Substitution of modified distillers grains with soybean meal with or without hulls had negligible effect on growth performance, efficiency, and carcass traits in yearling steers

C.R. Ross[1], S. Bird[2], Z.K. Smith[1], W.C. Rusche[1]
[1]Department of Animal Science, South Dakota State University, Brookings; [2]Southeast Research Farm, South Dakota Agricultural Experiment Station, Beresford

2023 ASAS-CSAS-WSASAS Annual Meeting
Ruminant Nutrition Session

South Dakota State University
College of Agriculture, Food and Environmental Sciences

South Dakota Soybean Research & Promotion Council

1

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2

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- 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.

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- Updated research data is needed:
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  - Greater final body weights
  - Increased growth potential
  - Additional technological tools

5

OBJECTIVE

- Determine 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.

6

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7

APPROACH

- 240 steers
  - Initial shrunk BW = 435 kg ± 23.2 kg
  - Single source: Eastern, SD
  - Shipped to SDSU South-East Research Farm near Beresford, SD

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8

DIETARY TREATMENTS

- 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 hull pellets [SBM-SBH]

9

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 NASEM requirements.

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Dry-rolled corn	69.78	75.17	69.48
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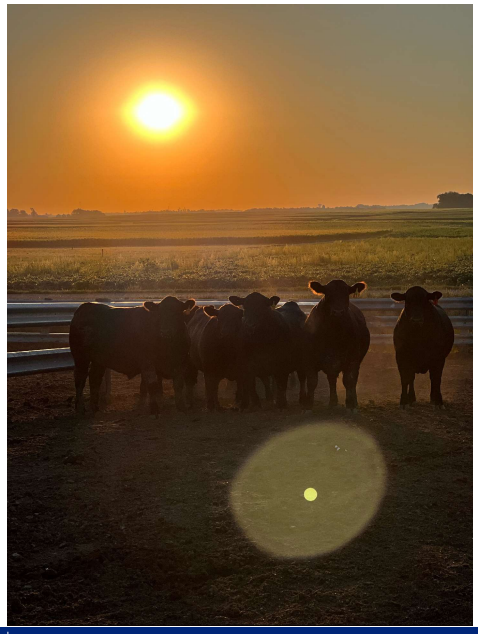

APPROACH

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  - Feed manufactured in a commercial mixer wagon (6.1 m^3)
- Steers were transitioned from a 70% concentrate to 90% concentrate diet over a 14d period and
- Feed deliveries were managed using a slick bunk management system.

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APPROACH

- Initial processing
  - Individual BW
  - Visual ID tag
  - Vaccinated
    - Viral respiratory diseases
    - *Clostridial* species
  - Pour-on Moxidectin for external and internal parasites

14

APPROACH

- Steers were weighed on d 21, 49, 77, and 118 (trial termination)
- Administration of a steroidal implant containing 200 mg trenbolone acetate and 28 mg estradiol benzoate on d21 (Synovex Plus, Zoetis)

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- Steers were weighed off test on d 118 when visually appraised to have 1.27 cm backfat
- Shipped after final BW measurement to Tyson Fresh Meats, Dakota City, NE
- Liver abscess prevalence and severity determined using Elanco scoring system with HCW and video image data provided by harvest facility

STATISTICAL ANALYSIS

- Randomized Complete Block
  - PROC GLIMMIX (SAS 9.4)
  - Experimental unit: Pen
  - Model included
    - Fixed Effect: Dietary Treatment
    - Random Effect: Block (Pen Location)
  - Growth and Performance data
    - Least square means calculated used the LSMEANS Statement
  - Data analyzed as a multinomial distribution
    - Distribution of USDA Yield and Quality grade
    - Liver abscess severity
- Significance determined
  - $P \leq 0.05$
- Tendencies
  - $0.05 < P \leq 0.10$

CALCULATIONS

- All performance values shown are carcass-adjusted and calculated from HCW/0.625.
- Empty body fat (EBF) percentage, final BW at 28% EBF (AFBW), and percentage of closely trimmed retail cuts were calculated from observed carcass traits.
- Performance adjusted net energy values were calculated from DMI, cattle performance, and AFBW (Zinn & Shen, 1998; Owen & Hicks, 2019)

