Research Progress Report Number 35 February 1996

Use of Canola in Dairy Cattle Diets: Year 3

Kirsten Randall
Dairy Laboratory Assistant
Palmer Research Center, Agricultural and Forestry Experiment Station

Stephen M. Dofing
Associate Professor of Agronomy
Palmer Research Center, Agricultural and Forestry Experiment Station

Donald J. Brainard
Herder Supervisor
Palmer Research Center, Agricultural and Forestry Experiment Station

Introduction

This report presents results from the third and final trial of a three–year study by the Agricultural and Forestry Experiment Station (AFES) investigating the use of Alaska–grown whole–seed canola in dairy cattle diets. In the Year 1 trial, diets containing 2, 4, and 6 pounds canola per cow per day were compared to a standard diet containing no canola. (Randall, Dofing, and Brainard, 1994). In the Year 2 trial, use of canola as a fat supplement was studied by comparing performance of cows fed dried fat, canola, and a tallow + dried fat mixture (Randall, Dofing, and Brainard, 1995). In both trials, addition of canola to diets to supplement either imported soybean meal (Year 1 trial) or dried fat (Year 2 trial) was economically viable. It was cautioned, however, that producers should consider existing feed and milk prices in formulating diets, as these will likely influence the net economic return of each diet.

Results from the Year 1 trial indicated exceptionally high dry matter intake for many cows assigned rations containing higher amounts of canola. In this trial, a Calan® gate system allowed each cow access to its own feed container, at the exclusion of all other cows. However, feed containers were located close enough to each other that some cows were able to enter their gate and feed from the container at an adjacent gate. This "stealing" was observed on several occasions. We speculated that this could have created artificially high feed intake values and, therefore, influenced our results. In this trial we repeated the Year 1 trial, eliminating the possibility of feed stealing. This Research Progress Report presents those results. Use of brand names does not imply endorsement by the AFES.

Materials & Methods

The feeding trial was conducted at the AFES dairy barn in Palmer, Alaska, from November 1993 to November 1994. The canola was grown by Dennis Green of Delta Junction, using standard canola production practices for Alaska (Knight, 1991).

Twenty mature Holstein cows were assigned to five groups of four cows each, with the four cows of each group having similar calving dates, age, and previous milk production. Within each group, each of these four cows were then randomly assigned to one of four diets. Unlike earlier feeding trials, no heifers were used.

Dietary formulations were identical to those of the Year 1 trial (Randall et al., 1994), and consisted of 0, 2, 4, and 6 pounds canola per cow per day. Ingredient contents of these diets is given in Table 1. All diets were based on an estimated dry matter consumption of 45 pounds per day. Feeding 0, 2, 4, and 6 pounds canola per cow per day resulted in 0, 4, 8, and 12% of canola in the total diet dry matter, respectively. Diets were not balanced to be isocaloric, but were balanced to contain about 17.5% crude protein on a total diet dry matter basis with a forage to concentrate ratio of 42:58.

Cows began the trial in their third week postpartum and continued through their 15th week. All cows were fed the diet containing no canola through their third week, and then fed their assigned experiment diet from weeks four

Table 1. Ingredient content of pelleted concentrate mixes in the Year 3 canola feeding trial.

	Concentrate Mix[1] (lbs/ton)			
Ingredient	0	2	4	6
Barley	1070	1009	939	820
Corn	207	207	207	1207
Soybean meal	432	393	357	336
Salmon meal	104	104	104	104
Canola seed	—	138	276	414
Fat (tallow)	69	31	—	—
Molasses	35	35	35	35
Limestone	45	45	45	45
TM salt	15	15	15	15
Magnesium oxide	5	5	4	4
Dicalcium phosphate	3	2	—	—
Potassium sulfate	9	10	12	14
Vitamin premix[2]	5	5	5	5
Selenium[3]	1	1	1	1

[1]Diets were formulated to provide 0,2,4,or 6 pounds of canola per cow per day.
[2]Contains 2 million IU of Vitamin A per pound, 1.6 million IU Vitamin D per pound, and 5,000 IU Vitamin E per pound.
[3]Contains 600 parts per million Se.

Table 2. Response of cows fed 0, 2, 4, and 6 pounds of canola per cow per day in the Year 3 canola feeding trail.

