QUICK GUIDE FOR LIVESTOCK TOXICITIES IN COVER CROP SPECIES

Emi Kimura[1], Jourdan Bell[1], Bill Pinchack[2] and Jason Smith[3]

All poisonings are dose related, and many of the plants we consider high quality forages may have some toxins because of species characteristics, physiological growth stages or growing season conditions. Toxins are naturally produced by plants as a defense mechanism and when ingested cause irritation or death depending on the type and concentration. To minimize risk, it is recommended to monitor plant stress, plant multiple species, and/or encourage animals to eat a forage mixture each day. Most plants of concern can safely be grazed or hayed as part of a high-quality diet, and supplemental nutrients may be used to offset problems (tannins or other bloat inhibitors, iodine with brassicas, supplemental magnesium and calcium for small grains, etc.). The below list provides a guide of potential toxicity caused by improper grazing management.

Cover crop species	Toxicities	Susceptible Livestock	Notes
Brassicas			
Brassicas can be high-protein feed for cattle with proper grazing management. Consider following options when grazing cover crops that contain Brassicas. If there are any concerns, check the laboratory test results. • Brassicas should be less than 75% of the total cattle diet. Glucosinate consumption can cause goiter over time. Additional iodine in the mineral supplement is generally recommended. • Make sure that animals are not hungry and full of hay before grazing. • Matured Brassicas contains less nitrate concentration in general. • Check water source for sulfates and nitrates and make sure that troughs are drained periodically to prevent evaporation from causing those to concentrate in the water.			
Canola	Nitrate toxicity, bloat, polioencephalomalacia (PEM)	Cattle	Test sulfur levels in the canola forage before grazing. High intake of sulfur increases the risk of PEM. PEM occurs because hydrogen sulfide is produced in the rumen when cattle consume high levels of sulfur. Symptoms include stumbling, seizures, and even death.
Mustard	Glucosinolate toxicity	All	High intake of glucosinolate can increase the risk of goiters.
Radish, turnips, swedes, beet	Choking, Nitrate, PEM, anemia, emphysema	Cattle	Hungry cattle may quickly consume large radishes resulting in choking and asphyxiation. The low carbon to nitrogen ratio can quickly result in bloat.
Rapeseeds	Nitrate, PEM, anemia, emphysema	Cattle	Test sulfur levels in rapeseed forage before grazing, because of risk for PEM.
Grasses			
Grasses are a high quality forage that provide high energy and intermediate protein depending on the maturity stage. Consider the following options when grazing cover crops that contain grasses. Read this article for testing forages for prussic acid potential. • Increased risk of nitrate toxicity can be observed in the grass pasture with high nitrogen fertilization and in cool and cloudy days during the dry environment. • Prussic acid HCN (hydrogen cyanide) poisoning risks are the highest with sorghum, followed by sorghum-sudangrass, and sudangrass.			
Cool-season			
Barley, cereal rye, oats, ryegrass, triticale, and wheat	Grass tetany, bloat, nitrates, oral abscesses by awns	Cattle	Grass tetany is more prominent in lush and rapidly growing grasses, particularly those that are fertilized with high levels of potassium, creating low magnesium levels in livestock blood. Especially avoid lush and rapidly growing grass for older lactating cows. Rapidly growing cereal can cause bloat.
Warm-season			
Pearl, foxtail and proso millet	Nitrate	Cattle	See the notes on forage and grain sorghum. No prussic acid risk.
Corn	Nitrate, acidosis, founder.	Cattle	Although corn is not normally planted as a cover crop, cattle graze corn residues and ears when cover crops are planted into standing residues. Cattle graze ears first, followed by leaves, tops, and stalks. Selective grazing by cattle can cause acidosis and founder. No prussic acid risk.

