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Robbi H. Pritchard
South Dakota State University

Donald L. Boggs
South Dakota State University

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Relative Efficiency of Natural Feeding Programs Using Germ or Bran Cake from a Dry Milling Process¹

Robbi H. Pritchard² and Donald L. Boggs³
Department of Animal and Range Sciences

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Summary

This experiment was designed to evaluate the potential of using high-fat ethanol co-products in cattle feeding programs that exclude implants and ionophores. Four treatments included: 1) Positive Control, implanted steers fed a typical diet that included 29g/T monensin; 2) Control Diet fed to non-implanted steers; 3) 14% Germ, no implant or ionophore; and 4) 30% Bran Cake, no implant, no ionophore. After a 110 d finishing period, the breakeven (B/E) fed cattle price increased \$3.04/cwt when an implant was not used on the Control diet. The Germ diet resulted in comparable performance as the Control diet fed to non-implanted steers. The Bran Cake diet resulted in lower ($P < 0.05$) ADG and higher ($P < 0.05$) feed/gain than the Control diet (2) although DMI were similar. Most of the performance loss associated with the Bran Cake diet occurred late in the feeding period. The substitution of bran for corn results in an apparent lower dietary NE value. A substantial reduction in feed price would be necessary for this Bran Cake diet to be a cost effective means of producing antibiotic-free beef. There was no evidence of bloat or digestive disorder in the higher fat-no ionophore diets.

Introduction

There is a steady growth of branded beef programs with production criteria that prohibit the use of growth promotant implants and/or antibiotics. Ionophores may be excluded in some programs under the antibiotic criteria. There are ample data available to allow one to calculate fed cattle premiums necessary to offset unrealized performance when implants and ionophores are not used. Rather than repeat those experiments, this study was designed to provide a cursory comparison of alternative feeding programs.

A basic premise behind the alternative diets used here was that it may be beneficial to increase the caloric intake as fat when ionophores are not used. The substitution of fat for starch would reduce the amount of starch fermentation, acid production, and bloat potential of the diet. The fat source would need to be a cost effective source of energy that could be easily handled in small to medium-sized feedlots located in the northern plains.

Two relatively new co-products of dry milling ethanol production were chosen as fat sources. The germ used is a free flowing dry (94% DM) product containing 16% CP and 20% fat. The bran cake used is a composite of corn bran and syrup. This material was 52% DM, 12% CP, and 11% fat. These products were substituted for corn at 14% or 30% of the diet to provide 5.1% total fat.

It is important to recognize that the comparisons reported are comparisons of conceptual production options. These data do not lend themselves to be used to determine the energy values of the co-products or to calculate responses to ionophores.

Materials and Methods

Steers (156 hd; Initial BW 866 lb.) were selected from a larger group of steers previously used in a backgrounding study. Steers were allotted to 20 pens of 7 or 8 hd such that the range of body weight was stratified within all pens. The experiment included four treatments: 1) Positive Control - implanted steers fed a typical finishing diet (including monensin and tylosin); 2) Non-implanted - These steers were fed the same typical finishing diet; 3) Germ - no implants, no ionophore, 14% germ; and 4) Bran Cake - no implants, no ionophores, 30% bran cake. The objective was to increase dietary fat from 2.7% in the control diet to 5.1% in Germ and Bran Cake diets. Complete diet formulations and compositions are reported in Table 1. The

¹ This study funded in part by USDA-ARS.

² Distinguished Professor

³ Professor

implant used in Treatment 1 was Revalor-S, administered on d 12.

For adaptation, all initial diets contained 50% corn silage. Germ and Bran Cake were included at 7 and 15% where appropriate in the initial diets. Four diets were used during the step-up period, reaching the fourth (final) diet at d 19. At d 104, oat hay replaced a diminished supply of oat silage at equal dry matter contribution to the diet. Steers were fed twice daily.

