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EC02-172 Plumeless Thistle

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Plumeless Thistle

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Biology
Identification
Distribution
Control
Plumeless thistle (Carduus acanthoides L.) is one of seven noxious weeds in Nebraska. An introduced invasive broad-leaf weed native to Europe and Asia, plumeless thistle currently infests about 65,000 acres in Nebraska. Infestations of plumeless thistle may reduce productivity of pastures and rangeland, where infestations tend to be the largest. Plumeless thistle competes with and suppresses growth of desirable species. Heavy infestations prevent livestock from grazing the area and lighter infestations prevent livestock from eating plants growing near the thistle (Figure 1). Estimates place the annual loss in Nebraska agricultural production due to plumeless thistle at $162,000. Although plumeless thistle is more limited in distribution than its close relative the musk thistle (Carduus nutans L.), the infestations require landowners and producers in Nebraska to spend thousands of dollars each year for control.

Biology

Plumeless thistle, a member of the sunflower family, is primarily found in pastures, rangeland, and non-cropped areas in northeastern Nebraska. The plant can be a biennial, winter annual, or occasionally summer annual. Biennials take two seasons to complete their life cycle, with vegetative growth the first year and reproduction the second. Winter annuals complete their life cycle in one year, germinating in late summer or fall and completing flowering in spring or summer. Summer annuals germinate in the spring, flower, produce seed, and die the same year. Typically plumeless thistle acts as a biennial with seed germination in April. Plants grow vegetatively the first year, overwintering in the rosette stage. (A rosette is a circular cluster of leaves growing close to the ground.) In the second season of growth, plumeless thistle produces a flowering stalk and flowers from June to August (See Life Cycle, Figure 11).

Plumeless thistle only reproduces from seed. Approximately 50 to 80 seeds are produced per head. Although most seeds germinate in the following year, seed viability can remain high for more than 10 years in the soil. Germination potential of the seed varies from 75 to 95 percent.

History

The native distribution of plumeless thistle covers Europe and Asia. It was first introduced to North America on the east coast. The earliest collection in North America was at Camden, New Jersey, in 1879. Plumeless thistle was first observed in other midwest states, including Iowa, South Dakota, Wyoming, Colorado, Idaho, Minnesota, and Wisconsin. In 1967, the Nebraska Legislature proclaimed plumeless thistle as a noxious weed, requiring all landowners in the state to control it.
The pappus often breaks off and blows away with the seed remaining attached to the flower head.

The non-native thistle does have some value in its Nebraska habitat. Plumeless thistle is an important plant for many butterfly and songbird species. Songbirds eat the thistle seeds, which may contribute to seed dispersal.

Plumeless thistle may accumulate poisonous levels of nitrates when drought stressed, as do many plants; however, this does not appear to pose a problem for livestock since livestock will generally not eat the plant due to spines on leaf margins.

**Identification**

The basal rosette of the plumeless thistle is well developed. The leaves of the rosette are narrowly oval or oblong (Figure 2) and deeply lobed, near the midrib (Figure 3). The one to three points of each lobe end in a spine. The leaves of plumeless thistle are lobed to the midrib in contrast to the leaves of the musk thistle (Figure 4). The rosette leaves have fewer hairs than the stem leaves. The plumeless thistle is supported by a stout, fleshy taproot, which can penetrate the soil to a depth of several feet.

Plumeless thistle grows to a height of 1 to 5 feet, usually reaching 3 to 4 feet. The stem of plumeless thistle is erect, freely branching in the upper portion of the plant (Figure 5). The leaves extend onto the stem, giving it a
winged or frilled appearance (Figure 6). The stem can be densely hairy to nearly hairless. The leaves of the plumeless thistle are alternate, with one leaf at each node. The leaves are attached directly to the stem and extend downward from the point of attachment, giving them a curled look. The leaves are oval or oblong and 4 to 8 inches long. They are irregularly and deeply lobed with small spines along the margin. The segments of the lobes are one to four, pointed, with 1/32- to 1/4-inch long marginal spines. The surface of the leaves is covered with fine hairs, unlike the surface of the musk thistle.

