Use of Economical Fat sources in Molasses-Based Supplements Fed to Grazing Beef Cattle in South Florida

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Introduction

The supplement most fed to cattle grazing perennial grass pasture, rangeland, and other low to medium quality roughages is molasses-based liquid feed fortified with crude protein. A problem with molasses-based supplements is a moderate energy content of 55 to 65% TDN (as-fed basis). In some situations it would be useful if the energy level of molasses-based liquid supplements were higher. The best way to increase the energy level in liquid feed is to add fat. Adding 10% fat would increase the TDN of liquid feed by 20 percentage units to 75 to 85% TDN making it comparable in energy to many dry feed supplements on an as fed basis.

There are very few production studies with grazing beef cattle fed molasses-based liquid feeds containing added fat. Previous Florida studies conducted in the 1960's showed that a molasses supplement containing 10% vegetable fat and fed at a rate of 3 pounds per day to growing steers grazing pasture increased rate of gain 16%. No further research was conducted on the value of fat in a liquid supplement in Florida, or elsewhere, until recently.

Past Florida research was conducted with vegetable oil which readily mixed with molasses and remained in suspension for reasonable periods of time without suspending agents. Products also offering potential advantage in terms of supply and costs are animal fats (tallow and catfish oil) and restaurant grease (reconstituted vegetable oil). The effectiveness of fat in a molasses-based liquid feed fed to yearling heifers or brood cows was conducted in Florida during the past nine years. This paper will discuss these studies.

Types of Fats Used in Trials

Fats are very different in many aspects and one of the biggest differences is in their fatty acid composition. The fatty acid composition affects many of the chemical and physical characteristics of triglyceride fats. It is suggested that specific fatty acids have a profound influence on the nutritive value of fats to animals, including the reproductive performance ruminant females. It is not the purpose of this paper to address this area of discussion, but for reference the fatty acid composition of the three fat sources used in trials presented in this paper are shown in Table 1.

Table 1. Percent fatty acid composition of various fat sources used in trials in the present study.

Fatty acid		Catfish oil[1]	Animal fat (tallow)[2]	Vegetable fat[3]
14:0	Myristic	1.43	2.17	0.53
16:0	Palmitic	16.84	25.25	15.20
16:1	Palmitoleic	4.14	0.56	1.26
18:0	Stearic	3.76	17.73	8.42
18:1	Oleic	49.51	43.45	52.07
18:2n6	Linoleic	12.22	5.40	21.15
18:3n3	Linolenic	1.31	0.66	1.19

[1] Catfish oil is derived from the rendering of offal from commercial catfish processing.
[2] Animal fat was mostly tallow, but contained some pork fat.
[3] Vegetable fat is reconstituted vegetable oil, also termed yellow grease or restaurant grease. It is probably mostly soybean oil.

Fat in Molasses-based Supplements Fed to Yearling Heifers

Procedure

Two trials were completed at the Range Cattle Research and Education Center which evaluated the addition of 5% fat, as catfish oil, in a molasses-feather meal slurry (13% feather meal) fed to yearling heifers. Heifers were fed supplement in open troughs twice weekly to provide 5 pounds per head daily from weaning in September at 8.5 months of age through a 60 day breeding season starting March 1. Heifers were grazed on bahiagrass pasture and fed stargrass hay from December through the breeding period. Heifers were weighed at the start of the trial, approximately every 60 days, and at the beginning and end of the breeding period. Heifers were bled at each weighing, and blood samples were analyzed for serum cholesterol content. Heifers were palpated for pregnancy in August.

Results

In comparison to heifers supplemented with molasses-urea, heifers fed molasses slurry containing feather meal or feather meal and catfish oil gained faster and had a higher pregnancy rate ($P < .05$). Also, heifers fed the molasses slurry containing feather meal and catfish oil has a faster rate of gain and a higher pregnancy rate ($P < .05$) than heifers supplemented with molasses containing only feather meal (Table 2).

Table 2. Daily gain, feed intake, pregnancy, and blood urea nitrogen and cholesterol levels of yearling heifers fed molasses-based supplements containing urea, feather meal, or feather meal and catfish oil.

	Molasses urea	Molasses feather meal	Molasses feather meal catfish oil
Trial 1			
Initial wt, lb	579	575	575
Average daily gain, lb	-.15[a]	.09[b]	.24[c]
Supplement intake, lb/d	3.7	4.8	4.8
Hay intake, lb/d	6.4	6.4	5.5
Pregnancy, %	9.5[a]	31.4[b]	47.6[c]
Cholesterol, mg/dl	94[a]	97[a]	133[b]
Trial 2			
Initial wt, lb	551	551	555
Daily gain, lb	.44[a]	.71[b]	.82[c]
Supplement intake, lb/d	4.6	4.6	4.6
Hay intake, lb/d	13.4	13.4	13.4
Pregnancy, %	42.9[a]	69.1[b]	80.0[b]
Cholesterol, mg/dl	82[a]	92[ab]	143[c]

[a, b, c] Means in the same row with a different letter in their superscript differ (P<.05).

Because of their greater need for energy, the addition of at least 5% fat to liquid supplements has a very positive effect on the performance of heifers to be bred as yearlings. The degree of response appears to be economical with current prices for fat (15 to 20 cents per pound). Other competitive fat sources are animal fat (tallow) and restaurant grease (yellow grease or reconstituted vegetable oil).

