QLF QUALITY LIQUID FEEDS

CATTLE SENSE

Information that makes sense helping you make cents

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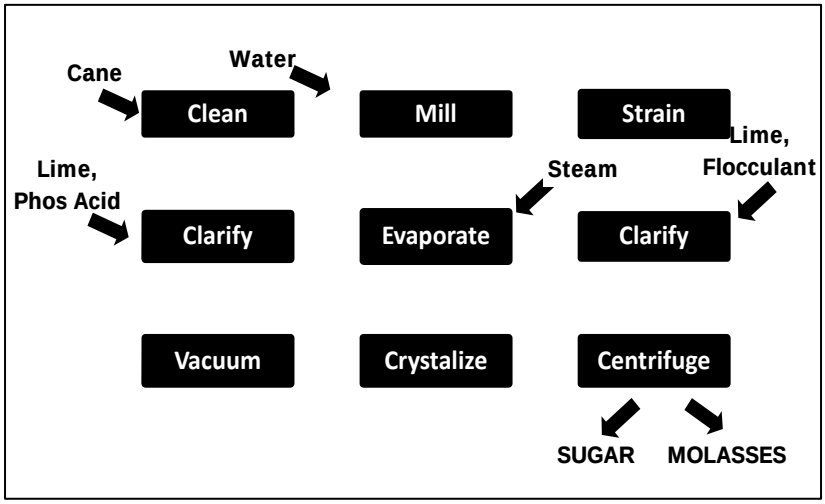
Molasses 101

Around Christmastime, thoughts of molasses are generally tied to holiday cookies. I know I made my annual batch last week! All through the year, molasses is also a widely used feed ingredient. But despite the long history and broad applications of molasses in livestock nutrition, it seems to be a feedstuff that doesn't receive much discussion.

When someone says "molasses," they are probably talking about the common co-product of the sugar cane industry. Molasses can also be produced from sugar beets, citrus, and wood, albeit with some differences in composition and characteristics.

This simplified schematic illustrates the key steps in the production of sugar and molasses from sugarcane. The molasses is typically re-boiled and centrifuged three times to ensure extraction of as much sugar as can be recovered economically. Molasses left at the end of these intermediate processes is termed A, first, or mild molasses (after the first boil) or B, second, or dark (after the second). The final, or "C" molasses, is also known as blackstrap molasses, or in some countries, treacle. It will contain roughly 50 to 60% sugar; 35 – 40% as sucrose, and the remainder as glucose and fructose. Blackstrap may be diluted with water to a set concentration to facilitate handling and standardize trade.



Talk the Talk

The following terms are the basis for defining and discussing molasses:

Brix. Degrees Brix (often labeled °Bx) is based on a relative density scale, and represents % of sugar (sucrose) by weight (g/100 ml). While it is actually indicative of specific gravity, it is used to approximate solids content. Brix readings are temperature dependent. In practice, the term brix is used in calculations as a measure of substance, i.e., 'tons brix.'

Hydrometer. Tool used to measure specific gravity (that is, the ratio of the density of a liquid to the density of water), which can be expressed as Brix. The molasses is put in a narrow container that is then placed in another container of water. Obviously, more dense (higher sugar) samples will sink lower in the water. Hydrometers are scaled to equate this level with the correlating °Bx.

Refractometer. Another tool used to estimate Brix. A small amount of solution (molasses) is placed on a pane, and the angle of light shining through it is measured. Since light will bend differently

(and predictably) as the amount of sugar in solution increases, refractometer readings can be correlated to a refractive index scale of Brix values.

Double dilution. Molasses is diluted with water prior to Brix measurement, allowing more precise readings. These values are then used to back-calculate the Brix of the original sample.

Invert Sugars. Sugar content is the primary source of value in molasses, and it is typically expressed as "Total Sugars, As Invert." Invert sugar is a mixture of equal parts of glucose and fructose resulting from the hydrolysis of sucrose. Compared to sucrose, inverted sugar is sweeter and its products tend to remain more moist and are less prone to spontaneous crystallization.

Reducing Sugars. These are defined as sugars that "reduce" Fehling's Solution. This is a standard mixture that contains cupric ions; in the presence of reducing sugars, cuprous oxide is formed and the solution loses its blue color. Glucose and fructose are reducing sugars; sucrose is not.

Sulphured Molasses. When unripened cane (green cane) is used to make sugar, the molasses is infused with sulfur as a preservative. When ripe sugar cane is used, no sulfur is needed.

<u>The Standard: 79.5 Cane Molasses</u>

While molasses may be bought, sold, and used at a range of Brix values, trade and other discussions requiring standardization have historically been done on a 79.5° Brix basis. The official AAFCO definition reads ***"a byproduct of the manufacture or refining of sucrose from sugar cane. It must not contain less than 43% total sugars expressed as invert and not less than 73% total solids."*** Prior to 2008, this also included the phrase ***"If its moisture content exceeds 27%, its density determined by double dilution must not be less than 79.5° Brix."***

As shown to the right, the viscosity of molasses is highly dependent on temperature. Cane molasses does heat twice as easily as water. In the 'real world,' the density of bulk molasses may be as much as 5% less than calculated for a specific Brix. That is because mixing and pumping can cause air to become entrapped in the molasses, effectively lowering the weight per gallon.

79.5 Cane Molasses

- 11.75 lb/gallon (at 20°C)
- specific gravity 1.41
- pH ~ 5
- specific heat 0.5 BTU/lb/°F
- Viscosity, centipoises
  - at 60°F, 13,000
  - at 80°F, 5,000
  - at 100, 1500

<u>Uses</u>

Molasses is used extensively as animal feed and human food, and in a wide range of other commercial fermentation processes, notably ethanol production. As a feedstuff, its greatest use has been in ruminant diets, where it has been shown to stimulate rumen activity, yielding more available nutrients than the ration's calculated TDN content. Molasses is highly palatable to livestock, and is used to encourage feed intake. When incorporated with other feedstuffs, molasses and molasses-based blends and feeds improve ration mix, reduce separation and sorting, and suppress dustiness. These products may also be used as carriers for trace ingredients and feed additives.

Next month we will look at the specific nutrient contributions of molasses to the diet, and some of the molasses-feeding research that has been published .

Wishing a JOYOUS CHRISTMAS to you and yours!