Negligible difference between distillers and soybean protein sources on growth performance, efficiency of dietary net energy utilization, and carcass trait responses in finishing steers

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Introduction

- Traditionally, corn dry-milling co-products are used as a standard feed ingredient in American feedlots, whereas oilseed meals are rarely used.
- Changes to the fuel landscape in the United States may result in changing of long-held supplemental protein price relationships.
- Market fluctuation cause management difficulties regarding feed supply.
- As fractionation technologies become more sophisticated, feeding value of corn dry-milling co-products has become increasingly variable.
- Soybean meal offers a key advantage in consistency of nutrient composition over corn dry-milling co-products.

Materials & Methods

Experimental Design

- Single sourced, predominantly Angus steers (n = 240, initial shrunk BW = 959 ± 51.2 lb) were received at the Southeast Research Farm (SERF) near Beresford, SD in September 2022.
- Steers were randomly allotted to 1 of 24 pens and 1 of 3 treatments.
  1. A diet containing modified corn distillers grains plus solubles at 15% diet DM [MDGS]
  2. A diet replacing MDGS with soybean meal and corn [SBM]
  3. A diet replacing MDGS with soybean meal and soybean hulls [SBM-SBH]

Initial Processing & Dietary Management

- Upon arrival, steers were weighed, vaccinated against respiratory pathogens (IBR, BRSV, PI3, BVD Types 1 & 2) and clostridial species and administered pour-on moxidectin.
- On d 21 steers were administered a steroidal implant with 200 mg trenbolone acetate and 28 mg estradiol benzoate (SYNOVEX-PLUS, Zoetis, Parsippany, NJ).
- Steers were transitioned from a 70% concentrate to 90% concentrate diet over a 14 d period and feed deliveries managed using a slick bunk management system.

Calculations

- Due to weather related mud and tag at time of harvest, all performance values shown are carcass-adjusted and calculated from (HCW/0.625).
- Empty body fat (EBF) percentage and final BW at 28% EBF (AFBW) were calculated from observed carcass traits (Guiroy et al., 2002) as well as proportion of closely trimmed retail cuts (Retail Yield, RY; Murphy et al., 1960).

Statistical Analysis

- Growth performance, carcass traits, and efficiency of dietary energy were analyzed as a completely randomized design using the GLIMMIX procedure of SAS 9.4 (SAS Inst. Inc., Cary, NC) with pen as the experimental unit with the fixed effect of treatment.
- Distributions of QG, YG, and liver abscess data were analyzed as a multinomial distribution using the GLIMMIX procedure.
- An α of 0.05 determined significance and an α of 0.06 to 0.10 was considered a tendency.

Table 1. Formulated diets and nutrient composition

Ingredient, %DM	MDGS	SBM	SBM-SBH
Dry-rolled corn	69.78	75.17	69.48
MDGS	14.74	0	0
Soybean Meal	0	9.26	8.97
Soybean Hull Pellets	0	0	5.91
Roughage[1]	11.48	11.58	11.62
Liquid supplement[2]	4.02	3.99	4.01
Composition, %DM			
DM, %	65.41	72.24	72.17
CP	12.23	12.45	12.68
NDF	16.62	13.59	16.75
Crude fat	4.67	4.05	4.01

[1]Roughage source was ryelage from d 1 to 44, corn silage from d 45 to 105, & sorghum silage from d 106 to 118.
[2]Provided 30 g/T of monensin, as well as vitamins and minerals to exceed requirements.

Objective

Examine the effects of soybean meal with or without additional soybean hulls in replacement of modified corn distillers grains plus solubles on growth performance efficiency of dietary net energy utilization and carcass traits responses in finishing beef steers.

Results

Table 2. Cumulative growth performance responses through d 118 (Deads and Removals Excluded)[1]

Item	MDGS	SBM	SBM-SBH	SEM	*P*-value
Pens, n	8	8	8	-	-
Steers, n	79	79	80	-	-
Initial BW[1], lbs	963	956	957	-	-
Final BW[2], lbs	1508	1497	1481	8.5	0.11
ADG[2], lbs	4.61	4.58	4.44	0.071	0.22
DMI, lbs	29.08	29.33	29.28	0.212	0.68
G:F[2]	0.159	0.156	0.152	0.0023	0.13
F:G[2]	6.29	6.41	6.58	-	-
NEm[2], Mcal/cwt	93.03	92.56	90.76	0.881	0.19
NEg[2], Mcal/cwt	62.99	62.57	61.00	0.772	0.19
O:E dietary NEm[3]	1.00	1.00	0.99	0.010	0.92
O:E dietary NEg[3]	1.01	1.01	1.00	0.012	0.88
O:E DMI[3]	1.00	0.99	1.00	0.110	0.88
O:E ADG[3]	1.01	1.01	1.00	0.016	0.88

[1] A 4% shrink was applied to the initial BW measure to account for digestive tract fill.
[2]Determined from carcass-adjusted growth performance (HCW/0.625).
[3]O:E = Observed-to-expected ratio for dietary net energy of maintenance and gain, dry matter intake, and average daily gain.

