

## Hoary Cress Management (*Cardaria* sp.)

Celestine A. Duncan<sup>1</sup>, Weed Management Services and Mark J. Renz, New Mexico State University

### INTRODUCTION

Hoary cress (*Cardaria* sp.) is also known as whitetop or little whitetop. It is a deep-rooted, creeping perennial mustard that spreads by seed and vegetative root growth. There are three species including lens-podded hoary cress (*C. chalapensis*), heart-podded hoary cress (*C. draba*); and globe-podded hoary cress (*C. pubescens*). Hoary cress is well adapted to moist sites including sub-irrigated and irrigated pastures and hay-fields, rangeland, and disturbed sites such as roadsides, railways, and ditch banks. It can also invade cropland including small grain and alfalfa fields. Hoary cress may reduce crop yields, displace native plants, and reduce biodiversity, wildlife habitat, and forage production. The weed contains glucosinolates that can be toxic to cattle (McInnis et al. 1993). Hoary cress begins growth early in spring from a rhizomatous root system and flowers by April or early May. Seeds are produced about a month after flowering.



Hoary cress is native to southwestern Asia and has been introduced to every continent except Antarctica (Mulligan and Findlay 1974). It was probably introduced to North America as a contaminant in alfalfa seed from Turkestan in the early 1900s up until around 1922 (Mulligan and Frankton 1962). Heart-podded hoary cress is the most wide-spread of the three species in the United States.

### IDENTIFICATION

The three species of hoary cress share similar characteristics. They are perennial forbs with a spreading root system from which many 6 to 24 inch long stems are produced (Kartesz and Meacham 1999). Stems are generally erect but can bend over or “lodge” as the plant ages. Leaves are about 0.5 to 4 inches long, and 0.1 to 1.4 inches wide with upper leaves clasping the stem. The inflorescence of hoary cress is composed of numerous small white flowers each with 4 petals about 0.1 inch long, and 6 stamens.

Hoary cress species can be distinguished by the shape of their seed pods (silicles) (Sheley and Stivers 1999). Globe-podded whitetop has small purplish globe-shaped seed pods. Fruit of lens-podded whitetop is flat and round. Heart-podded whitetop has a heart-shaped, broad, flat seed pod. In all species, the seed pod is tipped with a beak which is rare in the mustard family.

### REPRODUCTION AND SPREAD

---

<sup>1</sup> Celestine Duncan, Consultant, Weed Management Services, Helena, MT 59624 406-443-1469

Hoary cress spreads both by roots and seed. Root systems consist of deeply penetrating rhizomes with thick, corky-like bark, and numerous underground buds from which aboveground shoots arise (Mulligan and Findlay 1974). Hoary cress tends to spread more by vegetative reproduction than by seed, resulting in scattered, sometimes dense patches. Seed production may vary with individual species, site characteristics, and weather conditions. Hoary cress seeds are released singly through ruptures in the seed pod walls or when the entire seed pod breaks away from the plant. Seeds are spread during irrigation, by wind, vehicles, livestock and wildlife, seed and hay products, road building materials, or movement of topsoil. Hoary cress seeds are about the same size as alfalfa and clover seeds and are often introduced as a seed contaminate.

Individual plants can live at least 8 years (Dietz and Schweingruber 2002). Heart-podded hoary cress plants contain phytotoxic chemicals that may inhibit germination and initial seedling growth of other plants in natural environments. This gives the weed a competitive advantage over desirable plants.

## MANAGEMENT

Hoary cress can be controlled with various management techniques. Preventing movement of seeds and root fragments to non-infested sites is a critical management consideration. Avoid moving livestock, equipment, and vehicles through infestations during the seeding period. Annually monitor high-risk sites for invasion including transportation corridors, trail heads, livestock feeding areas, and waterways, and eradicate newly established plants as soon as possible.

