1995

Effect of Test Weight on the Feed Value of Corn to Feedlot Lambs

C. L. Willms
South Dakota State University

R. H. Pritchard

C. P. Birkelo

A. L. Miron

SDSU

Effect of Test Weight on the Feed Value of Corn to Feedlot Lambs

C.L. Willms,[1] R.H. Pritchard, C.P. Birkelo, and A.L. Miron[1]
Department of Animal and Range Sciences

SHEEP 95-7

Summary

Four lots of corn varying in test weight (54.5, 50.0, 45.5, and 41.0 lb/bu) were fed to lambs (initial weight 84 lb) in a 56-day growth study. There were no differences ($P > .05$) in daily gain or feed efficiency among treatments. Results indicate that light test weight corn has similar feeding value to normal test weight corn. This conclusion assumes no negative effects due to mold or mycotoxins and that diets are mixed by weight not volume.

Key Words: Corn, Test Weight, Lambs

Introduction

Light test weight corn has been a major concern in recent years due to the cool, wet growing conditions and early frost. Limited data exist on the composition and feeding value of light test weight corn. Thornton et al. (1969a) harvested a single variety of corn at four different stages of maturity and found that crude protein, crude fiber, and neutral detergent fiber decreased while fat, nitrogen free extract, and starch increased (% of DM) with advancing maturity. There was little difference in gross energy. However, when expressed as weight per 100 kernels of corn, all proximate constituents increased from mid-dent to mature stage. Less consistent results but similar trends were reported for three lots of corn with differing test weight but unknown agronomic origin. Lamb digestibility studies showed that TDN decreased .34% for each lb/bu decrease in test weight below 54 lb/bu (Thornton et al., 1969b). Since lambs were fed at maintenance, greater differences in digestible energy due to test weight could be observed with ad libitum feeding.

Growth studies with sheep fed light test weight corn have not been conducted. Because substantial discounts are applied to light test weight corn, there are opportunities for livestock producers to market their corn at a higher value through livestock if the feeding value is only slightly decreased, as suggested by the above studies.

The objective of this trial was to evaluate the feeding value of corn with differing test weight in a growth study with lambs fed a finishing diet ad libitum.

Experimental Procedure

Four lots of corn of differing test weights were obtained from local commercial elevators. Corn was checked visually for mold, dryness, and test weight upon receipt. Test weights were measured following standard procedures. The corn test weights were 54.5, 50.0, 45.5, and 41.0 lb per bushel. By design, corn test weight was confounded with agronomic factors such as variety, fertility, and other growing conditions.

One hundred twenty white-faced wether lambs of similar genetic background and originating from one ranch were used in a 56-day growth trial. Lambs were housed in a 24-pen, totally confined, environmentally controlled facility with expanded metal flooring.

Upon arrival, lambs were ear tagged, treated for internal and external parasites, vaccinated against enterotoxemia, and sheared. Lambs

---

Prepared for Sheep Day, June 8, 1995.
[1]Harvest States Cooperative, Sioux Falls, SD.

were then weighed and this weight was used to randomly allot lambs to treatments using a randomized complete block design (6 blocks of pens, 4 corn test weight treatments, and 5 lambs/pen). Lambs were reweighed the following day and placed in assigned pens. Initial weight was considered the average weight from the two days.

Lambs were fed grass hay until started on test. They were then adjusted to all-concentrate finishing diets with the respective corn treatments using a series of diets with decreasing levels of roughage (Table 1). Corn was substituted for a roughage pellet (Table 2) during the adjustment period. Corn with 54.5 lb/bu test weight was used in the first diet across all treatments and fed for four days. The remaining adjustment diets used corn of the respective treatments and were fed three days each. The final diets (85% whole corn; 15% supplement) were fed for the remaining 40 days. The supplement composition is given in Table 3.

Table 1. As fed composition (%) of diets fed to lambs

	Diet[a]					
Item	1	2	3	4	5	6
Roughage pellet	60	45	30	15	8	0
Whole corn[b]	25	40	55	70	77	85
Supplement	15	15	15	15	15	15

[a]Diet 1 was fed for 4 days, diets 2, 3, 4, and 5 were fed for 3 days each, and diet 6 was fed 40 days.
[b]All lambs were fed 54.5 lb/bu corn in diet 1. Diets 2, 3, 4, 5, and 6 used corn of differing test weights for appropriate treatments.

Table 2. As-fed composition of the roughage pellet

Ingredient	%
Wheat middlings	24.55
Corn cobs	23.25
Soy hulls	15.00
Oat hulls	10.00
Sun-cured alfalfa	10.00
Wheat	10.00
Molasses	5.00
Lignin sulfonate	1.25
Animal fat	.50
Calcium oxide	.40
Anise flavor	.05
Crude protein[a]	10.1
Neutral detergent fiber[a]	47.4
Acid detergent fiber[a]	25.8

[a]Calculated values.

Diets were formulated to contain 30 g/ton lasalocid and 15% minimum crude protein. Protein in excess of NRC (1975) requirements was fed in order to avoid effects due to potential differences in protein content of the test corns. Samples of each diet were collected at the time of mixing for subsequent DM analysis.

Feed was offered ad libitum in self-feeders, but feed was added daily to keep feed fresh. Feed refusals were weighed and removed as needed. Body weights were obtained at 28 and 56 days. The final weight was adjusted to a constant dressing percentage. Carcass data were collected after slaughter.

Feedlot performance data were analyzed as a completely randomized block design with pen as the experimental unit. Carcass data were analyzed as a completely randomized design with each individual lamb as the experimental unit. Treatment means were separated using the LSD method after a significant F-test ($P<.05$).

