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Beef Cattle Sciences

Beef Cattle Library

Management Strategies for Dealing with Select Poisonous Plants in Oregon [1]

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Introduction

Rangelands, pastures and hay fields throughout Oregon often contain poisonous plants that are potentially dangerous to cattle and other livestock. Toxic secondary compounds found in these plant species perform multiple, complex functions. One role that these compounds play in plants is that they can serve as a defense mechanism against herbivory. Plants containing these compounds can have distinct, unpleasant odors and a bitter taste and are therefore usually not eaten and avoided by livestock. However, consumption of generally unpalatable plants can occur under a variety of environmental and management circumstances. For example, cattle in lush pastures may inadvertently consume poisonous plants such as poison hemlock. It is under these circumstances that livestock producers need to be aware that accidental livestock poisoning can occur. Unfortunately, with the increased reliance on maximizing forage in all types of rangeland and pasture-based production systems the potential to overgraze and degrade these areas also exists. Taken to the extreme, this may force livestock, including cattle, sheep and horses, to graze plants that they normally would not eat. It is under these situations that poisonous plants and livestock poisoning become a management issue for landowners who are either unaware of poisonous plant populations on their property or who simply can not afford to purchase additional forage. However, with a basic understanding of the occurrence of these plants in Oregon and of how these plants may affect livestock, poisonous plants can be successfully avoided or managed in a variety of ways that limit losses for livestock producers. Livestock producers should work with local Extension agents to learn to correctly identify toxic plants and have established working relationships with local veterinarians who may be able to treat affected animals to mitigate losses to toxic plants.

General Management Recommendations

General improvement of rangeland or pasture is always important when high densities of poisonous plants occur throughout grazed areas. Minimizing overgrazing and knowing the locations of established poisonous plant populations are good first steps towards limiting livestock losses. More specific management strategies for dealing with poisonous plants may be grouped into two broad categories. These categories include targeted management of the problem poisonous plant

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population and management of the affected livestock species.

It is seldom possible to eradicate plant populations from entire landscapes, but integrated management strategies to control problem poisonous species can be useful over small areas of rangelands and pastures. These strategies include the use of preventative, cultural, physical, chemical and biological vegetation management practices. The goal of this targeted management should be to reduce the size and spread of the problem plant population to reduce the risk to livestock.

Perhaps no other form of vegetation management is more important than the prevention of unwanted plant species from becoming established. It is almost always easier and more cost effective to prevent the introduction of unwanted species than it is to manage established populations. Examples of preventative measures than can limit the spread of unwanted plant species include utilizing weed free forage and seed, cleaning vehicles, mowing and tillage equipment after working in areas where unwanted species are present and having a manure management plan in place that limits the unintentional spread of weed seeds.

The goal of cultural vegetation management in the context of managing poisonous plants is to create an environment where the competitive advantage of the desirable rangeland and pasture plants is maximized over the unwanted species. This can be accomplished by using competitive forage varieties and following a soil fertility management plan in pasture systems and by not overgrazing or using grazing as a tool in rangeland systems to promote desirable species.

Mechanical or physical control of unwanted species can be accomplished through a variety of techniques including hand pulling or digging of small populations, or using tillage or mowing over larger areas. Physical vegetation management techniques are generally most effective for controlling annual plants and can limit large amounts of seed dispersal if completed prior to seed production.

To control problem perennial species, the use of chemical control techniques using herbicides is often the most cost effective way to manage unwanted poisonous plants. Many herbicide products are labeled for use in Oregon pastures and rangelands. An excellent resource for chemical weed management recommendations that is updated yearly is the Pacific Northwest Weed Management Handbook. This publication has information specifically related to vegetation management in rangeland and pastures and is available online at: http://weeds.ippc.orst.edu/pnw/weeds. A copy can also be found at your local Extension office. Livestock producers should be aware that many herbicide labels have specific language related to grazing and haying restrictions after application as well as on some of the unintended consequences of herbicide use including offsite movement of active ingredients and non-target plant injury, persistence of active ingredients in the environment, and the potential for development of herbicide resistant plant populations.