### *Physical/Mechanical/Cultural*

Mowing alone will not effectively control hoary cress and may injure desirable vegetation. However, mowing at the early flower growth stage may reduce stem density and the number of seed produced.

Cultivation as part of a normal cropping sequence can spread hoary cress, and roots of the plant are reported to survive for at least one year with top-growth removed (Sterling 1951). Clean cultivation that eliminates above-ground portions of the plant throughout the growing season (cultivate every 3 to 4 weeks or as needed) for 2 to 4 years is required to control the plant. Hoeing that completely removes top-growth for 2 to 4 years is also effective on small infestations.

Hoary cress establishment and spread on range, pasture, and wildland sites can be reduced by maintaining competitive desirable vegetation. Cattle and sheep will graze the weed and property timed grazing followed by an herbicide application may increase control (McInnis et al. 1990). Managers should use caution when allowing animals to graze infested range and pasture by providing supplemental iodine, and utilizing mature, non-lactating animals since hoary cress is considered at least mildly toxic to livestock (McInnis et al. 1993). Livestock may also act as vectors for seed and increase weed spread.

### *Biological Control*

There are no biological control agents available for hoary cress management in the United States at the time of this publication. In 2001 CABI Bioscience Switzerland Centre conducted European field surveys and found 80 insects, one mite, and 2 fungal pathogens collected on hoary cress (Hinz et al. 2004). Four weevils and a flea beetle have been selected for further study. Host specificity tests are on-going to determine the suitability of the biocontrol agents for release.

## Herbicides

Herbicides are effective in suppressing or controlling new infestations of hoary cress. On large, well-established infestations, herbicides should be combined with management methods that increase desirable competitive vegetation to achieve long-term control. Metsulfuron or chlorsulfuron provide the most effective hoary cress control on range, pasture, wildland, and rights-of-way sites. There are limited herbicide options for hoary cress control in alfalfa. For example, a single application of imazethapyr (Pursuit) in alfalfa-grass pastures can provide greater than 90% hoary cress control the year of application, but no control the following year (Stougaard et al 1999). Table 1 describes herbicide options for managing hoary cress. *It is important to read the herbicide label BEFORE making any application, as different herbicides will have different requirements and restrictions.*

**Table 1. Herbicide options for hoary cress management.**

Herbicide	Active Ingredient	Rate of Herbicide (amount/acre)	Timing of Application	Comments
Many products	2,4-D ester or amine	Depends on formulation (1 to 2 lb a.i.)	Bolting to bud	<ul style="list-style-type: none"> <li>• No soil residual to control seedlings</li> <li>• Control minor after bud growth stage.</li> <li>• Apply annually for at least 2 years to reduce density.</li> <li>• Selective, will not harm grass</li> </ul>
Plateau + MSO	Imazapic	8 to 12 fl oz (0.124 to 0.188 lb a.e.) + MSO 1 qt/ac	Full bloom or fall to rosettes	<ul style="list-style-type: none"> <li>• Residual activity</li> <li>• Before using note crop restrictions</li> <li>• May cause injury to some grasses at the 12 oz rate</li> </ul>
Many products	Glyphosate	Depends on formulation (2 to 3 lbs a.e.)	Bolt growth stage	<ul style="list-style-type: none"> <li>• Non-selective, can damage most plants</li> </ul>
Cimarron + NIS	Metsulfuron	0.75 to 1 oz (0.45 to 0.6 oz a.i.) + NIS 0.25% V/V	Pre-bloom to bloom; or fall	<ul style="list-style-type: none"> <li>• Residual herbicide</li> <li>• Selective, will not harm many grasses</li> </ul>
Telar + NIS	Chlorsulfuron	1 to 1.5 oz (0.75 to 1.12 oz a.i.) + NIS 0.25% V/V	Pre-bloom to bloom; or fall	<ul style="list-style-type: none"> <li>• Residual herbicide</li> <li>• Selective, will not harm many grasses</li> </ul>
Raptor + MSO + Nitrogen	Imazamox	6 fl oz (0.047 lb a.e.) + MSO 1 qt/ac	Rosettes – spring or fall in crops (alfalfa)	<ul style="list-style-type: none"> <li>• Residual herbicide</li> <li>• Registered for use in alfalfa</li> <li>• Suppression only</li> </ul>
Pursuit + MSO + Nitrogen	Imazethapyr	6.0 fl oz (0.095 lb a.e.) + MSO 1 qt/ac	Rosettes – spring or fall in crops (alfalfa)	<ul style="list-style-type: none"> <li>• Residual herbicide</li> <li>• Registered for use in alfalfa</li> <li>• Suppression only</li> </ul>