Results

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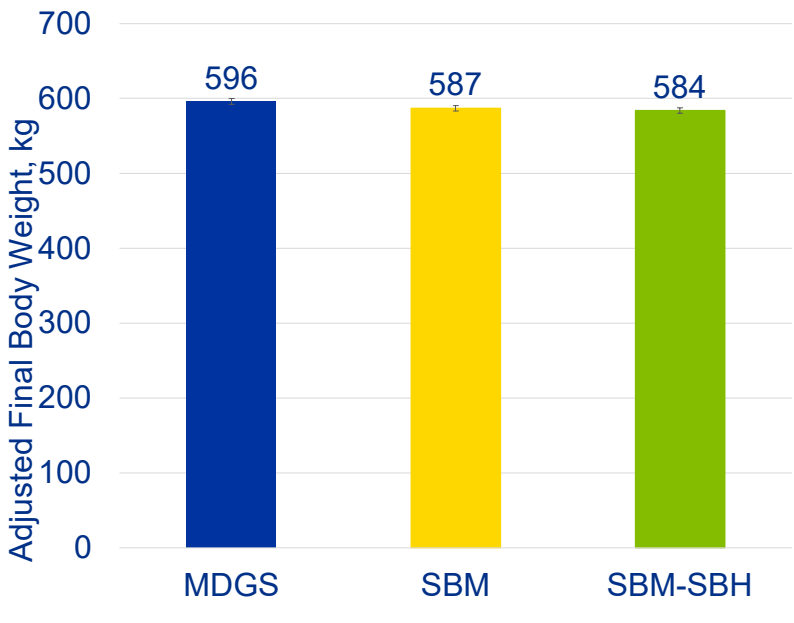
19



CARCASS ADJUSTED FINAL BW

No effect of treatment on adjusted final body weight (P = 0.11)

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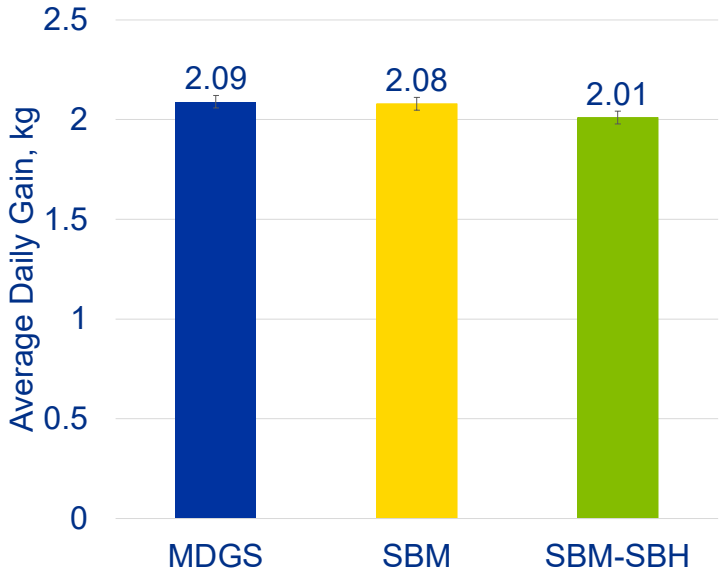
20



AVERAGE DAILY GAIN

No effect of treatment on rate of gain (P = 0.22)

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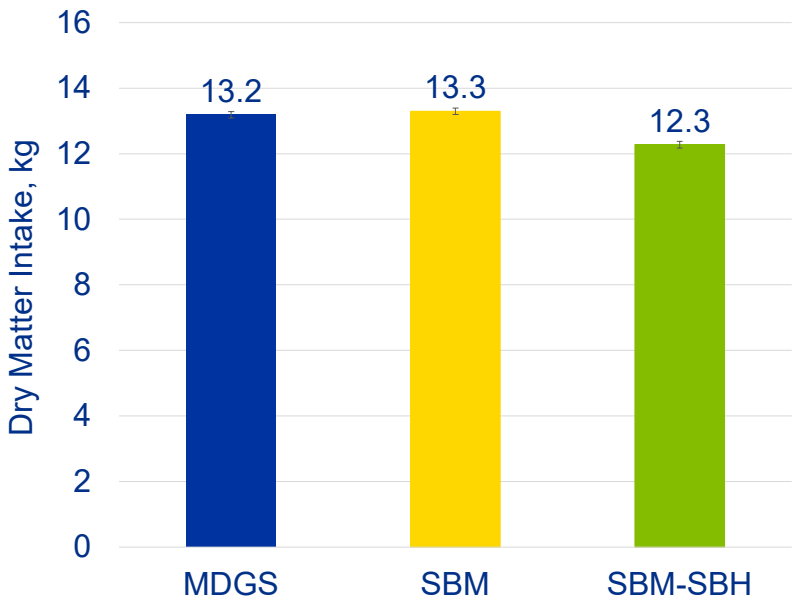

DRY MATTER INTAKE

No effect of treatment on dry matter intake (P = 0.68)

