Cost-Effective Additives for Liquid Feeds

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Introduction

Molasses-based liquid feed is the supplement most fed to cattle in Florida. Originally cattlemen fed straight molasses, but with the advent of urea as a crude protein source in the 1950's, molasses–urea mixtures became a standard liquid feed formula. Subsequently, other ingredients were added to liquid feed formulas. This talk will discuss the more important additives used in a molasses-based liquid and the economics of their use.

Supplementing Lactating Cows

Molasses as an Energy Supplement Two long-term studies were conducted on organic soil pastures at Belle Glade to evaluate heavy blackstrap molasses solely as an energy supplement. Brood cows were fed 5 pounds per cow per day of molasses, from the start of calving to the end of breeding (140 days). Cows grazed St. Augustine grass pasture which contained 13 to 15% crude protein, a level exceeding the requirements of lactating brood cows. Both studies showed that cows fed molasses supplement produced 52 pounds more calf than cows not supplemented.

In both studies, 1 pound of additional calf was produced for every 14 pounds of molasses fed. Over the past 5 years, an average cost of heavy blackstrap molasses is 5¢ per pound, placed in the trough. To pay for a heavy blackstrap molasses supplementation program, the breakeven cost for calves produced would be $70/cwt.

Data are not available which show the value of feeding molasses alone as a supplement to brood cows grazing sand land pastures. It is the author's opinion that the response would exceed that obtained from feeding molasses to cows grazing organic soil pastures.

Urea vs. Natural Protein in Molasses Fed to the Brood Cow Herd On sand land pasture, both protein and energy supplementation are needed by grazing cattle. At Ona, we have compared molasses only, molasses–urea, and molasses–cottonseed meal (the latter containing a small amount of urea) as supplements to brood cows grazing bahiagrass pasture and fed stargrass hay. Molasses contained 6% crude protein and the supplements containing urea or cottonseed meal contained 20% crude protein. All supplements were fed at 3 pounds/cow/day for 100 days during the calving and breeding season. The 90-day breeding season began March 1. Cow ages ranged from 3-year-old first calf heifers to 13-year-old cows. The study lasted four years.

For the total herd, cows fed molasses–urea produced 40 pounds more calf/cow, and cows fed molasses–cottonseed meal produced 62 pounds more calf/cow than cows fed molasses only. The increased cost of feeding a supplement containing urea or natural protein above molasses alone is $4.95 and $9.60/cow, respectively. With a $70/cwt calf market, net return per cow is $23.05 for feeding urea, and $33.80 for feeding natural protein. With a $90/cwt calf market, net return per cow is $30.51 for feeding urea, and $46.20 for feeding natural protein.

Response of Young Cows to Urea and Natural Protein Three-year-old first calf heifers used in the above study responded best to urea and to cottonseed meal additions to molasses supplement. First calf heifers fed molasses–urea had a 22% higher pregnancy rate and weaned a 13-

pound-heavier calf than heifers fed molasses. First calf heifers fed molasses–cottonseed meal had a 32% higher pregnancy rate and weaned a 31-pound-heavier calf than those fed only molasses. With a $70/cwt calf market, the net return per cow is $62.25 for feeding urea and $93.58 for feeding natural protein.

Response of Middle-Age Cows to Urea and Natural Protein Middle-age cows (4, 5, and 6-year-old) also showed rather large responses to adding either urea or cottonseed meal to molasses. Those fed molasses–urea had a 10% higher pregnancy rate and weaned a 17-pound-heavier calf, and those fed molasses–cottonseed meal had a 13% higher pregnancy rate and weaned a 3-pound-heavier calf than cows fed molasses alone. With a $70/cwt calf market, net return per cow is $34.45 for feeding urea, and $32.40 for feeding natural protein. For cows in this age bracket, urea was as effective as natural protein.

Response of Older cows to Urea and Natural Protein Older cows (7 to 13-year-old) showed the least response to either urea or cottonseed meal. Those fed molasses–urea had a 0.6% higher pregnancy rate and weaned a 4-pound-heavier calf, and cows fed molasses–cottonseed meal had a 4.5% higher pregnancy rate and weaned a 5-pound-heavier calf than cows fed molasses alone. With a $70/cwt calf market, net return per cow is -$0.55 for feeding urea and $7.90 for feeding natural protein.

