A COMPARISON OF BARLEY DISTILLERS DRIED GRAIN, SUNFLOWER MEAL AND SOYBEAN OIL MEAL AS PROTEIN SUPPLEMENTS IN BACKGROUNDING RATIONS

BY

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INTRODUCTION:

Agricultural statistics for North Dakota, (1986), show that North Dakota farmers planted approximately 3/6 million acres of barley, 1.2 million acres of oil sunflowers and 475,000 acres of soybeans. Sunflowers and soybeans are principally grown for their oil but the meal by-product is very valuable as a protein supplement for livestock feed. Soybean oil meal (SBOM) contains approximately 44% crude protein and sunflower oil meal (SFOM), depending upon the amount of hull that has been removed before oil extraction can contain anywhere from 28-44% crude protein, with the most common level being 34%.

The newest protein by-product, barley distillers dried grain with solubles (BDDG), comes from the distillation of ethanol from barley. Laboratory analysis of BDDG shows in a crude protein value of approximately 26%.

The distillers dried grain being produced in North Dakota has not been used in experimental feeding trials. However, some work has been conducted by Montana State University animal scientists with dairy cows and sheep. Moss and co-workers, (1983), used dry pelleted barley stillage in dairy cow rations and found pelleted BDDG to be equivalent to SBOM as a protein source if it replaced SBOM based on pounds of protein. When replaced on a volume or weight basis, performance was lowered. Moss and Kezar, (1982), evaluated wet barley stillage in a digestion trial using sheep and when compared to an all alfalfa diet, rations containing 80% wet barley stillage had a lower TDN value and slightly higher protein digestion, which suggests that BDDG may have some ruminal by-pass protein characteristics. These digestion trial results also suggest that the energy value of wet stillage was considerably higher than that of the alfalfa hay being used. Moss and Kezar concluded that wet stillage could be considered as a good intermediate source of both energy and protein for ruminants.

The purpose of the present investigation is to evaluate the capabilities of sunflower oil meal and barley distillers dried grain as replacement protein supplements when compared to soybean oil meal in beef cattle backgrounding rations. In addition, the economics of feeding these supplements is also being documented.

PROCEDURE

Beginning in the fall of 1985, and continuing in the fall of 1986, weanling crossbred Charolais X (Angus X Hereford) heifer calves that ranged in weight from 512 to 591 pounds were used to compare the feeding value and economics of BDDG, SBOM and SFOM when included in backgrounding rations on a pound of protein basis. To better partition animal response to the supplements, the calves were separated by weight class, and pooled into lightweight, middleweight and heavyweight classes. They were then randomly allotted from the pooled groups to three replicates within each weight class, and fed for an average period of 110 days.

Since North Dakota grains and roughages are normally fairly good sources of protein for growing cattle, it was necessary to lower the quantity and digestibility of available protein in the rations to insure that we would get a measureable response from the supplementation. Therefore, approximately 14% wheat straw was included in each of the diets and crude protein was balanced on a pound of protein basis using SBOM, SFOM, and BDDG. The average dry matter protein content of the rations based on routine bunkline analysis was 11.9% in 1985 and 11.1% in 1986. The rations fed and protein analysis of each ration type are shown in Table 1.

To minimize variability, the starting and final weights were determined using the average of two consecutive daily weighings with interim weights taken at 28 day intervals. Average daily gains (ADG) were computed using regression analysis.

Results of the feeding study have been summarized by weight class for each of the supplements and are shown in Tables 2, and 3. In Table 4, the data have been combined for each supplement and a partial economic model developed using the calf placement cost, feed cost per head and gross return per head which reflects the type of returns that might be expected when feeding rations of the types compared in this experiment.

SUMMARY:

Feeding North Dakota protein by-products to backgrounded heifer calves on a pound of protein basis resulted in nearly equal gains among heifers fed either SBOM, BDDG or SFOM. When the data were combined, ADG's computed using regression analysis for the SBOM, BDDG and SFOM groups were 2.47, 2.47, and 2.40 pounds/day respectively. While body weight gains were similar for the three treatments, feed efficiency was improved by feeding BDDG. When compared to SBOM, feeding BDDG required .6 pound less feed/pound of gain and when compared to SFOM .8 pound less feed was needed/pound of gain. The level of barley was reduced in the BDDG ration, and feed efficiency was still improved over other supplement types showing that BDDG provides not only protein but energy for body weight gain as well, which is in keeping with the findings of Moss and co-workers, (1982). The improvement in feed efficiency favoring BDDG is reflected in the net returns obtained using each supplement. SBOM, SFOM, and BDDG returns over feed and calf costs were $47.98, $45.60, and $50.47 respectively.

