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Forage-Related Cattle Disorders

Brassicas: Be Aware of the Animal Health Risks

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Winter annuals are often used to extend the grazing season. These forages can be used as supplemental feed when lower quality perennial forages dominate or to provide grazing at times when other forages are not available. On farms where row crops are grown, the combination of crop residues and fall growth of annual crops can allow live-stock grazing to be extended well into the winter months. The annuals provide a cover for the soil during winter as well. Winter annuals planted in the early fall will allow grazing in late fall to early winter similar to stockpiled fescue. Based on their high forage quality and increased cost of production, winter annuals are most economical to use primarily for livestock with high nutrient requirements, such as lactating and growing animals. Additionally, mature animals could be utilized as second grazers in a leader-follower grazing system.

Brassicas (including turnips, rape, kale, and swedes or rutabagas) are highly productive, digestible forbs that contain relatively high levels of crude protein and digestible carbohydrates (Figure 1). Animals will readily consume the tops and will also grub the root bulbs out of the ground. These winter annuals are often grazed with no ill effects yet, on occasion, adverse effects do occur. Brassicas have a readily digestible carbohydrate content but are relatively low in fiber so cattle should be provided a fiber source to prevent rumen acidosis or bloat. Brassicas should be limited to 70% or less of total cattle diet dry matter. Interseeding brassicas with cereal grains such as wheat, rye or oats is often recommended rather than using a pure stand to ensure adequate fiber is consumed by grazing livestock. Adjacent pasture, corn stalks, or palatable hay can also be offered to provide additional fiber. Cattle



Figure 1. Kale, a type of brassicas.

should be introduced to brassicas slowly by limiting grazing for a few hours per day for the first week to ten days. Strip-grazing brassicas is also recommended to increase utilization and ensure uniform grazing of the plant.

Although infrequent, brassica crops can cause animal health disorders if grazing is managed improperly. Most brassica-related disorders in cattle tend to occur during the first two weeks of grazing while adjusting to the forage. The primary potential disorders are polioencephalomalacia or PEM, hemolytic anemia (mainly with kale), nitrate poisoning, and pulmonary emphysema. Other possible clinical disorders include bloat and rumen acidosis, and metabolic problems such as hypomagnesemia and hypothyroidism with goiter (Figure 2). Glucosinates present in brassicas are precursors of irritants that can cause colic and diarrhea. Large bulbs may lodge in the esophagus and lead to choking. Certain brassicas (specifically rape) can cause sunburn or “scald” on light-skinned animals, especially when grazed while the plants are immature. Other potential problems include oxalate poisoning and off-flavoring of meat and milk. The following is a brief description of the potential disorders and the mechanisms by which they occur.



Figure 2. Lamb with goiter.

Polioencephalomalacia

Polioencephalomalacia (PEM) is a brain disorder characterized by blindness, aimless wandering, lack of coordination, and twitching of ears, eyes, and skin. This may develop in some cattle after a week or more of eating brassicas (most often forage turnips). Other clinical signs may include circling, convulsions, and death. This disorder is thought to be related to the sulfur content of the plants, and can be exacerbated if the diet includes other high-sulfur feedstuffs such as corn gluten feed or distiller's grains or high-sulfur water. However, brassicas can cause PEM by other mechanisms not fully understood as well. Thiamine typically is administered as a treatment, but animals do not consistently respond to therapy.

Hemolytic anemia

Hemolytic anemia is a blood disorder that may develop in livestock on a diet of pure brassicas. The severity of this disorder is greatest in cattle which have grazed for one to three weeks on kale, rape and turnips. The amino acid compound S-methyl -L-cysteine sulfoxide (SMCO) which accumulates in the plants is unique to this family of forage crops. The SMCO content increases with the maturity of the plant and is high in regrowth and after flowering. In the rumen, SMCO is converted to dimethyl disulfide which is absorbed into the bloodstream and

oxidizes hemoglobin. The spleen detects the defective hemoglobin in the red blood cells and then removes the damaged red blood cells from circulation. Cattle become progressively weaker and may die from severe anemia unless removed from the plants. Hemolysis (rupture of the red blood cell) also occurs as a result of the oxidative damage to the red blood cell membrane that results in hemoglobinuria (red urine). Hemolytic anemia is characterized by dark brown to red urine, pale or icteric (yellow) mucous membranes, and unthrifty appearance. Some animals may collapse and suddenly die.

Nitrates

Brassica crops may accumulate high concentrations of nitrates. Plants absorb nitrates from the soil and generally convert them rapidly to other nitrogenous compounds. During periods of stress on the plant, these nitrates accumulate in the plant and when consumed by grazing livestock are transformed to nitrite in the rumen. Absorbed nitrites combine with hemoglobin in the blood to form methemoglobin, which is incapable of transporting oxygen. The clinical signs associated with nitrite poisoning include gasping and rapid respiration, a rapid heart rate, muscle tremors and weakness. In severe cases membranes appear chocolate-colored, and eventually cyanotic (blue) in appearance due to the high blood methemoglobin content. Death can occur within a few hours of eating nitrate-rich plants, although it is more common for a few days of grazing to elapse before clinical signs appear. Abortion is often observed as a sequel to nitrate poisoning in surviving cattle.