Supplementing Thin, Lactating Cows We recently analyzed three years of data from a study which used mature, lactating cows wintered on native range. Cows grazing range were fed 5 pounds/cow/day of a molasses supplement containing either urea or cottonseed meal. Supplements were fed from calving in December to the start of the breeding season. During the range period, cows responded similarly to molasses supplements containing either urea or cottonseed meal. Cows fed both supplements lost an average of 125 pounds while grazing range and were very thin going into the breeding season.

For the breeding season (March 1 to May 30) all cows were moved from range to bahiagrass pasture and fed 5 pounds/cow/day of a 20% crude protein molasses–cottonseed meal slurry. The overall pregnancy rate obtained was 83%, quite high for thin, lactating cows. Previous studies at Ona showed that lactating range cows which were either supplemented with molasses or grazed on grass–clover pasture had pregnancy rates of 50 to 65%.

Further analysis of the pregnancy data showed that cows with condition scores of 2, 3, and 4 at the start of breeding had pregnancy rates equal to that of cows with condition scores of 5 or better (Table 1). Thin cows also rebred as soon after calving as cows in good body condition. We feel that the addition of natural protein to a liquid supplement is important when breeding thin, lactating cows. We are currently researching this concept and will have production data this fall.

Fat in Liquid Feed Fed to Brood Cows There is no research information available on the response of brood cows to fat added to a liquid supplement. We have completed the first year of a study which will evaluate adding 10% tallow and 10% restaurant grease to molasses–feather meal slurry fed to brood cows. Supplements were fed at 5 pounds/cow/day for 135 days during the calving and breeding season. Cows were grazed on bahiagrass pasture, fed stargrass hay as needed during winter, and exposed to bulls for 90 days beginning March 1.

Adding fat to the molasses–feather meal slurry did not affect weaning weight, but cows fed slurry containing tallow and restaurant grease had a 10% and 8% higher pregnancy rate, respectively, than cows fed slurry without fat.

This study will continue for two more years and the above results are only preliminary. However, adding 10% fat to a molasses supplement currently

costs $26/ton (18¢/pound of fat). The above supplementation program costs $9.78/cow to feed fat. To pay for the added fat, calf weaning rate (500-pound calves) would have to increase 3% with a $70/cwt calf market and 2.5% with a $90/cwt calf market.

Use of Other Additives The only other nutrients recommended as additives to liquid feeds are minerals and vitamins. The important ones for cattle grazed on Florida pastures are phosphorus, copper, cobalt, iron, selenium, vitamin A and vitamin E. Be aware of extra costs of purchasing liquid feeds containing added minerals and vitamins. Costs should be reasonable and in line with the cost of feeding a standard dry mineral mixture, which costs about 1.5¢/cow/day.

The Range Cattle Research Center has conducted several studies on adding Bovatec to molasses supplements fed to brood cows and to yearling heifers. Results of these studies have not shown a positive response in animal performance to this ionophore. In one study with yearling steers, a positive response in rate of gain was obtained with Rumensin, but not Bovatec, as an additive to a molasses supplement. More research needs to be conducted on the use of ionophores in molasses-based supplements.

Supplementing Yearling Heifers

Young cattle require a higher quality diet than mature cows and are much more responsive to changes in a liquid supplement. We have already seen this sensitivity as expressed by first calf heifers.

Urea vs. Natural Protein in Liquid Feed Fed to Yearling Heifers We have completed several trials at the Range Cattle Research Center on feeding molasses-based supplements to heifers bred as yearlings. In all trials there has been a significant advantage to feeding heifers a liquid supplement containing natural proteins in place of urea (Table 2).

It is very important to avoid urea as a source of crude protein in liquid feeds fed to young cattle. Urea adversely affects rate of gain in all young, growing cattle and reproduction in yearling heifers.

Fat in Liquid Supplements Fed to Yearling Heifers We have completed two trials at the Range Cattle Research Center which evaluated the addition of 5% fat, as catfish oil, in a molasses–feather meal slurry fed to yearling heifers. In comparison to slurry alone, supplements containing catfish oil increased rate of gain from 0.4 to 0.5 pound/heifer/day and increased pregnancy rate from 50 to 64% (Table 2).

It is recommended that at least 5% fat be included in liquid supplements fed to yearling heifers to be bred as yearlings. Other available fat sources are animal fat (tallow) and restaurant grease (yellow grease). All fats suspend quite well in a molasses slurry, even without suspending agents.

