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COMPARISON OF CONCENTRATED SEPARATOR BYPRODUCT AND CANE MOLASSES FOR FINISHING HEIFERS

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Summary

We compared concentrated separator byproduct (CSB) to cane molasses on feedlot performance and carcass merit of 394 crossbred yearling beef heifers fed for 148 days. Sugar beet molasses undergoes a process in which approximately half of the sugar is removed, concentrating protein and mineral in CSB. Compared with cane molasses, CSB has more crude protein, ash, and moisture. Two diets based on steam-flaked corn containing either CSB or cane molasses at 5% (dry matter basis) of the diet were fed. Feedlot performance was similar between heifers fed the two diets ($P>0.23$). Apparent dietary concentrations of net energy for gain (NE_g), calculated from performance, were similar ($P=0.21$) for the CSB and cane molasses diets. The apparent NE_g for cane molasses and CSB were not statistically different ($P=0.20$); the NE_g concentrations of cane molasses and CSB were 0.21 and 0.50 ± 0.15 Mcal/lb, respectively. Carcass characteristics were similar between diets. Based on our data, CSB and cane molasses have a similar feeding value and energy content in beef finishing diets that are based on steam-flaked corn.

Introduction

Concentrated separator byproduct is a liquid byproduct derived through chromatographic separation of sucrose from beet molasses, reducing the concentration of sucrose by half. Reduced sucrose and increased moisture and ash have fueled the thought that CSB is inferior to cane molasses as an energy source. Inherent in this assumption is the undocumented expectation that relatively small differences in sugar content will yield measurable differences in animal performance. Unfortunately, these characterizations of CSB do not take into consideration some of its potentially valuable attributes. Relative to cane molasses, CSB contains higher levels of crude protein and potassium, both of which must be supplemented in finishing cattle diets. Additionally, CSB contains relatively high levels of betaine, which is altogether absent from cane molasses.

Previous studies at Kansas State University have evaluated betaine as a supplement for finishing cattle diets. Resulting improvements in gain, efficiency, and carcass attributes were small to moderate, but were relatively consistent and economically significant. Given the small differences in carbohydrate content, as well as the relatively low dietary inclusions of cane molasses and CSB in finishing diets, it seems unlikely that differences in sugar content of the two products would result in measurable differences in animal performance. However, improvements due to betaine supplementation are, in fact, possible. Nutrient analyses of cane molasses and CSB are listed in Table 1.

Our objective was to compare performance during the finishing period and carcass characteristics of beef heifers fed diets containing either CSB or cane molasses.

Experimental Procedures

Crossbred yearling heifers (n = 394; 658 ± 4 lb initially) were fed for 148 days. The heifers were allocated to 24 feedlot pens. Twelve pens were fed a diet containing CSB; 12 pens were fed a diet containing cane molasses. Diet compositions and actual nutrient levels are listed in Table 2. Both diets were formulated to provide a minimum 14% crude protein, 0.7% calcium, 0.3% phosphorus, 0.7% potassium, 300 mg/heifer monensin daily, 90 mg/heifer tylosin daily, and 0.5 mg/heifer melengestrol acetate daily. During processing heifers were vaccinated against viral (Bovishield-IV®) and clostridial (Fortress-7®) diseases, implanted with Component EH®, treated for internal and external parasites with Eprinex® pour-on, and administered a metaphylactic dose of Micotil®.

The statistical design of this study was a randomized complete block design with a 2 × 2 factorial arrangement of treatments; factors were CSB or cane molasses and high or low blood glucose measured at arrival. Data related to blood glucose is not presented, but blood glucose did not interact with diet to affect any criteria.

Cattle were blocked by initial glucose concentrations and allotted to feedlot pens at random. Feedlot pen served as the statistical unit. Pens of heifers were weighed at the beginning of the experiment and immediately before shipping to a commercial slaughterhouse in Emporia, Kansas. Treatment differences were evaluated by analysis of variance using the General Linear Models procedure of SAS.

Results and Discussion

There was no effect of dietary treatment on feedlot performance (P>0.23; Table 3). Using feedlot performance, apparent dietary NE_g values were calculated and no difference occurred between diets containing CSB or cane molasses (P=0.21). The NE_g for cane molasses and CSB were 0.21 and 0.50 Mcal/lb (P=0.20), respectively. These NE_g values are based on feedlot performance and, because gains were identical, the numerical difference between the NE_g values for CSB and cane was a result of the slight difference in feed intake. Carcass characteristics of heifers fed diets containing CSB and cane molasses are listed in Table 3 and were similar between diets.