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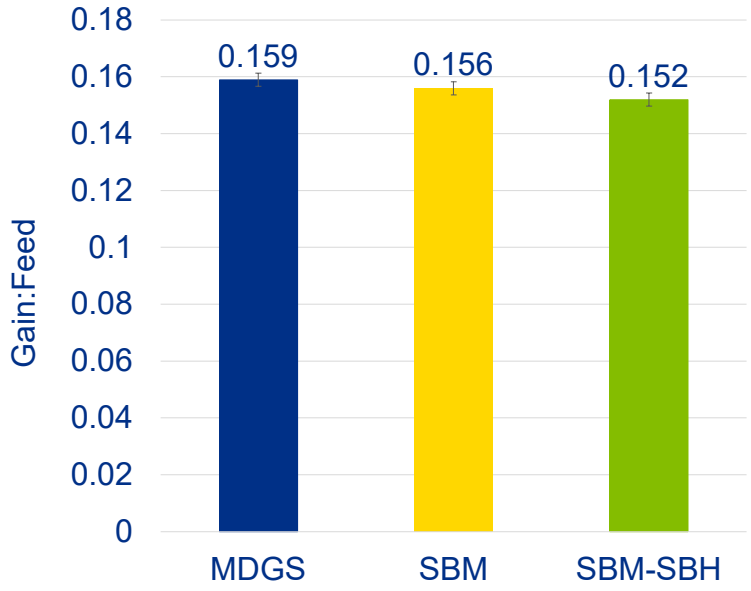

CUMULATIVE FEED CONVERSION

No effect of treatment on feed conversion (P = 0.13)

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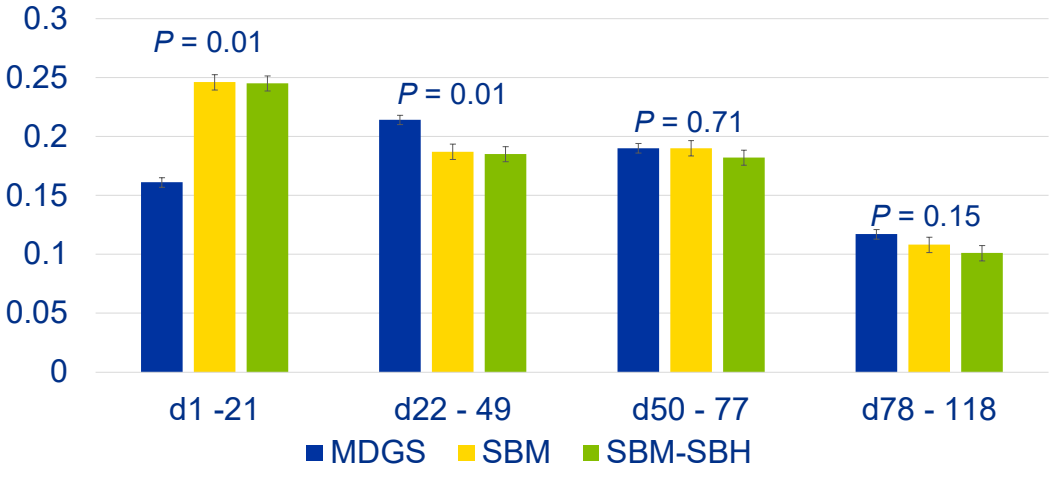
CUMULATIVE FEED CONVERSION (LIVE WEIGHT BASIS)



