Can byproduct pellets replace barley grain in diets for finishing cattle?

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Project Title: Understanding the physiology behind changes in feed efficiency throughout the finishing period

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Background:
Alberta’s feedlot industry is globally recognized as a leader for the production of high quality, healthy and safe beef used in both domestic and international markets. The growth of this industry has been based in part on a readily available supply of cereal grains. Specifically, peas, canola and canola meal have made barley, the principle cereal grain for Alberta feedlots. Recently, this long-standing reliance on barley as the principle feed source has shown signs of change. It is well known that barley acres are shrinking in western Canada. As the grain industry continues to evolve towards the production of crops that create value-added opportunities, it is clear that Alberta’s feedlot sector will be challenged with maintaining profitability while faced with tightening supplies of barley grain and higher cereal grain prices.

What It Means:
Studies 4 and 5 demonstrated that the high lipid byproduct pellets can be an effective alternative to barley grain and canola meal. Rumen pH, short-chain fatty acids (acetate and methyl butyrate) were increased with the addition of HLP. Research also indicated that a combined diet feeding strategy with a reduction in the amount of barley grain can improve growth performance and carcass characteristics for finishing beef cattle. Overall, this research has demonstrated that HLP are a viable alternative to barley grain and, depending on feed prices, may be a strategy to reduce feed cost.

What They Did:
A total of five studies were conducted within this project:

Study 1. The first study evaluated how the inclusion rate of a strategically formulated high-lipid byproduct pellet (HLP) affects dry matter intake, rumen fermentation, and nutrient digestibility when used as a partial replacement for barley grain and canola meal. Ruminally cannulated cattle were used for this study. A 4 x 4 Latin square design. Treatments included HLP at 0, 30, 60, or 90% of the barley grain and canola meal. Rumen pH, short-chain fatty acids (acetate and methyl butyrate), total tract digestion, and post-absorptive utilization of glucose and acetate (two important nutrients used by muscle tissue and fat tissue).

Study 2. A growth performance study was conducted using 288 steers housed in 24 pens (12 steers/pen) and assigned to 1 of 4 treatments. Treatments included a combination of diet and the duration for which the diet was fed with a major difference being that the HLP were included at 30% of the barley grain and canola meal rather than 60% as for Study 4; 1) steers were fed the barley-based control diet for the full 120-d finishing period, 2) steers were fed a diet where HLP replaced 30% of the barley grain and canola meal for the full 120-d finishing period, 3) steers were fed the barley-based control diet for the first 49-d of the finishing period followed by the HLP diet for the last 71-d period, 4) steers were fed the HLP diet for the last 49-d followed by feeding the barley-based control diet for the first 71-d period. Performance of each treatment phase was evaluated including body weight, dry matter intake, average daily gain, and feed efficiency.

Study 3. A growth performance study was conducted using 288 steers housed in 24 pens (12 steers/pen) and assigned to 1 of 4 treatments. Treatments included HLP incorporated with 0, 30, 60, or 90% of the barley grain and canola meal. Data and samples were collected every 40-d to evaluate dry matter intake, rumen pH, rumen infection, fatty acid composition, total tract digestion, and post-absorptive utilization of glucose and acetate. Differences among treatments were determined using analysis of variance for repeated measures. Statistical analysis was performed using the ANOVA procedure of the SAS statistical software. Significance was determined at the p ≤ 0.05 level.

Study 4. A growth performance study was conducted using 288 steers housed in 24 pens (12 steers/pen) and assigned to 1 of 4 treatments. Treatments included HLP included at 0, 30, 60, or 90% of the barley grain and canola meal. Rumen pH, short-chain fatty acids acetate (acetate and methyl butyrate) were increased with the addition of HLP. Research also indicated that a combined diet feeding strategy with a reduction in the amount of barley grain can improve growth performance and carcass characteristics for finishing beef cattle. Overall, this research has demonstrated that HLP are a viable alternative to barley grain and, depending on feed prices, may be a strategy to reduce feed cost.

Study 5. A growth performance study was conducted using 288 steers housed in 24 pens (12 steers/pen) and assigned to 1 of 4 treatments. Treatments included HLP included at 0, 30, 60, or 90% of the barley grain and canola meal. Rumen pH, short-chain fatty acids acetate (acetate and methyl butyrate) were increased with the addition of HLP. Research also indicated that a combined diet feeding strategy with a reduction in the amount of barley grain can improve growth performance and carcass characteristics for finishing beef cattle. Overall, this research has demonstrated that HLP are a viable alternative to barley grain and, depending on feed prices, may be a strategy to reduce feed cost.

What They Learned:
Evaluating the inclusion rate of HLP (Studies 1 and 2)

Increasing the inclusion rate of HLP as a partial replacement for barley grain and canola meal did not affect dry matter intake but increased rumen pH as the inclusion rate of HLP increased. That said, organic matter digestibility in the rumen and for total tract was decreased in a dose-dependent manner with increasing HLP inclusion. At the growth performance study, steers fed HLP had greater dry matter intake but average daily gain did not differ from steers fed the barley-based control diet. Because of the greater dry matter intake and no change in growth, the G:F was less desirable for steers fed HLP. Carcass yield and quality traits were not affected.

Studies 3, 4 and 5 demonstrated that the high lipid byproduct pellets can be an effective alternative to barley grain and canola meal in conventional feedlot rations. However, reduced G:F, ADG, and low carcass weights may occur when feeding the HLP throughout the finishing period. What is needed is a strategic approach to feeding HLP such as decreasing the inclusion rate of HLP as the finishing period progresses. Providing additional energy in the form of oil can improve growth performance and carcass characteristics for finishing cattle. Performance of steers during each 60-d period was measured including dry matter intake, average daily gain, and feed efficiency.

Order to Conclude:
The studies within this project evaluated the use of high-lipid byproduct pellets (HLP) as a partial alternative to barley grain in diets for finishing cattle. At the time of the studies, HLP were priced at approximately $60/Mt less than rolled barley grain. This research demonstrated that the use HLP in diets for finishing cattle reduced G:F. However, increased feed costs were associated with the use of HLP.
This research has been funded in part through the Alberta Livestock Feeding Initiative. In 2010, ALMA provided $8 million to start the Livestock Feeding Initiative program that ACIDF administers. The strategic priorities are:

1. “Feed Utilization” The more efficient utilization of feed grains by the livestock sector.
2. “Feed Value” Technology that identifies feed grains' livestock performance attributes for both growers and feeders.
3. “Innovation in Breeding” Increased investment in public and/or private research and plant breeding dedicated to feed grains.

Further information is available at www.acidf.ca/feeding or e-mail at info@acidf.ca.