DAIRY RESEARCH HIGHLIGHTS

In brief ...

This past summer, the dairy research group at the University of Alberta presented some 24 papers at scientific meetings in Canada, the US and overseas. Here are summaries of just a few.

Barley/Triticale and Pea/Triticale Silage for Lactating Cows

Objectives of this study were to determine the effects of substituting whole crop barley/triticale or pea/triticale silage for alfalfa silage on feed intake, milk production, and milk composition. Twenty Holstein cows in early-lactation and 24 in mid-lactation were fed one of 4 diets in a 7 week trial. All diets were formulated to contain 60% concentrate and 40% forage on a dry matter (DM) basis where 25% of forage dry matter was alfalfa hay and the remaining 75% was either :

- alfalfa silage;
- barley/triticale silage;
- high quality pea/triticale silage, or;
- low quality pea/triticale silage.

Silage analysis results and milk production responses are summarized in the table on the right. Dry matter intake averaged 21.4 kg/day and was highest for cows fed high quality pea/triticale silage, intermediate for alfalfa silage and lowest for cows fed barley/triticale and low quality pea/triticale silage. Early- and mid-lactation cows consumed similar amounts of dry matter. Milk fat percentage was highest for cows fed high quality pea/triticale silage, intermediate for cows fed barley/triticale silage and lowest for cows fed alfalfa and low quality pea/triticale silage.

This study indicated that barley/triticale and high quality pea/triticale silage can replace alfalfa silage at 30% of the total DM in the ration without any major effect on milk production.

SILAGES :	ALFALFA	BARLEY TRIT	HIGH PEA TRIT	LOW PEA TRIT
SILAGE ANALYSIS (% on DM basis):				
Dry Matter	51	41	28	44
Crude Protein	17.5	16.1	15.6	12.7
ND Fibre	49	54	50	50
PRODUCTION (kg/day):				
Actual Milk Yield	33.9	33.5	33.3	31.4
4% Fat Corrected	30.2	31.5	30.3	27.6

The Effect of Dietary Fat Source on Performance

This trial was designed to determine whether oilseeds, which are readily available in Alberta, can replace more expensive supplemental fat sources in diets for lactating cows. After consuming a common diet for 2 weeks, 24 early- and 8 mid-lactation Holstein cows were randomly assigned to one of four diets for a 12-week feeding trial. On a dry matter (DM) basis, diets contained 20% alfalfa silage, 20% alfalfa hay and 60% of a concentrate mixture containing either :

- 8.2% rolled canola seed;
- 8.2% rolled flaxseed;
- 4.1 % canola seed and 4.1 % flaxseed, or;
- 3.6% Megalac®, a commonly used source of bypass (rumen inert) fat.

All supplements contributed 2.2 % added fat to the dietary DM.

DM intakes, milk yields and milk composition of cows on the 4 diets are summarized in the table below. There were no significant differences between diets for any of these variables. Source of dietary fat also had no influence on milk fat composition with the exception that flax seed increased the concentration of linolenic acid.

Results indicate that the addition of 2.2% dietary fat as canola seed or flaxseed and/or combination of these oilseeds to the diet of dairy cattle can promote similar performance to that observed for cows fed similar levels of fat in the form of Megalac®.

FAT SOURCE :	CANOLA SEED	FLAX SEED	CANOLA + FLAX SEED	MEGA LAC®
DM Intake (kg)	21.4	21.4	21.8	20.4
Milk Yield (kg)	34.4	35.3	38.0	36.2
Milk Fat %	3.3	3.3	3.1	3.4
Milk Protein %	3.0	3.2	3.1	3.1
Milk Lactose %	4.6	4.7	4.8	4.7

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Effect of a Bacterial Inoculant on Silage Fermentation

Bacterial inoculants are used to enhance silage fermentation, especially under poor ensiling conditions. Desired effects are lower pH, increased lactic acid to acetic acid ratio and reduced ammonia. Research on the efficacy of inoculants has primarily focussed on forages such as alfalfa, grass and corn. Data on the effect of inoculants on the fermentation characteristics of cereal silages are limited. The primary objective of this study was to evaluate the effects of a lactic acid bacterial inoculant on the quality of cereal silages under practical conditions in Alberta. Alfalfa forage was also treated with the same inoculant for comparison purposes.

