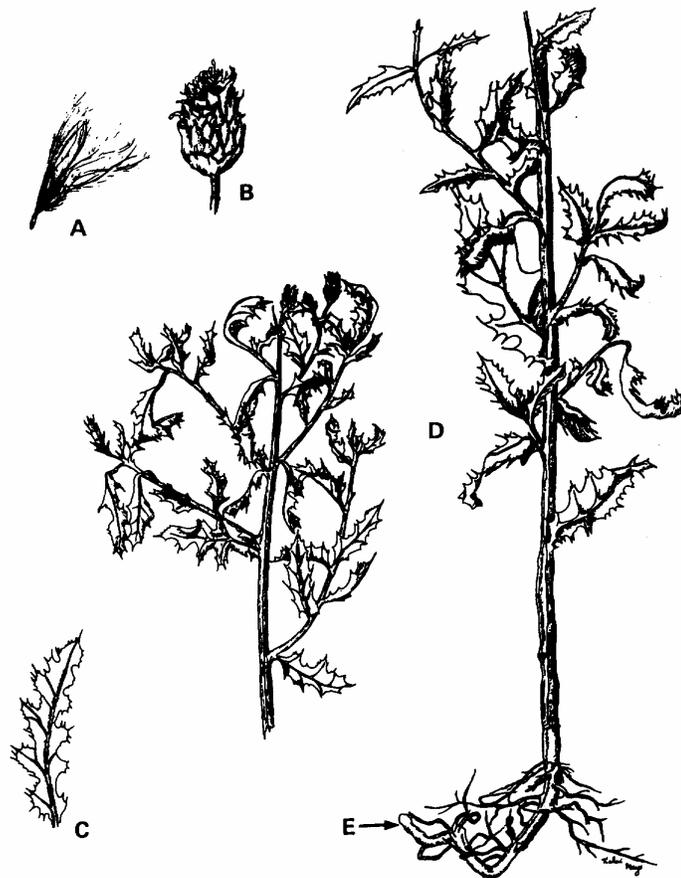


Fig. 1. Canada thistle. A) achene and plumose pappus, B) head of flowers surrounded by spineless bracts, C) leaf, D) stems, and E) rhizome.

II. History: By the beginning of the 1500's A.D. *Cirsium arvense* was a troublesome weed throughout southern Europe and by the mid-1700's was common in continental Europe (Dewey 1901). It was believed to have arrived in North America via French settlements in the early 17th century (Dewey 1901). However, Hansen (1918) states that *Cirsium arvense* was probably brought independently to America as a contaminant in farm seed in both New France and New England, not entering New England from Canada as some authors suggest. Early reports indicate that French soldiers introduced this weed into the American colonies in hay during the Revolutionary War. This tenet is questionable since the weed was commonplace in Vermont shortly after the Revolutionary War; weed control legislation was enacted in this state in 1795 (Moore 1975). Canada thistle was not reported west of the Allegheny Mountains until after 1835. Dewey states that by 1896 21 of 25 states having weed legislation prescribe Canada thistle.

Pennsylvania legislation mandating control of *Cirsium arvense* dates from 1862 (Public Law 164, No.164). Muhlenberg, a Pennsylvania botanist, questioned whether the plants were yet in the Commonwealth in 1813, and none were deposited in his herbarium. Darlington (1837) states that it is "rare" and writes: "This foreigner, the vilest pest that ever invaded the farms of our country, in the form of a weed, was first observed in the Great Valley, near Warren Tavern (Chester Co., PA) in 1828 by Mr. Joshua Hoopes, and has been found, since, at Kimberton, and in one or two other localities. It appears to have been introduced among Timothy seeds. The utmost vigilance will be required, to prevent it from spreading. . . ." In 1832, de Schweinitz, a native of Bethlehem PA, claimed that Canada thistle was naturalized in the United States". . . not further south than New Jersey." It has continued to spread as a weed of cultivated fields and waste places since early Pennsylvania botanists first encountered it.

