**Use of soybean hulls in rations for drylot beef cows**

**Technical Report – FY 2020**

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**Goals/Objectives:**

The purpose of this project is to evaluate feeding options including soybean hulls for the management of drylot cow/calf pairs. The current project is still ongoing with the support of continued funding, and collection of animal data continues at the time of this report.

Our specific objectives included:

1. To evaluate performance of beef cows fed either soybean hull-based rations or corn/corn silage-based rations under drylot management throughout an entire production cycle.
2. To evaluate milk production and quality during lactation and performance of beef calves resulting from cows fed either soybean hull- or corn/corn silage-based rations under drylot management.
3. To provide a demonstration of feeding soybean hull-based rations to beef cows under drylot management.

**Results:**

At the initiation of the project cows were sorted in to pens and placed on respective treatments. Rations were developed for lactation, mid-gestation, and late gestation. Soybean hulls were included at a rate of 26% replacing 12.8% of the corn silage, 4.5% of the straw, and 8.5% of the mDGS (DM basis) in the ration during lactation. Due to animal behavior, we adjusted the rations for mid-gestation to allow for animals to achieve a greater degree of satiety than the original rations provided. Mid-gestation rations included 27% soybean hulls, which replaced portions of the mDGS and corn silage.

There were no differences (*P* ≥ 0.12; Table 1) in body weight, body condition score, or average daily gain during the three study segments evaluated (lactation, mid-gestation, and late-gestion) for control and soybean hull treatments, respectively. Conception rate to artificial insemination and final pregnancy rates were not affected (*P* ≥ 0.77) by inclusion of soybean hulls in the diet of beef cows. During calving in the spring of 2020 milk samples (< 24h after calving) were collected. No differences were found in fat content, somatic cell count, milk urea nitrogen, or other solids in milk samples between the two treatment (*P* ≥ 0.12; Table 2). However, protein content of milk samples was greater (*P* = 0.02) for cows fed control rations compared to those fed soybean hull rations (11.9 vs. 9.5 ± 0.54%, respectively).

On going data collections include weigh-suckle-weigh collections which will provide insight as to overall milk production. With the additional funds provided we will be collecting in-depth measurements of calf carcass quality and weight at weaning; as well as analysis of blood NEFA and glucose measurements all of these data will be collected the fall of this year.

**Presentations/Deliverables:**

1. This project was highlighted during our 2019 Field Day. Participants were briefed on the project and were able to observe a portion of the cows from the study while the graduate student working on this project discussed the project.
2. Pending presentations planned at time of this grant update include an update on research findings at our 2020 CREC Virtual Field Day, and anticipated presentation at Western Section American Society of Animal Science Meetings in 2021.
3. Publication of research findings will be accomplished in the 2020 NDSU - Beef Report and a peer-reviewed manuscript (target submission January 2021).

**Key Benefits for Producers:**

While data collection is still on going with continued funding provided in 2020 the data and preliminary analyses presented here appear to indicate that replacement of portions of roughage with soybean hulls to beef cows fed in confinement can be accomplished with no impacts to cow performance. Data on the impacts of these diets on calf performance will be determined and reported in future grant reports. Future data on calf performance will assist in understanding the implications of roughage replacement with soybean hulls on calf weaning data, and subsequently feasibility and profitability of the overall feeding system.

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| Table 1. Effects of soybean hull inclusion on performance and conception rate of beef cows fed in confinement during lactation, mid-gestation, and late-gestation. |
|  | Treatment |  |  |
|  | Control | Soybean Hulls | SE | *P*-value1 |
| *Lactation* |  |  |  |  |
|  Initial BW, lb | 1428 | 1437 | 71.3 | 0.93 |
|  Final BW, lb | 1344 | 1351 | 62.1 | 0.94 |
|  ADG, lb/d |  - 0.8 |  - 0.8 |  0.10 | 0.91 |
|  Initial BCS |  5.4 |  5.4 |  0.15 | 0.98 |
|  Final BCS |  5.3 |  5.2 |  0.15 | 0.84 |
|  |  |  |  |  |
| *Mid-Gestation2* |  |  |  |  |
|  Initial BW, lb | 1265 | 1282 | 52.5 | 0.83 |
|  Final BW, lb | 1396 | 1424 | 60.0 | 0.75 |
|  ADG, lb/d |  1.4 |  1.6 |  0.12 | 0.50 |
|  Initial BCS |  5.4 |  5.3 |  0.25 | 0.93 |
|  Final BCS |  5.9 |  6.1 |  0.11 | 0.16 |
|  |  |  |  |  |
| *Late-Gestation* |  |  |  |  |
|  Initial BW, lb | 1396 | 1424 | 60.0 | 0.75 |
|  Final BW, lb | 1484 | 1535 | 56.9 | 0.55 |
|  ADG, lb/d |  1.1 |  1.3 |  0.11 | 0.12 |
|  Initial BCS |  5.9 |  6.1 |  0.11 | 0.16 |
|  Final BCS |  5.6 |  5.6 |  0.09 | 0.89 |
|  |  |  |  |  |
| *Conception Rate*3 |  |  |  |  |
|  AI, % | 70.7 | 73.3 | 5.93 | 0.77 |
|  Final, % | 95.1 | 95.0 | 2.54 | 0.98 |
| 1 *P*-value less than 0.05 considered significantly different.2 Replacement of open cows with replacement heifers completed at weaning. Replacement heifers were previously managed on control and soybean hull rations.3 Conception rates to artificial insemination and final pregnancy rate determined via ultrasound. |

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| Table 2. Impacts of inclusion of soybean hulls in beef cow diets on calf birth weight and milk quality. |
|  | Treatment |  |  |
|  | Control | Soybean Hulls | SE | *P*-value1 |
| *Calf Performance* |  |  |  |  |
|  Birth Weight, lb |  78.8 |  81.3 |  2.69 | 0.54 |
|  |  |  |  |  |
| *Milk Analysis2* |  |  |  |  |
|  Fat, % |  4.1 |  4.9 |  0.33 | 0.14 |
|  Protein, % |  11.9 |  9.5 |  0.54 | 0.02 |
|  SCC, cells/ml  | 2405 |  5319 | 871.1 | 0.06 |
|  MUN, mg/dL |  2.7 |  6.6 |  1.54 | 0.12 |
| 1 *P*-value less than 0.05 considered significantly different.2 SCC = somatic cell count, MUN = milk urea nitrogen |