

MN NRCS Range and Pasture Technical Note No. 2

Poisonous Plants

Introduction

Livestock operations across Minnesota rely upon forages as either stored feed or grown in pastures for livestock grazing. It is important that these forages be free of poisonous plants or toxins to avoid unnecessary livestock mortality or disease.

The objective of this technical note is to help producers and conservationists identify common poisonous plants and toxins found in Minnesota, how to recognize and deal with suspected poisonings, and how to minimize risk of livestock exposure to these poisonous plants and toxins.

Toxins and Associated Plants Found In Minnesota

Nitrates

Nitrate levels can accumulate in plant material and become toxic to animals. Nitrate or Nitrite poisoning has been listed as the most common form of plant poisoning to livestock in the state.¹ Drought and high temperatures or low humidity, cold temperatures, hail damage and frost may slow or stop plant growth and cause nitrates to accumulate.²

Plants most associated with nitrate accumulation are red root pigweed and common lamb's-quarter. However, it is possible for most forages found in Minnesota to accumulate nitrates following herbicide application, fertilization, or drought.

Fertilizers should be applied at recommended rates, follow grazing restrictions after applying herbicides, test forages harvested/grazed during drought conditions, mix forages with suspected high nitrate levels with a different forage batch with lower nitrate levels, and delay harvesting/grazing if environmental conditions favor nitrate accumulation.

Table 1. Signs of poisoning³

Death	Weakness	Trembling	Brown or cyanotic mucus membranes	Dyspnea	Brown or discolored blood	Abortion
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Table 2. Common plants in MN that can lead to Nitrate poisoning

Pigweeds (<i>Amaranthus spp.</i>)	Common lamb's-quarters (<i>Chenopodium album</i>)	Corn (<i>Zea Mays</i>)	Sorghum-sudangrass (<i>Sorghum bicolor</i>)	Drought affected forages
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Figure 1. Red Root Pigweed. Robert H. Mohlenbrock @ USDA-NRCS PLANTS Database / USDA SCS. 1989. Center, Lincoln.



Figure 2. Lamb's quarters. Bill Summers @ USDA-NRCS PLANTS Database / USDA SCS. 1989. *Midwest wetland flora: Field office illustrated guide to plant species.* Midwest National Technical Center, Lincoln.



Figure 3. Sorghum. Robert Soreng @ USDA-NRCS PLANTS Database

Gallotannins

Oaks (*Quercus spp.*) have been listed as a common plant poisonous to livestock in Minnesota. Most grazing animals are susceptible to the gallotannins found in oak species. In the spring of the year, animals eat the young buds, leaves, and shoots where the gallotannins can accumulate. This toxic compound becomes less prevalent as plant parts age. In the fall time, animals can consume large amounts of acorns which can lead to poisoning. Drought can cause reduced available forage and can lead oaks to produce large amounts of acorns. Producers should be cautious about droughty conditions in the fall, and avoid grazing areas with high populations of oak trees.

Table 3. Signs of poisoning⁴

Death	Weakness	Trembling	Brown or cyanotic mucus membranes	Dyspnea	Brown or discolored blood	Abortion
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Table 4. Common species in MN that contain gallotannins

Oak Species (*Quercus spp.*)



Figure 4. White Oak. J.S. Peterson @ USDA-NRCS PLANTS Database

Cyanide and Cyanogenic Glycosides

Prussic acid can accumulate in certain plant species that livestock will readily consume, and effects of poisoning are likened to suffocation due to the prussic acid inhibiting oxygen absorption in the blood. Periods of stress such as drought and frost can cause susceptible plants to accumulate prussic acid. The plants with the most cause for concern are sorghum-sudan grass, and chokecherry. It is recommended that producers do not allow livestock to graze sorghum-sudans until reaching 18”, and avoid grazing these species immediately following a frost.