Based on the findings of this experiment, the feeding value of CSB is similar to that of cane molasses when included at 5% (dry matter basis) in diets based on steam-flaked corn. Dependent on price and availability, CSB is a suitable replacement for cane molasses in finishing cattle diets.

Table 1. Analyzed Nutrient Concentration of Cane Molasses and Concentrated Separator Byproduct

Item, %	Cane Molasses	Concentrated Separator Byproduct
Dry matter	70.7	65.4
	------------------------Dry matter basis------------------------	
Crude protein	6.3	21.9
Calcium	1.19	0.47
Phosphorus	0.04	0.03
Potassium	5.3	10.2
Ash[a]	13.3	30.3

[a]Ash content of cane molasses and concentrated separator byproduct are tabular values.

Table 2. Diet Composition, % of Dry Matter

Ingredient	CANE	CSB[a]
Steam-flaked corn	76.7	77.2
Ground alfalfa hay	8.1	8.0
Cane molasses	5.0	–
Concentrated separator byproduct	–	5.3
Soybean meal	4.0	3.1
Tallow	3.2	3.2
Limestone	1.3	1.5
Urea	1.3	1.3
Salt	0.3	0.3
Premix [b]	0.1	–
Premix [c]	–	0.1
Nutrient [d]		
Crude protein	15.2	15.9
Calcium	0.78	0.74
Phosphorus	0.24	0.24
Potassium	0.66	0.90

[a]Concentrated separator byproduct.
[b]Formulated to provide 1200 IU/lb vitamin A, 50 ppm Zn, 50 ppm Mn, 8.3 ppm Cu, 0.5 ppm I, 0.3 ppm Fe, 0.25 ppm Se, 0.1 ppm Co, 33.3 grams/ton Rumensin, 10 grams/ton Tylan, and 0.5 mg/heifer melengestrol acetate daily.
[c]Formulated to provide 1200 IU/lb vitamin A, 51 ppm Zn, 50 ppm Mn, 9.4 ppm Cu, 4.5 ppm Fe, 0.5 ppm I, 0.25 ppm Se, 0.1 ppm Co, 33.3 grams/ton Rumensin, 10 grams/ton Tylan, and 0.5 mg/head melengestrol acetate daily.
[d]From analysis of ingredients.

Table 3. Finishing Performance and Carcass Characteristics of Yearling Heifers Fed Diets Containing Either Cane Molasses (CANE) or Concentrated Separator Byproduct (CSB)

Item	CANE	CSB	SEM	P [a]
Dry matter intake, lb/day	17.9	17.6	0.2	0.24
Initial body weight, lb	659	656	3.8	0.54
Final body weight, lb[b]	1125	1122	9.3	0.81
Average daily gain, lb[c]	3.15	3.15	0.06	0.99
Feed:Gain	5.70	5.58	–	0.24
Net energy for gain, Mcal/lb [d]				
Diet	0.73	0.74	0.01	0.21
Ingredient, Cane or CSB	0.21	0.50	0.15	0.20
Hot carcass weight, lb	714	712	5.9	0.81
Dress, %	63.9	64.0	0.1	0.50
Longissimus muscle area, inch^2	13.3	13.3	0.1	0.90
12th rib fat thickness, inches	0.49	0.51	0.02	0.53
Kidney, pelvic, & heart fat, %	2.37	2.45	0.06	0.34
Yield grade 1, %	18.8	12.7	2.5	0.10
Yield grade 2, %	31.4	38.6	3.6	0.17
Yield grade 3, %	40.7	38.1	2.8	0.53
Yield grades 4 & 5, %	9.1	10.6	2.4	0.65
Marbling score	Slight 71	Slight 77	7.1	0.54
USDA Choice, %	40.1	45.5	4.3	0.39
USDA Select, %	52.8	43.6	4.2	0.13
USDA Standard, %	6.0	8.8	1.4	0.17
Liver abscesses, %	1.5	2.1	0.8	0.61
Dark cutters, %	0.5	1.5	0.7	0.29

[a]Probability that the observed response is not due to random chance.
[b]Calculated as hot carcass weight ÷ 63.5% dress.
[c]Calculated using carcass adjusted final weight.
[d]Calculated from heifer performance using the NRC (1984) equations and the method of substitution.