Undertaking a Yearling Heifer Breeding Program Using Liquid Feed Breeding yearling heifers in Florida is difficult. What must be understood at the beginning is that this is a full two-year program. Heifers must be provided good quality nutrition from the time they are weaned until they are rebred as 2-year-olds.

The following guidelines should be considered if a yearling heifer breeding program is to be successful:

- All heifers must weigh 500 pounds or more at weaning.
- All heifers should weigh 700 pounds or more when bred (650 for heifers with high degree of Angus).
- Excellent quality pasture or hay must be provided at all times.
- All heifers should weigh 900 pounds or more at calving.
- Heifer body weight and body condition must be maintained from the time she calves until she is rebred as a 2-year-old.

With these guidelines, yearling heifers should produce an 80% weaned calf crop that averages 450 pounds or better at weaning, and have a 90% breed back.

We feel that these objectives can be obtained with a liquid feed supplementation program using molasses—natural protein—5% fat. Remember, along with the supplement, adequate amounts of good quality forage, either as pasture and/or hay, must be available. At the Range Cattle Station we feed about two 750-pound bales of stargrass hay (10% crude protein and 55% TDN) to each heifer each winter.

The cost of the above program is about $270 ($170 for supplement and $100 for hay) for each heifer from the time she is weaned until she is rebred as a 2-year-old. With an 80% weaned calf crop, that first calf will cost about $340 in supplement and hay. This is a true added expense if the rancher did not intend to spend any money on supplement and hay for heifers to be first bred at two years of age. This cost can be reduced by $120 per calf produced (80% calf crop) by eliminating hay. But an adequate quantity of good quality pasture is essential, for which a cost must be included.

With feeder calf prices of $90/cwt, this program is economically attractive, returning $405/calf. The breakeven price relative to feeder calves is $77/cwt.

A yearling heifer breeding program is a practice that many Florida producers can take advantage of to increase profits. However, it is a program that should be initiated on a small scale and then grown into slowly.Summary

The two important cost-effective additives to liquid supplement are natural protein and fat. Natural protein is the crude protein source of choice when supplementing cow herds not separated by age. Increased production is of a magnitude that always insures a positive economic return. Yearling and first calf heifers (2 or 3-year-olds) show a large response to natural protein, and urea should be avoided when supplementing these type cattle with a liquid feed. Middle-age (4 to 6-year-old) and old cows (7-year-old and older) can be fed liquid supplements containing urea, and urea will help in controlling supplement intake.

Thin, lactating cows appear to respond to liquid feeds containing natural protein fed during the breeding season. A pregnancy rate of 83% was obtained with lactating cows having condition scores of 2, 3, and 4 going into the breeding season and fed molasses–cottonseed meal slurry.

The addition of 5% fat to a liquid supplement will improve the performance of yearling cattle. Adding 10% fat to liquid supplements fed to the brood cow herd could possibly improve reproductive performance.

Table 1. Effect of body condition of cows upon removal from range on pregnancy rate and subsequent calving date. Cows placed on bahiagrass pasture, fed 5 pounds/cow/day of a molasses–cottonseed meal slurry, and exposed to bulls for 90 days.

Body condition score[a]	Number of cows	Pregnancy rate (%)	Calving date[b]
2 & 3	48	85.4	Jan. 12
4	66	80.3	Jan. 10
5+	45	84.4	Jan. 19

[a] Body condition score from 1 to 9, with 1=emaciated, 5=moderate flesh, and 9=extremely fat.
[b] Calving date subsequent to breeding season at which body condition score was assigned.

Table 2. Effect of various molasses mixtures on the performance of yearling heifers.

Trial	Molasses Urea	Molasses Cottonseed meal	Molasses Feather meal	Molasses Feather meal Catfish oil
Trial 1				
Supplement intake (lb/d)	3.8	5.7	5.0	----
ADG (lb)	0.1	0.6	0.5	----
Pregnancy rate (%)	7	48	48	----
Trials 2 and 3				
Supplement intake (lb/d)	4.1	5.0	----	----
ADG (lb)	0.7	0.9	----	----
Pregnancy rate (%)	26	43	----	----
Trials 4 and 5				
Supplement intake (lb/d)	4.2	----	4.7	4.7
ADG (lb)	0.1	----	0.4	0.5
Pregnancy rate (%)	26	----	50	64