Fat in Molasses-based Supplements Fed to Brood Cows

Procedure

Six cow/calf production trials were conducted between 1993 and 1999 at the Range Cattle Research and Education Center to evaluate the addition of waste fats in a molasses based liquid slurry fed as a winter supplement to producing beef cows grazing bahiagrass pasture. The Molasses-based supplementation treatments used in the six trials were as follows:

Trials 1 and 2

Treatment 1..... no fat.
Treatment 2..... 10% animal fat (40.5).
Treatment 3..... 10% restaurant grease.

Trials 3 and 4

Treatment 1..... no fat.
Treatment 2..... 5% restaurant grease.

Trials 5 and 6

Treatment 1..... no fat.
Treatment 2..... 5% mixed animal and vegetable fat.

In each trial cows were fed 5 lb of molasses per head per day for approximately 140 days beginning at the start of the calving season (around December 1st), and continuing to about 60 days into the breeding season. Molasses mixes were fed twice weekly in open troughs. Fat was added to the molasses, feather meal, and urea slurry in place of molasses. The molasses-based slurry contained 18% crude protein.

Approximately 200 Braford brood cows were used in each trial. Cows were randomly assigned to two to four replications depending upon trial. Cows were grazed on bahiagrass pasture all year and fed stargrass hay during the winter on an as-needed basis. Cows were exposed to bulls for 90 days starting March 1. Cows were palpated for pregnancy in late August. Calves were weighed at weaning in mid-September.

Results

Cows consumed slurry mixtures containing either fat source very well. Field observations indicated that all slurry mixtures containing fat were eaten quicker than the molasses and feather meal mixture containing no fat. Cattle appeared to prefer the slurry containing restaurant grease over the one containing animal fat.

Table 3. Conception rates of brood cows fed molasses-based supplements during the winter with or without added fat, and the weaning weights of their calves.

		No Fat	Animal Fat [1]	Vegetable Fat[2]	Animal-Vegetable[3]
Trials 1 and 2					
1993-94	Pregnancy rate, %	82.2	91.8	90.2	----
	Wean weight, lb	457	460	454	----
1994-95	Pregnancy rate, %	81.0	85.7	76.4	----
	Wean weight, lb	434	449	456	----
Trials 3 and 4					
1995-96	Pregnancy rate, %	67.7	----	73.3	----
	Wean weight, lb	435	----	420	----
1996-97	Pregnancy rate, %	88.0	----	83.5	----
	Wean weight, lb	416	----	435	----
Trials 5 and 6					
1997-98	Pregnancy rate, %	88.3	----	----	94.5
	Wean weight, lb	460	----	----	464
1998-99	Pregnancy rate, %	72.6	----	----	74.0
	Wean weight, lb	474	----	----	491

[1] Animal fat had a titer of 40.5.
[2] Reconstituted vegetable oil or restaurant grease.
[3] A commercial mixture of animal and vegetable fat marketed by Griffin Industries.

Only the two important production variables, cow pregnancy percentage and calf weaning weight, will be presented for discussion. These results over the six cow/calf trials conducted were inconsistent. In trials 1, there was an apparent higher pregnancy rate of cows fed supplement containing either animal or vegetable fat in comparison to cows fed supplement containing no fat. Calf weaning weights were similar for all treatments in trial 1. In the second trial there was an apparent advantage in pregnancy rate by cows fed supplement containing animal fat, but a disadvantage in pregnancy rate by cows fed supplement with vegetable fat in comparison to cows fed the supplement containing no fat. In the second trial, calves from cows fed supplements

containing both fats appeared to be heavier than calves from cows in the control treatment.

In trials 3 and 4, which evaluated only vegetable fat, results were again inconsistent. In comparison to cows in the control treatment, cows fed supplement with vegetable fat had a higher pregnancy rates in trial 3, but a lower pregnancy rate in trial 4. Calf weaning weights were just the opposite, with calves from cows fed supplements with vegetable fat being lighter than control calves in trial 3, and heavier than calves from the control treatment in trial 4.

In both of the last two trials (5 and 6), cows fed supplement containing a commercial animal-vegetable fat mixture had a higher pregnancy rate than that of cows fed the molasses-based slurry with no fat. Also, in both trials, calves from cows fed supplement with animal-vegetable fat mixture were apparently heavier at weaning than calves from cows fed the supplement with no added fat.

Summary

The present study indicated that brood cows use animal and vegetable fats equally well as an additive to a molasses-based slurry fed as a supplement during the winter.

Evaluations of means over all six trials showed that pregnancy rate of cows fed supplement with added fat was 83% compared to 80% for cows fed supplement with no fat. The average weaning weight of calves over all six trials was 453 pounds for the fat treatments and 446 pounds for the no fat treatment.

An overall measurement of cow productivity is a product of cow reproduction and calf weaning weight. Estimating cow productivity, using the average pregnancy rate and calf weaning weigh data above, suggests that cows fed a molasses-based slurry containing 5 to 10% added fat will produce approximately 20 pounds more calf per cow than cows fed a similar supplement without added fat. With the current feeder calf market this would be a very economical response.

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