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MONTANA STATE UNIVERSITY EXTENSION

MontGuide

Poison Hemlock
Conium maculatum

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Poison hemlock is a toxic weedy plant in the parsley or carrot family that occurs where moisture is adequate and disturbance is frequent. Proper identification and management can help to prevent poisoning of livestock, wildlife, pets, and even humans.

MT200013AG Revised 1/18

THE TOXICITY OF POISON HEMLOCK HAS BEEN known throughout history. In ancient Greece it was used to poison political prisoners. Perhaps the most renowned prisoner to die from the plant was Socrates in Athens in 329 B.C. Condemned to die, he drank the poisonous juice to commit suicide. Native Americans once used hemlock toxins as a component of the poison in the tips of their arrows. The most recent human deaths have resulted from mistaking poison hemlock with edible species of the carrot family.

Identification and Biology

Poison hemlock (*Conium maculatum*), also called poison parsley, is a member of the parsley or carrot family Apiaceae. It is a deeply-taprooted biennial, or sometimes perennial, growing three to eight feet tall and occasionally reaching 10 feet (Figure 1A). The fleshy, white taproots may be up to ¾ inch in diameter. The roots have an odor similar to carrots or parsnips, and the foliage has a strong musty odor. During the first year of growth, poison hemlock forms a large rosette and usually remains in the vegetative stage. During the second year, it produces tall stems and then flowers. The dried stems can persist after aging and are found throughout the winter.

Identifying characteristics of poison hemlock are its stout, extensively-branched, erect stem with distinct ridges. Stems are hollow, except at the nodes - the points at which the leaves attach. The lower portions of the stems are distinctly mottled with purple spots (Figure 1B).

Poison hemlock leaves are shiny green, triangular, and highly dissected (Figure 1C). The leaves have long stems that attach to the main stem, and the length of the leaf stems decreases upward on the plant. The leaves are large, up to 12 inches long and four inches wide, and they are alternately arranged on the stem. Poison hemlock leaves are pinnately compound, meaning that each leaf is made up of several pairs of leaflets that sprout from opposite sides of a main leaf stalk. The leaflets are segmented

FIGURE 1. A: Poison hemlock plant. Photo by Matt Lavin, MSU. B: Purple spots on stem. Photo by Matt Lavin, MSU. C: Leaves are highly dissected. Photo by Chris Evans, University of Illinois, Bugwood.org

and ⅛ to ¼ inch long. The leaf veins terminate at the tips of the teeth of the leaf.

Flowering occurs in July and August. The flowers are white, lack sepals (green leaf-like petals at the flower base), and are arranged in a broad (about two inches wide) compound umbel: an umbrella-shaped bunch composed of small flowers on individual stems that extend from a common terminal stalk (Figure 2). The bracts at the base of the umbel are ¼ inch long with a green center and whitish edges.

Poison hemlock reproduces solely by seeds. Seeds are paired, ⅛ inch long, light brown, barrel shaped capsules with conspicuous longitudinal ribs. Seeds often drop next to the parent plant and regenerate, forming dense stands. The seeds are not well developed for long-range dispersal, so the plant relies on seed spread primarily by water, birds and rodents.

Up to 85 percent of seeds germinate as soon as environmental conditions allow. The remaining seeds enter a dormant period. Their dormancy can be broken as soon as light, temperature, and moisture conditions are favorable. Poison hemlock seeds are relatively short-lived (three years).

Look-a-likes

Misidentification of poison hemlock with other members of the carrot family is common. Poison hemlock may be mistaken as wild carrot (*Daucus carota*) also called Queen Anne's lace. The best characteristic to differentiate the two is the lack of hairs on the leaves and stems of poison hemlock. Poison hemlock may also be confused with cow parsnip (*Heracleum lanatum*). Cow parsnip differs from poison hemlock by its palmately compound leaves. Unlike pinnately compound leaves, which are arranged in rows along the stalk, palmately compound leaves radiate at the end of the stalk in a semicircle. Water hemlock (*Cicuta douglasii*), a native plant that is also very toxic, can be distinguished from poison hemlock by the main taproot and stem. In water hemlock, the taproot is branching, tuberous, and divided into horizontal chambers which contain its toxicant. When examining any of these species, care should be taken due to their toxicity, particularly with poison hemlock and water hemlock.