Oregon has a very active biological control program, administered through the Oregon Department of Agriculture (ODA), which relies primarily on the use of insect species to help manage unwanted plant species including some poisonous plants. The use of biological control to suppress large populations of unwanted plant species can be a very useful management practice when it is not economical to use other management methods or when sites impacted by the problem species are largely inaccessible. For more information on ongoing biological control programs in Oregon the ODA maintains an online database of information available at: http://www.oregon.gov/ODA/PLANT/WEEDS/biocontrolprogram.shtml

If it is not practical to manage the poisonous plants themselves, steps can be taken by livestock producers to manage their livestock in ways that minimize exposure to poisonous plants and risk of accidental poisoning. Managing the timing of grazing in areas known to have poisonous plants, for example, is a very effective tool for limiting losses. Avoiding grazing rangeland and pastures that contain these plants when they are most toxic will greatly reduce the chances of livestock being harmed. Most poisonings occur in the early spring or late fall so waiting to graze until desirable forage makes up the majority of the plant community will decrease the likelihood that livestock will come in contact with undesirable species. Conversely, early removal of livestock from rangelands or pastures in the fall before forage becomes limiting can also reduce exposure. Additionally, some plant species become more toxic after frosts or herbicide applications so removal of animals from these affected areas is also an important management consideration. Simply avoiding contact between livestock and poisonous plants through herding of animals or fencing off areas where these plants grow

can also be effective. The fact that different livestock species exhibit differential tolerances to poisonous plant species should also be considered by livestock producers. Sheep, for example, may be more tolerant of some plant toxins than cattle.

Poisonous Plants Found in Oregon

Many species of poisonous plants, both native and non-native, can be found throughout Oregon. Some of these species are not always poisonous and can often be desirable components of the pasture or rangeland plant community. Others may be toxic only at specific growth stages or have only certain plant parts (roots, foliage, seeds) that are toxic. Therefore, it is useful to group poisonous plants together based on the type of potential toxin or poisoning response that they elicit in livestock (Table 1). Some of the more common types of livestock poisoning are presented here.

Nitrate Poisoning

Plants uptake nitrates from the soil and metabolize them to form plant proteins. If plants uptake excess nitrates and are consumed by livestock before the nitrates are converted to proteins, nitrate poisoning can occur. Forage crops that are over fertilized before being harvested or grazed can be a common cause of nitrate poisoning. However, excess nitrate accumulation also occurs readily in some common range and pasture species. Nitrate concentration can vary widely among plants and growing conditions. Nitrates are highest in plants in mornings and evenings, and on cool, cloudy days (when plant metabolism is slower). Drought, fertilization and nutrient deficiency can result in nitrate accumulation in plant tissues. Highest concentrations occur generally in stems, rather than leaves, flowers or fruit/seed.

Animal metabolism converts nitrate (NO_3) to nitrite (NO_2), which is toxic. This metabolism occurs less frequently for horses which do not readily convert nitrate to nitrite. In small quantities, nitrates are reduced by beneficial bacteria in the rumen to microbial proteins. It is the rapid absorption of large quantities of nitrates that can lead to poisoning, overwhelming the rumen's ability to convert nitrates into proteins. Increasing the carbohydrates (energy content) in an animal's diet can prevent poisoning as it allows the conversion of nitrates to proteins to occur more quickly, thus reducing the likelihood of nitrate poisoning.

Symptoms of nitrate poisoning include drowsiness and weakness followed by muscular tremors, increased heart and respiratory rates, staggering gait and recumbency (inability to stand upright without support). Sub-lethal doses can cause abortion and reduced milk production. Animals suspected of having nitrate poisoning should be kept stress free and the suspect food source removed. Forages assumed to be high in nitrates, especially if they have been heavily fertilized with N-fertilizer or experienced drought, should be tested. If nitrate poisoning occurs, a veterinarian may be able to administer methylene blue as a specific treatment for nitrate toxicity.

Oxalate Poisoning

Rather than absorbing excess nitrates, some plants store high quantities of potassium and sodium oxalates (salts). If large quantities of oxalate accumulating plants are eaten, the rumen is overwhelmed and unable to metabolize the salts and they are absorbed into the bloodstream. In the bloodstream they form insoluble salts that precipitate in the kidney, causing kidney failure.

