

Digestibility of Feedlot Waste

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Story in Brief

Because of the recent intense interest on the possibilities of recycling feedlot waste through ruminant animals as a means of disposing of this agricultural pollutant, two digestion trials were conducted this past year to determine the digestibility of typical feedlot waste. The feedlot wastes utilized were characterized by very high ash content varying from 35 to 44 percent. Most of this was a highly indigestible and insoluble form of ash resembling sand. The organic matter portion of the feedlot waste, however, consisted of between 20 and 30 percent crude protein and 25 to 43 percent fiber.

Three separate samples of feedlot wastes were included in digestion trials with sheep at levels of 25 and 40 percent. Digestibilities of the dry matter of the feedlot waste component varied from 35 to 50 percent. Digestibilities for organic matter varied from 42 to 56 percent and for crude protein they varied from 60 to 71 percent digestibility.

Introduction

Recently considerable interest has been shown in the search for systems for removal and possible utilization of feedlot wastes from large feedlot operations such as those in western Oklahoma. Laws and regulations governing the handling of feedlot wastes are becoming more restrictive every year and it would appear that enforcement of the requirement for some system to handle this material might be mandatory before long. Scientists, therefore, have been looking for economic systems for utilizing the waste for other purposes. One of the proposed uses has been the recycling of the waste through other ruminant animals to utilize any additional nutritive value they might contain.

Previous work conducted with manure and animal wastes, collected from confinement operations in the east and pure samples of manure from animals such as dairy cows, have shown that there is considerable nutritive value remaining in the feces when they have been voided. However, most of these studies have not been conducted with the kind of feedlot wastes which are typical of Oklahoma feedlots. In the case of feedlots in the southern high plains, not only are the rations often different from those fed in other areas of the country but the systems for collecting, removal and storage of the feedlot wastes are considerably different. Therefore, this experiment was initiated to investigate the nu-

tritive value of feedlot wastes as a component of rations for ruminant animals.

Materials and Methods

Three samples of feedlot wastes were obtained from typical feedlot operations. The first was a sample from the mound of material which has been collected at the Texas County Feedlot in Guymon, Oklahoma. The second and third samples were obtained from the Ark Valley Feedlot, Arkansas City, Kansas, one being a feedlot waste from a growing lot and the other from a finishing lot. These latter two were removed directly from the lots themselves.

The feedlot wastes were included in rations at the level of 25 and 40 percent as shown in Table 1. These were basically high roughage rations consisting of cottonseed hulls plus a small amount of alfalfa meal and the feedlot wastes were substituted for the cottonseed hulls. These rations were fed to sheep in digestion trials and apparent digestibilities of the ration components were determined by the usual techniques. Based on the digestibilities observed, the theoretical digestibility of the feedlot waste itself was calculated.

Results and Discussion

Table 2 presents a summary of the composition of the feedlot wastes utilized in these experiments. It will be observed, first of all, that they were extremely high in ash content varying from 35 to 43.5 percent. Investigation of the solubility and digestibility of the ash showed that these parameters were close to zero which suggested that the ash or mineral content was primarily due to collection of wind blown dust and sand with the feedlot wastes in addition to soil included at the time of remov-

Table 1. Composition of Rations Containing Feedlot Wastes

Ingredient	Percent on Air Dry Basis						
	1	2	3	4	5	6	7
Cottonseed hulls	81	56	41	56	41	56	41
Dried feedlot waste, No. 1 ¹	-	25	40	-	-	-	-
No. 2	-	-	-	25	40	-	-
No. 3	-	-	-	-	-	25	40
Alfalfa meal, 17%	10	10	10	10	10	10	0
Soybean meal, 44%	8	8	8	8	8	8	0
Dicalcium phosphate	0.5	0.5	0.5	0.5	0.5	0.5	0.5
T. M. Salt	0.5	0.5	0.5	0.5	0.5	0.5	0.5
Vit A	+	+	+	+	+	+	+