Generally, young plant tissues can accumulate more toxins than mature plant parts, and leaves will accumulate more toxins than stems. **Nightshades are highly toxic to livestock.**

Table 5. Signs of poisoning⁵

Death	Excitement	Rapid Pulse	Muscle Tremors	Rapid and Labored Breathing	Staggering	Collapse
Cherry Red Blood	Pink Mucus Membranes	Salivation	Runny Eyes			

Table 6. Common plants in MN that can lead to cyanide and glycoside poisoning

Sorghum-sudan grass (<i>Sorghum bicolor</i>)	Choke Cherry (<i>Prunus virginiana</i>)	Nightshades (<i>Solanum spp.</i>)	Cocklebur (<i>Xanthium strumarium</i>)
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Figure 5. Choke Cherry. Elaine Haug @ USDA-NRCS PLANTS Database



Figure 6. American Black Nightshade. R.A. Howard @ USDA-NRCS PLANTS Database



Figure 7. Cocklebur. Clarence A. Rechenthin @ USDA-NRCS PLANTS Database



Figure 8. Black Cherry leaves. "Prunus Poisoning in Horses and Other Livestock" Dr. Bob Wright, Andrea Bebbington and Todd Leuty Ministry of Agriculture, Food and Rural Affairs Ontario 2008.



Figure 9. Black Cherry bark. "Prunus Poisoning in Horses and Other Livestock" Dr. Bob Wright, Andrea Bebbington and Todd Leuty Ministry of Agriculture, Food and Rural Affairs Ontario 2008

Other species that may cause poisoning in livestock are black and pin cherry which are found in wooded pastures, particularly in the Southeast portion of Minnesota. Although cases are rare, animals consuming large amounts of leaves and/or fruits may ingest fatal amounts of cyanide.

Cardiac Glycosides

Milkweeds and Indian hemp can contain cardiac glycosides which can affect the cardiovascular system of livestock. Milkweeds in the vegetative stage can remain poisonous when harvested as hay. No treatment for livestock poisoning is available.

Table 7. Signs of poisoning³

Death	Weakness	Trembling	Weak Rapid Pulse	Dyspnea
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Table 8. Common plants in MN that contain cardiac glycosides

Swamp Milkweed (<i>Asclepias incarnata</i>)	Indian Hemp (<i>Apocynum cannabinum</i>)	Butterfly Milkweed (<i>Asclepias tuberosa</i>)	Common Milkweed (<i>Asclepias syriaca</i>)	Grecian Foxglove (<i>Digitalis lanata</i>)
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Figure 10. Indian Hemp. Ted Bodner @ USDA-NRCS PLANTS Database / James H. Miller and Karl V. Miller. 2005. *Forest plants of the southeast and their wildlife uses*. University of Georgia Press., Athens.

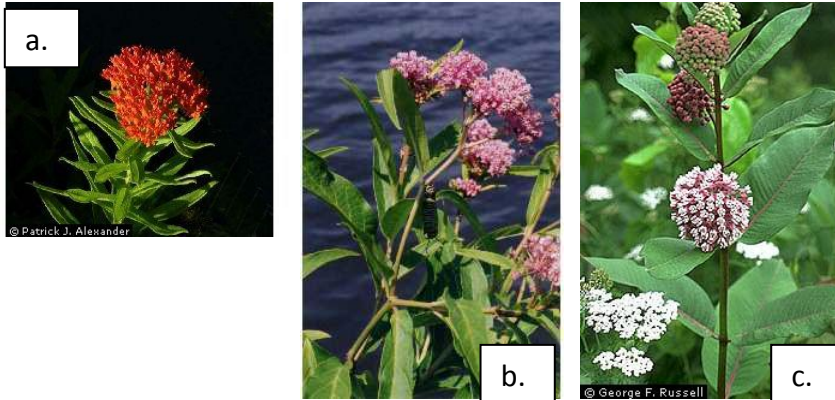


Figure 11. a. Butterfly Milkweed. Patrick J. Alexander @ USDA-NRCS PLANTS Database.

 b. Swamp Milkweed. Jennifer Anderson @ USDA-NRCS PLANTS Database.

 c. Common Milkweed. Rusty Russell @ USDA-NRCS PLANTS Database.

Poison Hemlock (Conium maculatum) and Spotted Water Hemlock (Cicuta maculate)

 Poison hemlock is a biennial and spotted water hemlock is a perennial.

Livestock ingestion usually results in sudden death. Both species are highly toxic and all plant parts contain enough toxins to cause mortality. Poison and spotted water hemlock can be found in ditches, wet areas, and on disturbed sites.

Poison hemlock’s main toxin is coline, while spotted water hemlock’s main toxin are alkaloids.

Table 9. Signs of poisoning⁶

Birth Defects	Convulsions (spotted water hemlock)	Vomiting	Diarrhea	Weak Pulse	Teeth clenching
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Figure 12. a. Spotted water hemlock. b. Poison hemlock. William S. Justice @ USDA-NRCS PLANTS Database

Horsetail (Equisetum avense) and Brackenfern (Pteridium aquilinum)
 Both species are perennials

Horsetail occupies wet sites that have a very shallow water table and brackenfern is found mostly in northern MN and occupies open woodlands and well drained sandy sites.

