Beet Pulp -- A Solution to Reduce Fat Cows' Body Condition Scores (BCS)

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Introduction

Fat cow syndrome is an important problem in the dairy industry when large groups of cows are fed *ad libitum*. This is common where large amounts of corn silage are fed and attention is not paid to limiting access to concentrates. Various metabolic disorders threaten these cows, including fatty liver, ketosis, displaced abomasum, oxidative stress, hypocalcaemia, and reproductive problems. Nowadays, there isn't any way to reduce body condition score (BCS) except for diluting diet, resulting in lower milk production. We hypothesize that altering dietary composition can influence partitioning of nutrients toward the mammary gland rather than other body tissues. Our objective was to determine effects of replacing barley grain (glucogenic) with beet pulp (lipogenic) on milk fat and energy outputs and changes in BCS and external body fat thickness in over-conditioned, late lactation cows.

Materials and Methods

Eighteen late lactation Holsteins cows (BCS = 4.12 ± 0.35) at 171 ± 16 days-in-pregnancy and 289 ± 35 days-in-milk were used in a randomized block design study (8 wk before dry period until drying off). Cows were fed one of three diets: 1) 23.47% barley grain, 2) 14.87% barley grain and 8.6% beet pulp (BP), or 3) 6.27% barley grain and 17.2% BP (dry matter basis). Cows were milked at 0030, 1100, and 1900 h. A total mixed ration (based on alfalfa hay, corn silage, and soybean and canola meals) with a forage to concentrate ratio of 45.6:54.4 was offered twice daily for *ad libitum* at 0800 and 1600 h. Cows were housed in a bedded pack barn and were group fed (crude protein = 15.5, 15.3, and 15.1%; net energy for lactation = 0.70, 0.69, and 0.68 Mcal/lb (1.54, 1.52, and 1.51 Mcal/kg), respectively). Body condition was scored at the beginning and end of the experiment. Back fat thickness (BFT) was measured using a portable B-mode ultrasound generator (Sonovet 600V, BCF Technology Ltd, West Lothian EH54 9BJ, Scotland). Milk production (corrected to 3.5% fat and energy-corrected milk) and milk components data were analyzed as repeated measures using PROC MIXED of SAS (2003). Cow nested within treatment was considered random and all other effects in the model were considered fixed. Significant treatment differences were declared at $P < 0.05$, and trends were set at $0.05 \leq P < 0.15$.

Results

Beet pulp replacing barley grain increased milk fat percent (4.37 vs. 4.91 and 5.18%, $P < 0.002$) and milk energy (0.34 vs. 0.37 and 0.38 Mcal/lb [0.76 vs 0.82 and 0.84 Mcal/kg], $P < 0.01$) without affecting milk yield (39.5, 38.4, 39.5 lb [17.9, 17.4, 17.9 kg]) and milk percents of protein and lactose. By adding BP, BCS (0.13 vs. -0.09 and -0.12, $P = 0.01$) and back fat thickness (2.5 vs. -0.4 and -1.6 mm, $P < 0.01$) reduced linearly. Results suggested that feeding BP to high BCS cows in late lactation can modestly reduce BCS and increase milk fat and energy output.

Significance

Substitution of barley grain with BP resulted in higher milk energy output as well as increased milk fat and milk energy BP was increased in the diet. Measurement of BFT using ultrasound showed body reserve mobilization was higher for cows fed BP treatments, which resulted in a negative value of BFT for cows fed BP diets. Because there isn't any way to reduce BCS except diluting the diet, which results in lower milk production, these results suggest that inclusion of a lipogenic feed, especially BP (a relative cheap feed), in diet of fat cows can slightly reduce BCS without compromising milk production and milk energy output.