WHEAT TO CORN RATIOS FOR FEEDLOT CATTLE

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Story in Brief

One hundred fifty black and black baldy implanted yearling steers were fed cracked grain diets containing (1) 50% corn and 50% wheat (50W), (2) 25% corn and 75% wheat (75W) or (3) 100% wheat (100W). Diets contained monensin (30 g/ton of feed) and tylosin (90 mg/hd/d) and 12% roughage of which 7% was cottonseed hulls, 2.5% was alfalfa pellets and 2.5% was in the supplement.

Feed consumption, rate of gain, shrunk live weight, carcass adjusted gain, hot carcass weight and marbling score all favored the 50W diet. Daily feed intake was depressed by 7.6% or about 1.7 pounds per head by 75W and 100W diets. Daily gains for cattle fed 50W, 75W and 100W diets were 3.23, 3.09 and 3.09 pounds (live basis) or 3.44, 3.32 and 3.22 pounds (carcass weight adjusted basis). Fat thickness and yield grades slightly favored steers fed 75W and 100W diets. Efficiency of feed use was best for the 75W diet (6.13 vs 6.44 and 6.39 pounds of feed per pound of gain for 75W vs 50W and 100W diets). Metabolizable energy value was between 3 and 14% greater (mean 8.4%) for wheat than corn depending on level of substitution in the diet.

(Key words: Wheat, Corn, Energy value, Steers.)

Introduction

In the past, hard red winter wheat was never fed as more than one-third of the grain in diets for finishing steers. Bloat and acidosis became prevalent at higher levels of wheat incorporation. With the advent of ionophores, problems with bloat and acidosis decreased (Bartley et al., 1983). Hence, when attractively priced, wheat would be ideal as the only grain in the diet and in 1984 there was a resurgence in the use of wheat in diets for finishing cattle. Level of roughage in wheat diets may be important. Gill et al. (1981) with corn-based diets indicated that rate and efficiency of gain are improved as roughage levels are reduced to 12% or below though type of grain, method of processing and type of roughage may make other levels more desirable. The 12% level of roughage will still provides some margin of safety while providing sufficient energy for rapid and efficient gains. This trial was conducted to (1) test the feasibility of feeding wheat as 100% of the grain portion of the diet, (2) determine the relative energy values of cracked wheat and corn grains for feedlot steers and (3) test the effects of a elevated wheat levels on feedlot performance, liver abscesses and carcass characteristics of steers.

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Materials and Methods

One hundred fifty black and black baldy yearling steers, some of which were crossed with exotic breeds and had been pastured together on wheat near Alva, OK were trucked 185 miles to Panhandle State University, Goodwell, OK on May 17, 1984. On arrival, all steers received routine feedlot vaccinations, were ear tagged and received a Synovex-S® implant. A second Synovex-S® implant was administered 56 days later.

Steers had an average shrunk weight initially of 711 pounds. They were blocked by weight into two groups (674 and 749 lb means) and randomly allocated within block to three treatments. A total of 6 pens (2 per treatment) with 25 steers per pen were used in this experiment. Composition of the finishing diets is shown in Table 1. Animals were gradually switched from the initial diet (50% roughage) to their finishing diet (12% roughage) during the first 56 days of the study. Animals were weighed after trucking (shrunk) initially and on full feed on days 28, 56, 84 and 126 with a pencil shrunk of 4% applied to calculate shrunk weights and weight gains.

After feeding for 126 days, cattle were trucked for slaughter at National Beef, Liberal, KS and data on hot carcass weight, marbling score, preliminary yield grade, fat thickness at the 12th rib, and liver abscess incidence were obtained. Treatment means for performance and carcass characteristics were compared by Analysis of Variance (Steel and Torrie, 1960).

Table 1. Diet composition, dry matter basis.

	Percentage Wheat		
	50%(50W)	75%(75W)	100%(100W)
Ingredients			
Wheat, cracked	40.7	61.1	81.4
Corn, cracked	40.7	20.4	0
Cottonseed hulls	7.00	7.00	7.00
Alfalfa pellets	2.55	2.55	2.55
Molasses	4.00	5.00	5.00
Supplement[a]	5.00	4.00	4.00
Calculated composition, % of dry matter			
Crude protein, %	11.8	12.6	13.6
Calcium, %	.438	.383	.381
Phosphorus, %	.336	.334	.371
Potassium, %	.776	.874	.932
NE_m, mcal/100 lb	90.8	90.6	91.0
NE_g, mcal/100 lb	56.6	57.2	57.8
ME, mcal/kg	2.93	2.97	2.97

[a]Supplements, formulated to provide Monensin, (30 mg/hd/d) and Tylosin, (90 mg/hd/d) in the total diet contained (%): Alfalfa meal, 59.7; cottonseed meal, 10.4; $CaCO_3$, 15.6; urea, 7.68; salt, 5.76; Monensin 60, .47; Vitamin A 30, .23; and Tylosin 40, .23 percent.

Results and Discussion

Daily gains favored cattle fed the 50W diet (Table 2). Daily gain tended to decrease linearly as percentage of wheat in the diet increased. Steers fed 100W gained less rapidly ($P<.05$) than steers fed other diets during 56 to 84 days on feed.
Feed consumption tended to be lower as wheat became more than 50% of the grain in the diet. But feed efficiency was improved by replacing corn by wheat in the diet with 75W producing the lowest feed intake and best efficiency. Part of this effect may be due to energy (starch) digestibility of the wheat being higher than for corn though the higher level of protein in the higher wheat diets (Table 1) may be involved as well.

Table 2. Animal performance with various wheat levels.

