Feeding Molasses Slurries to Cattle

by

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Molasses has been fed to grazing cattle in Florida for many decades. This was particularly true in south Florida where a sugar industry was developing in the early part of this century. With the advent of urea as a crude protein source, liquid supplements formulated from molasses and urea become popular in the 1950s and 1960s and dry feed and natural protein supplements declined in use.

Many research studies have compared urea with natural proteins as a crude protein source in cattle diets. Urea was proven to be an acceptable source of crude protein in high energy diets, but in most studies natural protein was superior to urea as a crude protein source when fed to growing cattle consuming low to medium quality forages. It has been a major thrust in Florida to incorporate natural proteins into a molasses based liquid supplement or molasses slurry and determine any benefits it may have over conventional molasses-urea mixtures when fed to cattle offered low to medium quality forages.

Dry Ingredient Levels in Molasses Slurries

The level of dry ingredient that can be mixed into molasses depends on several factors; the moisture level or brix of the molasses, the dry ingredient used, and the ambient temperature. For south Florida a level of around 20% dry ingredient in standard molasses is about maximum to obtain acceptable flow during the winter. Cottonseed meal was used at the 25% level in standard molasses with difficulty during cool periods, but a similar level of soybean meal set up in a solid-like state and was dug from the mixer tank. Probably each combination of dry ingredient and molasses type (standard, millrun, etc.) will require trial and error mixing if the maximum level of a specific dry ingredient is desired.

Stability of Molasses Slurries

We have been concerned about stability of slurry mixtures in our research program. Our observations are that the two dry ingredients used to date, cottonseed meal and hydrolyzed feather meal, mix well and remain stable for several weeks in a molasses slurry. Some parts of cottonseed meal tend to float to the top of the slurry when first mixed, but subsequent stirring tends to eliminate this problem.

U.S. Sugar Corporation evaluated the stability of slurry mixes of molasses-feather meal and molasses-commercial slurry formula (feather meal, corn meal, wheat middlings, and rice bran the major ingredients). Feather meal and commercial slurry formula were added at the 10% level in standard molasses. After 3 weeks the protein content in the top and bottom of the slurry column was

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19.4 and 20.1% for the feather meal and 16.0 and 16.6% for the commercial slurry formula. In general we do not feel that separation of most common dry feed ingredients in a molasses slurry mix formulated without suspending agents is a problem in terms of providing uniform nutrition to cattle over a reasonable period of time. We do not have data to assess this problem in terms of quality control as required for guaranteed analysis in commercial feed manufacturing.

Intake of Molasses Slurries

The most noticeable effect of adding dry feed ingredients to molasses is increased intake. At the Everglades Experiment Station in the middle 1970s cottonseed meal was mixed into a molasses supplement fed to yearling cattle grazing St. Augustinegrass pasture to increase molasses intake. Molasses and molasses-urea supplements are not palatable feeds, particularly for young cattle. In several studies the intake of molasses alone by young cattle on pasture was 2 to 4 lbs per head daily and intake of a slurry containing 10 to 15% dry ingredients such as corn or cottonseed meal was 6 to 10 lb per head daily. High supplement intake may be an advantage in some cases, but it could also be a disadvantage where low supplement intake with ad lib feeding is desired.

Molasses Slurries for the Brood Cow Herd

A four-year experiment at the Ona AREC from 1984 to 1988 compared three molasses mixtures: 1. 6% crude protein (CP) standard blackstrap molasses, fed at 2.9 lbs/cow/day; 2. 20% CP standard blackstrap molasses-urea mixture fed at 3.2 lbs/cow/day (3 lbs molasses, .16 lbs urea, .16 lbs water); and 3. 18% CP standard blackstrap molasses-cottonseed meal-urea mixture fed at 2.8 lbs/cow/day (2 lbs molasses, .7 lbs cottonseed meal, .03 lbs urea; .03 lbs water).

Mixtures were fed to Braford-type brood cows (approximately 45 per treatment per year) grazing bahiagrass pasture. The breeding season was from March 1 to June 1. Cows were fed free-choice a low to medium quality stargrass hay (5.5% crude protein and 50% TDN) for an average of 100 days starting in December or January and ending in April or May depending upon weather and pasture conditions. Molasses mixtures were fed twice weekly in open troughs from December 16 to April 22.