	Pounds canola per cow per day				
	0	2	4	6	LSD [1]
Lbs. milk production	91.6	103.2	99.4	98.7	4.40
Lbs. dry matter intake (DMI)	47.2	48.1	44.9	45.6	2.14
Milk production/DMI	1.96	2.17	2.24	2.22	0.11
% fat	3.00	2.67	3.04	2.68	0.22
Lbs. fat	2.74	2.70	3.02	2.57	0.18
% protein	2.83	2.83	2.81	2.80	0.06
Lbs. protein	2.59	2.92	2.78	2.76	0.13
% solids not fat	8.77	8.62	8.66	8.45	0.11
Lbs. solids not fat	8.03	8.91	8.60	8.33	0.39
% total solids	11.77	11.29	11.70	11.13	0.24
Lbs. total solids	10.77	11.61	11.62	10.90	0.44

[1]Least Significant Difference. Differences of at least this amount are considered statistically different (P=0.05).

through 15.

Cows were housed in individual stalls in order to prevent stealing of feed. A total mixed ration was weighed and mixed by a Calan® mechanized mixer cart. Cows were given excess feed, and daily feed intake after weighback was recorded for each cow. Milk weights were also recorded daily, and weekly milk samples were tested for fat, protein, and total solids.

RESULTS

All three canola diets produced significantly more milk than the diet containing no canola Table 2). Dry matter intake was significantly lower for the 4 and 6 pound canola ration; this contrasts with the Year 1 trial in which the 4

Table 3. Income over feed costs in the Year 3 canola feeding trial. Pounds canola per cow per day

	0	2	4	6
Milk price/cwt[1]	19.42	18.88	19.49	18.90
Milk income/day	17.79	19.48	19.37	18.65
Feed cost/day[2]	6.46	6.78	6.29	6.37
Income over feed cost/day	11.33	12.70	13.08	12.28

[1]Base price $19.75/cwt adjusted for 0.164/cwt fat differential below 3.2% fat.
[2]Concentrate costs of diet: 0@290.57/ton, 2@303.15/ton, 4@300.37/ton, 6@299.04/ton.

and 6 pound diets produced significantly higher dry matter intake. This reversal may be due to stealing that occurred in the Year 1 trial. Efficiency of milk production, measured as pounds of milk produced per pound of dry feed consumed, was significantly higher for all three canola diets compared to the diet containing no canola.

Calculation of income over feed costs is shown in Table 3. Income was calculated using the adjusted milk price and average milk production for each diet. Feed costs were given on an as–fed basis. Silage cost was calculated using competitive bid hay prices for hay purchased by AFES during the trial. All three canola diets show higher net income than the diet that contained no canola. This was due to higher milk production of diets that contained canola, as well as lower dry matter intake for diets that contained 4 and 6 pounds of canola. Milk prices used in these calculations were influenced by milkfat percent, with price adjusted for milkfat less than 3.2%. The 2 and the 6 pound canola diets produced significantly less milkfat than the 0 and the 4 pound canola diets. In both this and the first Year trial, the 6 pound canola diet produced significantly less milkfat than the diet containing no canola.

Discussions & Conclusions

Based on combined results from this and previous trials, recommendations for feeding whole canola seed are three to four pounds of canola per cow per day, or 6 to 8% of the total diet dry matter. An economic analysis performed using actual current milk prices and feed costs supported the use of Alaska–grown whole–seed canola in dairy rations. As with any other diet, results obtained will depend on feed quality, production level, and herd genetics. The costs of the diets used in this study (Table 3) are the actual costs of the experimental diets and may not reflect costs of commercial diets mixed in large quantities. Changes in feed costs may shift the expected profitability of one diet over another. These results should provide a basis for future diet formulations that take into account existing feed and milk prices.

References

Knight, C.W. (1991) *Summary of Canola Production Practices for Alaska.* Misc. Publ. 91-4. Agricultural and Forestry Experiment Station, University of Alaska Fairbanks.

Randall, K.M., Dofing, S.M. & Brainard, D.J. (1994) *Use of Alaska-grown whole-seed canola in dairy cattle diets: Year 1.* Research Progress Report No. 30. Agricultural and Forestry Experiment Station, University of Alaska Fairbanks.

Randall, K.M., Dofing, S.M. & Brainard, D.J. (1995) *Use of Alaska-grown whole-seed canola in dairy cattle diets.* Research Circular No. 101. Agricultural and Forestry Experiment Station, University of Alaska Fairbanks.

Acknowledgments

This research was made possible by funding from the Alaska Science & Technology Foundation; the cooperation of Delta Junction producers Dennis Green and Paul Knopp; C.W. Knight of AFES; Don Quarberg of ACE; Ron Kincaid of Washington State Univ; Paul Windschitl of GTA Feeds; and the AFES dairy barn crew and laboratory personnel.