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Research Series-AS-72-1
January, 1972

Roughage Source-Tallow Level Relationships in High Energy Finishing Rations[1]

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Roughage sources for finishing rations on the High-Plains are in short supply and in many instances are more expensive than grains. Further complicating the situation is the lack of adequate data on the nutritive value of various roughages when fed in high energy finishing rations. Research presented in this paper is from a continuing program designed to provide information relative to the feeding value of various roughages available to cattle feeders in the Southwest.

Animal tallow has found wide use and acceptance in livestock feeding as a concentrated source of energy. Tallow, which is a by-product from the packing industry has been used for many years in poultry rations, and has only within the past 10 years found acceptance in the cattle feeding industry.

The objective of the present trial was to investigate the feeding value of animal tallow in high energy finishing rations with different sources of roughages.

Experimental Procedure

One-hundred thirty-five steers weighing approximately 675 lb were randomly assigned to nine treatments with three pens of five animals each. Treatments are listed below by roughage and tallow level.

1. hay with 0% tallow
2. hay with 2% tallow
3. hay with 4% tallow
4. corn silage with 0% tallow
5. corn silage with 2% tallow
6. corn silage with 4% tallow
7. cottonseed hulls with 0% tallow
8. cottonseed hulls with 2% tallow
9. cottonseed hulls with 4% tallow

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[1]Data reported in this paper is from continuing studies supported by the Texas Cattle Feeders Assn., Amarillo, Texas. Special consideration is due Mr. Lloyd Bergsma, Exec. Vice President.

Animal tallow used in the trial was acquired from a local packing plant and met Fat Trading Standards established in 1971. Hay used in the study was an irrigated sudan x sudan grass (Northrup-King Trudan 2) cut at the pre-boot stage. Corn silage was a combination of grain, silage, and dual purpose varieties. Cottonseed hulls were typical of those used in area feedyards.

Roughage and ration analyses are presented in table 1 and 2, respectively. All rations contained 10% roughage on an "as fed" basis, and were formulated to be isonitrogenous. Milo used in the trial was dry-rolled processed (table 3).

TABLE 1. PROXIMATE ANALYSIS OF EXPERIMENTAL ROUGHAGES

Item	Experimental roughage		
	Hay[1]	Silage[2]	Cottonseed hulls
Ash	11.2	6.4	2.8
Ether extract	1.9	2.8	1.5
Crude fiber	27.8	25.1	47.5
Crude protein	11.2	7.5	4.3
Nitrogen-free-extract	47.9	58.2	43.9

[1]Hay was Northrup-King Trudan 2

[2]Corn silage - combination of Northrup-King varieties PX 63, PX 635, KT 680, and NK 717.

All steers were individually identified, implanted with 24 mg of diethylstibestrol, given routine vaccinations, individually weighed and allotted to treatments after a 21 day adjustment period. Cattle were fed for 153 days and slaughtered.

Results

Performance and carcass data are presented in table 4. Several points should be noted as background information to the discussion of results obtained in the trial. Cattle used in the trial were heavier with more finish than normally preferred by feeders in the area. This resulted in the difficulty of obtaining at least a 150 day feeding period before slaughter without producing excessive finish. These conditions probably contributed greatly to the poorer feed conversion, and subsequent higher cost of gain. Dry-rolled processed milo is also implicated in the high feed costs. Carcass data revealed higher dressing percents and fat thicknesses than desired, with only 50% of the carcasses grading choice.

TABLE 2. PROXIMATE ANALYSIS OF EXPERIMENTAL RATIONS

Percent tallow[1]	Proximate components as % of dry matter				
	Ash	Ether extract	Crude fiber	Crude protein	Nitrogen-free-extract
			Grass hay		
0	3.88	2.83	4.99	14.87	73.43
2	3.74	4.60	5.36	13.81	72.49
4	4.45	7.32	5.40	15.37	67.46
			Corn silage		
0	4.01	3.11	5.34	14.75	72.79
2	4.00	5.51	6.18	14.75	69.56
4	4.30	7.19	5.76	14.50	69.15
			Cottonseed hulls		
0	3.23	3.20	7.00	13.75	72.82
2	2.61	4.56	6.57	13.91	72.35
4	3.50	7.99	6.84	15.25	66.42

[1]Animal tallow meeting Fat Trading Standards, 1971.

