Effect of Feeding L-Carnitine and Sunflower Seeds on CLA Content of Pasture-Fed Beef

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Introduction Pasture finishing enhances levels of conjugated linoleic acids (CLA) in beef lipids (Shanta et al. 1997). CLA (e.g., C18:2 c9, t11), formed during biohydrogenation of polyunsaturated fatty acids (PUFA) in the rumen, can reduce the incidence of heart disease, cancer and obesity in humans. However, pasture finishing cattle can reduce carcass grade. Feeding pasture-fed cattle a high-grain diet for a short finishing period (~60 d) improves grades but may reduce lipid CLA levels. A feeding regime is required that maintains the positive nutritional attributes of pasture-fed beef and improves the meat grade. The objective of this study was to investigate the effects of adding sunflower seeds (SFS), a good source of PUFA (Mir et al. 2000), or carnitine, a vitamin-like compound shown to increase fat deposition and marbling in cattle, to finishing diets of pasture-fed cattle on lipid fatty acid profiles (FAP).

Materials and methods Sixty-four steers grazed 11 paddocks (94.4% grass, 4.6% alfalfa) 13 May to 02 Sep 2003. Sixteen steers (503.1 ± 34.9 kg) were slaughtered off pasture (Time 0); carcass data and ribeye steaks were obtained. The remaining 48 steers (469.3± 34.5kg) received a basal diet of 80% barley grain and 20% hay (15.0 MJ DE/kg, 17.4% ADF, 28.2% NDF, 5.3% ash, 7.0 mg L-carnitine/kg, DM basis) and were allocated to one of the following diets: 1) 200 mg added carnitine (Carnipass®, Lonza, Inc., USA)/kg DM + 14% DM SFS (substituted for barley), 2) 0 mg added carnitine/kg DM + 14% DM SFS, 3) 200 mg added carnitine/kg DM + 0% DM SFS, and 4) 0 mg added carnitine/kg DM + 0% DM SFS (control). Blood samples were obtained every 14 d for analysis of plasma carnitine. Feed intake was measured every 7 d and feed sampled for analysis of nutrient and carnitine content. Body weights were measured every 14 d to calculate average daily gain (ADG). Every 28 d (Times 1, 2 & 3), 16 steers were slaughtered and carcass data and ribeye steaks were obtained.

Results Addition of carnitine to diets increased plasma levels of carnitine (µmol/L) and feeding SFS resulted in greater DM intakes (DMI, kg/d) and ADG (kg/d), with no effect on feed:gain (Table 1). FAP analysis of the lean portion of ribeye steaks showed that grain-finished animals had similar levels of total saturated fatty acids (ΣSFA) and total mono-unsaturated fatty acids (ΣMUFA), but lower levels of total PUFA (ΣPUFA) than steaks from pasture-fed animals. Feeding SFS increased total trans fatty acids (ΣTFA), mostly due to higher levels of C18:1 t11 (Table 1). With respect to pasture-fed steers, CLA content of beef (mg C18:2 c9, t11/100 mg lipid) increased by 50% in SFS-fed steers and decreased by 50% in barley-fed steers (Figure 1).

Table 1 Effect of diet on beef performance & FAP

Diet	Pasture	+SFS +CAR	+SFS -CAR	-SFS +CAR	-SFS -CAR
Carnitine	18.9	28.5	17.2	25.6	16.9
DMI	ND	13.2	13.1	11.7	12.8
ADG	ND	1.55	1.56	1.44	1.42
F : G	ND	8.48	8.40	8.12	9.02
ΣSFA	48.6	47.8	48.3	46.7	47.8
ΣMUFA	37.9	39.8	41.4	43.9	42.9
ΣPUFA	10.6	8.17	6.07	7.29	7.45
ΣTFA	2.21	3.60	3.56	1.75	1.59

ND=not determined

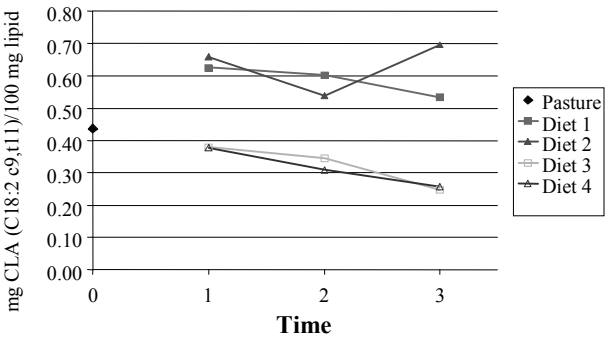

Figure 1 Effect of diet on CLA concentration (mg CLA/100 mg lipid) in meat from pasture-fed and finished steers

Conclusions The results demonstrate that adding SFS to diets of pasture-fed steers during a 28-, 56-, or 84-d finishing period can increase lipid levels of the C18:2 c9, t11 CLA isomer.

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