# A Comparison of Barley Distillers Dried Grain, Sunflower Oil Meal and Soybean Oil Meal As Protein Supplements in Backgrounding Rations

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## INTRODUCTION:

Agricultural statistics show that North Dakota farmers planted approximately 3.6 million acers of barley, 1.2 million acres of oil sunflowers and 475,000 acres of soybeans in 1987. Sunflowers and soybeans are principally grown for their oil content, but the meal by-product is very valuable as a protein supplement for livestock feed. Soybean oil meal (SBOM) contains approximately 44 percent 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 to 44 percent crude protein, with the most common level being 34 percent.

The newest by-product protein feedstuff, barley distillers dried grain with solubles (BDDG), comes from the distillation of ethanol from barley and contains approximately 26 percent crude protein.

North Dakota cattlemen background a large percentage of their weaned calves before sending them to midwest cattle feeders for finishing. These growing cattle, as a class, have a relatively high demand for protein in their diet, which normally is provided for by feeding protein supplements. This protein supplementation is expensive, and it is to the feeder's advantage to lower costs whenever possible. The purpose of this investigation was to evaluate the capabilities of SFOM and BDDG as replacement protein supplements when compared to SBOM in heifer backgrounding rations, and to document the economics of feeding each supplement type.

## PREVIOUS WORK:

The distillers dried grain produced in North Dakota had not been investigated when this project was initiated. However, some work had 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 equivalent units 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 percent wet barley stillage had a lower TDN value and slightly higher protein digestion, which suggested to them that BDDG may possess some ruminal by-pass protein characteristics. These digestion trial results also suggested 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.

Weiss and co-workers (1987), following initiation of the present study, conducted a series of investigations with BDDG at North Dakota State University, the Carrington Irrigation Station, and the Central Grasslands Research Station. Their investigations evaluated BDDG and SBOM in isonitrogenous backgrounding and finishing rations. They reported no difference in backgrounding calf performance among either steers or heifers when fed rations supplemented with BDDG or SBOM on a unit of protein basis. In the finishing trial, steer calves fed SBOM gained more rapidly than steers fed BDDG, which was suggested to have been a response to the higher energy value of SBOM instead of a protein response. The authors further summarized that BDDG and SBOM were quite similar under finishing conditions when daily gains of 3 pounds per day were not attainable. However, when gains greater than 3 pounds per day were a realistic goal, SBOM would be the supplement of choice.

## PROCEDURE:

Beginning in the fall of 1985 and continuing in the fall of 1986, weanling crossbred Charolais X Angus X Hereford

**By product protein heifers.**

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heifer calves that ranged in weight from 512 to 591 pounds were used to compare the replacement value and economics of BDDG, SBOM and SFOM when included in backgrounding rations on an equal unit of protein basis. The heifers were separated each year into three weight classes -light, medium and heavy. This was done to make the comparisons of the experimental rations more accurate because the initial weight of the animal affects the animal's weight gain, which was the response variable of this experiment. Within each weight class, the animals were randomly allotted into three outcome groups. Each outcome group was then assigned a different ration. This meant that there were nine pens each year, each with five animals. The animals were fed the rations for an average 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 a measureable supplementation response would be obtained. Therefore, approximately 14 percent 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 for the two years was 11.6 percent. 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 at 28-day intervals. Average daily gains (ADG) were computed using regression analysis.

Table two summarizes the combined data for each supplement, and further presents 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, ADGs computed using regression analysis for the SBOM, BDDG and SFOM groups were 2.47, 2.47, and 2.40 pounds per day, respectively. While body weight gains were virtually identical, feed efficiency was improved slightly by feeding BDDG. When compared to SBOM, feeding BDDG required .6 pound less feed per pound of gain, and when compared to SFOM .8 pound less feed was needed per pound of gain. These differences were not significant, however. The results of this experiment are in complete agreement with the findings of Weiss and co-workers (1987) and Moss et al. (1983), in that BDDG is interchangeable on a unit-of-protein basis with SBOM under backgrounding conditions. It is further concluded that SFOM is also equally interchangeable on a pound-of-protein basis with SBOM under the conditions of backgrounding. The slight improvement in feed efficiency favoring BDDG is reflected in the net returns obtained using each supplement. Returns over feed and calf costs were $47.98 for the SBOM calves, $45.60 for the SFOM calves, and $50.47 for the BDDG supplemented calves.

**Table 1. Average dry matter and as fed composition of experimental rations formulated with the by-product protein supplements soybean oil meal (SBOM), barley distillers dried grain (BDDG), and sunflower oil meal (SFOM).**

| | Ration Dry Matter Percent (as fed percent) | | |
|---|---|---|---|
| | SBOM | SFOM | BDDG |
| SBOM (44% CP) | 7.1( 4.1 ) | | |
| SFOM (34% CP) | | 11.0( 6.4 ) | |
| BDDG (26% CP) | | | 18.6(11.4 ) |
| Barley | 32.0(18.1 ) | 31.0(18.2 ) | 28.0(17.2 ) |
| Ground wheat straw | 14.0( 7.9 ) | 14.7( 8.6 ) | 14.5( 8.9 ) |
| Corn silage | 33.0(62.2 ) | 30.4(59.4 ) | 27.0(55.3 ) |
| Mixed hay | 12.0( 6.8 ) | 11.0( 6.4 ) | 10.0( 6.2 ) |
| Limestone | 1.3( .65) | 1.4( .74) | 1.4( .77) |
| Trace mineral salt | .5( .25) | .5( .26) | .5( .28) |
| Protein Percent 1/ | 11.5 | 11.8 | 11.5 |

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

**Table 2. Two year combined weights, gains, and partial feeding economics among backgrounded crossbed Charolais heifer calves supplemented with either soybean oil meal (SBOM), barley distillers (BDDG), or sunflower oil meal (SFOM).**

| | SBOM | BDDG | SFOM 1/ |
|---|---|---|---|
| No. head | 30 | 30 | 29 |
| Days fed | 110 | 110 | 110 |
| Initial wt., lbs. | 558 | 557 | 553 |
| Final wt., lbs. | 824 | 822 | 811 |
| Gain, lbs. | 266 | 265 | 258 |
| ADG by regression analysis, 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 |
| Feeder cost/hd., $ | 122.71 | 119.56 | 117.72 |
| Gross return/hd., $ | 558.50 | 557.15 | 547.66 |
| Net return (gain or loss), $ | +47.98 | +50.47 | +45.60 |

1/ Heifer removed with broken leg.

## LITERATURE CITED

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