

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

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Description^{2,4,5,6}: Canada thistle is a prickly perennial herb with slender green, freely branched, 30 to 150 cm tall stems. Stems and leaf margins have spines, which are its best known feature. The leaves are alternate, clasping and oblong, 3-5 times as long as they are wide. The amount of leaf lobbing, folding, hairiness, number and strength of spines varies. Plants are usually either male or female, but both produce one to five rose-purple to pinkish, occasionally white, flower heads per branch. The female heads are 15 to 25 mm high and 5 to 6 mm wide. The males are slightly smaller; but the most obvious difference is that they turn brown while the females develop copious white pappus (seed hair). In Canada flowering begins mid June to early July and continues until frost. The dead stems collapse over winter, but the roots survive. These form rosettes when the average weekly spring temperature reaches 5° C, and in early summer produce vertical shoots growing up to 3 cm a day.

Canada thistle was introduced from southeastern Europe and eastern Mediterranean in the 17th century. It now occurs in all provinces up to 58-59° N, but is most numerous south of the -18° C mean January isotherm. Spread is by seed, which requires male flowers within 50 m, by lateral roots and, following cultivation, by root fragments. Canada has four varieties, but there are more in eastern Europe where each is treated as a species. There are also numerous ecotypes that differ in the time of growth and flowering, vigour, number of stomata and response to herbicides. Hybrids are formed with nine Old World *Cirsium* spp. and occasionally with native North American *Cirsium* spp.

The problem: The thistle is a tenacious weed of crop and pasture land on fertile moist soils. Wheat losses in Saskatchewan have been estimated at \$3.6 million/year, as although herbicides delay growth, they do not kill the thistle. In moist grassland it displaces grazing by domestic and native livestock, and is disliked by recreational users. It is particularly dense on irrigated sheep pasture, on sheep-grazed cut-blocks in British Columbia, and along the Alberta foothills.

Biological Control: In Europe, Canada thistle is attacked by about 40 insect species that are restricted to the thistle subtribe Cardueae, and most to the genera *Cirsium*, *Carduus* and *Silybum*¹⁰. These insects are almost equally divided between internal feeders (root-crown, stem, leaves and flower-heads), and external leaf feeders, and few have specialized on the roots. Most of the insects accept the 92 North American *Cirsium* spp. in no-choice tests. Since the late Miocene (12 million years ago), the native *Cirsium* spp. have evolved, different chromosome numbers from their Eurasian relatives. From 4-10 million years ago a few Eurasian thistle-feeding flies arrived in North America to evolve on the native *Cirsium* spp⁷.

Four biocontrol agents are established in Canada: the stem gall fly, [*Urophora cardui*](#), the stem weevil, [*Hadroplontus litura*](#), the defoliating beetle, *Lema cyanella*, and the seed-head weevil [*Rhinocyllus conicus*](#). The thistle is also attacked by six adventitious and one native insect¹: the root-crown weevil [*Cleonis pigra*](#), the defoliating beetle [*Cassida rubiginosus*](#), the seed-head weevil [*Larinus planus*](#), the seed-head fly, [*Terellia ruficauda*](#), the systemic rust fungus, [*Puccinia punctiformis*](#), and a small midge with yellow-orange larvae *Dasineura gibsoni* (not discussed) that feeds on the seed hairs. Finally, there is the native painted lady butterfly, [*Vanessa cardui*](#), and over 70 general feeders⁴. In spite of the plethora of enemies, the thistle is still a problem. However, strategies are suggested for increasing the impact of several species.

There are still prospects for additional biocontrol agents: a defoliating beetle, *Altica cirsicola*, that in NW China favours thistles regenerating after cultivation⁸, and a stem mining weevil, *Lixus* sp. Both are restricted to Canada thistle in the field, although they develop on native *Cirsium* spp. in no-choice tests. *Altica cirsicola* interbreeds with *A. carduorum* but egg fertility and hatch in the hybrids was reduced. Iso, the 46% DNA similarity between them is similar to that reported for other insect species. Thus it was concluded that the two beetles are separate species in spite of their morphological similarity³. The NW China *A. cirsicola* appears to be better adapted to Canada than *A. carduorum*. However, if the biocontrol of Canada thistle is to continue, it will be necessary to get regulatory acceptance of tests that shows which species will not attack native *Cirsium* spp. in the field⁹.

References

1. Forsyth, S.E and A.K. Watson. 1985. Stress inflicted by organisms on Canada thistle. Proceedings of the VII International Symposium on Biological Control of Weeds. E.S. Delfosse, (ed.). Agriculture Canada, Ottawa. pp 425-431.
2. Lalone, R.G. and B. D. Roitberg. 1994. Mating system, life-history and reproduction in Canada thistle (*Cirsium arvense*; Asteraceae). American Journal of Botany 81: 21-28.
3. Laroche, A.R.A. DeClerck-Floate, L. LeSage, D.K.D. Floate & T. Demeke. 1996. Are *Altica carduorum* and *A. cirsicola* (Coleoptera: Chrysomelidae) different species? Implications for the release of *A. cirsicola* for the biological control of Canada thistle in Canada. Biological Control 6: 306-314.
4. Maw, M.G. 1976. An annotated list of insects associated with Canada thistle (*Cirsium arvense*) in Canada. Canadian Entomologist 108: 235-244.

5. Moore, R. J. 1975. The biology of Canadian weeds. 13. *Cirsium arvense* (L.) Scop. Canadian Journal of Plant Science 55: 1033-1048.
6. Moore, R.J. and C. Frankton. 1974. The Thistles of Canada. Canada Department of Agriculture Monograph No. 10. Ottawa. I 11 pp.
7. Steck, G.J. 1981. North American *Terellinae* (Diptera: Tephritidae): Biochemical systematics and evolution of larval feeding niches and adult life. PhD thesis, University of Texas at Austin. 251 pp.
8. Wan, F.-H, P. Harris, L-M Cai & M-X Zhang 1996. Host specificity of *Altica carduorum* Guer. (Chrysomelidae: Coleoptera). A defoliator of *Cirsium arvense* (L.) Scop. (Asteraceae) from north-western China. Biocontrol Science and Technology 6: 521-530.
9. Wan, F.-H and P. Harris. 1997. Use of risk analysis for screening weed biocontrol, agents: *Altica carduorum* Guer. (Coleoptera: Chrysomelidae) from China as a biocontrol agent of *Cirsium arvense* (L.) Scop. in North America. Biocontrol Science and Technology 7: 299-308.
10. Zwölfer, H. 1965. Preliminary list of phytophagous insects attacking wild *Cynareae* (Compositae) species in Europe. Technical Bulletin of the Commonwealth Institute of Biological Control 6:16-19.