EFFECT OF WHOLE COTTONSEEDS IN CATTLE FINISHING DIETS ON GROWTH, EFFICIENCY AND BODY FAT COMPOSITION[1]

R. L. Preston and S. J. Bartle
Texas Tech University, Lubbock 79409, USA

and

D. C. Rule
University of Wyoming, Laramie 82071, USA

Introduction

Whole-unprocessed cottonseeds (WCS) have been fed to lactating dairy cows at dietary levels of 9 to 18% with little influence (Anderson et al., 1979) or some increase in milk fat concentration and total fat production (Davis and Harland, 1946; Moody and Barnes, 1966; Stanley et al., 1969). The latter results may have occurred because either the diet fed or the warm climate resulted in milk with lower fat content compared to control cows. Decreased palmitate incorporation and glucose utilization for glycerol and reducing equivalent synthesis were observed in lactating dairy cows fed diets containing 18.5% WCS (Cummins and Russell, 1985).

Similar studies have not been conducted in growing-finishing beef cattle. Because of the high fat and protein content of WCS (25% of each), feeding WCS to finishing cattle should improve feed efficiency and possibly alter fatty acid composition of depot fats, if any of the fat in WCS passes unaltered through the rumen and is absorbed in the small intestine.

Materials and Methods

Forty eight steers (386 kg) were divided into two blocks based on phenotype (Red Angus X Hereford or Brangus X Hereford; 24 each) and randomly placed into pens of eight steers each within blocks. All steers were treated with a systemic parasiticide (Ivermectin) and implanted (Synovex-S) at the start of the experiment. The steers were ad-lib fed their respective diets and water was available at all times. Diets were prepared daily and delivered by belt to fenceline bunks in each pen. Steers were housed in open concrete pens with partially-slotted floors that provided 2.0 m^2 of floor space per steer. The experiment was conducted from April 20 through August 11 (113 d).

The diets (12% roughage equivalent) were based on steam-flaked sorghum grain, cottonseed hulls, cottonseed meal, urea and cane molasses; minerals, vitamins, tylosin and monensin were also added. Diets containing 0, 5, 10, 15, 20 and 25% WCS were fed during the experiment using three treatment combinations. One pen of steers in each block were fed the control diet (0% WCS) throughout the experiment. One pen of steers in each block was fed 5% WCS (0 to 28 d), 10% WCS (29 to 55 d), 15% WCS (56 to 84 d) or 20% WCS (85 to 113 d). Similarly, one pen of steers in each block was sequentially fed 10, 15, 20 or 25% WCS. The steers were weighed on d 0, 28, 55, 84 and 113, when they were slaughtered for carcass evaluation.

In addition to routine carcass grade and yield measurements, body fat samples were obtained from the subcutaneous fat behind the left shoulder (near the 12-13 rib) and from the left kidney fat. These samples were analyzed for individual fatty acids by gas chromatography.

All data were statistically analyzed by the General Linear Model procedure of SAS.

Results

Gain and gain efficiency did not differ between blocks ($P > .25$). Control steers gained 1.19, 1.27, 1.12 and 1.29 kg/d during 0-28, 29-55, 56-84 and 85-113 d, respectively; gain efficiency (gain/100 feed) for control steers was 15.3, 14.2, 11.8 and 11.8, respectively. Expressed as a multiple of the control steers during the same period,

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steers fed diets containing 5, 10, 15, 20 and 25% WCS gained 1.12, 1.03, 1.07, .80 and .58 times the control steers, respectively; gain efficiency was 1.24, 1.07, 1.10, .87 and .74 times the control steers, respectively. None of the period differences were significant ($P > .05$). Steers fed the diet containing 25% WCS were somewhat diarrhetic.

Carcass yield and quality data were unaffected by feeding WCS. Warm carcass weight was progressively less (327, 320, 307 kg, respectively) with increasing level of WCS, reflecting the lower gain on the higher WCS levels. Carcass yield averaged 61.6% of live weight and USDA yield and quality grade averaged 3 and low Choice, respectively.

Depot site markedly affected fatty acid concentration in directions previously published. Compared to kidney fat, subcutaneous fat had higher concentrations of 14:0 (4.1 vs 4.7%; ($P < .001$), 14:1 (.55 vs 1.09%; $P < .001$), 15:0 (.50 vs .64%; $P < .001$), 16:0 (26.9 vs 27.7%; $P < .03$), 16:1 (2.3 vs 4.1%; $P < .001$), 18:1 (37.4 vs 43.0%; $P < .001$) and 20:1 (.61 vs .84%; $P < .001$) and lower concentrations of 18:0 (21.7 vs 11.8%; $P < .001$) and 18:3 (.11 vs .07%; $P < .001$), respectively. The only depot X treatment interactions which approached significance were for 16:1 ($P = .05$), which decreased in subcutaneous fat with increasing dietary WCS with little change in kidney fat concentration, and 18:0 ($P = .07$), which increased in concentration in subcutaneous fat but was unchanged in kidney fat. Increasing dietary WCS increased depot concentrations of 18:0 (16.3, 16.4, 17.5%; $P = .02$) and decreased concentrations of 14:1 (.94, .84, .68%; $P = .002$), 16:1 (3.45, 3.16, 2.97%; $P = .006$), 18:3 (.10, .08, .08%; $P = .005$) and 20:1 (.79, .71, .68%; $P < .001$). None of the depot fatty acid concentrations were affected by the phenotype of the steers ($P > .11$).

Discussion

These results demonstrate that growing-finishing steers will consume diets containing 15% WCS or less and will gain with equal or better gain efficiency compared to steers fed a diet without WCS. With 20% or more WCS in the diet, gain and gain efficiency were decreased. Carcass yield and grading factors were not affected, indicating no *major change in general carcass compostion* due to the feeding of WCS.

Depot fatty acid concentrations were changed somewhat by the feeding of WCS, especially stearic acid (18:0) which was increased in subcutaneous fat with higher levels of WCS in the diet. Since this saturated fatty acid does not affect blood cholesterol in humans, this change in fatty acid composition as the result of feeding WCS *may have practical importance in cattle feeding.* (**Key Words**: Whole Cottonseeds, Cattle, Fatty Acid Composition)

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