	Wheat, percentage		
	50	75	100
Animals	50	50	50
Pens	2	2	2
Period daily gain, lbs			
0-28 days	3.42	3.32	3.50
29-56	3.17	2.91	3.34
57-84	3.31[a]	3.22[a]	2.76[b]
85-126	3.07	2.95	2.85
Cumulative daily gain, lbs			
0-56	3.30	3.12	3.42
57-84, live basis	3.12	3.01	2.77
0-126, live basis	3.23	3.09	3.09
0-126, carcass basis	3.44	3.32	3.22
Period daily feed, lbs			
0-28 days	17.42	16.08	16.20
29-56	21.72	19.49	19.34
57-84	23.75	21.80	22.19
85-126	24.60	22.90	23.27
Cumulative daily feed, lbs			
0-56	19.57	17.79	17.78
57-84	23.91	22.14	22.51
0-126	22.17	20.38	20.59
Period feed/gain ratio			
0-28, live basis	5.09	4.84	4.62
29-56, live basis	6.85	6.69	5.79
57-84, live basis	7.17	6.77	8.03
85-126, live basis	8.01	7.76	8.16
Cumulative feed/gain ratio			
0-56, live basis	5.93	5.70	5.19
57-84, live basis	7.67	7.35	8.12
0-126, carcass basis	6.44	6.13	6.39
Calculated Metabolizable Energy			
mcal/kg diet dry matter	2.60	2.69	2.64

[ab]Means within a row with different superscripts differ ($P<.05$).

Animals with lower initial weights had lower feed intakes, higher rates of gain and more favorable feed efficiency than animals with heavier initial weights (Table 3). This difference could be due to being on an earlier part of the growth curve or to genetic or background differences in the two weight groups. Feed intake continued to increase throughout the feeding trial for lighter steers but intake plateaued for heavier steers near the end of the trial. Intake and efficiency differences match patterns often observed in commercial feedlots.

Table 3. Effects of initial weight grouping on performance and efficiency.

	Starting weight, lb.	
	674	749
Animals	75	75
Cumulative daily gain, lbs		
0-56, live basis	3.28	3.28
57-126, live basis	2.87	3.07
0-126, carcass basis	3.35	3.31
Period daily feed, lbs		
0-28	16.27	16.86
29-56	19.70	20.67
57-84	21.76	23.40
85-126	23.06	24.11
Cumulative daily feed, lbs		
0-56	17.98	18.77
57-84	22.22	23.48
0-126	20.52	21.58
Period feed/gain ratio		
0-28, live basis	4.39	5.40
29-56, live basis	6.88	6.06
57-84, live basis	6.63	8.01
85-126, live basis	8.63	7.44
Cumulative feed/gain ratio		
0-56, live basis	5.48	5.72
57-84, live basis	7.74	7.65
0-126, carcass basis	6.12	6.51
Calculated Metabolizable Energy mcal/kg diet dry matter	2.56	2.66

Most carcass measurement including adjusted gain, hot carcass weight, marbling score and dressing percentage tended to favor steers fed the 50W diet (Table 4). Since the treatment differences in fat thickness and other carcasses measurements were small, the slightly lowered marbling score with the 100W diet may be due to random biological variation.

The incidence of liver abscesses were all high for diets containing the antibiotic tylosin. Incidence of abscesses tended to greater with higher levels of wheat in the diet though the difference was not significant (P>.05). The incidence of liver abscesses was typical of that found in the feedlot industry though higher than most previous

Table 4. Effects of different wheat levels on animal performance and carcass characteristics.

	Wheat, percentage		
	50	75	100
Dressing percentage	63.5	63.6	62.9
Live weight, lbs	1119.1	1101.6	1102.4
Gain/head, live, lbs	407.2	389.2	389.4
Gain/hd, 62% carcass adjusted	434.6	418.5	406.8
Carcass weight, lbs	710.5	701.2	693.8
Marbling score[a]	12.8	12.7	11.8
Yield grade	3.22	3.13	3.13
Fat thickness, inches[b]	.48	.45	.45
Liver abscesses, % of cattle	16	32	22
Cost of gain, $/cwt	54.28	50.68	49.68

[a] 11 = good plus; 12 = choice minus.
[b] Measured at the 12th rib.

studies from the Goodwell station with small pens of cattle and corn or milo based diets.

The metabolizable energy values for the total diet tended to favor the diets containing more wheat. The first increment of cracked wheat added to the 50W diet to increase the percentage of wheat to 75% calculates to have a value 114% that of cracked corn. In contrast, wheat added to the 50W diet to increase wheat to 100% of the diet had a value 103% that of cracked corn for an overall mean advantage for wheat over corn of about 8% for the total ration or about 10% for the wheat alone considering that 81% of the ration dry matter is grain. This advantage for wheat conflicts with tabular values (NRC, 1984) which indicate that dry corn grain has about 102% the metabolizable energy value of wheat. Differences in grain processing and varieties as well as feeding conditions (roughage level and source) may be responsible for this discrepancy. Metabolizable energy values all were about 12% lower than expected from composition of the finishing diet (Table 1). This is probably due to the 56-day period which was needed to adapt cattle to the 88% concentrate diets.

Based on the price of corn grain ($6.61) and wheat ($5.83) when this trial was conducted, the feed cost of gain favored diets higher in wheat. Since wheat at 75% of the grain in the diet gave the highest efficiency, little economic advantage to feeding more than 75% wheat was apparent.

Diets containing up to 100% of their grain from rolled wheat were well utilized by growing steers at a roughage level of 12%. For prevention of metabolic disorders, which appear more frequently with wheat than corn or milo diets, wheat diets should contain an ionophore plus a liver-abscess preventing antibiotic. Good bunk management can make high wheat diets work in the feedlot though the optimal level for wheat feeding may be less than 100%.

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