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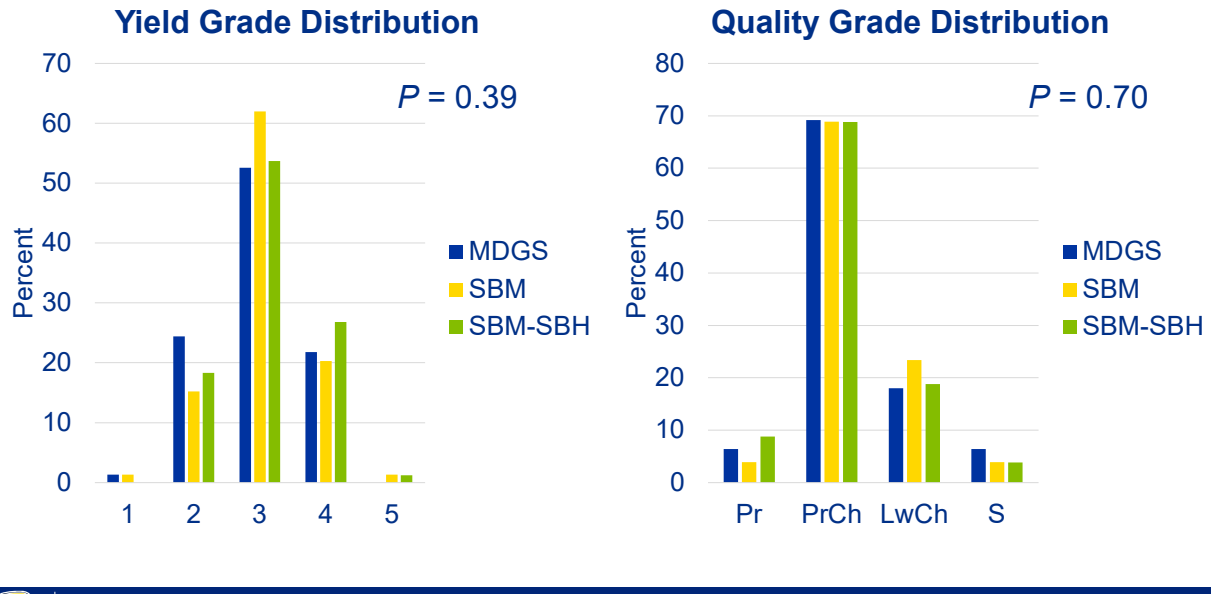
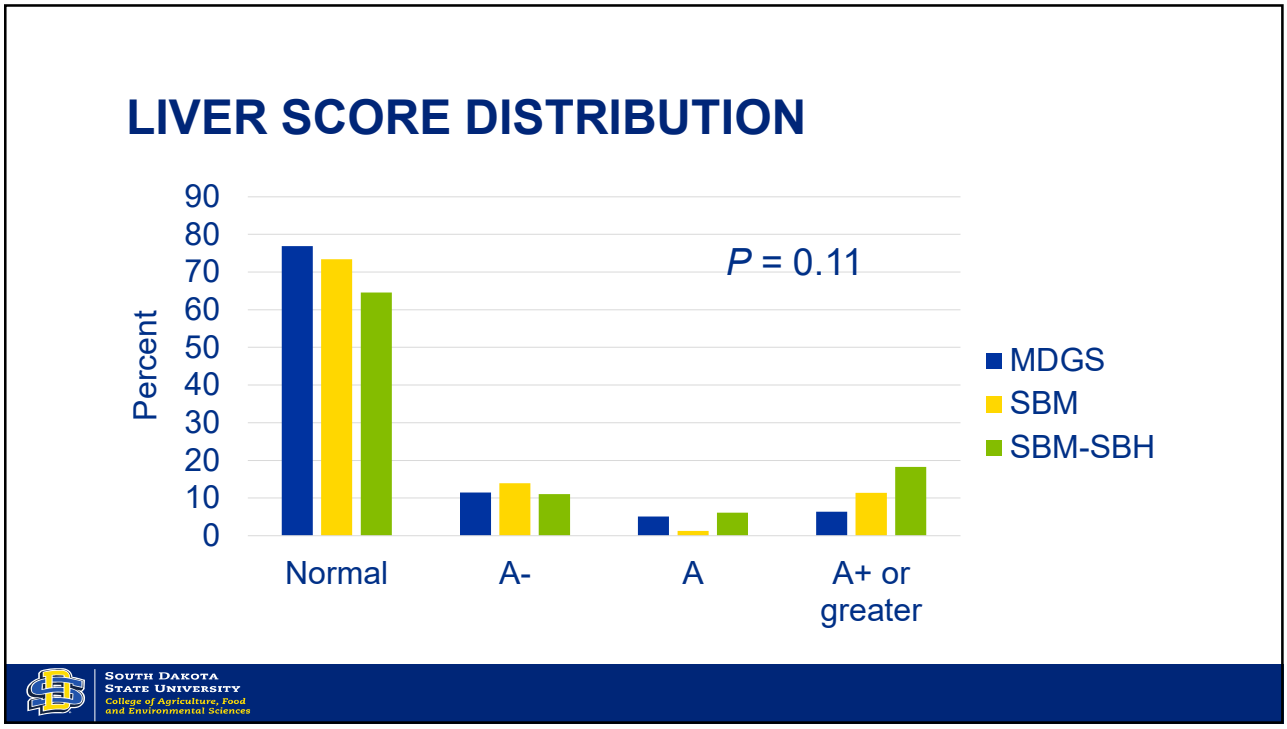

Yield Grade Distribution
Percent
70
60
50
40
30
20
10
0
1
2
3
4
5
P = 0.39
MDGS
SBM
SBM-SBH
Quality Grade Distribution
Percent
80
70
60
50
40
30
20
10
0
Pr
PrCh
LwCh
S
P = 0.70
MDGS
SBM
SBM-SBH

25


LIVER SCORE DISTRIBUTION
Percent
90
80
70
60
50
40
30
20
10
0
Normal
A-
A
A+ or greater
P = 0.11
MDGS
SBM
SBM-SBH

26

CARCASS TRAIT RESPONSES

Item	MDGS	SBM	SBM-SBH	SEM	P-value
HCW, kg	427	425	420	2.4	0.11
DP[a], %	61.96	61.14	61.23	0.291	0.13
REA, cm²	90.0	88.4	88.1	0.71	0.17
RF, cm	1.55	1.57	1.57	0.041	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], kg	596	587	584	3.8	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).

DIETARY ENERGETICS

Item	MDGS	SBM	SBM-SBH	SEM	*P*-value
NEm[1], Mcal/kg	2.05	2.04	2.00	0.019	0.19
NEg[1], Mcal/kg	1.39	1.38	1.34	0.017	0.19
O:E dietary NEm[2]	1.00	1.00	0.99	0.010	0.92
O:E dietary NEg[2]	1.01	1.01	1.00	0.012	0.88

[1] Determined from carcass-adjusted growth performance (HCW/0.625).
[2]O:E = Observed-to-expected ratio for dietary net energy of maintenance and gain, dry matter intake, and average daily gain.