Individual body weights were determined prior to morning feeding at days 0, 28, 56, 84, and 110. All interim performance data were based on these unshrunk weights. A carcass weight basis final body weight, used for calculating cumulative performance was determined as hot carcass weight \div 0.625. Feed ingredients were sampled weekly for determination of dry matter and crude protein content. These dry matter values were applied to feed batching records to calculate DMI. Intakes were summarized at weekly intervals.

Two batches of germ and bran cake were received for this experiment. Germ was stored in a hopper-bottom bulk bin. Bran cake was piled on a concrete slab.

Data were analyzed using procedures appropriate for a completely random designed experiment. Means separations were accomplished using a Fishers T test.

Results and Discussion

Three animals were removed from the experiment. Reasons included a stag, pneumonia, and a non-performer, none of which should be attributed to treatments.

The implanted steers fed the Control diet had higher ADG, lower feed/gain, heavier final weights, and produced heavier carcasses ($P < 0.05$) than the other systems. The importance of this treatment in this experiment is to provide a benchmark or reference point for evaluating the economics of the other treatments. This short version of production costs [yardage 30¢/d, feed \$120/T (DMB), and feeder steer at \$100/cwt] applied to production rates in Table 3 resulted in a breakeven market price of \$84.39/cwt. Doing the same calculation for Treatment 2 resulted in a breakeven of \$87.43/cwt. This assumed no

premium was paid for feeders certified for an implant-free program. There also was no Quality Grade premium applied since this implant caused no Quality Grade depression as used in this study.

Treatments 2 and 3 resulted in similar performance. The substitution of germ for the ionophore, SBM, and corn resulted in similar ADG and carcass weight. There was a trend ($P < 0.10$) toward slightly higher DMI when feeding germ. Since growth was similar on these diets, the application of production data would be to calculate the competitive price of the Germ diet. Compared to the \$120/T Control diet, a comparable breakeven is achieved if the Germ diet cost is \$116.50/T. There is no ionophore cost and less supplemental CP cost in the Germ diet, which is sufficient to meet or exceed savings required. Actual benefits would be dependent on the price of germ.

Steers fed the Bran Cake diet grew more slowly ($P < 0.05$) and less efficiently ($P < 0.05$) than those fed the Control or Germ diets. If this diet could be formulated at \$120/T, the B/E selling price on the steers would increase to \$89.47/cwt. There was no additional savings in supplemental CP to be had over the Germ diet. To match the B/E of the Germ treatment, diet cost would have to be reduced to \$75.52/T. The performance drag due to Bran Cake was most pronounced from 85 to 110 d on feed. Feed efficiency differences would be more pronounced in lower energy feeds as cattle approach harvest flesh and body weight. This period also coincides with feeding of the second load of Bran Cake (days 82 to 110). It was not apparent that the feeding quality of the Bran Cake changed, but that possibility cannot be ruled out.

The original premise of this experiment was to determine if using ethanol co-products to add fat to finishing diets would offset the advantages provided by ionophores in typical diets. Using this dry milling germ product containing 20% fat at 14% of the diet appeared to adequately replace SBM, corn, and monensin. There was no evidence of an increased prevalence of bloat, acidosis, or coccidiosis on either co-product diet. The bran cake product was not suitable for this purpose.

Tables

Table 1. Final diets formulations and composition^a

	Treatment ^b		
	1 and 2	3	4
Oat silage, % ^c	10.00	10.00	10.00
Whole shelled corn, %	78.81	67.16	51.47
Germ	-	14.00	-
Bran cake	-	-	30.00
SBM ^d	9.20	6.20	6.20
Urea ^d	0.30	0.30	0.30
Limestone ^d	1.44	2.09	1.78
Trace mineralized salt ^d	0.25	0.25	0.25
DM ^e	79	79	67
CP ^e	12.4	12.4	12.4
NDF ^e	14	16	19
Ca ^e	0.57	0.78	0.68
P ^e	0.32	0.45	0.39

^a DM basis.

^b Treatment 1 = Positive Control; 2 = Non-implanted Control; 3 = Germ, non-implanted, no ionophore; and 4 = Bran Cake, non-implanted, no ionophore.

