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Dry and High-Moisture Grain Fed Whole or Rolled With  
Hay or Haylage in Cattle Finishing Diets

J. D. Burkhardt and L. B. Embry

In a previous experiment (A.S. Series 70-20), steers were fed dry or reconstituted high-moisture corn grain, whole or rolled, at 1 lb. per 100 lb. of body weight with alfalfa-brome hay or reconstituted haylage to appetite from weights of about 500 to 825 lb. Higher rates of gain with lower feed requirements were obtained with high-moisture corn and haylage than from dry corn and hay. The greatest benefits from the moist feeds resulted when high-moisture corn and haylage were fed together. There appeared to be a slight advantage for rolling the corn under these conditions of limited grain and full-fed roughage.

The cattle were also used in a finishing experiment where diet treatments were the same as during the growing experiment, except the roughage portion of the diet was limited to low levels with corn grain full-fed. This finishing experiment is reported herein.

Procedures

One hundred twenty-eight yearling steers were used in this experiment. They were randomly allotted after stratifying on basis of weight. Experimental diets were dry or high-moisture corn grain fed whole or rolled with alfalfa-brome hay or reconstituted haylage. Each of the eight treatments was replicated twice with eight animals per pen.

The dry corn contained an average of 12.0% moisture. The high-moisture corn was from the same source with water added, resulting in an average moisture content of 21.9%. The corn was stored in an oxygen-limiting silo by means of an auger with water being added at several points as it was augered into the structure. This method has been used other times to obtain grain with about 28% moisture. However, the moisture content was considerable less this time. Rolling of both dry and high-moisture corn was just prior to feeding. A roller mill having corrugated rollers 10 inches in diameter with about 10 corrugations per inch was used to roll the grain. The dry grain was rolled to a medium degree of fineness while the high-moisture grain was rolled to produce a flattened kernel with a minimum amount of fine material.

The hay was a baled alfalfa-brome mixture and chopped with a forage chopper. The average moisture content was 13.0%. Haylage was reconstituted from the same source of baled hay. It was chopped in the same manner as the dry hay and was blown into an oxygen-limiting silo. Water was added at the forage chopper and at the blower resulting in the moisture content averaging 48.4%.

All cattle were fed hay or haylage at the rate of about 1.5 lb. dry matter per head daily with the appropriate type of corn being fed to appetite. About 2 weeks were used to change from the previous high-roughage diet to the high-concentrate one. A 32% protein supplement was fed at the rate of 2 lb. per head

daily. The supplement was a soybean meal-corn-urea type supplement with added chlortetracycline and vitamin A to furnish 70 mg. and 20,000 I.U., respectively, per head daily. Urea was included at 3% of the supplement. Feeding was once daily in outside paved pens.

The experiment was terminated after 105 days. Carcass data were obtained and livers and rumens were examined for abnormalities.

### Results

Average daily gain for cattle fed dry rolled corn was about the same as for those fed the high-moisture grain (2.64 vs. 2.67 lb.). Differences that existed between various forage and grain preparation treatments with dry or high-moisture corn were not large or consistent. Differences in feed efficiency between dry and high-moisture corn were also small, but feed requirements were consistently lower for cattle fed high-moisture grain. Other research at this station has shown only small differences between dry and high-moisture corn fed with low levels of roughage. Research at other stations has indicated a 26 to 30% moisture level is most desirable for maximum benefits from high-moisture corn. The corn used in this experiment contained somewhat less (21.9%).

Only in the case of dry corn fed with haylage was there any appreciable difference in rate of gain between whole and rolled corn (5.8%). Feed requirements were slightly, but consistently, lower for cattle fed rolled corn, amounting to an average of 4.1%. The advantage was primarily from a reduction in corn requirements. Therefore, processing costs which exceed this value as percent of the price of corn are not likely to be economical under conditions as in this experiment.

Steers fed the reconstituted haylage gained at a slightly faster rate than did those fed dry hay, except when fed dry whole corn. Feed requirements were slightly less (3.4%) for cattle fed diets with haylage. This percent change is small, but it represents the improvement in total feed requirements from the haylage which made up only about 10% of the diet dry matter.

An U.S.D.A. beef grader placed the carcass grades on the animals after about an 18-hour chill. There appeared to be no consistent effect on carcass grade between treatments imposed in this experiment. Dressing percentage also did not vary appreciably between treatments.

Also upon slaughter, rumens were examined for papillae matting, thickness of rumen wall and hair accumulation. These parameters were scored from 1 to 4 with 1 representing normal conditions. Color was scored from 1 to 3 with a higher number representing a darker color. While these scores are very subjective, they give some indication of the changes brought about by the diets.