FIGURE 2. Flowers are clustered into an umbrella-shaped bunch. Photo by Pedro Tenorio-Lezama, Bugwood.org

Origin and Distribution

Poison hemlock originated in Europe and was introduced to North America in the 1800's as an ornamental. Since then, it has been extremely successful distributing itself throughout most of North America. It now occurs in every state in the United States except Hawaii and in southern Canada. Poison hemlock is not a Montana state listed noxious weed, but it is on 11 county noxious weed lists as of 2017 (Figure 3).

Poison hemlock grows at low elevations bordering pastures and cropland and gradually invades perennial crops. It occurs where moisture is adequate and disturbance is relatively frequent – for example, stream and ditch banks, riparian woodlands and flood plains. Poison hemlock tends to be more competitive in wet soil conditions, but it can survive in dry sites. It is common for the weed to first spread downstream and then move to drier upland sites.

Impacts

Poison hemlock can invade perennial crops like alfalfa, but it is only a significant problem in the first cutting because subsequent regrowth of the alfalfa can suppress poison hemlock. In grain fields, poison hemlock can contaminate harvested grain seed. However, it is more common for poison hemlock to invade grazing areas than crop fields. It tends to grow in moist pastures and meadows where it has the potential to out-compete more desirable native species. Perhaps the largest impact of poison hemlock is its toxicity to humans and livestock. Serious livestock losses can occur when animals graze on fresh forage, harvested silage, or hay contaminated with poison hemlock.

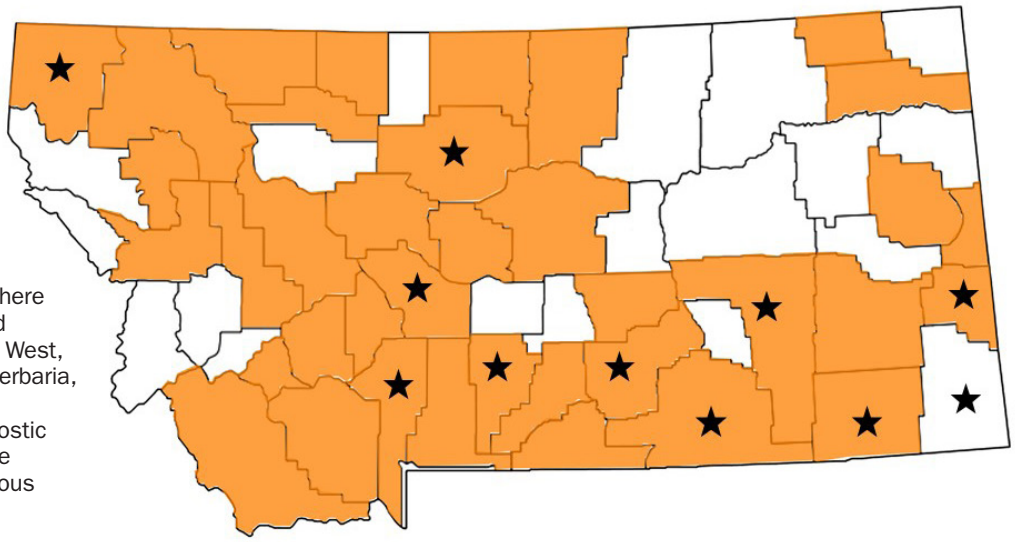

FIGURE 3. Counties in Montana where poison hemlock has been reported (Compiled records from EDDMapS West, Consortium of Pacific Northwest Herbaria, Intermountain Region Herbarium Network, and MSU Schutter Diagnostic Lab). Stars indicate counties where poison hemlock is listed as a noxious weed as of 2017.

Toxicity

All parts of the plant are extremely poisonous to humans and livestock. The lower portions of the stem and root are particularly deadly. Of the eight known alkaloids in poison hemlock, the principle toxins are the piperidine alkaloids coniine and gamma-coniceine. Coniine is more common in the seed and in mature plants, but gamma-coniceine makes up 98 percent of the total alkaloids in the early vegetative stage. These two principle alkaloids affect the reproductive system and the central nervous system. Poison hemlock is also toxic to the skin and respiratory system so wear gloves and a mask when digging or mowing these plants. Wash hands and arms thoroughly after exposure.