The results of this investigation indicate that while small differences do exist between these protein supplements, their over-all performance was very similar, showing that SBOM, BDDG, and SFOM can be interchanged on a pound of protein basis provided the cost per pound of protein is the same.

Table 1. Composition of Rations Formulated with the By-Product Protein Supplements: SBOM, BDDG, and SFOM

	RATION PERCENT (100% DRY)							
	SBOM			BDDG			SFOM	
	1985	1986		1985	1986		1985	1986
SBOM (44% CP)	7.3	6.9		-0-	-0-		-0-	-0-
SFOM (34% CP)	-0-	-0-		-0-	-0-		10.9	11.0
BDDG (26% CP)	-0-	-0-		18.2	19.0		-0-	-0-
Barley	44.0	21.5		36.5	19.7		40.4	22.0
Ground wheat straw	14.5	13.8		14.6	14.3		14.5	15.1
Corn silage (32% DM)	32.8	34.8		29.3	25.0		32.8	27.9
Limestone	1.4	1.2		1.4	1.3		1.4	1.3
Mixed Hay	-0-	23.5		-0-	19.9		-0-	21.7
Protein Percent 1/	12.3	10.7		11.5	11.6		11.9	11.7

1/ Protein value obtained by proximate analysis of the complete mixed ration as it was fed.

Table 2. Two Year Combined Weights, Gains, and Feeding Economics for Charolais Crossbred Heifer Weight Classes Supplemented with SBOM or BDDG

	SBOM		
	LT. WT.	**MD. WT.**	**HVY. WT.**
No. Head	10	10	10
Days Fed	110	110	110
Initial wt., lbs.	525	561	589
Final wt., lbs.	793	822	856
Gain, lbs.	268	261	267
ADG, lbs.	2.46	2.48	2.47
Feeding Economics:			
Feed/hd., lbs.	3861	4112	4162
Feed/day, lbs.	35.1	37.4	37.8
Feed/lb. of gain, lbs.	14.3	15.1	15.3
Feed cost/hd., $	117.10	124.96	126.06
Feed cost/cwt. gain, $	43.69	47.88	47.21
	BDDG		
No. Head	10	10	10
Days Fed	110	110	110
Initial wt., lbs.	524	561	587
Final wt., lbs.	772	824	869
Gain, lbs.	248	261	282
ADG, lbs.	2.29	2.48	2.63
Feeding Economics:			
Feed/hd., lbs.	3702	4019	3952
Feed/day, lbs.	33.7	36.5	35.9
Feed/lb. of gain, lbs.	14.7	14.7	13.7
Feed cost/hd., $	113.76	123.02	121.91
Feed cost/cwt. gain, $	45.87	47.13	43.23

Table 3. Two Year Combined Weights, Gains, and Feeding Economics for Charolais Crossbred Heifer Weight Classes Supplemented with SBOM or BDDG

	SFOM		
	LT. WT.	**MD. WT.**	**HVY. WT.**
No. Head	10	10	9 1/
Days Fed	110	110	110
Initial wt., lbs.	512	555	592
Final wt., lbs.	790	803	841
Gain, lbs.	278	248	249
ADG, lbs.	2.50	2.34	2.38
Feeding Economics:			
Feed/hd., lbs.	3911	3839	4198
Feed/day, lbs.	35.6	34.9	38.2
Feed/lb. of gain, lbs.	14.2	14.9	16.0
Feed cost/hd., $	115.68	113.44	124.03
Feed cost/cwt. gain, $	41.61	45.74	51.46

1/ One heifer removed with broken leg

Table 4. Two Year Combined Weights, Gains and Partial Feeding Economics for Backgrounded Crossbred Charolais Heifer Calves Supplemented with Either SBOM, BDDG, or SFOM

	SBOM	BDDG	SFOM
No. Head	30	30	29 1/
Days Fed	110	110	110
Initial wt., lbs.	558	557	553
Final wt., lbs.	824	822	811
Gain, lbs.	266	265	258
ADG, lbs.	2.47	2.47	2.40
Feeding Economics:			
Feed/hd., lbs.	4045	3891	3982
Feed/day, lbs.	36.8	35.4	36.2
Feed/lb. of gain, lbs.	14.9	14.3	15.1
Feed cost/hd., $	122.71	119.56	117.72
Feed cost/cwt. gain, $	46.13	45.12	46.16
Feeder calf cost/hd., $	387.81	387.12	384.34
Feed cost/hd. $	122.71	119.56	117.72
Gross return/hd., $	558.50	557.15	547.66
Net return, $	+47.98	+50.47	+45.60

1/ One heifer removed with broken leg

LITERATURE CITED

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