



11-2014

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Repository Citation

Lehmkuhler, Jeff; Burris, Roy; and Amaral-Phillips, Donna M., "Mineral and Protein Blocks and Tubs for Beef Cattle" (2014). *Agriculture and Natural Resources Publications*. 147.

https://uknowledge.uky.edu/anr_reports/147

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Mineral and Protein Blocks and Tubs for Beef Cattle

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Nutritional supplement blocks and tubs are convenient for beef producers, require no investment in feeding troughs and require a limited area for storing. One of the most attractive features is that they lower the labor needed to supplement livestock. Many producers use these products to provide supplemental nutrients to cattle consuming low-quality forages or as a mechanism to promote a more consistent intake of minerals. These products are also attractive to producers who have off-farm employment as they eliminate the need for daily feeding. Yet, they often come at a greater cost per unit of nutrient than more conventional feedstuffs. Since there are differences in the blocks and tubs being marketed today, familiarity with how to compare products and determine their differences will enable producers to decide which product best fits their needs.

Package

One of the most obvious differences is package size. Blocks usually weigh 50 pounds or less, while many of the tubs are between 125 to 250 pounds, with some weighing as much as 500 pounds. Consideration should be given to how to handle these heavier tubs safely and whether the size makes them impractical. Blocks and tubs are easily stacked, simplifying hauling and storage at the farm. Packaging material and ease of disposal is another consideration. Most blocks will be wrapped in a light clear plastic film that can be cut away and easily discarded. Tub products may come in plastic or metal drums, biodegradable fiber wraps or cardboard containers. Some companies will reuse or recycle the empty tubs; otherwise finding a proper method for disposal of the containers can be a hassle. Plastic containers can be cleaned and repurposed as planters with urban areas being a potential market.

Purpose

Another distinction between products is its intended use as mineral or protein and energy supplement.

Mineral Supplements

Mineral blocks and tubs are marketed by several manufacturers. Mineral blocks and tubs are different from the more traditional white salt or trace mineralized salt blocks in that they generally contain both macro- and micro-minerals, contain less than 25 percent salt and utilize a co-product feedstuff, roughage product and/or molasses carrier. Most of the molasses-based mineral products have targeted intakes in the 2 to 8 ounce per head per day range. Not all products are molasses-based and ingredients may vary by manufacturer, which can impact intake. These products are designed to be used as a replacement to loose mineral supplements and not as a protein and/or energy supplement. The low intakes associated with these mineral blocks and tubs generally provide little additional energy or protein to cattle.

White salt blocks are 100 percent salt and contain no additional minerals. Trace mineralized salt blocks are generally red in color. These blocks will often contain more than 95 percent salt and do not include any energy, protein or macro-minerals such as calcium, phosphorus or magnesium. Yellow sulfur salt blocks contain only sulfur and salt. Salt-based blocks have lower intakes than loose, complete mineral products with intakes that may be as low as 1 ounce per head daily. Due to their low intakes and lack of macro minerals, salt-based blocks are not recommended for most beef operations. A common misuse of salt-based blocks is providing them to grazing

livestock at the same time a complete mineral supplement is offered. Having access to salt blocks can reduce intake of the complete mineral supplement, leading to potential deficiencies. Be sure to read the tag for feeding directions of self-fed supplements, particularly mineral supplements, before providing salt blocks to cattle.

Protein Supplements

Products designed as a protein and energy supplement will have higher target intakes ranging from 0.5 to 3 pounds per head per day. Protein blocks or tubs may be formulated to contain between 14 to 50 percent crude protein. Many tub and block products will have a portion of the protein from non-protein nitrogen sources such as urea, diammonium phosphate or other inorganic ingredients. Excessive non-protein nitrogen intake can result in lowered efficiency of protein utilization. Further, overconsumption of non-protein nitrogen can lead to toxicity and death. Protein tubs and blocks are best utilized with low protein forages and feedstuffs where the intake of the block or tub provides supplemental protein at levels that improve forage digestion and increase forage intake. Many of these products will be manufactured using molasses or grain co-products, which will provide additional energy and protein to the livestock. Blocks/tubs may also have a source of supplemental fat, increasing the energy density of the product. Yet, the low intakes of some products limits the amount of energy consumed by beef cattle and should not be relied upon as an energy supplement for low-quality forage diets that are fed to cattle during late gestation or early lactation when cattle have high energy requirements.

Manufacturing

Continued differentiation between products is related to the manufacturing process. These products generally can be divided into three categories: pressed, chemically hardened, and low-moisture cooked blocks and tubs. These categories refer to the method in which they are manufactured and can have an impact on targeted intake levels.