^c Replaced with oat hay day 105.

^d Incorporated into pelleted supplement fortified with Vitamins A and E, ZnSO₄, and CuSO₄. Diet 1 and 2 provided 29g/T monensin.

^e Tabular values.

Table 2. Interim performance by treatment

	Treatment ^a				SEM
	1	2	3	4	
Initial BW, lb	870	867	868	861	5.3
d 28 BW	1001 ^b	987 ^{bc}	974 ^c	968 ^c	8.4
1 to 28d					
ADG	4.69 ^b	4.31 ^{bc}	3.79 ^c	3.83 ^c	0.214
DMI	18.67 ^f	18.70 ^f	19.05 ^e	18.71 ^f	0.113
F/G	4.01 ^b	4.39 ^{bc}	5.09 ^c	4.90 ^c	0.252
d 56 BW, lb	1117 ^b	1086 ^c	1084 ^c	1065 ^d	6.3
29 to 56d					
ADG	4.15 ^e	3.54 ^f	3.94 ^{ef}	3.44 ^f	0.212
DMI	24.85	24.53	24.91	24.49	0.245
F/G	6.03 ^e	6.98 ^{ef}	6.37 ^{ef}	7.30 ^f	0.337
d 84 BW, lb	1236 ^b	1195 ^c	1185 ^{cd}	1174 ^d	6.2
57 to 84d					
ADG	4.26	3.87	3.60	3.91	0.211
DMI	26.68 ^b	26.35 ^b	27.36 ^c	26.51 ^b	0.229
F/G	6.33 ^e	6.86 ^{ef}	7.65 ^f	6.85 ^{ef}	0.350
d 110 BW, lb	1321 ^b	1283 ^c	1274 ^c	1243 ^d	6.1
85 to 110d					
ADG	3.27 ^{ef}	3.40 ^e	3.43 ^e	2.65 ^f	0.237
DMI	27.64	27.68	28.95	28.29	0.481
F/G	8.86 ^{ef}	8.19 ^e	8.50 ^e	10.97 ^f	0.760

^a Treatment 1 = Positive Control; 2 = Non-implanted Control; 3 = Germ, non-implanted, no ionophore; and 4 = Bran Cake, non-implanted, no ionophore.

^{b,c,d} Means without common superscripts differ ($P < 0.05$).

^{e,f} Means without common superscripts differ ($P < 0.10$).

Table 3. Cumulative steer performance and carcass traits by treatment

	Treatment ^a				SEM
	1	2	3	4	
110d - Cumulative					
Final BW, lb ^b	1264 ^d	1216 ^e	1214 ^e	1180 ^f	4.9
ADG	3.59 ^d	3.18 ^e	3.14 ^e	2.89 ^f	0.045
DMI	24.40 ^h	24.25 ^h	25.00 ^g	24.43 ^h	0.196
F/G	6.80 ^d	7.65 ^e	7.95 ^e	8.45 ^f	0.131
Carcass wt., lb	790 ^d	760 ^e	758 ^e	743 ^f	4.5
Ribfat, in.	0.52	0.49	0.49	0.48	0.020
REA, in ²	12.2	12.1	12.3	12.0	0.11
KPH, %	2.33 ^h	2.20 ^{gh}	2.28 ^h	2.02 ^g	0.082
Marbling ^c	5.5	5.6	5.5	5.3	0.15
Yield Grade	3.34 ^g	3.19 ^{gh}	3.11 ^h	3.05 ^h	0.077
≥ Choice, %	76	65	64	64	

^a Treatment 1 = Positive Control; 2 = Non-implanted Control; 3 = Germ, non-implanted, no ionophore; and 4 = Bran Cake, non-implanted, no ionophore.

^b Calculated as hot carcass weight ÷ 0.625.

^c 4.0 = Slight^o; 5.0 = Small^o.

^{d,e,f} Means differ $P < 0.05$.

^{g,h} Means differ $P < 0.10$.