EVALUATION OF HEAT DAMAGED CORN AS AN ENERGY SOURCE FOR FINISHING LAMBS

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Summary

The objective of this experiment was to examine the effect of heat damaged corn on performance of finishing lambs. Damaged corn used was harvested in 1990 at a high moisture level (22% moisture) and stored. After about 8 mo. of storage, the corn was hot, discolored, off-odor and high in moisture. The damaged corn was not of acceptable quality to market through normal grain marketing channels. The heat damaged corn did test negative for vomitoxin, aflatoxin, zearalenone and ochratoxin.

A lamb finishing study was designed to investigate the use of heat damaged corn as an energy source for finishing lambs. A 42-day trial was conducted testing three diets. Diets differed only in corn used as an energy source and were: 1) 100% of corn as normal corn (NC), 2) 50% normal corn and 50% damaged corn (N+DC) and 3) 100% as damaged corn (DC). Diets used to finish lambs were whole shelled corn (85%) and a 40% crude protein supplement pellet (15% of diet).

Response variables used to evaluate effect of corn source on performance of lambs were: average daily gain (ADG), daily pen (4 lambs per pen) feed intake, feed efficiency, feed cost per pound of gain and selected carcass traits. Lamb ADG for the 42-day trial was not significantly different for the lambs consuming NC rations (.757 lbs), NC+DC rations (.742 lbs) or DC diets (.685 lbs). Daily pen feed intake for lambs consuming the NC diets (12.81 lbs), N+DC diets (11.55 lbs) and the DC diets (12.22 lbs) were not statistically different. Feed efficiency (lbs feed per lb gain) was not different between lambs consuming the NC (4.24), N+DC (4.01) and DC (4.49). Feed cost per pound of gain was $.24 for lambs fed the normal corn, $.19 for lambs on the blend of normal and damaged corn and $.17 for lambs fed the heat damaged corn. Carcass traits of hot carcass weight, dressing percent, fat depth and kidney and pelvic fat was not different in lambs regardless of diet fed.

Therefore, the use of heat damaged corn may be an economical source of energy for finishing lambs. Also, the feeding of damaged corn to lambs may be one method of adding value to a commodity not salable through normal marketing channels.

Introduction

Normally, feed costs are the largest, single expense in finishing lambs to an acceptable weight and carcass grade. Of the feed inputs, energy in the form of concentrates is a primary consideration. Past research has shown the most cost effective, efficient method of finishing lambs is to feed a diet of whole shelled corn along with a pelleted supplement.

Use of by-product feeds, damaged feeds, or lower cost feedstuffs can be used to lower the cost of gain by lambs and also add value to a less valuable commodity.

The objective of the research reported in this article was to examine the effect of using heat damaged corn as an energy source on performance, cost of gain and carcass traits of finishing lambs.

Procedures

Forty-eight Polypay cross ewe and wether lambs averaging 82.5 lbs were utilized to study three finishing diets. Lambs were dewormed, sheared and randomized by sex into three treatments for a 42-day feeding trial. The dietary treatments differed in the corn used as an energy source.

Corn was harvested in 1990 with a moisture content of 22% and was stored in a bin with air circulation, but without capability of heat to dry it. After about 8 months of storage, corn was hot (95o F), discolored, off-odor and contained 22% moisture. The corn was not of acceptable quality to market through normal grain marketing channels. After the eight months of storage, the corn was transferred to

another bin and dried. Chemical composition of the normal and damaged corn is presented in Table 1. Damaged corn tested negative for vomitoxin, aflatoxin, zearalenone and ochratoxin.

Finishing diets consisted of whole shelled corn and a 40% CP supplement with 30 grams per ton of lasalocid. Diets consisted of 85% whole shelled corn and 15% pelleted supplement and were offered ad libitum. Dietary treatments differed only in corn source utilized and were: 100% of corn as normal corn (NC), 50% normal corn and 50% damaged corn (N + DC), and 100% damaged corn (DC). Salt and mineral was offered on a free choice basis. Table 2 contains analysis of the three diets.

Lambs were fed in confinement on mesh screen floors with four lambs per pen. Each treatment was replicated four times for a total of 12 pens and 48 lambs. Each pen contained one wether and three ewe lambs.

Lambs were weighed and feed weighbacks were taken every 14 days. Feed intake data is reported on a pen basis.

Data was analyzed as a completely random split plot design, with diet as the whole plot treatment and weigh period as the subplot. Response variables included: average daily gain (ADG) pen feed intake (PFI), feed to gain ration (FG), feed cost per pound of gain (CG), fat depth (FD), hot carcass weight (CW), dressing percent (DP) and kidney and pelvic fat (KP).

Results and Discussion

One lamb from the D + NC treatment was pulled from the study after the 14-day weigh period because of sickness. All other lambs appeared healthy and normal.

There was some variation in CP content of the three diets (from 15.8% to 13.7%) (Table 2), that was attributed to the crude protein content of the normal corn.

Effect of corn type on lamb ADG, FI, FE and feed cost per pound gain. There was no ($P > .09$) interaction between treatment and period on ADG by lambs. Lambs average 82.5 lbs. at the start of the trial and there was no significant difference in ADG by the lambs over the 42-day trial. Although ADG by lambs consuming the DC diets (.685) was approaching ($P < .11$) significance as compared to lambs fed NC (.757) finishing diets.

