

# UTILIZATION OF THE GRAIN IN KAFIR AND CANE SILAGE BY DAIRY COWS<sup>1</sup>

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## INTRODUCTION

Throughout the Southwest and along the southern border of the Corn Belt a large acreage of the sorghums is grown and used as silage in feeding dairy and beef cattle. During the course of a feeding experiment with dairy cows at the Oklahoma Experiment Station, it was observed that a considerable quantity of the grain in such silages is passed out into the manure apparently unused. Because of this loss many farmers practice heading these crops before ensiling them, grinding the heads separately, and feeding them in the concentrate portion of the ration. There is a question as to whether the loss of grain from the silage is sufficient to justify this practice being more widely recommended.

## HISTORICAL

Cave and Fitch<sup>2</sup> found that as high as 90 per cent of the seeds in sorgo (sweet sorghum) silage pass through the cow undigested. The determinations were made by counting the number of seeds in aliquot samples of silage and of manure secured from two cows over a five-day period. As the result of this brief work these investigators raised the question as to whether it might not be advisable to remove the heads before ensiling this crop, and to use the ground heads in the grain ration.

In a feeding trial conducted by Aicher and McCampbell,<sup>3</sup> it was found that kafir and cane silages fed to steers in combination with two pounds of cottonseed meal daily had comparative feeding values as follows:

	With heads	Without heads
Kafir silage.....	72.40	45.31
Cane silage.....	69.90	60.60

Thompson<sup>4 5</sup> found after four years of feeding trials with swine that whole kafir was utilized less efficiently than ground kafir, and that these had relative feeding values on a numerical basis as follows:

	Whole kafir	Ground kafir
Self-fed.....	110	130
Hand-fed.....	100	111
Soaked, whole.....	87	
In the head (dry).....	86	

<sup>1</sup> Received for publication Apr. 25, 1927; issued September, 1927.

<sup>2</sup> CAVE, H. W., and FITCH, J. B. GROUND SORGO SEED AS A FEED FOR DAIRY COWS. *Kans. Agr. Expt. Sta. Circ.* 110, 8 p. 1925.

<sup>3</sup> AICHER, L. C., and McCAMPBELL, C. W. FOURTEENTH ANNUAL CATTLEMEN'S ROUND UP. *Kans. Agr. Expt. Sta., Fort Hays Branch Pamphlet*, 6 p. 1926.

<sup>4</sup> THOMPSON, C. P. SWINE FEEDING INVESTIGATIONS. *OKLAHOMA FEEDS AND HOW TO PREPARE THEM. Okla. Agr. Expt. Sta. Bul.* 148, 15 p. 1923.

<sup>5</sup> — THE PREPARATION OF THE GRAIN SORGHUMS AND OTHER SMALL GRAINS FOR FATTENING SWINE. *Amer. Soc. Anim. Prod. Proc.* 1924: 37-39. 1925.

<sup>6</sup> Information to the authors. 1927.

He concluded that the feeding value of cane seed and of the grain sorghums was increased 10 to 25 per cent by grinding, since when fed in ground form a larger proportion of the grain was prevented from passing through the digestive tract apparently unused.

#### EXPERIMENTAL METHODS

Eight dairy cows were divided into two groups, one receiving kafir silage and the other cane silage. The cows were fed individually, each animal being allowed 30 pounds of silage and 10 pounds of alfalfa hay per 1,000 pounds live weight. The grain ration of corn meal, ground oats, wheat bran, and cottonseed meal was fed according to the milk and butterfat yields to meet the calculated requirements of the Morrison feeding standard. Refused feeds were reweighed and recorded.

A 20-day preliminary feeding period preceded the 10-day experimental period. During the latter period manure was collected from each cow daily. The cows remained in stanchions except when released for exercise, at which times an attendant was with them to collect all manure voided.

The cane and kafir grains voided by the individual cows were mechanically separated daily from the entire quantity of manure, by the use of screens and water. These recovered grains were dried, screened, fanned, and hand picked to remove all foreign material. Samples of these air-dry kernels were preserved for chemical analysis.

The grain from large quantities of cane and kafir silages was secured mechanically, by the use of sieves, water, and a fan to free the grain from all stalk and leaf material.

The dry weights of 1,000 hull-free kernels from the silage and from the manure were taken to determine whether any losses in weights of individual kernels had occurred during their passage through the cow's digestive tract.

Chemical analyses were made of the dry hull-free samples of grain obtained from the silage and from the manure, to determine by comparison what losses of nutrients had occurred in the kernels thus recovered from the manure.

#### PRESENTATION OF DATA

From 565 pounds of cane silage, 21 pounds of clean, air-dry grain were obtained. The air-dry grain constituted 3.72 per cent of the weight of fresh silage. Likewise, 611 pounds of fresh kafir silage contained 18.76 pounds of air-dry kafir grain, or 3.07 per cent of the weight of fresh kafir silage.

The first group of four cows consumed a net total of 1,374 pounds of cane silage, while the second group of four cows ate 1,364 pounds of kafir silage. One cow in the latter group was off feed. Exclusive of this animal, 1,096 pounds of kafir silage were consumed by the group. The first group consumed 51.11 pounds of grain in the form of whole cane seed in the silage, and of this amount 17.33 pounds, or 33.91 per cent, were recovered from the manure. Excluding the cow in the second group which was off feed, 33.65 pounds of kafir grain were consumed, of which 16.64 pounds, or 49.46 per cent, of kafir grain were found to have been voided in the manure. Data for the individual cows are presented in Table 1.