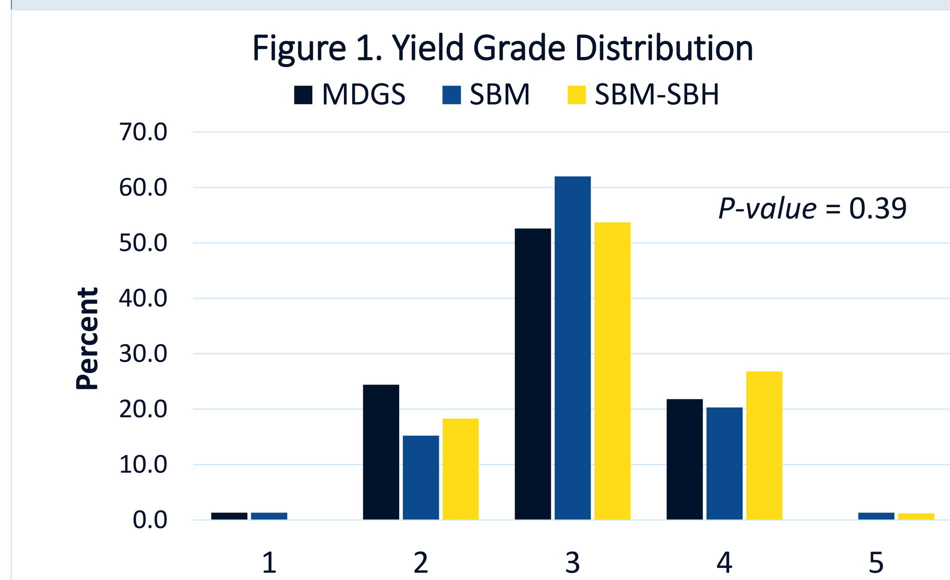

Figure 1. Yield Grade Distribution

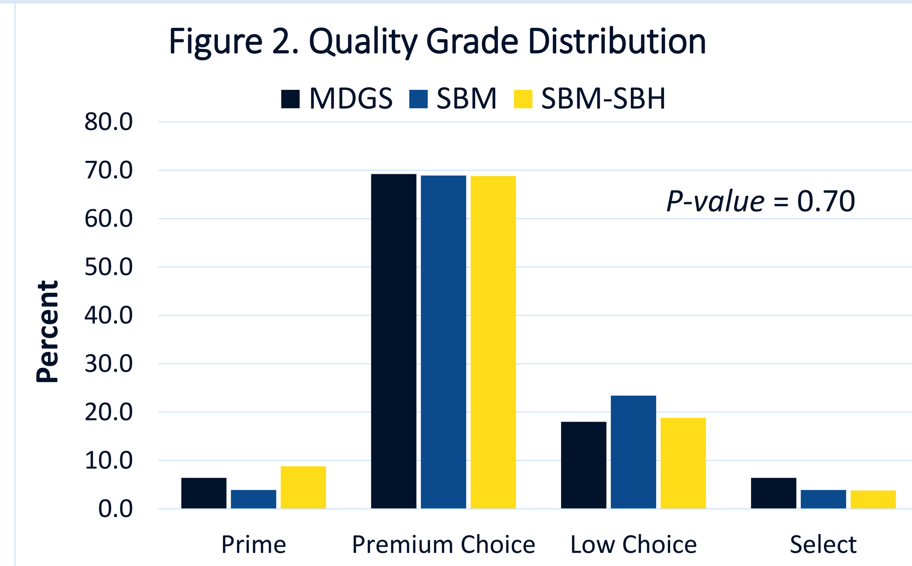

Figure 2. Quality Grade Distribution

Table 3. Carcass trait responses

Item	MDGS	SBM	SBM-SBH	SEM	P-value
HCW, lbs	942	936	926	5.3	0.11
DP[a], %	61.96	61.14	61.23	0.291	0.13
REA, in²	13.95	13.70	13.66	0.110	0.17
RF, in	0.61	0.62	0.62	0.016	0.90
Marbling[b]	535	549	531	10.9	0.51
Calculated YG	3.65	3.72	3.69	0.062	0.74
EBF[c], %	32.49	32.72	32.51	0.279	0.81
AFBW[c], lbs	1313	1295	1288	8.3	0.11

[a] Calculate as: (HCW/final BW shrunk 4%) × 100.
[b] 400 = $small^{00}$.
[c]Calculated according to the equations described by Guiroy et al. (2001).

- No differences amongst treatments for carcass-adjusted final BW, dry matter intake (DMI), average daily gain (ADG), or feed efficiency.
- Dietary treatment had no effect on HCW, dressing percentage, ribeye area (REA), rib fat (RF), marbling score, USDA Yield Grade, percent empty body fat (EBF), or final body weight adjusted to 28% EBF.
- Distribution of USDA Quality or Yield grades were unaffected by treatment.
- Dietary treatment did not affect liver abscess incidence and severity.
- Net energy values calculated from animal performance agreed closely with tabular estimates with observed to expected ratios for net energy equaling one.

Table 4. Liver outcomes, %

Item	MDGS	SBM	SBM-SBH	*P*-value
Normal	76.9	73.4	64.6	0.11
A-	11.5	13.9	11.0	-
A	5.1	1.3	6.1	-
A+ or greater	6.4	11.4	18.3	-

Conclusion

- Observed growth performance was in close agreement with current estimates for maintenance and retained energy.
- Feeding supplemental protein sources with enhanced diet conditioning attributes and greater concentrations of ruminally undegradable protein provided no advantage to cattle performance.
- Protein source decisions can be based upon price per unit of delivered crude protein.

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