Cows fed molasses with urea weaned approximately 7 more calves per 100 cows and their calves weighed 12 pounds more at weaning compared to cows fed molasses only (Table 1). Cows fed molasses-cottonseed meal-urea weaned approximately 12 more calves per 100 cows and their calves were 12 lbs heavier at weaning compared to cows fed only molasses. Calf production per cow in the breeding herd was increased 40 and 62 lbs, respectively, by adding urea and cottonseed meal-urea to the molasses mixture. Cow weight differences were not large across treatments, but cows fed the molasses-cottonseed meal-urea supplement were 11 and 25 lb heavier than cows fed molasses or molasses-urea supplement, respectively.

Younger cows exhibited a greater response to the addition of crude protein to molasses than older cows (Table 2). Three-year-old first-calf heifers fed molasses-urea had a 22.5 percentage point higher conception rate than heifers fed only molasses. First-calf heifers fed molasses-cottonseed meal-urea had a 32 percentage point higher conception rate than first-calf heifers fed only molasses. Even 4 to 6-year-old cows fed either molasses-urea or molasses-cottonseed meal-urea had a 10 and 13 percentage point higher conception rate, respectively, than cows fed molasses only. Seven to 13-year-old cows exhibited no response in conception rate to the addition of urea to molasses, and a slight response to the addition of cottonseed meal-urea to molasses (weaned about 4 more calves per 100 cows). A response to the addition of urea and cottonseed meal to molasses was observed in the weaning weight of calves from first-calf heifers.

Molasses Slurries for Growing Cattle

A feeding study conducted at the Ona AREC compared 4 molasses supplements fed to heifer calves from weaning in September through a 60 day breeding season ending on April 30. Treatments were: 1. molasses alone; 2. molasses-urea; 3. molasses-cottonseed meal-urea; and 4. molasses-feather meal-urea. Crude protein levels were approximately 18% in each mixture except in molasses alone. Heifers were grazed on bahiagrass pasture and fed stargrass hay (11% CP, 51% TDN) ad lib. Hay supplied most of the forage in the diet. Supplement intake was impeded by urea, averaging approximately one-half that of other supplements (Table 3). Highest intake was molasses alone. The supplements containing natural protein were limited fed at 5 lbs per head daily during much of the trial. Heifers fed molasses-urea gained poorly and had a very low conception rate. Much of this response may have been due to the lower supplement intake, but the utilization of urea as a nitrogen source could also be a factor. Heifers fed natural proteins in molasses gained more weight and had a much higher conception rate than heifers fed molasses-urea, but a conception rate only slightly higher than that of heifers fed molasses alone.

A study conducted at Gainesville compared supplements fed to heifer and steer calves placed on bahiagrass pasture 9 days after weaning on May 27. Supplements were: 1. no molasses, 2. molasses alone, 3. molasses (89.2%)-urea (3.6%), 4. molasses (77.7%)-corn (15.2%)-urea (2.2%), and 5. molasses (83.3%)-soybean meal (16.7%). Molasses supplementation increased calf rate of gain (Table 4). Adding urea to molasses reduced supplement intake as in the above trial at Ona, but rate of gain was similar to calves supplemented with molasses only. Adding either corn-urea or soybean meal to molasses significantly improved rate of gain of calves as compared to those fed molasses only.

Molasses Slurry as Summer Supplement to Cows and Their Calves

The crude protein content of bahiagrass pasture forage tends to progressively decrease from 10 to 12% in June to 7 to 9% in September. A study is in progress at the Ona AREC to determine if target feeding a molasses-protein mixture to cows and calves for 60 to 80 days prior to weaning calves in September will increase cow weights and/or calf weaning weights. Treatments were: 1. no molasses; 2. molasses-urea; and 3. molasses-feather meal-urea. Supplements were formulated to contain 30% crude protein. Sixty Braford cows were assigned to each treatment. Supplements were fed free-choice from lick-wheel tanks. Cattle were grazed on bahiagrass pasture.

Two years of data show that feeding molasses-urea resulted in a heavier cow and heavier calf at weaning each year. Calves exposed to molasses-urea were 18 lb heavier in 1989 and 38 lb heavier in 1990 than calves not exposed to molasses. Molasses-urea intake was about 4 lb per cow daily; but calves were frequently observed consuming the supplement and their intake of both supplements appeared to be significant. The response of cows and calves having access to molasses-feather meal-urea was about the same as cows and calves not fed molasses supplement in 1989 and the same as cows and calves offered molasses-urea in 1990. Intake of the molasses-feather meal-urea supplement averaged 4 lb per cow per day in 1989 and 7.6 lb per cow daily in 1990. Phosphoric acid was added to this mixture in 1989 to help limit intake, but not in 1990.

