Beef Cattle Rules of Thumb: Do They Apply to Bison?

It could be said that bison producers have a pretty good grasp on feeding and nutrition. Pasture, hay, silage and grain management are commonly used in all aspects of bison production, from the cow-calf herd to the feedlot. Support from industry specialists such as nutritionists and veterinarians has also helped to improve calving and weaning percentages, animal and herd behaviour, herd health, genetics and nutrition. That said, each year is unique and it never fails that we are challenged with drought, excessive moisture, frost or other weather conditions. No year is the same and each region faces different challenges.

To help deal with feed and feeding challenges, bison producers can resort to several rules of thumb that have been developed for other species. The following is a short list of production "rules" for cattle than can loosely be applied to bison production.

1. Nitrates

Nitrates may accumulate in plants when affected by spray drift, hail, drought or frost. Affected plants should be sent to an accredited laboratory for a nitrate analysis to determine if nitrates have accumulated to toxic levels. In beef cattle, a commonly accepted level of nitrate (NO_3) of 0.50 percent dry feed basis is considered safe. Nitrate levels above the safe level of 0.50 percent in harvested hay, silage or in swaths for swath grazing will require extra attention and management.

2. Prussic Acid and Flax

Prussic acid is formed in younger growing flax crops as a result of trauma to the plant. Trauma can occur due to grazing, chemical spraying, frost or drought. Prussic acid is a form of hydrocyanic acid (cyanide) that does not allow the blood to release the oxygen to the tissues. Acute forms of prussic acid poisoning usually swift and lethal. The toxicity level of prussic acid has been referenced at varying levels. One source from the University of Saskatchewan indicated that toxicity can occur should the level of prussic acid exceed 200 mg/kg (ppm) on a dry feed basis. Another sources from Kansas State indicates that the feed is generally safe for consumption at 0-500 mg/kg dry matter, potentially toxic and should be blended at the 600-1000 mg/kg dry matter and dangerous to cattle at >1000 mg/kg dry matter. The Merck Veterinary Manual suggests that processed forages and standing plants containing <500 mg/kg dry matter are considered safe; 500-750 mg/kg dry matter is cautionary and >750 mg/kg dry matter is extremely hazardous.

3. Feed Analysis

A feed analysis is an important aspect of all feed management programs. As a general rule, most grains are consistent in nutrient values with more variability expected from forages. The way feeds are sampled can greatly affect the nutrient values reported on a feed test. The proper protocol for sampling a hay stack is to randomly select a minimum of 15 to 20 sites from the stack, or the number of samples should be 10 percent of the number of bales in the stack (example: 100 bales x 10% = 10 different bales to take a

sample from). Scissors and a pail can be used, or for a more accurate sample use a forage probe. Once all the sites have been sampled, take enough material from the mixture to fill a two litre bag. Silage should be randomly sampled at 15 to 20 sites from the pit or bale or tube, taking care to take a sample that hasn't been exposed to air from the atmosphere. From the total collection of material, take enough material to fill a two litre bag, squeeze to remove all the oxygen from the bag and freeze to preserve the silage and prevent mold growth. Grains should be sampled from 15 to 20 random sites in the grain pile or grain bin using a grain probe. A final 1 litre sub-sample is all that is required. When deciding on what nutrients to test for, at minimum the analysis should provide moisture, crude protein and an estimated total digestible nutrient (TDN) content. A more complete analysis that includes mineral content is also useful, particularly when considering a different mineral program or troubleshooting a suspected nutrition problem.

4. Frost damaged grains

Frost damaged cereals, pulses and oilseeds have value as a livestock feed. The occurrence of a severe frost during the growing season usually results in lower starch content in the seed and therefore a lower energy value assigned to it. For example, 48 pound bushel weight barley has an estimated total digestible nutrient content of 84 percent dry feed basis. Barley that has been severely frozen and weighs 36 pounds bushel weight has an estimated total digestible nutrient content of 75 percent dry feed basis and is valued at 90 percent of the original feed barley. It should be noted though that when feedlot cattle are fed variable bushel weight barley, average daily gains are unaffected while the feed:gain ratio is moderately increased. However, it is doubtful that under a similar trial will bison feedlot producers measure similar differences, mainly because the daily weight gain of feeder bulls does not compare to the daily gain of feeder beef steers. Frozen wheat also has limitations similar to that of regular feed wheat. Regular feed wheat that weighs 58 pounds per bushel is limited in beef feedlot diets to no more than 40 percent of the grain portion of the diet. Frozen wheat is limited to no more than 10 to 15 percent of the daily diet. If we consider using 10 to 15 percent of the daily diet, a bison cow weighing 1000 pounds in mid January consuming 14 pounds of dry matter per day can be fed up to 2 pounds of frozen wheat per head per day. Limitations on feed wheat exist to prevent grain overload and sub-acute acidosis that may lead to liver damage, long term foot and founder problems, and in worse case scenarios, death. Frozen or green canola seed has feed value of bison as well. However, it must be processed before it can be utilized. Canola seeds are small and have a tough seed coat, making grinding necessary so that the seeds are digested and not passed through in the manure. Canola seeds can have as much as 40 percent oil content, making them difficult to grind on their own. The recommended procedure for grinding canola seed is to start with a blend of 50 percent canola seed with 50 percent barley. If the screens on the grinder become plugged, shift the 50:50 ratio to 25:75 canola to barley. The feeding limitation on canola seed is 10 to 15 percent of the daily intake. Therefore, a 1000 pound bison cow in mid January eating 14 pounds of dry matter per day is limited to 2 pounds of canola per day.

5. Grain Processing

The processing of grain, either by grinding or rolling, affects each feed grain differently. Whole barley and wheat grains are reported to be 10 to 25 percent less digestible than dry rolled barley. Whole corn is reported to be 10 percent less digestible than steam rolled and flaked corn. Whole oats are approximately 5 percent less digestible in beef calves and almost 10 percent less digestible in adult beef cattle than oats that are rolled. If dry rolling grains such as barley or wheat there needs to be some awareness that excessive fines can increase the risk of acidosis. The decision to process grain also has to be economical. If rolling barley and wheat for feedlot cattle, there is a trend showing efficiency and performance benefits compared to the cost of processing. However, the extra gain in digestibility by processing oats and corn are situation specific, as enhanced digestibility of these grains may not be offset by adequate financial returns above the cost of processing.

In conclusion, each of the five points listed above are general rules that have been developed for the cattle industry. Can bison producers put these rules of thumb to use? To be practical and with my best estimate the answer is yes. The nutrient requirements and physiology of bison are closely related to the domestic beef cow, *Bos taurus*. Yet, we need to be aware that there hasn't been any published research indicating that nitrates, prussic acid, the utilization of frozen feeds, or feed processing will behave similarly for bison as it does for cattle. The species differences between bison and cattle in respect to seasonality, rate of gain and ability to digest forages may alter how bison react to each situation. As well, consideration also needs to be given the context around each situation as these "rules of thumb" are more guidelines to safe production. In time, bison producers and industry support specialists more intimately understand how bison react and adapt to the above rules of thumb that cattle producers currently take for granted.

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