Sheep are most susceptible to oxalate poisoning followed by cattle. Cattle are able to detoxify large quantities of oxalates in their rumen, however, reducing chances of poisoning. Animals can develop a tolerance for oxalate accumulating plants by building up the concentration of oxalate-degrading bacteria in the rumen. If eaten in small amounts over time, with other feed to dilute the concentrations in the rumen, oxalate accumulating plants usually cease to be a problem.

Symptoms of oxalate poisoning include muscle tremors, tetany (calcium deficiency), weakness and recumbency within a few hours of poisoning. Coma and death can follow within 12 hours of consumption. Livestock should be adapted to oxalate plants over four days, incrementally increasing the time allowed to graze the plants, before being left in pastures or allowed to graze rangeland containing high densities of oxalate-accumulating plants.

Pyrrolizidine Alkaloid Poisoning

Pyrrolizidine alkaloids are the most common cause of liver damage in livestock. Found in numerous plant species, pyrrolizidine alkaloids are most toxic to pigs, then poultry, cattle, horses, goats and sheep, with sheep being the least susceptible. These alkaloids cause photosensitization (sensitivity

Table 1. Select poisonous plants common to Oregon pastures and rangeland.

Toxin Type[1]	Scientific Name	Common Name	Habitat
1	***Amaranthus* spp.**	Pigweeds	Cultivated land, pastures
	***Avena* spp.**	Tame and wild oat	Cultivated land, pastures, roadsides
	Chenopodium album	Common lambsquarters	Cultivated land, pastures
	Convolvulus arvense	Field bindweed	Cultivated land, pastures, roadsides
	Halogeton glomeratus	Halogeton	Rangeland, roadsides, alkaline sites
	Helianthus annuus	Sunflower	Roadsides, pastures
	Kochia scoparia	Kochia	Cultivated land, rangeland, roadsides
	Malva neglecta	Common mallow	Cultivated land, pastures
	***Melilotus* spp.**	Sweetclovers	Cultivated land, rangeland, roadsides
	***Polygonum* spp.**	Smartweeds	Cultivated land, pastures, roadsides
	Portulaca oleraceae	Common purslane	Cultivated land, pastures, roadsides
	***Rumex* spp.**	Docks	Pastures, roadsides
	Sarcobatus vermiculatus	Greasewood	Saline alkaline rangeland
	Salsola kali	Russian thistle	Cultivated land, rangeland, roadsides
2	***Amsinkia intermedia***	Coast fiddleneck	Cultivated land, rangeland, pastures
	Cynoglossum officinale	Houndstongue	Pastures
	***Heliotropium* spp.**	Heliotropes	Cultivated land, rangeland, pastures
	***Senecio* spp.**	Ragworts and Groundsels	Cultivated land, rangeland, pastures
	***Symphytum* spp.**	Comfrey	Moist meadows, pastures
3	***Allium* spp.**	Wild onion	Meadows, pastures
	Descuriania sophia	Tansy mustard	Cultivated land, rangeland, pastures
	***Equisetum* spp.**	Horsetail and Scouring rush	Moist meadows, pastures, roadsides
	Hypericum perferatum	St. Johnswort	Pastures, rangeland, roadsides
	Pteridium aquilinum	Western brackenfern	Open woods, pastures, roadsides
	***Ranunculus* spp.**	Buttercups	Pastures, rangeland
	Thermopsis rhombifolia	False lupine	Rangeland
	Tribulus terrestris	Puncturevine	Cultivated land, pasture, roadsides
	***Trifolium* spp.**	Clover	Cultivated land, pastures, rangeland
	Vaccaria pyramidata	Cowcockle	Cultivated land, pastures, roadsides