Pressed Blocks

Pressed blocks are manufactured as the name implies. Ingredients are mixed and conditioned with steam after which pressure is applied to the product. This process allows for use of a wide range of feed ingredients. In some cases, cold pressing may be utilized, which is often the case for on-farm production or where manufacturing resources are limited. The formulation relies on getting the correct coagulation or hardening agents into the mixture. Humidity and precipitation can lead to degradation of the tub/block. Feedstuffs that do not pelletize well are difficult to use in pressed blocks and tubs; for example, feeds with high fat concentrations result in a less firm block. The amount of pressure and the ingredients utilized also aid in controlling intake. High and sometimes excessive intakes can be achieved if the blocks are soft and easily consumed by livestock.

Chemically Hardened Blocks

Production of chemically hardened blocks involves a mixture of liquid and dry products poured into a container and allowed to cure or harden. The blocks are hardened by controlling the proportion of metal oxides, such as calcium oxide and magnesium oxide. The blocks become hardened through chemical interactions with the other ingredients. These chemical interactions impact the degree of hardness, which controls intake.

Low-Moisture or Cooked Blocks/Tubs

Typically low-moisture or cooked blocks and tubs are the most expensive to manufacture, especially as energy costs increase. A mixture of liquid and dry products is heated under pressure, and vacuum is applied to remove excess moisture. These tubs contain little moisture,

resulting in a greater amount of actual feed per tub. Cooked products typically have the lowest targeted intakes of those discussed. With decreased intake and increased cost, caution should be taken when evaluating these products to ensure that they will supply adequate nutrients cost effectively.

Ingredients

Ingredients are listed on feed labels in order of greatest concentration to least. The moisture content is not listed on the feed label of these products. Low moisture or cooked blocks and tubs are generally near 95 percent dry matter, or only 5 percent moisture. Pressed blocks and/or tubs can be as high as 65 percent dry matter, or 35 percent moisture, depending upon the main ingredients. Products with more moisture are less expensive than cooked tubs because part of what you are buying is water. For example, a tub weighing 250 pounds that has a moisture content of 30 percent results in the purchase and transport of 75 pounds of water. This information must be obtained from the salesperson or manufacturer. The moisture content is a critical piece of information when evaluating the cost effectiveness of supplying nutrients from various feedstuffs.

In general, reading the ingredient section of the product label will allow you to determine the main components. For example, the form of protein may be non-protein nitrogen such as urea, or the protein might come from plant-based sources such as distillers grains, linseed meal, soybean meal or others. Most tubs will include a combination of plant-derived and non-protein nitrogen sources. The source of protein will also influence the price. Urea is the most cost effective source of protein, but it may not provide the most efficient protein supplementation. Plant-based protein sources provide a greater efficiency of protein utilization on poor quality forages. The form or source of energy can also be determined from the list of ingredients. Sources of supplemental energy include sugars from molasses, fats from vegetable oil and animal fats, and digestible fiber from grain co-products. Thus, the ingredient list can provide useful insight and aid in assessing the quality of a product.

Calculating Dry Feed Equivalent

Tub price (\$/tub) = \$55.00
Tub weight (lb/tub) = 250 lb
Moisture content = 30%

1. Find the dry feed content:

= 100 - moisture content
= 100 - 30
= 70% dry feed

2. Determine how many pounds of feed in the tub are dry:

= tub weight x (dry feed content ÷ 100)
= 250 x (70 ÷ 100)
= 250 x 0.70
= 175 lb dry feed in the tub

3. Calculate the dry feed equivalent:

= (tub price ÷ dry feed) x lb in a ton
= (55 ÷ 175) x 2,000
= 0.31 x 2,000
= \$620/ton dry feed equivalent

For tubs and blocks used as a mineral supplement, the source of minerals should be considered because not all sources of minerals have the same biological feeding value. As an example, products containing copper oxide should be avoided as it is a poor source of copper for beef cattle. Chloride and sulfate forms are higher in bioavailability for most minerals compared to oxides. However, not all oxides are poor sources of minerals. Zinc and magnesium oxide are acceptable forms, and supplements will often contain these.

Organic sources of trace minerals generally have the highest bioavailability. Organic or chelated sources will be listed in the form they are added to the supplement. Examples to look for on the feed tag, though not all-inclusive, include copper amino acid complex, zinc methionine, cobalt glucoheptonate, copper proteinate, and selenium yeast. Chelated sources of minerals generally are more expensive, which may explain why one product has a higher price tag than another.

Sulfur is not required to be listed on the label; however, some feedstuffs such as corn gluten feed, corn distillers grains, condensed corn distillers solubles and condensed fermented corn extractives can be high in sulfur. These feedstuffs can be found in various protein blocks and

tubs. Excess sulfur intake increases the risk of polioencephalomalacia (brainers), especially when high sulfate concentrations exist in the water and/or forage. If you have a source of high sulfate water, it is recommended that you avoid products that contain corn co-products as the primary ingredients in tubs and blocks to reduce your risk of inducing polioencephalomalacia.