## REFERENCES

Dietz, Hansjorg and F.H. Schweingruber. 2002. Annual rings in native and introduced forbs of lower Michigan, U.S.A. Canadian Journal of Botany. 80: 642-649.

- Hinz, H., L. Skinner, D. Shaw, and C. Quimby. 2004. New and on-going biological control projects: Whitetop/hoary cress. In Coombs, E.M., J.K. Clark, G.L. Piper, and A.F. Cofrancesco, Jr., eds. Biological Control of Invasive Plants in the United States. Corvallis, Or. Oregon State University Press. p. 452.
- Kartesz, J.T. and C.A. Meacham. 1999. Synthesis of the North American flora (Windows Version 1.0), [CD-ROM]. Available: North Carolina Botanical Garden. In cooperation with the Nature Conservancy, Natural Resources Conservation Service, and U.S. Fish and Wildlife Service [2001, January 16].
- McInnis, M.L., L.L. Larson, and R.F. Miller. 1993. Nutrient composition of whitetop. Journal of Range Management. 46(3): 227-231.
- McInnis, M. L., L.L. Larson, R.F. Miller. 1990. First-year defoliation effects on whitetop (*Cardaria draba* (L.) Desv.). Northwest Science. 64(2): 107.
- Mulligan, G.A. and J.N. Findlay. 1974. The biology of Canadian weeds. 3. *Cardaria draba*, *C. chalepensis*, and *C. pubescens*. Canadian Journal of Plant Science. 54(1): 149-160.
- Mulligan, G.A. and C. Frankton. 1962. Taxonomy of the genus *Cardaria* with particular reference to the species introduced into North America. Canadian Journal of Botany. 40: 1411-1425.
- PNW Weed Management Handbook. 2005. Hoary cress or whitetop *Cardaria draba* (and related species). [Online] <http://weeds.ippc.orst.edu/pnw/weeds> Accessed: February 2006.
- Sheley, Roger and Jack Stivers. 1999. Whitetop. In Sheley, R.L. and J.K. Petroff, eds. Biology and Management of Noxious Rangeland Weeds. Corvallis, OR: Oregon State University Press. Pp. 401-407.
- Sterling, G. R. 1951. The control of hoary cress in Alberta. Field Crops Branch Report. Edmonton, AB: Alberta Department of Agriculture. 5 p.
- Stougaard, R.N., J.I. Stivers, and D.L. Holen. 1999. Hoary cress (*Cardaria draba*) management with imazethapyr. Weed Technology. 13(3): 581-585.
- [USDA NRCS] USDA Natural Resources Conservation Service. 2006. The PLANTS database, National Plant Data Center, Baton Rouge, LA. [Online] <http://plants.usda.gov>. Accessed: February 2006.

Web Sites:

- [http://tncweeds.ucdavis.edu/esadocs/card\\_spp.html](http://tncweeds.ucdavis.edu/esadocs/card_spp.html)  
[http://www.fs.fed.us/database/feis/plants/forb/cendif/fire\\_effects.html](http://www.fs.fed.us/database/feis/plants/forb/cendif/fire_effects.html)  
<http://plants.usda.gov/java/profile?symbol=CADR>  
<http://invader.dbs.umt.edu/>