TABLE 3. BASAL EXPERIMENTAL RATION

Item	Percent of ingredient
Dry-rolled milo	80.0
Cottonseed meal	2.2
Hay, silage or cottonseed hulls	10.0
Molasses, cane	5.0
Tallow[1]	0.0
Premix	2.8
Total	100.0
	Premix
Milo	47.6
Urea	15.8
Calcium source	15.8
Salt	15.8
Sulfur source	3.2
Vitamin A mix	0.5
Antibiotics source	1.3
	100.0

[1]Tallow levels of 2 and 4% were added by replacing equal portions of milo.

TABLE 4. EFFECT OF TALLOW LEVEL AND ROUGHAGE SOURCE ON FEEDLOT PERFORMANCE AND CARCASS TRAITS OF STEERS

	Experimental ration								
Item	Roughage source	Hay			Corn silage			Cottonseed hulls	
	% Tallow	0	2	4	0	2	4	0	2	4
No. animals		13	14	15	15	15	15	15	15	14
Initial wt., lb.		697	668	681	681	685	671	671	662	680
Final wt., lb.		1123	1098	1099	1098	1105	1077	1101	1085	1069
Av. daily gain, lb.		2.78	2.75	2.73	2.73	2.75	2.72	2.81	2.76	2.54
Feed consumption, lb		29.17	25.99	23.86	26.04	25.00	24.15	24.55	24.24	21.85
Feed conversion, lb.		10.42	9,48	8.78	9.56	9.11	8.89	8.86	8.81	8.64
Carcass wt., lb.		730	707	713	716	718	696	721	703	679
Dressing percent		65.0	65.0	64.9	65.2	65.0	64.6	65.5	64.8	63.5
Fat thickness, in.		0.63	0.63	0.65	0.55	0.52	0.54	0.69	0.63	0.59
Quality grade[1]		11.3	11.2	11.4	11.5	11.1	11.7	11.2	11.5	11.2
Liver abscesses		0	1	1	1	0	0	1	1	1

[1]USDA Quality grade - 10 = average good, 11 = high good, 12 = low choice.

Average daily gains were extremely uniform for the hay and corn silage groups with no apparent effect from the addition of animal tallow, however, gains decreased in the cottonseed hulls treatment with the addition of tallow (table 4). Feed consumption was highest for hay, intermediate for corn silage, and lowest for the cottonseed hull treatment, while feed conversion improved with the addition of tallow to each roughage treatment. Tallow levels exhibited less influence on feed conversion in the cottonseed hull treatment than in the others. Conversion ratios were closely related to feed consumption values. These data suggest a poor utilization of energy components in the rations containing hay and corn silage, since poor feed consumption accompanied high feed intake values.

The effect of tallow level on feedlot performance and carcass traits are presented in table 5. There were no significant differences in daily gain eventhough there was a trend for cattle fed rations containing 4% tallow to have lower gains. Feed consumption decreased significantly ($P<.05$) with increased levels of tallow. This effect is normally observed as energy concentration of finishing rations is increased. Significant ($P<.05$) improvements were noted for feed con-

TABLE 5. EFFECT OF PERCENT TALLOW ON PERFORMANCE AND CARCASS TRAITS OF STEERS FED HIGH ENERGY FINISHING RATIONS

Item	Tallow level (%)		
	0	2	4
No. Animals	43	44	44
Initial wt., lb.	682	672	674
Final wt., lb.	1107	1093	1082
Av. daily gain, lb.	2.77	2.75	2.67
Feed consumption, lb.	26.59[a]	25.08[b]	23.29[c]
Feed conversion, lb.	9.58[a]	9.13[a,b]	8.77[b]
Carcass wt., lb.	722	709	696
Dressing percent	65.2	64.9	64.3
Fat thickness, in.	0.62	0.59	0.59
Marbling score[1]	4.7	4.7	4.9
Quality grade[2]	11.3	11.3	11.4
Liver abscesses	2	2	2

[a,b,c]Mean on the same line with different superscripts are significantly different at the 5% level.

[1]Slight = 4; Small = 5; Modest = 6.

[2]Good plus = 11; Choice minus = 12.

version with each 2% increment of added tallow. These data closely agree with that reported by Arizona workers (Hale et al., 1965; 1966; and 1967). These workers have consistently reported increased feed efficiencies with 4% added tallow regardless of source or quality of roughage, but gains have only increased in rations containing poor quality roughages such as cottonseed hulls. These reports pertain to finishing rations with 20% roughages which may not be applicable to the data from the present trial since rations contained only 10% roughage.