TABLE 1.—Losses of grain into the manure, from cane and kafir silage consumed by dairy cows

Cow No.	Cane silage group				Cow No.	Kafir silage group			
	Silage consumed	Calculated grain in silage	Grain recovered from manure	Loss		Silage consumed	Calculated grain in silage	Grain recovered from manure	Loss
	Pounds	Pounds	Pounds	Per cent		Pounds	Pounds	Pounds	Per cent
1.....	300	11.16	3.60	32.26	5 <sup>a</sup> .....	268	8.23	2.41	<sup>a</sup> 29.25
2.....	360	13.39	4.83	36.08	6.....	340	10.44	6.09	58.35
3.....	360	13.39	4.65	34.70	7.....	420	12.89	6.65	51.57
4.....	354	13.17	4.25	32.29	8.....	336	10.32	3.90	37.84
Total.....	1,374	51.11	17.33	33.91	Total, excluding cow 5.....	1,096	33.65	16.64	49.46

<sup>a</sup> Cow 5 refused to eat a part of the kafir silage for three days previous to and for four days during the experimental period. The manure voided, therefore, represents less than 268 pounds of kafir silage consumed during the 10-day period in which manure was collected.

The question naturally arose as to whether the cows had derived any benefit from the whole grain voided in the manure. By weighing 1,000 kernels, dried to constant weight, as obtained from silage and from the manure, it was found that the kafir grain had decreased 2.98 per cent in weight. Likewise the cane seed showed a decrease of 7.85 per cent in the weight of an equal number of kernels. All weights were of hull-free kernels.

Chemical analyses were made of the hull-free kernels to ascertain if possible what changes had taken place in the kernels during their passage through the digestive tract. The kafir and cane kernels recovered from the manure were found to have a greater ash content than those from silage, due possibly to absorption of certain salts excreted into the alimentary tract. The ether extract was decreased about one-fifth. Crude fiber, contained largely in the outer covering of the kernel, was reduced slightly in percentage in the kafir sample, but for some unexplained reason appeared to increase in the sample of cane seed. Perhaps this increase may be attributed to a somewhat greater loss of the contents of the cane seed. A very small loss in crude protein was observed in the cane and kafir kernels. The nitrogen-free extract was not significantly affected. The character and extent of these changes may be noted in Tables 2 and 3.

The proportion of hulls and the closeness with which they clasp the kernels varies with cane and kafir. The percentage of kafir-grain hulls obtained from the silage was 13.75 per cent and was reduced to 0.50 per cent as recovered from the manure. Likewise, the percentage of hulls on the cane seed was reduced from 5.77 to 4.20 per cent by passage through the cow's digestive tract.

TABLE 2.—Composition of hull-free cane and kafir kernels as obtained from silage and from manure

Sample	Moisture	Ash	Crude protein	Crude fiber	Nitrogen-free extract	Ether extract
	Per cent	Per cent	Per cent	Per cent	Per cent	Per cent
Kafir grain:						
From silage.....	10.25	0.81	9.88	1.66	74.17	3.23
From manure.....	10.40	1.54	9.36	1.44	74.61	2.65
Cane seed:						
From silage.....	10.56	1.60	8.40	2.11	74.83	3.50
From manure.....	9.44	1.43	8.35	2.88	75.06	2.84

TABLE 3.—Changes in composition of dry matter in hull-free cane and kafir kernels which occurred during passage of the silage through the digestive tract of the cow

Item	Kafir kernels		Cane kernels	
	Actual change (grams)	Percentage change	Actual change (grams)	Percentage change
Crude protein.....	-0.60	-5.45	-0.17	-1.81
Ether extract.....	-.65	-18.06	-.78	-19.94
Nitrogen-free extract.....	1.24	1.50	.78	.94
Crude fiber.....	-.24	-13.04	.83	35.32
Ash.....	.82	91.11	.90	134.33
Total weight.....	-.436	-2.98	-1.002	-7.85

### DISCUSSION OF RESULTS

The data presented show that approximately one-third of the cane seed and over two-fifths of the kafir grain in silage made from these plants, as used in this feeding experiment, were voided in the manure. A comparison of the chemical analyses of the grain from the silage and of that from the manure shows that a negligible quantity of the nutrients in these undigested kernels was utilized. The increased percentage of ash may be explained by the absorption of salts by the grain while in the digestive tract of the cow.

The losses of whole kernels were sufficient to raise the question again as to the desirability of heading cane and kafir before ensiling these crops. If the heads are first removed, they may be ground and added to the grain ration. If they are not removed but are fed in the silage, pigs or poultry may be given access to the manure to salvage a part of the lost grain.

The cost of labor and time, the facilities available, as well as the value of kafir grain as feed, are factors to be considered in deciding whether to head cane and kafir before putting these crops into the silo.

### SUMMARY AND CONCLUSIONS

When dairy cows were fed cane and kafir silage made from fairly mature whole plants, one-third of the cane seed and over two-fifths of the kafir grain were voided in the manure.

Chemical analyses showed little utilization of nutrients from these whole kernels during passage through the cow's digestive tract. Some ether extract was digested, whereas only a small percentage of the crude protein was utilized. The effect upon the crude fiber was variable.

Heading cane and kafir silage before ensiling these crops is recommended. Such a practice will depend upon several economic factors, such as labor, facilities, and the value of kafir grain as feed.

When cows are fed silage made from the entire plant, the whole grain which passes out into the manure may be salvaged by pigs or poultry.