There appeared to be only small differences in the rumen characteristics studied between animals fed rolled or whole corn grain. Cattle receiving haylage had higher values for color and papillae matting. Animals receiving high-moisture grains tended to have darker rumen walls.

Incidence of abscessed livers amounted to 31 livers or about 24%. Twenty-one of the abscessed livers were from cattle receiving rolled corn. Moisture content of the corn grain or hay did not appear to influence the incidence of abscessed livers.

### Summary

There were only small differences in rate of gain and feed efficiency between whole and rolled corn in this experiment where alfalfa-brome hay or haylage was fed at 1.5 lb. dry matter daily after getting on full feed with a full feed of dry or high-moisture corn.

There appeared to be no benefits from rolling either high-moisture or dry corn grain in the experiment on basis of average daily gain. Feed requirements were slightly lower for rolled grain diets amounting to 4.1%, primarily as corn.

In most instances, steers fed the reconstituted haylage gained slightly faster with slightly lower feed requirements (3.4%) than those fed dry hay. This represents the change in total feed requirements from the haylage which made up only about 10% of the diet.

There was essentially no difference in any of the carcass parameters measured in this experiment. Rumen characteristics examined indicated more papillae matting and darker color for the haylage-fed cattle than for steers fed hay. Also, high-moisture corn grain tended to produce darker rumen walls.

In steers fed rolled grain, the incidence of abscessed livers was twice as high as for those fed whole grain. Moisture content of the roughages or grain appeared to have no effect on the incidence of abscessed livers.

Table 1. Processing Methods and Moisture Content for Grain and Forage in Cattle Diets  
(July 16, 1970–October 29, 1970 - 105 days)

	Dry corn				High-moisture corn <sup>a</sup>			
	Whole		Rolled		Whole		Rolled	
	Hay	Haylage	Hay	Haylage	Hay	Haylage	Hay	Haylage
Number of animals	16	16	16	16	16	16	16	16
Init. shrunk wt., lb.	828	818	823	819	829	821	817	818
Final shrunk wt., lb.	1109	1087	1094	1111	1105	1103	1096	1107
Avg. daily gain, lb.	2.66	2.55	2.58	2.78	2.62	2.68	2.65	2.75
Avg. daily feed, lb. (air-dry)								
Corn	20.12	18.99	18.55	19.14	18.96	18.97	18.62	18.73
Hay or haylage <sup>b</sup>	2.67	2.34	2.64	2.44	2.62	2.35	2.60	2.41
Supplement	2.02	2.02	2.02	2.02	2.02	2.02	2.02	2.02
Total	24.81	23.35	23.21	23.60	23.60	23.34	23.24	23.16
Feed/100 lb. gain, lb. (air-dry)								
Corn	754	744	718	689	722	706	702	680
Hay or haylage	100	91	102	87	99	91	98	88
Supplement	76	79	78	72	77	75	76	73
Total	930	914	898	848	898	872	876	841
Dressing percent	62.0	63.0	62.6	62.7	62.1	62.7	63.0	62.5
Conformation <sup>c</sup>	21.0	21.0	21.3	21.3	21.1	21.3	21.3	21.2
Marbling <sup>d</sup>	4.9	5.5	5.4	4.8	5.3	5.4	5.2	5.6
Carcass grade <sup>c</sup>	18.7	19.6	19.1	18.6	19.1	19.1	19.0	19.5
Kidney fat, %	2.8	3.2	3.0	2.8	2.9	3.0	2.9	3.4
Color <sup>e</sup>	1.6	3.3	1.5	3.3	1.8	3.5	2.4	3.3
Matting <sup>f</sup>	1.2	1.5	1.2	1.5	1.2	1.3	1.5	1.5
Hair <sup>f</sup>	1.0	1.0	1.0	1.0	1.0	1.4	1.0	1.0
Papillae <sup>f</sup>	2.9	2.5	2.5	2.8	2.6	2.6	2.5	2.5
Abscessed livers	2	2	6	5	5	1	4	6

<sup>a</sup> Stored in Harvestore, A. O. Smith Harvestore Products, Inc.

<sup>b</sup> Includes hay or haylage required to get animals on higher concentrate diet.

<sup>c</sup> Good = 17; Choice = 20. Graded to one-third of a grade.

<sup>d</sup> Slight, 4; small, 5; modest, 6.

<sup>e</sup> Higher number represents a darker color.

<sup>f</sup> 1 = normal conditions. Higher number represents an increase in the characteristics.