There are a variety of specialty products in tub and block form. High-magnesium products are available, which can be used during grass tetany risk periods. Blocks containing an anthelmintic or deworming agent can be purchased. Some products contain insect growth regulator (IGR) products to control horn fly numbers, while others contain ionophores, such as monensin or lasalocid, to aid in controlling coccidiosis and improve feed efficiency. Some tub products are designed to be offered during periods of high stress with low feed intake. These products generally contain higher concentrations of the micronutrients as the targeted intakes are often half that of other tubs or blocks. In some regions, tubs and blocks may contain a bloat prevention additive and are used seasonally to lower the risk of livestock losses from wheat pasture and clover bloat. Specialty tubs and blocks will cost more than those without the feed additives, so only use these products if the specific targeted result is desired.

Application/Evaluation of Products

One of the largest limitations when evaluating or selecting the appropriate tub product is that two key nutritional elements are not listed on the product label: the moisture content and the energy content. When evaluating a tub, it is challenging to assess it from a nutritive perspective without making some assumptions. Energy content can be estimated using a summative equation approach and making assumptions on digestibility of the various components such as protein, fiber, and fat. This is an approximation derived from available information on the feed tag and the true feeding value may differ from the calculated estimate. To aid in this comparison a spreadsheet was developed

Table 1. Side-by-side comparison of two products

Product Label Information	Product A		Product B	
	As-fed	Dry Matter	As-fed	Dry Matter
Moisture, % ¹	5	95	30	70
Crude protein, %	30	32	20	29
Non-protein Nitrogen, % units of CP Equivalent Supplied as NPN	4.5	4.7	0	0
Crude fiber, %	1	1.1	5	7
Crude fat, %	5	5.3	3.75	5.4
Calcium, %	1.5	1.6	6	8.6
Phosphorus, %	0.8	0.8	1	1.4
Potassium, %	2	2.1	1	1.4
Magnesium, %	1	1.1	2.7	3.9
Salt, %	0.0	0.0	2.8	3.9
Targeted Intake, lb/d	0.5-1.5	0.5-1.4	1-2	0.7-1.4
Estimated Total Digestible Nutrient, % ²		80		56

¹ Moisture content is generally not listed on product labels. A cooked product often contains 5% moisture or less while some pressed or chemically hardened products may contain 30-40% moisture. This information should be requested from the manufacturer.

² TDN was estimated for illustration only. A product sample should be submitted to a laboratory for a more accurate estimate of TDN or request the value from the manufacturer. If this is unavailable, it can be estimated from the feed tag using the spreadsheet mentioned in the text.

and is available upon request to compare various products. Table 1 provides results from the spreadsheet of a side-by-side comparison of two products.

When evaluating the two products from the table above, note that the moisture content varies dramatically. The moisture content was assumed based on the type of tub. Product A was marketed as a cooked product, which are typically near 5 percent moisture. Product B was advertised as a pressed tub, and the moisture was assumed to be 30 percent. Significant price and intake differences should result.

Consider the potential energy in these products. Product B has more fiber and total mineral content, thus, product B is expected to have less energy due to these differences as both products contain similar crude fat content. The estimated TDN value calculated using a summative approach reveals this. When accounting for the estimated intake, the projected TDN intake is approximately 0.8 pound and 0.6 pound for product A and B, respectively.

These two products are primarily designed as protein supplements. They might typically meet 25 to 50 percent of the energy shortage for a beef cow at peak lactation, assuming average forage quality; yet, they may fully meet the energy needs during gestation. Thus it is

important to consider the class of animal or stage of production when evaluating these products. This example is the process one should employ when comparing the various self-fed supplements to ensure the product will provide the needed nutrients at the desired amount to meet the needs of the livestock. Keep in mind that this process is not perfect. The digestibility of feedstuffs can differ leading to varying performance responses. Unless research is available on the actual product of interest, the above is a plausible approach to evaluating a product.

Summary

Nutritionally, free-choice tub/blocks can be beneficial and may be utilized most effectively during gestation as an alternative to hand-feeding. However, they may not supply adequate energy during lactation or support the desired target gain for growing calves. For free-choice products, a realistic target intake will help determine if the product will actually supply adequate amounts of nutrients to meet the animal's nutrient requirements. Considering the factors detailed in this publication before deciding which product to purchase should improve your chances of buying a product that will meet the animal's needs.

Additional Resources

Drinking Water Quality Guidelines for Cattle (UK ID-170)

The Kentucky Beef Book (UK ID-108)

Machen, R, J. Drouillard, and J. Harris. 2003. AgriLife Extension Texas A&M. *Block and Tub Supplements for Grazing Beef Cattle* (E-178).

Coombs, D.F., and D.W. Sanson. 2001. Louisiana State University. Supplementation of Mature Crossbred Cows Fed Bermudagrass Hay during the Last One-third of Gestation.

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Issued 11-2014