Conclusions

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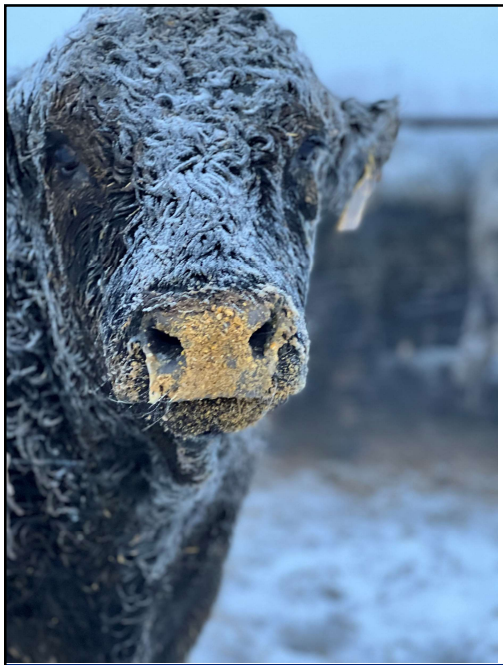
29



CONCLUSIONS

- 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 in this experiment.
- Protein source decisions can be based upon price per unit of delivered crude protein.

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30

ACKNOWLEDGEMENTS

This research was funded by the South Dakota Soybean Research and Promotion Council

SDSU RNC Faculty and Graduate Students

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31

Thank you for your time

Questions?

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32

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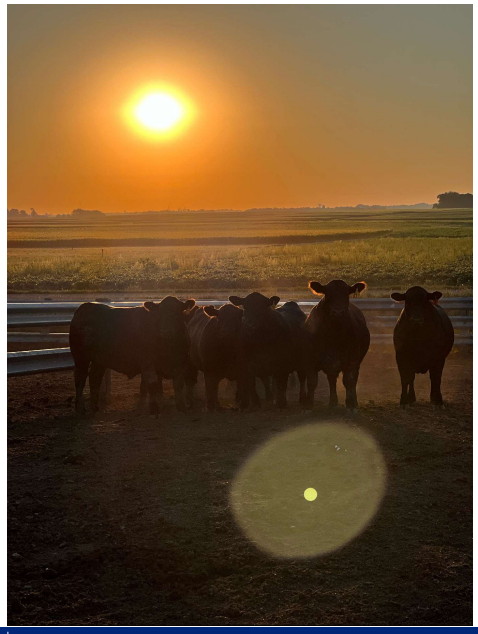

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Results

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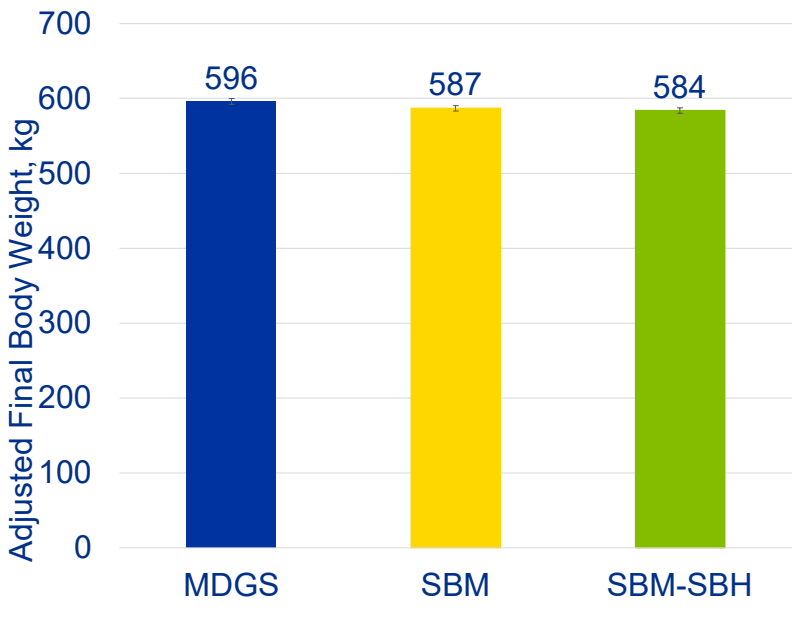
19



CARCASS ADJUSTED FINAL BW

No effect of treatment on adjusted final body weight (P = 0.11)

