Objectives

The objective of this study was to investigate the effect of whole linseed and cracked linseed on fatty acid composition and mRNA expression of PPARγ and stearoyl-CoA desaturase (SCD) in intramuscular fat. We hypothesized that supplementation of linseed in beef cattle fattening diets would increase conjugated linoleic acid (CLA) and modify adipogenic gene expression in intramuscular adipose tissue of feedlot steers.

Materials and Methods

Thirty fattening Yanbian Yellow steers were assigned randomly to 3 groups of 10 steers each and fed for 6 mo a basal diet without additional linseed (CON), with 8% whole linseed (LS, rich in α-linolenic acid), or with 8% cracked linseed (CLS). The cattle were processed at 28 mo of age, and subcutaneous, intermuscular, and intramuscular adipose tissue were obtained from the 12th-13th longissimus muscle for the analysis of fatty acid composition and specific gene expression. One hundred milligrams of adipose tissue were extracted in chloroform:methanol (2:1, vol/vol); and fatty acid methyl esters (FAME) were analyzed by gas chromatography. The injector and detector temperatures were maintained at 240 and 250°C, respectively. The oven temperature was maintained at 140°C for 2 min, increased to 240°C at a rate of 4°C/min, and maintained at 240°C for 40 min. Data were analyzed with a one-way analysis of variance using SPSS.

Results

The LS and CLS diet increased ADG and daily feed intake compared to CON. In subcutaneous adipose tissue, LS and CLS supplementation increased cis-9, trans-11 CLA, trans-10, cis-12 CLA, and α-linolenic acid concentrations, whereas neither LS nor CLS altered the concentration of oleic acid. In intermuscular adipose tissue, LS and CLS did not affect the concentration of oleic acid, but increased the concentrations of cis-9, trans-11 CLA and α-linolenic acid relative to CON. In intramuscular adipose tissue, LS and CLS increased the concentration of oleic acid concentration approximately 4.66 and 5.62%, respectively, compared to CON. Relative to CON intramuscular adipose tissue, LS and CLS significantly increased the concentrations of cis-9, trans-11 CLA (54.1, 47.7%), trans-10, cis-12 CLA (83.3, 36.3%), and α-linolenic acid (52.5, 78.7%). In intramuscular adipose tissue, PPARγ gene expression was greater following the LS and CLS treatments than in CON, whereas SCD gene expression was strongly depressed by LS and CLS.

Conclusion

These data indicate that supplementary linseed during late fattening in steers improves functional fatty acid composition and modifies adipogenic gene expression in intramuscular adipose tissue. These changes to fatty acid composition therefore provide consumers with value-added beef.