Results and Discussion

There were no effects due to block or block x treatment interaction on any feedlot performance criteria. This would indicate that

Table 3. As-fed composition of the protein supplement

Ingredient	%
Soybean meal, 47%	72.00
Meat and bone meal	2.50
Sun-cured alfalfa	2.00
Molasses	5.00
Calcium carbonate	9.00
Salt	3.50
Ammonium chloride	2.50
Dicalcium phosphate	.60
Calcium sulfate	.57
Vitamin premix[a]	1.50
Trace mineral premix[b]	.50
Selenium premix, 1600 ppm	.13
Lasalocid premix[c]	.15
Anise flavor	.05
Crude protein[d]	40.0
Calcium[d]	4.35
Phosphorus[d]	.65

[a]Provided 1,773,000 IU of vitamin A, 295,000 IU of vitamin D, and 6,700 IU of vitamin E per pound.
[b] Guaranteed analyses: 5.0% Fe, 12.0% Mn, 15.0% Zn, .5% I, .07% Co, and 15.0% Mg.
[c]Provided 68 g of lasalocid/lb.
[d]Calculated values.

pen location did not create environmental effects that impacted performance.

Performance data are given in Table 4. All lambs started the trial weighing approximately 84 lb. Average daily gain was not different for any of the corn test weights during either time period. During the first 28 days, lambs fed the lightest test weight corn (41.0 lb/bu) tended ($P<.07$) to consume less dry matter than lambs fed 54.5 and 45.5 lb/bu corn. Gain/feed did not differ among treatments.

There were no differences ($P>.05$) in carcass traits among treatments (Table 5). There was only a tendency ($P<.12$) for lambs fed 54.5 lb/bu corn to be fatter than lambs fed 50.0 and 41.0 lb/bu corn. This substantiates that composition of gain was similar across treatments.

The results of this study are in general agreement with other recent studies showing no detrimental effect of light test weight corn on performance in pigs (Cizmarik et al., 1994; Hansen et al., 1994; Johnson, 1994) and cattle (Rush et al., 1994).

Conclusions

There were no differences ($P>.05$) in daily gain or efficiency of gain among treatments. Results indicate that light test weight corn has similar feeding value to normal test weight corn. This conclusion assumes no negative effects due to mold or mycotoxins and that diets are mixed by weight not volume.

References

Cizmarik, P. P., W. G. Bergen, D. W. Rozeboom, D. A. Nelson, S. R. Debar, and E. R. Miller. 1994. Influence of bulk density on nutritional value of corn fed to growing pigs. J. Anim. Sci. 72(Suppl. 1):58.

Hansen, E. L., C. R. Hamilton, D. N. Peters, and G. W. Libal. 1994. Influence of corn density on pig growth and nutrient digestibility. J. Anim. Sci. 72(Suppl. 1):57.

Johnston, L. J. 1994. Effect of harvest year, moisture content, and bulk density of corn on performance of growing-finishing pigs. J. Anim. Sci. 72(Suppl. 1):57.

NRC. 1975. Nutrient Requirements of Sheep (6th Ed.). National Academy Press, Washington, DC.

Rush, I. G., B. A. Weichenthal, and B. G. Van Pelt. 1994. Feeding value of light-test weight corn for steers. J. Anim. Sci. 72(Suppl. 1):43.

Thornton, J. H., R. D. Goodrich, and J. C. Meiske. 1969a. Corn maturity. I. Composition of corn grain of various maturities and test weights. J. Anim. Sci. 29:977.

Thornton, J. D., R. D. Goodrich, and J. C. Meiske. 1969b. Corn maturity. II. Digestibility of nutrients and energy value of corn grain of various maturities and test weights. J. Anim. Sci. 29:983.

Table 4. Effect of corn bulk density on the feedlot performance of lambs

	Corn test weight, lb/bu				
Item	54.5	50.0	45.5	41.0	SE
Body weight, lb					
Initial (day 1)	83.9	84.0	84.0	83.8	
Mid (day 28)	102.2	99.3	102.0	99.9	
Final (day 56)	119.6	116.1	120.4	116.5	
Average daily gain, lb/day					
Days 1-28	.655	.546	.640	.574	.037
Days 29-56	.619	.601	.658	.593	.040
Days 1-56	.637	.573	.649	.584	.028
Days 1-56 adjusted[a]	.645	.578	.642	.578	.026
Dry matter intake, lb/day					
Days 1-28	3.12[b]	2.98[bc]	3.15[b]	2.90[c]	.067
Days 29-56	3.02	2.90	3.02	2.83	.090
Days 1-56	3.07[de]	2.94[de]	3.09[d]	2.87[e]	.068
Gain/feed					
Days 1-28	.209	.182	.203	.197	.010
Days 29-56	.206	.208	.217	.210	.011
Days 1-56	.208	.195	.210	.203	.0062
Days 1-56 adjusted	.210	.196	.208	.201	.0051

[a]Weights and efficiencies based on adjustment to constant dressing percentage.
[b,c]Means in the same row with different superscripts differ (P=.065).
[d,e]Means in the same row with different superscripts differ (P=.113).

Table 5. Effect of corn bulk density on carcass characteristics of lambs

	Corn test weight, lb/bu				
Item	54.5	50.0	45.5	41.0	SE
Dressing percent	53.15	53.06	53.78	52.74	.2930
Fat thickness, in.	.266[c]	.227[b]	.246[bc]	.223[b]	.0137
Leg score[a]	11.80	11.56	11.53	11.67	.1178
Rib eye area, sq. in.	2.31	2.35	2.38	2.37	.0343

[a]Leg conformation score: low choice = 10; avg choice = 11; high choice = 12; low prime = 13; avg prime = 14; high prime = 15.
[b,c]Means in the same row with different superscripts differ (P<.12).