The flower heads of the plumeless thistle are solitary or in clusters of two to five. The heads are 5/8 to 1 inch tall and 3/8 to 3/4 inch wide and smaller than the musk thistle flower (Figure 6). There are several series of bracts or small leaf-like structures below the flower head, including spiny outer bracts (1/4 to 1/2 inch) and spineless inner bracts (3/4 inch). A distinguishing characteristic separating plumeless thistle from musk thistle is the presence of spiny wings on the flowering stalk (1/8 to 5/8 inch wide) up to the base of the plumeless thistle head (Figure 7). The flower is purple, or rarely white or yellow, and is 1/2 to 3/4 inch long. The flower tube is 3/8 inch long and 1/32 inch wide. Anthers, the pollen-bearing portion of the flower, are 1/8 inch long, woolly, filaments.

The seed of plumeless thistle is straw-colored to light-brown. It is 1/8 inch long and slightly oblong to egg-shaped, appearing somewhat rectangular. At one end of the seed, there is a group of tiny barbed bristles, forming a ring (Figure 8).

Control Methods

The best strategies for controlling plumeless thistle use integrated weed management (IWM), a combination of two or more control methods. These can include cultural, mechanical, chemical, and biological control methods. The primary management goal should be to limit seed production. Pasture improvement programs consisting of cultivation, fertilization,
and herbicide application can be effective control practices. Proper management of rangelands, including fertilization and proper grazing practices, are the most cost effective and profitable control methods. However, well-managed grasslands are not exempt from infestations. Continued monitoring and follow-up control measures are essential for maintaining plumeless thistle infestations at low levels.

Cultural

Cultural control involves maintaining vigorous and competitive desirable plants in the pasture. Plumeless thistle seedlings do not compete well with established forage grasses and developing desirable plant cover limits thistle establishment. Maintaining a good soil fertility program and preventing overgrazing are important in improving rangeland. Prescribed burning is also a good range management tool. Grazing sheep, goats, horses, or donkeys with cattle also can help control plants that cattle do not eat.

Maintaining a healthy pasture by using best management practices is the most cost effective and profitable way to prevent the invasion of plumeless thistles. Best management practices consist of fertilization, herbicide application, rotational and controlled grazing, and continuous monitoring.

Mechanical

It has been observed that plumeless thistle does not tolerate regular cultivation, digging, or cutting. Mowing is most effective at late bloom. Regrowth and production of viable seed usually occurs from plants mowed before the first terminal buds bloom (Figure 9). At early growth stages, plumeless thistle must be cut at the soil surface to prevent the crown buds from resprouting.

Chemical

Several herbicide treatments are effective for plumeless thistle control (Table I). Timeliness of herbicide application is the key to success and depends greatly on the plant life cycle. Plumeless thistle is most susceptible to growth regulator herbicides applied during active growth of the seedlings or rosettes prior to bolting (flower stalk formation). Treatment effectiveness decreases as growth stage advances past the rosette (Figure 9). Treatments will likely need to continue over more than one year, due to the longevity of the seed in the soil. Herbicide application at late flower bud to early bloom, though less effective than earlier applications, can reduce seed production.

Fall herbicide applications offer several advantages over spring treatments. Because the thistles build up root reserves in the fall, herbicide applied in the fall moves readily from the foliage to the roots with the translocating sugars. Plumeless thistles growing in fall are either in the seedling or rosette growth stage and are therefore susceptible to herbicides. Growers generally have more time to treat in the fall than in spring. Also, with fall treatments there are fewer risks that herbicide drift will injure susceptible crops or trees like grapes, pecans, walnuts, soybeans or tomatoes as these plants have already matured. Fall application should be made after thistle germination has stopped, but while plants are actively growing and daytime high
temperatures are still above 50°F. It is important to scout fields in the fall, especially dry falls, prior to herbicide applications to determine if enough plants are present to justify treatment.

Biological

Several insects have been reported to feed on plumeless thistle and some of these insects have been evaluated for biological control. The Rhinocyllus conicus weevil, an insect of European origin, has been released in plumeless thistle in 23 states, including Nebraska. A rosette feeding beetle introduced from Europe, Trichosirocalus horridus, has also been used for biological control. Both of these exotic insects have been successfully established and contributed to significant reductions in plumeless thistle populations in Virginia.

Four fungi are capable of infecting musk and/or plumeless thistle, including parasitic rusts Puccinia carduorum and P. galatica and smuts Ustilago cardui and U. violacea. Of these, only P. carduorum has been introduced in North America.

Biological control agents should be considered as tools in plumeless thistle management; however, don’t rely on these practices to completely control an infestation.

Note: Reference to commercial products or trade names is made with the understanding that no discrimination is intended and no endorsement by Cooperative Extension is implied.

Figure 11. Biennial life cycle of plumeless thistle in Nebraska.