The effect of applying a commercial inoculant (AG BAG Plus®) to barley/triticale, pea/triticale and alfalfa silage was studied. The inoculant was applied at 250 g per tonne of fresh crop. A total of six silage bags (40 tonnes/bag) were filled; three contained treated forage and three control forage. After ensiling, samples were taken from each bag at one week intervals for up to six weeks and fermentation characteristics of the silage were measured.

The addition of inoculant resulted in a lower pH and greater lactic acid concentration one week after ensiling for all three silages, but beyond this time the effects of inoculant on the ensiling process were very minor. In general, silage pH was lowest for pea/triticale silage, intermediate for barley/triticale silage and highest for alfalfa silage. Addition of inoculant to silages did not significantly affect ammonia N , butyric acid or lactic acid content of silages. Based on lower pH and higher lactic acid concentration, silage quality was highest for pea/triticale, intermediate for barley/triticale and lowest for alfalfa.

It was concluded that under the good ensiling conditions of this study, the inoculant had a relatively minor influence on the fermentation characteristics of the silage. In addition, the effect of inoculant on fermentation patterns in silage bags was influenced by forage species.

Influence of Concentrate:Forage Ratio and Sodium Bicarbonate on Rumen Fermentation in Early-lactation Cows

High levels of concentrate fed in early lactation can lower milk fat and raise milk protein concentrations (see article **1F2**), effects which may be alleviated by adding buffer to the diet. It is assumed that high concentrate levels and buffers exert their effects by altering rumen fermentation patterns. The objective of this trial was to test this assumption.

Four ruminally cannulated Holstein cows in early lactation (100 ± 20 DIM) were assigned to four diets : a concentrate:forage ratio of 50:50 with and without buffer (sodium bicarbonate at 0 or 1.2% of DM) and a concentrate:forage ratio of 75:25 with and without buffer. Each cow received each diet for 3 weeks. The forage component of the ration was a 50:50 mixture of alfalfa and barley/triticale silage and diets were fed ad libitum as a total mixed ration. Rumen samples were taken on 16 and 14 occasions over a 24 h period for pH measurement and volatile fatty acid (VFA) analyses, respectively.

Average rumen pH (6.20 ±0.06) was not affected by dietary treatments. VFA results are shown in the table on the right.

Cows fed the high concentrate diet had lower ruminal acetate, butyrate and BCFA concentrations whereas propionate concentration was significantly elevated. The addition of buffer increased total VFA and acetate concentrations at both levels of concentrate inclusion. These changes in rumen VFA concentrations help to elucidate the mechanisms by which high concentate diets and dietary buffers exert their effects on milk composition. High rumen acetate levels favour milk fat synthesis, whereas high propionate levels favour milk protein yield.

	Without buffer		With buffer	
	50:50	75:25	50:50	75:25
Total VFA, mM[1]	102.9[b]	104.0[b]	113.0[a]	115.6[a]
Acetate (A), mM	59.5[b]	46.9[c]	67.0[a]	60.0[b]
Propionate (P), mM	21.2[c]	37.6[a]	22.1[c]	32.5[b]
A:P ratio	2.89[a]	1.3 l[c]	3.14[a]	2.00[b]
BC-VFA[2], mM	2.50[a]	1.68[b]	2.91[a]	2.39[a]

[a,b,c] means in a row with different superscripts are significantly different ($p < 0.05$: see article 1F2 for explanation of statistical significance)

[1] millimoles per litre, a measure of concentration

[2] branch-chained volatile fatty acids

researchers : Reza Khorasani and John Kennelly