Horsetail exhibits two different appearances; one is the sterile single stalk (which resembles asparagus), while the other is a bracketed, herbaceous, and leafless plant with multiple branches. This plant is tolerant to most herbicides and it can be quite persistent. Horses are the most commonly poisoned livestock from horsetail and it is typically consumed via hay without the producer aware the plant was harvest with other forages. Large amounts must be consumed before effects of poisoning become evident.

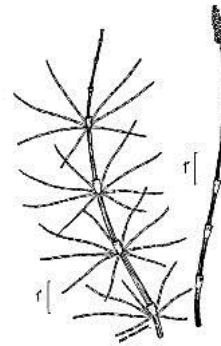


Figure 13. Horse tail. USDA-NRCS PLANTS Database/USDA NRCS. *Wetland flora: Field office illustrated guide to plant species.* USDA Natural Resources Conservation Service.

Table 10. Signs of poisoning⁶

Salivation	Redness and Blistering in Mouth and Throat	Increase in Urination, Bloody Urine	Cease of Urine Production on Severe Cases
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Brackenfern must be consumed over a period of time to become toxic to livestock. If it is chronically consumed at low doses it can lead to other diseases.



Figure 14. Brackenfern. Ted Bodner @ USDA-NRCS PLANTS Database / James H. Miller and Karl V. Miller. 2005. *Forest plants of the southeast and their wildlife uses.* University of Georgia Press., Athens.

Table 11. Signs of poisoning⁶

Clots of Blood in Feces	Weakness	Unthriftiness	Weight Loss
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Buttercups (Ranunculus spp.)

Buttercups can be annuals, biennials, or perennials

Buttercups are low in toxicity and must be chronically grazed over a period of time before symptoms become evident.

Table 12. Signs of poisoning⁷

Clots of Blood in Feces	Weakness	Unthriftiness	Weight Loss
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Figure 15. Tall buttercup. Patrick J. Alexander @ USDA-NRCS PLANTS Database

Hoary Alyssum (Berteroa incana)

Hoary alyssum is a short lived perennial.

Hoary alyssum is a common pasture invader that occupies well drained soils, and is relatively low in toxicity. Horses have been affected by hoary alyssum, and little evidence shows toxicity to other kinds and class of livestock.



Figure 16. Hoary alyssum. USDA-NRCS PLANTS Database / Britton, N.L., and A. Brown. 1913. *An illustrated flora of the northern United States, Canada and the British Possessions. 3 vols.* Charles Scribner's Sons, New York. Vol. 2: 153.

Table 13. Signs of poisoning⁸

Swelling of the Lower Legs "Stocking Up"
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White Snakeroot (Eupatorium rygosum)

White snakeroot is a perennial.

White snakeroot has a high toxicity rating and can be lethal to all kinds and classes of livestock especially in the late summer to fall. It is found throughout Minnesota in wooded pastures and shaded areas.



Figure 17. White snakeroot. Stan Gilliam @ USDA-NRCS PLANTS Database

Table 14. Signs of poisoning⁷

Toxic Milk	Sweating	Death	Stiff Gait	Depression
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How to Handle Cases of Suspected Livestock Poisoning from Toxic Plants

Many items factor into livestock health and it is extremely important to seek professional advice of a veterinarian to determine the cause of a given episode of livestock illness. Often times, livestock can become ill or die without knowing the main cause of illness. Determining if livestock have ingested a toxic plant is difficult enough, but to pinpoint the specific plant and the specific location of ingestion can be next to impossible. However, if you do suspect a toxic plant that has caused harm to your animals please use the following guidelines:

- Call a veterinarian to perform post mortem or to treat sick livestock.
- Animal diagnostic labs can test tissue or blood samples sent by the owner of the livestock.
- Track the animal's recent past. Was the animal fed stored feed, grazed in a pasture, or both?
- If the animal was fed hay, what was the composition of the plants in the hay? Send a forage sample to a certified lab for analysis. Contact the lab prior to sending the sample to confirm how to preserve the sample prior to mailing.
- If the animal was grazing on forages record or note the environmental factors. For instance, recent occurrences of frost, drought, rain, or cloud cover the past several days, or extreme temperatures could be the cause. Walk the grazed area and look for any of the above mentioned plant species.
- For plant identification send the sample to a local herbarium, botanist, extension specialist, or another trained person in plant identification. If sending a sample by mail to be identified please confirm how to preserve the sample prior to mailing.