All classes of livestock and wildlife are affected by the toxins of poison hemlock. Cattle, goats, and horses are the most susceptible domesticated animals. Symptoms of poisoning can occur within 30 minutes to two hours, depending on the animal, and include nervousness, trembling, muscular weakness, knuckling at the fetlock joints, loss of coordination, dilation of pupils, a weak and slow heartbeat, coma, and eventually death from respiratory paralysis. Poison hemlock can cause fetal deformation if a pregnant animal eats the plant. Toxins can pass into the milk of an animal, affecting the offspring, and in the case of dairy cattle can affect the safety of milk that humans consume. To reduce livestock exposure to poison hemlock's toxins, prevent grazing when the plant is the only available green forage, such as in early spring.

Managing Poison Hemlock

Early Detection, Prevention, Containment and Small-scale Eradication

It is important to prevent the expansion of poison hemlock from small to large-scale infestations. If you discover poison hemlock on your property, you should map and monitor areas of current populations and scout for newly established plants. To prevent seeds from spreading along the waterway, minimize soil disturbance. Refrain from driving vehicles and machinery through the infested area and limit livestock use in the area. The best way to contain large populations of poison hemlock is to spray the borders of the infested area with a herbicide. Containment is a long-term management commitment because it does not eliminate or reduce the infestation level, it simply limits the weed spread. Eradicate new infestations of one to a few plants immediately (preferably before the plant sets seed) by hoeing or spot-applying herbicide.

Biological Control

The European palearctic moth, or hemlock moth (*Agonopterix alstroemeriana* [Clerck]), is the only approved biological control agent for poison hemlock in the United States. Although it is not known how the insect was introduced to the United States, the hemlock moth has become widely dispersed. Its only known host plant in Europe and the United States is poison hemlock.

The hemlock moth larva is light green with a blackish-brown head, and adults are grayish-brown. The larvae feed on foliage, buds, immature seeds, stems, and flowers

in the spring and early summer. When several hundred larvae attack one plant it may be completely defoliated. Although high populations of larvae can decrease seed production and kill plants, many plants can recover and resume growth later in the summer. Adult moths emerge in summer and consume some foliage, but larvae are the most impactful. The success of the hemlock moth in controlling poison hemlock populations is questionable, and decreases in poison hemlock density due to the moth have not been documented in the northwestern United States.

Chemical Control

Several herbicides can be used to control poison hemlock. The sulfonylurea herbicides chlorsulfuron (e.g., Telar®) and metsulfuron (e.g., Escort®), provide excellent pre- and post-emergent control. The phenoxy herbicides, such as 2,4-D and MCPA, and glyphosate (e.g., Roundup® or Rodeo®) can also be used to control poison hemlock and are most effective if sprayed in the early spring after emergence. Glyphosate is non-selective, so care should be taken to limit its contact with desired vegetation. Always read and follow label directions when using herbicides to control poison hemlock or other weeds.

Chemical treatment of poison hemlock may require repeated applications to deplete the seed bank. The length between applications depends on the herbicide. Glyphosate and 2,4-D usually require yearly applications. Chlorsulfuron or metsulfuron usually need to be applied every two to four years. Once poison hemlock populations are reduced, it is important to implement proper grazing, fertilization, and irrigation management to promote the growth of desired species and to reduce the risk of reinfestation.

Mechanical Control

Plowing or repeated cultivation will prevent poison hemlock establishment, particulary in crop settings. In other areas, repeated mowings can be used to remove bolting plants, deplete carbohydrate energy reserves in the taproot, prevent seed production, and reduce poison hemlock's competitive ability. Burning is not typically used to manage poison hemlock because there is not adequate dry fuel in the spring to burn the plant before it sets seed.

Integrated Weed Management

The effectiveness of integrated management is largely unknown because few integrated programs have been used to manage poison hemlock. However, as is the case in managing most weed-infested areas, integration of techniques could be beneficial because a combination of techniques will stress the plant in multiple ways. Revegetation through broadcast seeding or a no-till drill may also be integrated with poison hemlock control techniques to increase competitive pressure on poison hemlock and promote desired species. Follow-up monitoring and management should always follow weed control.

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File under: Agriculture and Natural Resources (Weeds)
Revised January 2018 0118SA