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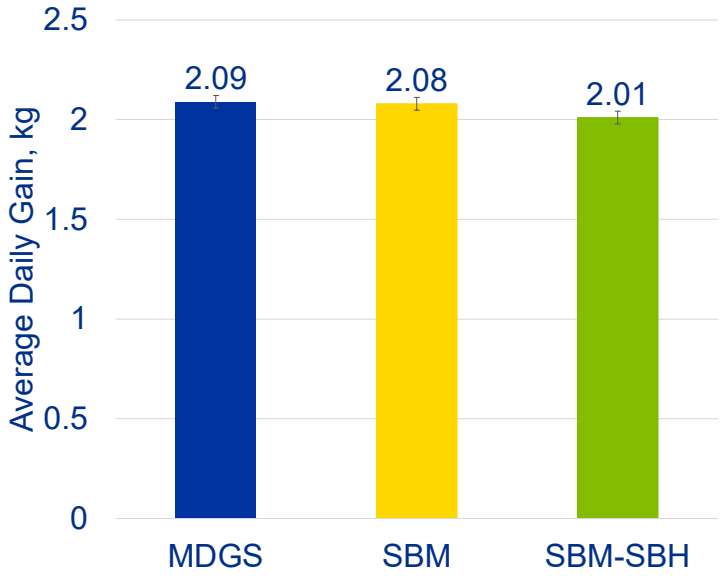
20



AVERAGE DAILY GAIN

No effect of treatment on rate of gain (P = 0.22)

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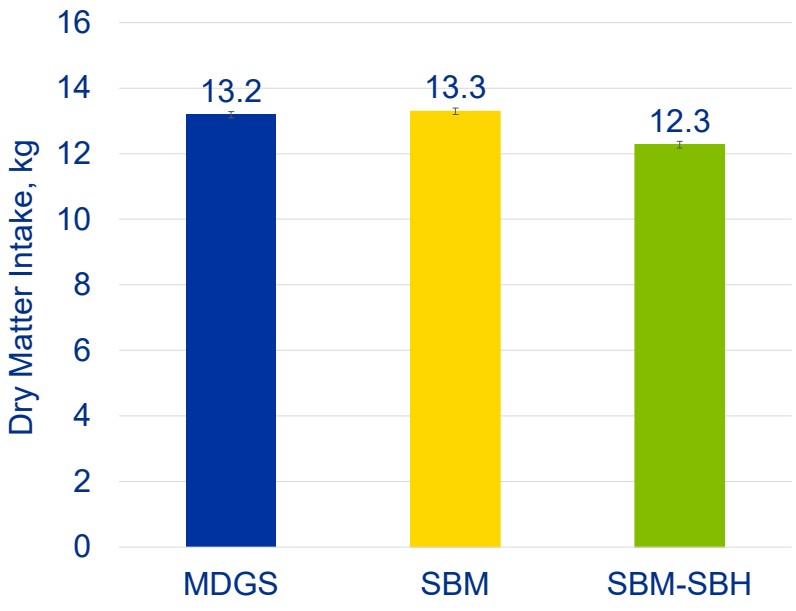

DRY MATTER INTAKE

No effect of treatment on dry matter intake (P = 0.68)

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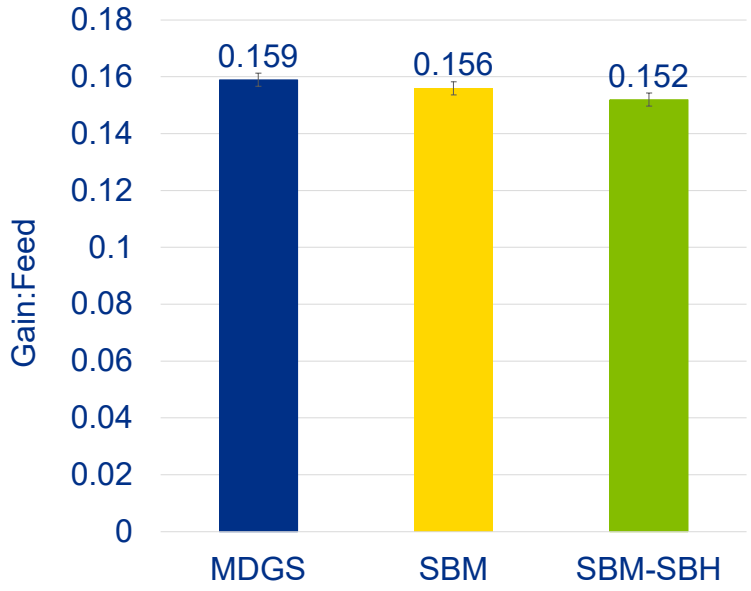