Acute Respiratory Distress Syndrome

Acute respiratory distress syndrome may develop when cattle are given sudden access to brassicas (usually turnip fields) following relatively dry, high roughage diets. Pulmonary emphysema causes rapid, difficult breathing accompanied by a grunt on expiration. Affected animals stand with extended heads, dilated nostrils, and open mouths with protruding tongues. Death may occur within two days. Surviving animals have



Figure 3. Photosensitization (sunburn or rape scald).

a slow recovery over several weeks. Green turnip tops are a rich source of tryptophan that is converted in the rumen to 3-methyl indole, a compound capable of damaging the lining of the air sacs in the lungs. This results in less movement of oxygen from the lungs to the red blood cells and may ultimately result in asphyxiation. The toxicity of the turnip tops is markedly reduced after they have been frozen.

Other Problems

Brassicas can cause a variety of other problems as well. Accumulation of calcium and potassium can reduce the availability of magnesium to animals, resulting in **hypomagnesemia** or “grass tetany.” All brassicas but especially turnips contain glucosinolates which are chemicals that prevent the uptake of iodine by the thyroid gland. This decrease in iodine results in **hypothyroidism** and **goiter** (enlarged thyroid gland). Pregnant animals grazing brassicas may give birth to hypothyroid offspring with a goiter; this is more of a concern with sheep and goats. Sudden onset of **blindness** in sheep (“rape blindness”) is also thought to be associated with glucosinolate poisoning. Certain brassica varieties can contain large amounts of oxalate, causing **oxalate poisoning** and subsequent kidney failure. A syndrome in lambs grazing on rape, known as “rape scald,” is believed to be a primary **photosensitivity** where compounds within the brassica cause skin to be sensitive to sunlight (Figure 3). Rape scald can cause the head and ears to swell and results in blisters and scabs, especially on white heads and faces. Sheep producers need to be aware that **copper toxicity** can be a problem with turnips.

Taint of Meat and Milk

Some people are genetic “tasters” and can easily taste the bitter phenylthiocarbamide (PTC) chemical in brassicas while to others it is virtually tasteless. The ability to taste PTC is a dominant genetic trait in humans. Producers should take this into consideration when grazing dairy animals or fattening grass fed feeder animals on brassica forage. It is important to graze brassicas after milking to avoid milk taint. Odor and flavor problems have been reduced by selection programs to reduce glucosinolate concentrations in the plants.

Prevention

Although there are many management factors to consider, forage brassicas do provide producers with a high yielding, quality forage option at a time when most cool season grasses are not available (Figure 4). Animal disorders can be avoided by the following management practices:

- Introduce grazing animals to brassica pastures slowly (over the first 5 to 7 days) for just a few hours per day. Use varieties specifically developed for forage such as canola which is simply rape that has been selected for low glucosinolates.
- Don't turn hungry animals that are not adapted to brassicas into a brassica pasture. Instead, two to three pounds of hay or straw should be fed to each animal each day before grazing during the first week.
- Brassicas should not constitute more than 70 percent of the animal's diet. Livestock must have access to a good quality pasture or hay to promote saliva production and healthy rumen function when grazing brassicas to avoid digestive disorders such as bloat or rumen acidosis. Interseeding brassicas with cereal grains such as wheat, rye or oats is often recommended rather than using a pure stand to ensure adequate fiber is consumed by grazing livestock.
- Feed a high quality trace mineral mix; the salt should be iodized. Consider a high magnesium mineral if grazing early lactation cattle. Certain brassicas

are low in trace elements, particularly copper, iodine, and selenium.

- Reduce the risk of off-flavors in meat and milk products by withholding animals from brassicas for a period of time before milking or before slaughter. Length of time necessary will depend upon the specific species of brassica being grazed or fed.
- Routinely soil test and fertilize according to the recommendations. Nitrate poisoning has been documented from excessive nitrogen fertilization. Test the forage for nitrates if circumstances suggest a potential problem such as drought or high manure or fertilizer rates.
- Consider measuring sulfur concentrations of the forage before grazing, as well as any other dietary components, especially if also feeding corn gluten feed, distillers dried grains with solubles (DDGS) or other potentially high-sulfur feeds or water. Avoid sulfur fertilizers. Gradual adaptation of the rumen microbial population to utilization of sulfur occurs over a period of 1-3 weeks and will reduce the risk of PEM over time.



Figure 4. Holsteins grazing on brassicas.

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Photos

- Figures 1-3: Neil Sargison/NADIS
Figure 4: Jennifer MacKenzie

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