¹No. 1. From Texas County Feedlot
 No. 2. Ark Valley Feedlot, Growing Lot
 No. 3. Ark Valley Feedlot, Finishing Lot

Table 2. Composition of Feedlot Wastes

Component	Percent Composition, D.M. Basis ¹		
	No. 1 ¹	No. 2 ²	No. 3 ³
Ash	43.5	36.4	35.2
Crude protein	14.8 (26.2)	15.0 (23.6)	19.2 (29.6)
Ether extract	2.9 (5.1)		
Cell walls	24.4 (43.2)	24.7 (38.8)	21.6 (33.3)
Acid det fiber	24.4 (43.2)	22.1 (34.7)	17.3 (26.7)
Cellulose	15.8 (28.0)	18.8 (29.6)	17.7 (27.3)
Lignin	5.0 (8.8)		

¹ Texas County Feedlot

² Ark Valley Feedlot, Growing Lots

³ Ark-Vally Feedlot, Finishing Lots

⁴ Figures in parenthesis are on ash free basis

al from the lot. The crude protein content varied from 15 to 19 percent on an "as is" basis and if this were calculated on an ash free basis it would vary from 20 to 30 percent. Furthermore, the acid detergent fiber content when calculated on an ash free basis varied from 25 to 40 percent.

The digestibilities of these rations and their components are shown in Tables 3 and 4. It will be noted, first of all, that in spite of the high percentage of feedlot wastes in these rations, the palatability of the rations apparently was not affected since the feed intake was essentially the same for all rations. Of course, if intake is calculated on an ash free basis, the intakes would be better for the control rations. Using the digestibilities shown in Table 3 and 4 and the respective percentages of material in these rations, the theoretical digestibility of the feedlot waste components of the rations were calculated and are presented in Table 5.

Digestibility of the dry matter varied from 35 to 50 percent and the organic matter from 42 to 56 percent. These digestibilities are in roughly the same range as many low quality roughages and therefore suggest that the nutritive value of the feedlot waste organic matter may well be similar to that of low quality roughages. The digestibility of the crude protein was even higher varying from 60 to 71 percent which is considerably in excess of poor quality roughages. Thus, the digestible protein content of the feedlot wastes is quite high.

Further analyses are being made on these rations and the feces from the animals in the digestion trial to determine the true digestibility of the energy in the ration to confirm the results shown above. If these data are confirmed, this would mean that the feedlot wastes as measured here might well be utilizable as a component for maintenance type rations such as those consumed by beef cows during the winter periods. Whether this could be done economically in association with feedlot operations is

another question and must be researched further. During the coming year, further studies will be conducted on the nutritive value of these feedlot wastes to include studies on the maintenance and growth of ruminants over long periods of time with rations containing various proportions of the feedlot wastes.

Table 3. Intake and Digestibilities of FLW Rations (No. 1)

Item	1	2	3
Intake, lb. per 100 lb. B. W.	2.78	2.90	2.86
Digestion coefficients			
Dry matter	53.5	50.8	46.2
Organic matter	53.7	53.8	51.5
Cellulose	48.0	48.5	40.4
Nitrogen	48.2	52.1	56.2
Ash	50.5	36.2	31.9

Table 4. Intake and Digestibility of FLW Rations (No. 2 & No. 3)

Item	1	4	5	6	7
Intake, lb. per 100 lb. B.W.	2.71	2.37	2.60	2.52	2.63
Digestion coefficients					
Dry matter	54.1	50.7	45.9	54.7	50.3
Organic matter	54.3	52.3	48.7	56.7	53.9
Cellulose	48.5	50.7	45.5	55.5	49.3
Nitrogen	49.6	51.6	54.0	55.0	57.2
Ash	51.2	41.4	34.8	41.2	33.4

Table 5. Calculated Theoretical Digestibilities of Feedlot Waste

	Apparent Digestibilities, %		
	No. 1	No. 2	No. 3
Dry matter	40	35	50
Organic matter	49	42	56
Crude protein	67	60	71