CUMULATIVE FEED CONVERSION

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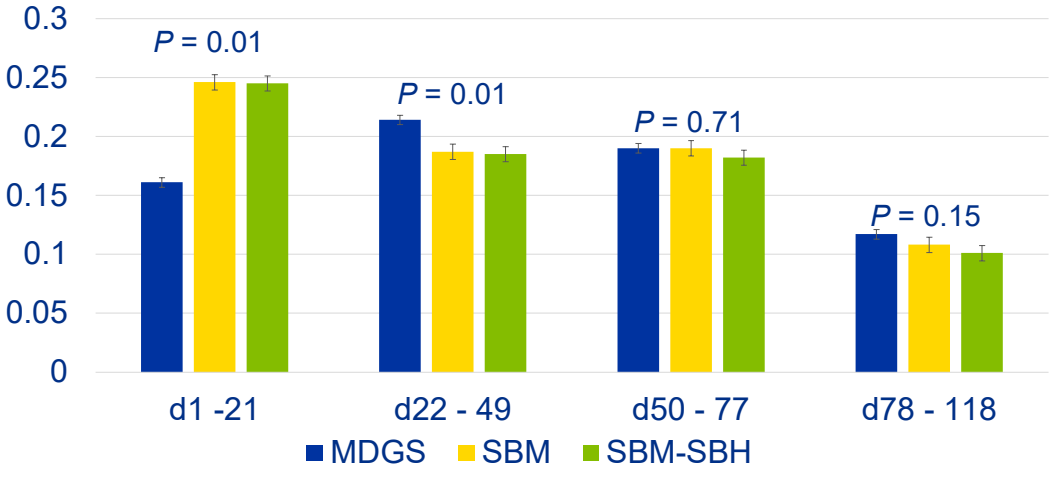
CUMULATIVE FEED CONVERSION (LIVE WEIGHT BASIS)



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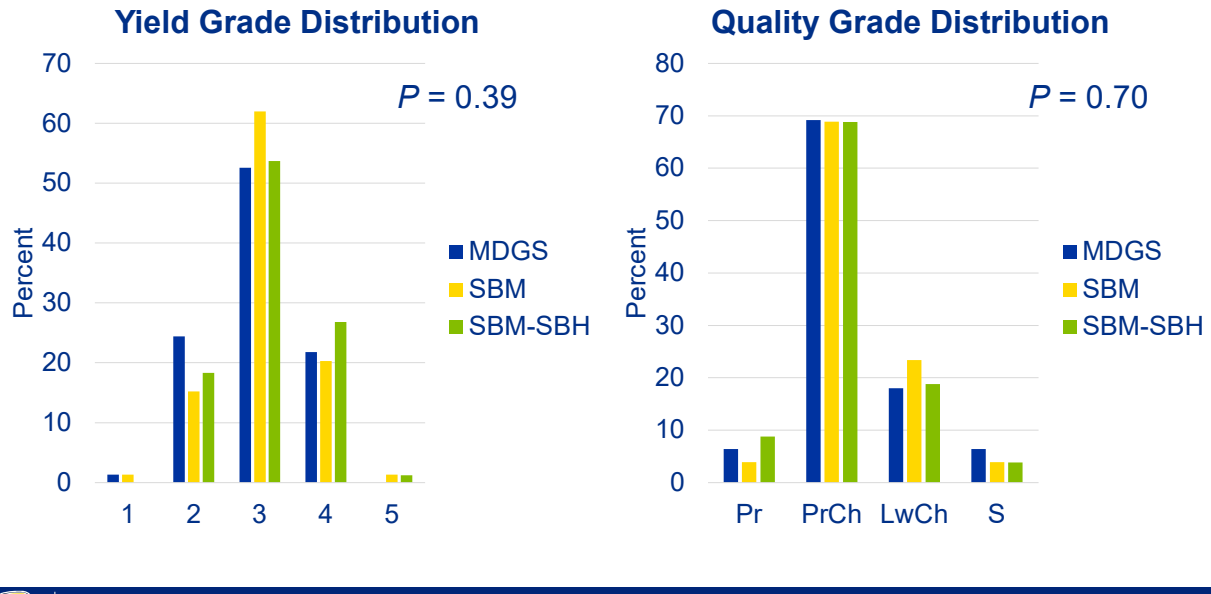
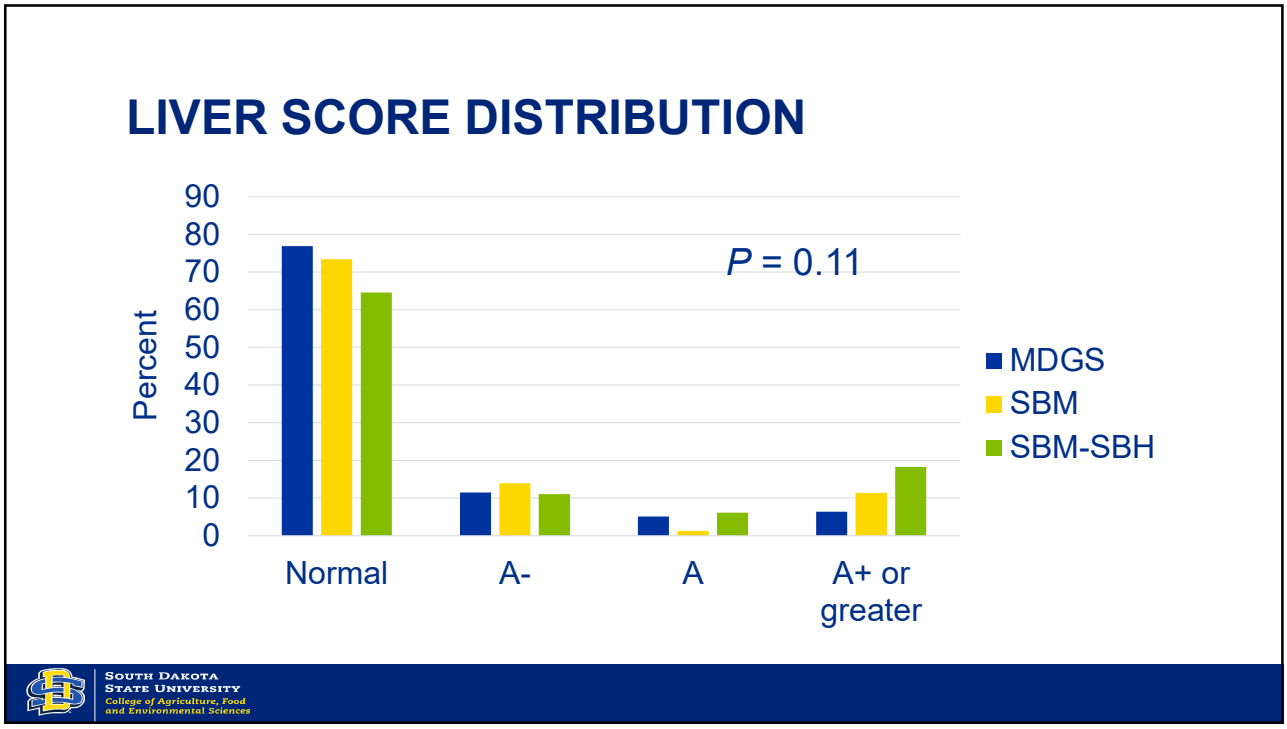