References


Table 1.
Herbicide treatments for plumeless thistle control.1,2

<table>
<thead>
<tr>
<th>Herbicide</th>
<th>Product per Acre</th>
<th>Application Time2</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ally</td>
<td>0.2-0.3 oz</td>
<td>Late fall or spring before bolting</td>
<td>Use in pastures or grasslands for seed, fallow and CRP. Curtail may be used in wheat.</td>
</tr>
<tr>
<td>Curtail</td>
<td>2 pt</td>
<td>Bolted plants in spring prior to flowering</td>
<td>Use in noncropland and roadsides. Add surfactant at 1 pint/100 gallons.</td>
</tr>
<tr>
<td>Escort</td>
<td>1 oz</td>
<td></td>
<td>Annual treatments necessary for control of new seedlings. Fall applications after trees drop leaves and before leafing out in the spring reduces damage. Do not apply after “soil freeze-up” in the fall. For use on ranges and permanent pastures only.</td>
</tr>
<tr>
<td>2,4-D ester (4L)</td>
<td>1.5-2 qt</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2,4-D ester (4L) + Banvel/Clarity</td>
<td>1 qt 0.5 qt</td>
<td>Late fall treatment of rosettes or spring treatment before bolting</td>
<td></td>
</tr>
<tr>
<td>Tordon 22K</td>
<td>8-12 oz</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Grazon P+D</td>
<td>2-4 pt</td>
<td></td>
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<tr>
<td>Transline</td>
<td>0.33-1 pt</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Redeem R+D</td>
<td>1-2 oz</td>
<td></td>
<td></td>
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</tbody>
</table>

1These recommendations were current as of July 1, 2002. See the NU Cooperative Extension publication, “Guide for Weed Management in Nebraska”, EC-130, for current information. It’s available in print at Nebraska Cooperative Extension offices or on the Web at http://www.ianr.unl.edu/pubs/fieldcrops/EC130.htm

2References to commercial products is made with the understanding that no discrimination is intended and no endorsement by NU Cooperative Extension is implied.

A Message From the Nebraska Department of Agriculture

The State of Nebraska has had a noxious weed law for many years. Over the years, the Nebraska Legislature has revised this law.

The term "noxious" means to be harmful or destructive. In its current usage "noxious" is a legal term used to denote a destructive or harmful pest for purposes of regulation. When a specific pest (in this case, a weed) is determined to pose a serious threat to the economic, social, or aesthetic well-being of the residents of the state, it may be declared noxious.

Noxious weeds compete with crops, rangeland, and pastures, reducing yields substantially. Some noxious weeds are directly poisonous or injurious to man, livestock, and wildlife. The losses from noxious weed infestations can be staggering, costing residents millions of dollars due to lost production. This not only directly affects the landowner, but erodes the tax base for all residents of the state. The control of noxious weeds is everyones concern and their control is to everyones benefit. The support of all individuals within the state is needed and vital for the control of noxious weeds within Nebraska.

It is the duty of each person who owns or controls land in Nebraska to effectively control noxious weeds on their land. County boards or control authorities are responsible for administration of noxious weed control laws at the county level. This system provides the citizens of Nebraska with “local control”. Each county is required to implement a coordinated noxious weed program. When landowners fail to control noxious weeds on their property, the county can serve them with a notice to comply. This notice gives specific instructions and methods on when and how certain noxious weeds are to be controlled.

The Director of Agriculture determines which plants are to be deemed as "noxious" and the control measures to be used in preventing their spread. In Nebraska, the following weeds have been designated as noxious:

- Canada thistle (Cirsium arvense (L.) Scop.)
- Leafy spurge (Euphorbia esula L.)
- Musk thistle (Carduus nutans L.)
- Plumeless thistle (Carduus acanthoides L.)
- Purple loosestrife (Lythrum salicaria L. and L. virgatum – including any cultivars and hybrids)
- Knapweed (spotted and diffuse) (Centaurea maculosa Lam. and C. diffusa Lam.)

Whether farmer or rancher, landowner or landscaper, it’s everyones responsibility and everyones benefit to aid in controlling these noxious weeds. If you have questions or concerns regarding noxious weeds in Nebraska, please contact your local county noxious weed control authority or the Nebraska Department of Agriculture.
Illustration of the plumeless thistle is by Bellamy Parks Jansen, originally published in Weeds of Nebraska and the Great Plains. Used with permission of the publisher, the Nebraska Department of Agriculture.