III. Technical Evaluation: A perennial herb spreading rapidly by horizontal deep-seated, creeping roots which give rise to aerial shoots. *Stems:* 3-15(20) dm tall, slender, green, branched; *leaves:* alternate, oblong to lanceolate, margin variable from entire to deeply pinnately segmented, subglabrous to white tomentose beneath, the base sessile and clasping or short decurrent; *flower heads:* numerous, 1-5/branch, 15-25 mm high, polygamo-dioecious (functionally dioecious but with a few flws. of the opposite sex or a few bisexual flws. on all plants at flowering time), male heads globular, slightly smaller than the flask-shaped female heads; *involucre:* numerous, appressed, ovate (outer) to narrow, 10-20 mm high, all bracts innocuous or with outer bracts phyllaries) subulate-tipped with spine 0.5-1.0 mm, ovate, tough-textured, glabrous to arachnoid, with a narrow glandular mid-line; inner bracts becoming longer, the innermost unarmed, apex flat, chartaceous, green to purple and erose; *florets:* all disc (tubular), pink-purple or occasionally white; *florets of female head:* 23.0-26.0 mm long (including achenes), tube 20.0-23.0 mm, lobes to 2.0 mm;

Fig. 2. A white feathery pappus aids in dispersal of the Canada thistle achenes (seeds).

Fig. 3. Achenes are flat-topped, with a central tubercle, straw colored or light brown.

pistils: well developed with long exerted styles, but anthers vestigial or none; *florets of male heads:* 12.0-14.0 mm long, vestigial ovary 3.0-5.0 mm, tube 7.0- 9.0 mm, lobes 3.0-4.0 mm, pistil absent or present and superficially normal; *anthers:* 4.0 mm long; *pollen:* 42.0-44.0 microns diam., spiny; *pappus* (Fig. 2): copious, white, plumose or feathery, usually surpassing tubes of the pistillate (female) flowers, corolla surpassing pappus in staminate heads, 20~30 mm long on mature achenes; *achenes* (Fig. 3): 2.5-4.0 mm x 1.0 mm, slightly flattened, straight or curved, apex truncate with a central tubercle, stramineous or light brown; *chromosomes:* $2n = 34$; *distribution:* a noxious weed, native to Eurasia, naturalized in the northern U.S. and southern Canada. It is a longday plant that does not tolerate high summer temperatures. These factors limit the southern distribution of the taxon. Canada thistle occurs in orchards, pastures, meadows, lawns, gardens, on cultivated land, roadsides, railway embankments and waste

places; the plant prefers rich soil (open mesophytic areas) but thrives everywhere except swamps (wet soils produce a shallow root development), dense woodlands, and the very driest, hard-pack situations; *seedlings* (adapted from Kummer, 1951) (Fig. 4): The roots of the seedling quickly become long with few or no adventitious roots from the hypocotyl, *cotyledons*: 3.0(5.5) -6.0 (14.0) mm, crisp, thick, dull with very few granules on upper surface, midvein shining beneath, united at the base to form a shallow cup, *leaves*: alternate, broadened bases half-clasping the crown or stem, bristly hairs on both surfaces, some leaves white hairy beneath. Margins undulating, irregularly dentate, or lobed-dentate, each tooth terminating in a sharp prickle. leaves in bud folded together lengthwise, the fold distended by spines and prickles; surrounded by ephemeral, webby hairs. Stem not apparent in autumn specimens. Spring seedlings with a well-developed stem, bent (reclining) at base.

Variations in leaf characters (including marginal segmentation, spininess and vestiture, and texture) are the basis for four varieties currently recognized (Moore 1975).

1. Leaves white-tomentose beneath. *Cirsium arvense* (L.) Scop. var. *vestitum* Wimm. & Grab.
1. Lvs. glabrous or + arachnoid beneath.
 2. Lvs. thin, flat, marginal spines few, fine and short
 3. Lvs. entire (lower stem lvs. may be shallowly pinnatifid or undulating. var. *integrifolium* Wimm. & Grab.
 3. Lvs. shallowly to deeply pinnatifid, often asymmetrical. var. *arvense*
 2. Lvs. thick, surface undulating, marginal spines long and stout.
 4. Flowers purple. var. *horridum* forma *horridum* Wimm. & Grab.
 4. Flowers white. var. *horridum* forma *albiflorum* (Rand. & Redf.) R. Hoffm.

Fig. 4. Seedling stage of Canada thistle

IV. Diagnostic characteristics (Fig. 1): numerous, small, unisexual, purple-flowered heads; florets all disc (no rays); perennial plants having creeping, deep roots; green, glabrous stems that lack spiny wings; involucre bracts subtending the heads (florets) are not spine-tipped (rarely soft tipped).