Yield Grade Distribution
Percent
70
60
50
40
30
20
10
0
1
2
3
4
5
P = 0.39
MDGS
SBM
SBM-SBH
Quality Grade Distribution
Percent
80
70
60
50
40
30
20
10
0
Pr
PrCh
LwCh
S
P = 0.70
MDGS
SBM
SBM-SBH

25


LIVER SCORE DISTRIBUTION
Percent
90
80
70
60
50
40
30
20
10
0
Normal
A-
A
A+ or greater
P = 0.11
MDGS
SBM
SBM-SBH

26

CARCASS TRAIT RESPONSES

Item	MDGS	SBM	SBM-SBH	SEM	P-value
HCW, kg	427	425	420	2.4	0.11
DP[a], %	61.96	61.14	61.23	0.291	0.13
REA, cm²	90.0	88.4	88.1	0.71	0.17
RF, cm	1.55	1.57	1.57	0.041	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], kg	596	587	584	3.8	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).

DIETARY ENERGETICS

Item	MDGS	SBM	SBM-SBH	SEM	*P*-value
NEm[1], Mcal/kg	2.05	2.04	2.00	0.019	0.19
NEg[1], Mcal/kg	1.39	1.38	1.34	0.017	0.19
O:E dietary NEm[2]	1.00	1.00	0.99	0.010	0.92
O:E dietary NEg[2]	1.01	1.01	1.00	0.012	0.88

[1] Determined from carcass-adjusted growth performance (HCW/0.625).
[2]O:E = Observed-to-expected ratio for dietary net energy of maintenance and gain, dry matter intake, and average daily gain.

Conclusions

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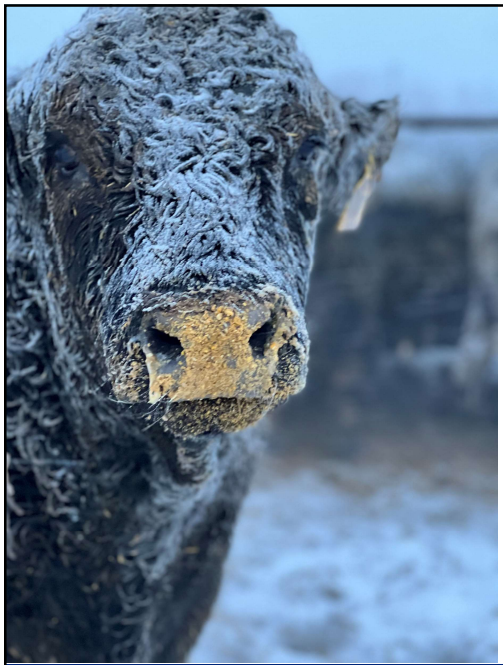
29



CONCLUSIONS

- 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 in this experiment.
- Protein source decisions can be based upon price per unit of delivered crude protein.

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30

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31

Thank you for your time

Questions?

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32