There was no difference in daily pen FI (table 3) between lambs consuming either NC, N+DC or DC as a dietary energy source. There did not appear to be a problem with lambs sorting and preferentially consuming the protein pellet or the corn, however, lambs consuming the N+DC diets may have been consuming the normal corn before they consumed the damaged corn. There was a trend ($P < .12$) for lambs fed the NC diets (12.81 lbs.) to consume more on a daily pen basis than lambs fed a blend (N+DC) of the corn types (11.55 lbs). Daily pen FI values for the N+DC treatment utilized a weighted average intake calculation for the pen with the missing animal.

Pounds of feed required per pound of lamb gain (FE) was not significantly different between the three dietary treatments. Although, the lambs consuming the N+DC diets (4.01 lbs.) tended ($P < .11$) to be more efficient than lambs consuming the DC (4.49) diet.

Feed cost per pound of gain for the lambs consuming the NC diets was highest ($.24), with intermediate feed costs for the lambs fed N+DC ($.19) and the most economical gain was exhibited by lambs consuming the DC ($.17) diets. Since there was no significant difference in lamb ADG, pen FI or FE the damaged corn would be equal in value to the normal corn used in this study.

Effect of period on lamb performance. There was a significant difference ($P < .05$) on lamb ADG, daily pen FI and FE by period (table 4). Lamb ADG was higher ($P < .05$) for days 14 to 28 (.846 lbs.) and days 28 to 42 (.781 lbs.) than for the first 14 days (.563 lbs.) of the trial. Daily pen FI by the lambs was significantly higher for the 28 to 42 day portion of the trial than the other two data collection periods.

Lamb FE was greatest (P < .05) for the middle (14 to 28 days) period as compared to periods one or three. The increase in feed consumption for the 28 to 42 day period without a corresponding increase in growth rate indicates that the lambs were depositing fat and not muscle tissue.

Effect of diet on carcass traits. The wether lamb from each pen was slaughtered and carcass data collected. This equaled four lambs per treatment, for a total of 12 lambs. There was no difference (table 5) in hot carcass weight or in dressing percent of the lambs.

Data for fat depth and KP fat support the observation of the period effects on FE, that the last 14 days of the study FE decreased due to fat deposition. There was no significant difference of diet on carcass fat depth or kidney and pelvic fat. Carcasses from all treatments had excess internal and external fat. However, this was probably related to genotype and the length of the feeding period rather than diets used.

Implications

There was no difference in ADG, daily pen FI, feed to gain ratio or selected carcass traits by lambs fed either normal corn, heat damaged corn or an equal mix of normal and damaged corn as the energy source during finishing. Based on commodity prices (corn, supplement) at the time the study was conducted, inclusion of heat damaged corn either as 50% or 100% of the grain fed lowered feed cost per pound of gain. Since there was no effect on performance by the finishing lambs due to diet, the value of the damaged corn was increased to a level equal that of the normal corn.

Performance of lambs on heat damaged corn could possibly depend in large part on the extent of heat damage to a particular batch or bin of corn. Corn used in this study was not a significant factor in growth and performance. However, extent of damage to other lots of corn could be larger than corn used in this study. Certainly, when feeding corn that has undergone abnormal storage, it would be prudent to test for potential toxic compounds.

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Table 1. Chemical Composition of Normal and Heat Damaged Corn

	Corn Type	
Item*	**Normal**	**Damaged**
Dry Matter, %	89.27	90.82
Crude Protein, %	7.45	8.30
ADF, %	1.54	2.85
Ca, %	-------	-------
P, %	.25	.23

*All on Dry Matter Basis

Table 2. Nutritional Composition of Dietary Treatments

	Corn Type		
Item*	100%	50%	100%

	Normal	Damaged	Damaged
Dry Matter, %	91.23	90.02	90.41
Crude Protein, %	15.83	13.74	14.23
ADF, %	1.44	1.71	2.59
Ca, %	.45	.41	.52
P, %	.46	.38	.44

*All on Dry Matter Basis

Table 3. Influence of Corn Type on Performance of Finishing Lambs

	Corn Type			
Item	**100% Normal**	**50% Damaged**	**100% Damaged**	**SEM**
Initial wt., lbs.	83.06	81.68	82.81	
Daily gain, lbs.	.757[a]	.742[a]	.685[a]	.029
Daily pen FI, lbs.	12.81[a]	11.55[a]	12.22[a]	.504
Feed/gain, lbs.	4.24[a]	4.01[a]	4.49[a]	.19
Feed cost/lb. gain*	$.24	$.19	$.17	

[a]Means within same row not followed by common superscript differ (P < .05)

*Assumes normal corn at $2.50/bushel, damaged corn at $1.25/bushel and protein supplement at $12.50/cwt.

Table 4. Effect of Period on Lamb Performance

	Days			
Item	**0 to 14**	**14 to 28**	**28 to 42**	**SEM**
Daily gain, lbs.	.563[a]	.846[b]	.781[b]	.036
Daily pen FI, lbs.	11.1[a]	10.1[a]	15.3[b]	.31
Feed/gain, lbs.	5.19[a]	3.08[b]	5.15[a]	.284

[a,b]Means within same row not followed by a common superscript differ (P < .05)

Table 5. Effect of Corn Type on Carcass Traits

	Corn Type			
Item*	**100% Normal**	**50% Damaged**	**100% Damaged**	**SEM**

Hot carcass, lbs.	68.0	63.0	67.6	2.45
Dressing percent	56.1	54.8	53.6	1.26
Fat depth, in.	.31	.34	.41	.048
Kidney-pelvic fat, %	4.98	4.28	4.58	.38

*Means within rows are not significantly different.