These results indicate that cows and nursing calves will response to molasses-based supplement fed during the summer immediately before weaning. However natural protein was not superior to urea as a nitrogen source. It is possible that the response was due to energy supplementation from molasses, thus another series of studies will be conducted to determine if a similar response can be obtained with molasses alone.

Table 1. Performance of crossbred brood cows fed different molasses-based mixtures during the winter while grazing bahiagrass pasture and fed low-quality hay (4 years data 1984-1988).

Item	Molasses[a]	Molasses-urea[b]	Molasses-cottonseed meal-urea[c]
Weaning rate, %	63.8	70.9	75.7
Calf weaning weight, lb	443	455	455
Calf produced/cow in breeding herd, lb	283	323	345
Increased calve production/cow over molasses alone, lb	----	40	62
Cow weights at different times of year, lb			
November (pre-calving)	1092	1091	1106
March (start breeding)	936	927	949
June (end breeding)	988	983	1002
August (weaning)	1027	1011	1036
Molasses mixture fed/cow, lb[d]	368	406	356
Hay fed/cow, lb	1816	1753	1856

[a]Standard blackstrap molasses, 79.5° Brix; 6% crude protein (2.9 lbs/cow/day).
[b]Standard molasses, 90%; urea, 5%; water, 5%; 20% crude protein (3.2 lbs/cow/day).
[c]Standard molasses, 73%; cottonseed meal, 25%; urea, 1%; water, 1%; 16% crude protein.
[d]Molasses mixtures were fed for 127 days with an average starting date of December 16 and average ending date of April 22.

Table 2. Performance of different age cows fed molasses-based mixtures during the winter while grazing bahiagrass pasture and fed low-quality hay (4 years data 1984-1988).

Item	Molasses[a]	Molasses-urea[b]	Molasses-cottonseed meal-urea[c]
Conception rate for different age cows, %			
3 year olds	37.5	60.0	69.6
4, 5 and 6 year olds	66.1	76.1	79.3
7 to 13 year olds	78.1	78.7	82.7
Weaning weight of calves from different age cows, lb			
3 year olds	392	405	423
4, 5 and 6 year olds	437	454	440
7 to 13 year olds	460	464	465

[abc]See footnotes in table 1.

Table 3. Response of weaned heifers and their breeding as yearlings to molasses-based mixtures (133 days).

Item	Molasses	Molasses-urea	Molasses-Cottonseed meal-urea	Molasses-feather meal-urea
Number heifers	27	27	27	27
Initial weight, lb	568	573	560	586
ADG wean-breeding, lb	.29	.09	.48	.60
Breeding weight, lb	606	586	626	670
Supp. intake, lb/head/d	5.1	2.0	4.6	4.6
Conception rate, %	44.4	7.4	48.2	48.2

Table 4. Response of weaned calves to molasses-bases mixtures fed as supplements to summer bahiagrass pasture (91 days).[a]

Item	No molasses	Molasses only	Molasses urea	Molasses-corn-urea	Molasses soybean-meal
No of calves	8	8	8	8	8
Initial wt, lb	466	460	465	467	461
Avg. daily gain, lb	0.64	0.95	1.03	1.29	1.32
Supp. intake, lb/head/d	-	5.2	3.8	5.7	5.1

[a]From: Kunkle, Bates and Pitzer. 1988. Fla. Beef Cattle Res. Rpt., Univ. of Fla.

Table 5. Response of cows and their calves to molasses mixtures fed free-choice in lick-wheel feeders for about two months immediately prior to weaning.

Item	No molasses	Molasses-urea	Molasses-feather meal-urea
1989 (58 days)			
Supp. intake, lbs/cow[a]	---	3.6	4.0
Cow gain, lb	42	53	29
Steer calf gain, lb	123	140	121
Heifer calf gain, lb	102	120	114
1990 (79 days)			
Supp. intake, lbs/cow[a]	---	4.3	7.6
Cow gain, lb	13	40	47
Steer calf gain, lb	139	183	180
Heifer calf gain, lb	132	165	170

[a]Molasses mixtures were consumed by both cows and calves.2