The effect of roughage source on feedlot performance and carcass traits is presented in table 6. Alfalfa hay was deleted from this trial purposely since considerable data are available showing comparisons between alfalfa and poor quality roughages. Average daily gain was not significantly affected by roughage source. Feed consumption was highest with hay, intermediate with silage, and lowest with cottonseed hulls. Cattle fed the hay ration were least efficient ($P<.05$) in feed conversion while those fed cottonseed hulls were most efficient. Roughage source appeared to have little affect on carcass traits.

TABLE 6. EFFECT OF ROUGHAGE SOURCE ON FEEDLOT PERFORMANCE AND CARCASS TRAITS OF STEERS FED HIGH ENERGY FINISHING RATIONS

Item	Hay	Silage	Cottonseed hulls
No. animals	42	45	44
Initial wt., lb.	682	676	671
Final wt., lb.	1103	1093	1085
Av. daily gain, lb.	2.75	2.73	2.71
Feed consumption, lb.	26.34	25.06	23.55
Feed conversion, lb.	9.56[a]	9.19[a,b]	8.74[b]
Carcass wt., lb.	717	710	701
Dressing percent	65.0	65.2	64.6
Fat thickness, in.	0.64	0.54	0.64
Marbling score[1]	4.8	4.8	4.7
Quality grade[2]	11.3	11.3	11.3
Liver abscesses	2	1	3

[a,b]Means on the same line with different superscripts are significantly different at the 5% level.

[1]Slight = 4; Small = 5; Modest = 6.

[2]Good plus = 11; Choice minus = 12.

Roughage source had a marked influence on cattle performance. In high energy finishing rations such as those fed in the present study, roughage is not expected to contribute to the energy content of the ration, but rather to serve in slowing the rate of passage of the feed through the rumen. This in turn allows a uniform and complete digestion of the grain portion of the ration. All roughages used in the present trial were considered lower in quality than alfalfa hay. There was a considerable difference in crude fiber between the three materials (table 1). Based on this difference it is justifiable to suggest that the high fiber content of the cottonseed hulls, due to its slow rate of digestion, resulted in lowered feed consumption with resulting increase in grain digestion and energy utilization.

Economics

In studies of this nature economics are generally not discussed due to small numbers of animals and to the high feed costs resulting from low volume purchasing. However, since the primary stimulus for this research was to determine the value of tallow in high energy finishing rations, an attempt will be made to discuss the economics involved. It is suggested that values presented in this paper be considered only as examples and that each feeder apply his own values.

A cost analysis for the data is presented in table 7. Data in this trial indicated that with the addition of each 2% tallow to the ration, that approximately 5% increase in feed efficiency was obtained. This was equivalent to the added cost to the ration from the inclusion of tallow at 8¢ per lb. Therefore, to realize an economic advantage from the addition tallow, either an increase in efficiency of greater than 5% for each 2% added tallow, or a decrease in tallow price must occur. Eventhough there was a marked decrease in feed consumption and increase in feed efficiency resulting from the addition of tallow in the trial, there was no advantage in feed cost per 100 lb. of gain because of the cost of tallow.

TABLE 7. COST ANALYSIS FOR EXPERIMENTAL TREATMENTS

	Tallow level (%)		
	0	2	4
No. animals	43	44	44
Total gain, lb.	425	421	408
Av. daily gain, lb.	2.77	2.75	2.67
Total feed consumption, lb.	4068	3837	3563
Daily feed consumption, lb.	26.59	25.08	23.29
Feed per 100 lb. gain	958	913	877
Feed cost per ton	$50.00	$52.60	$54.99
Feed cost per 100 lb. gain	$23.93	$23.96	$23.92

Summary

The objective of the trial reported herein was to evaluate the use of hay, corn silage, and cottonseed hulls as roughage sources in high energy finishing rations containing either 0, 2, or 4% animal tallow. There was no particular advantage in daily gain on any of the rations due to roughage source or tallow level; however, there was a trend for cattle fed rations containing 4% tallow to have slightly lower gains. Feed consumption decreased significantly ($P<.05$) with increased levels of tallow. Feed conversions were significantly ($P<.05$) improved for cattle fed rations containing added levels of tallow. The only significant ($P<.05$) effect from roughage source was an improvement in feed efficiency in the cottonseed hull group.

Data indicated that for each 2% added tallow to the ration, 5% increase in efficiency was obtained. However, tallow cost (8¢ per lb. in the present trial) offset any advantage in feed efficiency due to the addition of tallow. It was concluded that either a greater increase in feed efficiency or a reduction in tallow cost must be obtained to make feeding of tallow economically feasible.

Literature Cited

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