V. Confused taxa. There are 16 species of *Cirsium* in our range. *Cirsium arvense* differs from all others by the combination of diagnostic characters given above. Thistles of the genus *Carduus* L. (3 species in our area) all possess pappus-bristles that are barbellate (harpoonlike teeth), whereas in *Cirsium* the pappus-bristles are plumose (branched or featherlike). Both pappus types, however, are deciduous in a ring, leaving an unadorned achene. The genus *Cirsium* is also similar to *Onopordum* L., differing chiefly in the receptacle which is flat, fleshy, and honey-combed, often with short bristle-tips on the partitions. Our Eurasian weed, *Onopordum acanthium* L., also has a barbellate pappus similar to members of the genus *Carduus*. Canada thistle was formerly placed in the genus *Cnicus*; however, all members of this taxon have yellow flowers and a pappus in two series (biseriate). The outer series consists of 10 firm, smooth awns about as long as the achene, alternating with a much shorter, minutely hairy inner one.

Bull thistle, *Cirsium vulgare* (Savi) Tenore (= *C. lanceolatum* misapplied), is the most commonly confused taxon. This plant (Fig. 5) is a biennial, has conspicuously spiny-winged stems and spine-tipped (outer) floral bracts (involucre).

Fig. 5. Photograph of a herbarium specimen of Bull thistle, commonly confused with Canada thistle.

VI. Natural History. Canada thistle is the only thistle in our range that has dioecious plants. The weed is highly variable and includes ecotypes based on phenology, photoperiodism, vigor, growth habit, stomatal frequency, response to herbicides, seed dormancy, and germination (Moore 1975). Four varieties are formally recognized, although all are interfertile and the usefulness of this classification is limited. *Cirsium arvense* reproduces by seeds and roots; a 3-inch piece of root has been known to produce a patch of weeds 60 feet in diameter within 3 years. It has been suggested (Hansen 1921) that Canada thistle does not produce seeds in Pennsylvania. This statement is probably an erroneous conclusion emanating from the dioecious condition where male populations (staminate flowered) spread by vegetative means. Large populations of all male plants are sometimes encountered. Flowering commences in mid-June and continues into September (until frost in some populations). Plants flower freely under 18 hr. illumination; it is a long day plant. In mid-November 1982 populations were found flowering (male flowers only) under approximately 9.5 hr. day length. Plants can grow in soils with salt concentration of up to 2%. Favored conditions are unshaded, moist, aerated clay loam. Bakker (1960) observed 39 shoots/sq meter with 41 heads/shoot on plants growing under favorable environmental parameters. The number of seeds produced by a single plant depends on effective pollination. Plants have been observed to produce more than 5,000 seeds, yet 1,530 seeds/plant is average (Hay 1937). Seeds are distributed primarily by wind, in impure seed mixtures, farm machinery, in hay, by railroad cars, and with nursery stock. *Cirsium arvense* is susceptible to the rust *Puccinia suaveolens* Rostr. as well as *Albugo tragopogonis* Pers. ex S. F. Gray, white-rust (NY to IA, TX, WY); *Cuscuta* sp., dodder (NY); *Erysiphe cichoracearum* DC, powdery mildew (rare, TX); *Fusarium* sp., wilt (WA); *Meloidogyne* sp., root knot nematodes (KS, OH); *Phyllosticta cirsii* Desm., leaf spot (NY); *Phymatotrichum omnivorum* (Shear) Dug, root rot (TX); *Sclerotinia sclerotiorum* (Lib.) d By., crown rot (CO, MT, OR); *Sclerotium rolfsii* Sacc., southern blight (TX); and *Septoria cirsii* Niessl (*S. commonsii* Ell. Ev.), leaf spot (VT to IN, TX, WI) (from Index of Plant Diseases in the US, USDA Handbook 165, Washington DC, 1960).

VII. Economic Importance. A) Beneficial. Canada thistle is attractive to honeybees, and very young thistle shoots may be eaten by livestock. It lacks most virtuous qualities and is rightly considered noxious.

B) Detrimental. Canada thistle is found in almost all situations, including agricultural land, where it spreads rapidly by sexual (seeds) and asexual (root fragments) means. The scientific literature is replete with studies indicating the reduction in crop yield where Canada thistle competes with desired plants. The plants also harbor insects (bean aphid and stalk borer) that attack corn and tomatoes, and it is an alternate host for some pathogenic organisms (Moore 1975).

Food processing equipment is frequently unable to discriminate small thistle buds from peas. Therefore, small buds are occasionally found in canned peas since they are equivalent in size and shape.

VIII. Control: Table 1 details control methods for *Cirsium arvense* in agricultural situations'

1 Disclaimer: when trade names are used, no discrimination is intended and no endorsement by either the author or the Pennsylvania Department of Agriculture is implied.