[1]Extension Agronomist-Texas A&M AgriLife (TAMU) Extension Service, [2]Animal Nutritionist – TAMU Research, [3]Beef Cattle Specialist – TAMU Extension.
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Sorghum Species (Forage and grain sorghum, Sorghum-sudan grass, sudangrass, and Johnsongrass)	Nitrate, prussic acid	Cattle and sheep. Not recommended for horses.	**Nitrates:** Nitrates remain in cut forage unlike the HCN. Make sure to conduct a laboratory test if there are any concerns on high nitrate concentrations. Nitrates tend to accumulate most heavily near the base of the stem, so leaving a higher residual cover at the end of a grazing period will help to alleviate some danger of nitrate poisoning. **Prussic acid:** Conditions of high HCN concentrations include plant height less than 18-inch, lush growth after drought, and after hard freeze and/or light frost. Prussic acid is not a concern with cut forage or hay especially when crimped. The HCN usually dissipates as the forage dries, but if there is a concern, baled forage should be tested before feeding.
Legumes ***Legumes*** are highly beneficial for livestock due to their high nutritional values. Consider the following options when grazing cover crops that contain legumes. • Legumes can increase the risk of bloat. Maintain less than 30% of legume to reduce the risk of bloat. • Make sure that animals are not hungry before turning them into legume pasture and/or legume hay. • Use high tannin legumes such as cicer milkvetch, birdsfoot trefoil, and sainfoin that can diminish the likelihood of bloat.			
Cool-season			
Austrian winter pea	Bloat and Stringhalt for horses	Cattle and horses (seeds)	Forage is not toxic; however, the seeds contain toxic amino acids for horses.
Yellow and white sweet clover	Bloat, "sweet clover poisoning", vitamin K interference	Cattle	Dicoumarin, developed in ***moldy*** sweet clover, interferes with vitamin K metabolism and causes hemorrhaging. Risk of sweet clover poisoning is low with low-coumarin clover variety and grazing healthy (non-moldy) sweet clover.
Hairy vetch	Unknown toxin that causes prurient lesions on the skin, some abortions	Cattle and horses	It is a great cover crop species; however, generally mature animals are more likely to be sensitive especially to matured hairy vetch.
Some Lupine spp. (Silly, tailcup, velvet, silvery, summer, sulfur, and bluebonnets)	Teratogen, alkaloids that can cause acute neural toxicity that results in tremors, muscle spasms, death	Cattle and sheep	**Do not graze specific Lupine species.** Non-toxic Lupine species (narrowflower, white, European yellow, and tarwi) can be a good source of protein and energy. Make sure that livestock are NOT grazing the toxic species.
Warm-season			
Cowpea	Low chance of bloat, photosensitivity in sheep	Cattle and sheep	Cowpeas have a low risk of bloat, but if hungry cows are released on lush, young cowpea forage, bloat can occur. Bloat risk declines with forage age.
Guar	Bloat, Nitrates, Prussic Acid	Cattle	Guar can accumulate nitrates and prussic acid under stress.
Soybean	Minimal chance of bloat, potential for lupinosis in sheep, Nitrate	Sheep	Sheep are susceptible to the fungus Phomopsis, which can accumulate on rain-damaged soybean forage resulting in lupinosis symptoms in sheep.
Sunn Hemp	Liver damage and reduced iron metabolism	Cattle, sheep, horses	Although Sunn Hemp would not set seeds in 28° N latitude (north of Corpus Christi), Sunn Hemp seeds can be toxic because of pyrrolizidine alkaloids. Non-ruminants such as horses are especially susceptible.
Other Species *Cover crops are frequently seeded as a mixed species blend to maximize soil health benefits, so producers should verify toxicity risks for all species used. Sunflowers are often incorporated because the tap root can improve soil structure and reduce plow pan compaction, but under stress, nitrate toxicity can be a concern in sunflowers.* Avoid grazing green flax plants in high quantity. They contain prussic acid; however, flax seeds are safe to use for feeds. *Also, kochia may accumulate in poor cover crop stands. While kochia is a palatable and nutritious forage when young, kochia can be toxic in large quantities causing death, blindness, and liver and kidney disease, calcium deficiency, and photosensitization. Nitrates, oxalates (kidney failure), alkaloids (liver disease) and saponins (liver disease) can accumulate in kochia under stress. Although silver nightshade is not used as a cover crop, they contain neurotoxic glycosides and highly poisonous to livestock. Palmer Amaranth also is a noxious weed and not used for cover crop; however, it can contains high nitrate levels.*			