Toxin Type[1]	***Scientific Name***	Common Name	Habitat
3	***Xanthium strunarium***	Common cocklebur	Cultivated land, pastures
4	***Acroptilon repens***	Russian knapweed	Rangeland, pastures, roadsides
	Apocynum cannabinum	Hemp dogbane	Pastures, roadsides
	Daucus carota	Wild carrot	Pastures, roadsides
	***Prunus* spp.**	Black cherry and Chokecherry	Forest edges, clearings
	***Trifolium* spp.**	Clover	Cultivated land, pastures, rangeland
	***Triglochin* spp.**	Arrowgrass	Alkaline marshes, meadows
5	***Asclepias* spp.**	Milkweeds	Pastures, roadsides
	Atropa belladonna	Deadly nightshade	Pastures, roadsides
	Datura stramonium	Jimsonweed	Cultivated land, pastures
	Digitalis purpurea	Foxglove	Cultivated land, pastures, forest edges
	***Solanum* spp.**	Nightshades	Cultivated land, pastures
	***Zigadenus* spp.**	Deathcamas	Open forests, wet meadows
6	***Astragalus* spp.**	Milkvetches	Saline rangeland
7	***Cicuta douglasii***	Western water hemlock	Shallow ponds, marshes, meadows
8	***Conium maculatum***	Poison hemlock	Pastures, roadsides
	***Lupinus* spp.**	Lupine	Pasture, rangeland
9	***Delphinium* spp.**	Larkspur	Pasture, rangeland
10	***Pinus ponderosa***	Ponderosa pine	Pasture, rangeland

[1] Toxin type:
1 - Plants causing nitrate and oxalate poisoning
2 - Plants causing pyrrolizidine alkaloid poisoning
3 - Plants affecting the liver and blood and/or causing photosensitization
4 - Plants causing cyanogenic glycoside poisoning
5 - Plants causing cardiac glycoside poisoning
6 - Plants causing indolizidine alkaloid or nitrotoxin poisoning
7 - Plants contaning cicutoxin, a nerve toxin
8 - Plants causing piperidine and quinolizidine alkaloid poisoning
9 - Plants causing diterpene alkaloid poisoning
10 - Plants causing abortion in cattle from isocupressic acid present in needles

to sunlight), liver and kidney damage and can also cause cancer and heart failure. Animals will not readily eat plants containing pyrrolizidine alkaloids, unless no other forage is available. However, some plants become more palatable when dried and will be readily eaten in hay, with little loss of toxicity. Effects are often cumulative, so symptoms may not appear until long after the toxic plant was eaten (sometimes 9-12 months). Young animals with very active liver metabolism are more susceptible to pyrrolizidine alkaloid toxicosis than are older animals.

Photosensitization

Plants causing liver disease and photosensitization are often grouped together, as photosensitization is often, but not always, a secondary symptom of liver disease caused by poisonous plants. As chlorophyll breaks down, it is converted to phylloerythrin, a phototoxic compound. In healthy animals, the liver filters phylloerythrin from the blood, preventing any damage. If the liver is compromised by toxins, it is unable to remove the compound from the blood and photosensitization occurs. Some plants also contain secondary compounds that, once absorbed into the bloodstream, react to ultraviolet light exposure, without any effect on the liver. Photosensitization resembles severe sunburn. Plants from a variety of families can impact liver health or cause related nutrient deficiencies. Photosensitization symptoms are most significant on white skinned animals or white skinned portions of animals around the face, near hooves, and around the udders of lactating cattle.

Cyanogenic Glycoside Poisoning

Cyanogenic glycosides are present in many plants and are converted to hydrogen cyanide or prussic acid when plant cells are damaged. The concentration of cyanogenic glycosides within a plant is variable. Growth stage, plant moisture content and time of day can all influence plant cyanogenic glycosides levels. Fertilization and herbicide application can increase cyanogenic glycoside concentrations in some plants. Chronic cyanide poisoning from eating sublethal doses over time causes loss of nerve function in livestock. Acute cyanide poisoning causes sudden death. Care should be taken to remove or limit animal exposure to plants containing cyanogenic glycosides in pastures and rangeland.

Cardiac Glycoside Poisoning

Cardiac glycosides are the most common toxin affecting cardiovascular health and are found in wide variety of plant families. Generally all parts of the plant are highly toxic and lethal if eaten in small quantities. Plants containing cardiac glycosides are not a significant cause of livestock death because most plants are not very palatable.

Conclusions

The best way to protect livestock from poisonous plants is to implement a comprehensive livestock grazing management plan and vegetation management programs integrating preventative, cultural, chemical, physical and biological control practices. Survey rangeland and pastures and document where toxic plant species are present. Devote some time and effort to understanding the biology and ecology of these plants and determine how livestock might interact with these plants to develop adaptive management plans based on available resources for management. Plans should be flexible and evaluated for their effectiveness over time. Change management practices if necessary. Monitor the successes and failures of your plan and use multiple management techniques to minimize the impacts of poisonous plants on livestock.

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