Reference

- Bakker, D. 1960. A comparative life history of *Cirsium arvense* (L.) Scop. and *Tusillago farfara* L., the most troublesome weeds in the newly reclaimed polders of the former Zuiderzee. in J. L. Harper, ed. The Biology of Weeds. Blackwell, Oxford.
- Darlington, W. 1837. Flora Cestricea. Simeon Siegfried, West Chester, PA, xxiii +640 pp.
- de Schweinitz, L. D. 1832 (1828-1836). Remarks on the plants of Europe which have become naturalized in a more or less degree, in the United States. Ann. Lyceum Nat. Hist. NY. Vol. III. G. P. Scott Co., NY, pp. 148-155.
- Dewey, L. H. 1896. Legislation against weeds. U.S. Dep. Agric. Div. Bot. Bull. No. 17. 60pp.
- Dewey, L. H. 1901. Canada thistle. U.S. Dep. Agric. Bur. Bot. Circ. 27. 14 pp.
- Hansen, A. A. 1918. Canada thistle and methods of eradication. U.S. Dep. Agric. Farm Bull. 1001. 15 pp.
- Hansen, A. A. 1921. Canada thistle. Penn State Agric. Exp. Stn. Weed Leaflet No. 2. 4pp.
- Hay, W. D. 1937. Canada thistle seed production and its occurrence in Montana seed. Seed World, March 26. pp. 6-7.
- Kummer, A. P. 1951. Weed Seedlings. Univ. Chicago Press, Chicago. p. 392.
- Moore, R. J. 1975. The biology of Canadian weeds. 13. *Cirsium arvense* (L.) Scop. Can. J. Plant. Sci. 55: 1033-1048.
- Muhlenberg, H. 1813. Catalogus Plantarum Americae Septentrionalis. Wm. Hamilton, Lancaster. 112 pp.

<u>Crop</u>	<u>Product</u>	<u>Rate per Treated Acre</u>	<u>Time of Application</u>
Asparagus Banvel	0.25-0.5 lb. ai. (dicamba)	(0.5-1.0 pt) 0.75-1.0 lb ai	In harvest, apply immediately after before next cutting but at least 24 hrs. before next cutting.
Beans (dry: kidney, lima and green); peas	Basagran (bentazon)	0.75-1.0 lb ai (0.75-1 qt.)	early postemergence
Beans (green)	Roundup (glyphosphate)	1-5 lb ai (1-5 qt.)	prior to crop emergence
Peas	Roundup (glyphosate)	2-5 lb ai (2-5 qt)	prior to crop emergence
Sweet Corn Popcorn	Aatrex 80W, 4L or Nine-0	4 lb ai (5lb 80W, 8 pt 4L, 4.4 lb Nine-0) + 1 gal. Emulsifiable oil spilt application	broadcast 2.5 lb 80 W, 4 pt 4L, 2.2lb Nine-0/A diring of shortly after planting but before corn or Canada thistle emerge. Follow with some rate after corn and thistle emerge, but before thistles emerge, but before thistles are 6" high. It usually takes several annual applications of Aatrex to eliminate thistle.
	Basagran (bentazon)	0.75-1.0 lb ai (0.75-1.0 qt)	early postemergence, consult label
	Roundup (glyphosate)	2-5 lb ai (2-5 qts)	preemergence, consult label
	2,4-D amine	1 lb ai (2 qt)	apply to floor of orchard, avoid drift to tree foliage
Field Corn	Banvel (dicamba)	0.25-0.5 lb ai (0.5-1.0 pt)	preemergence up to early post emergence
	Banvel (dicamba)	0.25 lb ai (0.5 pt)	post emergence up to 36" tall corn or 15 days before tassel emergence
	Basagran (bentazon)	0.75-1.0 lb ai (0.75-1.0 qt)	early postemergence, consult label
Soybeans	Basagran, as above for field corn Roundup, as above for sweet corn		
Pasture	Weedone LV6 Emulsifiable (2,4-d-ester)	2-3 lb ai (2.67-4 pt) in enough water to thoroughly cover	consult label for grazing animals
Grasses	Banvel (dicamba)	up to 1 lb ai (2 Pt) on well established perennial grasses. Use 0.25-0.5 lb ai (0.5-1.0pt) after 3-5 leaf seedling grass stage	
non-cropland	Banvel 4-W. S (dicamba)	0.5-6 lb ai (1-12 pt)	