Table 15. List of regional veterinary diagnostic laboratories.

University of Minnesota Veterinary Diagnostic Laboratory	Veterinary Diagnostic Laboratory University of Minnesota 1333 Gortner Avenue St. Paul, MN 55108-1098	Phone: (612) 625-8787 Toll Free: (800) 605-8787 Fax: (612) 624-8707
North Dakota Veterinary Diagnostic Laboratory	Veterinary Diagnostic Laboratory NDSU Dept. 7691 PO Box 6050 Fargo, ND 58108-6050	Phone: (701) 231-7527 or (701) 231-8307 Fax: (701) 231-7514
Wisconsin Veterinary Diagnostic Laboratory	Madison: 445 Easterday Ln, Madison, WI 53706 Barron: 1521 E. Guy Ave, Barron, WI 54812	Phone: 608-262-5432 Toll Free: 800-608-8387 Fax: 847-574-8085 Phone: 715-637-3151 Toll Free: 800-771-8387 Fax: 715-637-9220
Iowa Veterinary Diagnostic Laboratory	Iowa State University 1600 South 16th St Ames, IA 50011	Phone: 515-294-1950 Fax: 515-294-3564

South Dakota Veterinary Diagnostic Laboratory	Department of Veterinary and Biomedical Sciences SDSU Animal Disease Research and Diagnostic Laboratory (SAR) Box: 2175 Brookings, SD 57007	Phone: 605.688.5171 Fax: 605.688.6003
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Table 16. List of regional plant identification contacts.

University of Minnesota Bell Museum of Natural History	10 Church Street SE Minneapolis, MN 55455	Phone: (612) 624-7083
North Dakota State University Herbarium	1340 Administration Ave Hastings Hall Fargo, ND 58102	Phone: (701) 231-7222
South Dakota State University Herbarium	Department of Biology and Microbiology SDSU Alfred Dairy Science Hall 228 Box: 2104A Brookings, SD 57007	Phone: (605)688.6141
Wisconsin State Herbarium	160 Birge Hall 430 Lincoln Drive Madison, WI 53706-1381	Phone.: (608) 262-2792 Fax: (608) 262-7509
Iowa State University Herbarium	Ada Hayden Herbarium (ISC) 340 Bessey Hall Iowa State University Ames, IA 50011	Phone: (515) 294-9499,
USDA/Agricultural Research Service Poisonous Plant Research Laboratory	USDA, ARS, NPA, POISONOUS PLANT RESEARCH UNIT 1150 East 1400 North Logan UT 84341	Phone: (435) 752-2941

Table 17. Certified Forage Testing Labs.

Contact the National Forage Testing Association for a current list of certified labs.	National Forage Testing Association Brian Shreve, Data Manager PO Box 756 Avoca, NE 68307	Phone: (402) 466-7677 Fax: (831) 303-4938 http://foragetesting.org/
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How to Avoid Livestock Poisoning from Toxic Plants

- Do not overgraze. Limiting forage availability will increase the risk of grazing animals to ingest toxic plants.
- If you are facing drought conditions, know what forages are being grazed and test for toxins if necessary.
- If using annuals in a grazing operation have these tested and delay grazing after prolonged dry periods, frost, fertilization, or herbicide application.

- Drought can also limit forage availability which can increase the risk of grazing animals to ingest toxic plants. Limit access to areas that might harbor toxic plants, and utilize stored feeds during this time to avoid intake.
- Do not move hungry animals to new pasture, time moves after grazing activities.
- If you are haying or grazing unfamiliar areas, idled grassland areas, or lands with native vegetation, walk the site and look for populations of plants mentioned in this tech note. If grazing, assess the risk of grazing pressure with the chances of consuming toxic plants that may be present.
- Do not feed hay from an unknown source without closely inspecting for toxic plants.
- Follow recommended herbicide application guidelines, and do not over apply.
- Adhere to grazing restrictions following herbicide application.
- Always apply fertilizer at the recommended rates.

References

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4. Barringer DVM, S. *Livestock Production: Acorns Can be Deadly*. West Virginia University Extension Service Publication. Available at: <http://www.caf.wvu.edu/~forage/acorns/acorns.htm>. Accessed on 17 May 2012.
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