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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 cattle. During the course of a feeding experiment with dairy cows at the Oklahoma Experiment Station, it was observed that a considerable amount of the grain in such silage passed out into the manure, apparently unused. Because of this loss many farmers practice heading the crop before ensiling it, 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 the practice being more widely recommended.

REVIEW OF LITERATURE

Cave and Fitch (1) found that as high as 90 percent of the seeds in sorgo (sweet sorghum) silage passes 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 they 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 (2), it was found that kafir and cane silage 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 (3) found after four years of feeding trials with swine, that whole kafir was utilized less efficiently than ground kafir, and that these had a relative feeding value 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	.....

He concluded that the feeding value of cane seed and of the grain sorghums was increased 10 to 25 percent by grinding, since thus a larger proportion of the grain was prevented from passing through the digestive tract apparently unused.

1. Published with the consent of C. T. Dowell, director of the Oklahoma Agricultural Experiment Station.

PLAN OF EXPERIMENT

1. Eight dairy cows were divided into two groups, one group to receive 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 1000 pounds liveweight. The grain ration of cornmeal, ground oats, wheat bran and cottonseed meal was fed according to milk and butterfat yields to meet the Morrison feeding standard. Any refused feeds were reweighed and recorded.

2. A twenty-day preliminary feeding period preceded the ten-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.

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

4. The total amount of grain in a large quantity of cane and kafir silages was secured by mechanical separation using sieves, water and a fan to free the grain from all stalk and leaf material.

5. The dry weight of 1000 hull-free kernels from the silage and from the manure, was taken to determine if any loss in weight of individual kernels had occurred during passage through the cow's digestive tract.

6. 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 percent 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 percent of the weight of fresh kafir silage.

The first group of four cows consumed a net total of 1374 pounds of cane silage, while the second group of four cows ate 1364 pounds of kafir silage. One cow in the latter group was off-feed. Exclusive of this animal, 1096 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 percent were recovered from the manure. The second group of cows consumed 41.88 pounds of whole kafir grain in the silage, and 19.05 pounds of this were recovered from the manure. Excluding data from the cow that was off-feed, 33.65 pounds of kafir grain were consumed, of which 16.64 pounds or 49.46 percent of kafir grain were found to have been voided in the manure. Data from the individual cows are presented in table I.

TABLE I.

Losses into the manure, of grain in cane and kafir silage consumed by dairy cows

Cow	Silage Consumed lbs.	Calculated Grain in Silage lbs.	Grain Recovered From Manure lbs.	Loss percent
Cane Silage Group				
1	300	11.16	3.60	32.26
2	360	13.39	4.83	36.08
3	360	13.39	4.65	34.70
4	354	13.17	4.25	32 29
Total	1374	51.11	17.33	33.91
Kafir Silage Group				
5*	268	8.23	2.41*	29.25*
6	340	10.44	6.09	58.35
7	420	12.89	6.65	51.57
8	336	10.32	3.90	37.84
Total, excluding Cow 5	1096	33.65	16.64	49.46

*Cow 5 refused to eat a part of the kafir silage for 3 days previous to, and for 4 days during the experimental period. The manure voided therefore represents less than 268 pounds of kafir silage consumed during the ten days when 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 1000 kernels, dried to constant weight, as obtained from silage and from the manure, it was found that the kafir grain had decreased 2.98 percent in weight. Likewise the cane seed showed a decrease of 7.85 percent 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 passage through the digestive tract. The kafir and cane kernels recovered from the manure were found to have a greater ash content, due possibly to absorption of certain salts excreted into the alimentary tract. The ether extract (crude fat) was decreased approximately one-fifth. Crude fiber which is contained largely in the outer covering of the kernels, was reduced slightly in percentage in the kafir, 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 II and III.

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

TABLE II.

Composition of hull-free cane and kafir kernels as obtained from silage and from manure:

Sample	Moisture percent	Ash percent	Crude Protein percent	Crude Fiber percent	Nitrogen-free Extract percent	Ether Extract percent
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	0.60	8.40	2.11	74.83	3.50
From Manure	9.44	1.43	8.35	2.88	75.06	2.84

TABLE III.

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:

	KAFIR KERNELS		CANE KERNELS	
	Actual Change grams	Pct. Change percent	Actual Change grams	Pct. Change percent
Crude Protein	—0.60	—5.45	—0.17	—1.81
Ether Extract	—0.65	—18.06	—0.78	—19.94
Nitroge-free Extract	1.24	1.50	0.78	0.94
Crude Fiber	—0.24	—13.04	0.83	35.32
Ash	0.82	91.11	0.90	134.33
Total Weight	—0.436	—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 amount of the nutrients in these undigested kernels was utilized. The increased percentage of ash can be explained as having been due to absorption of salts during passage through 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 in order to salvage a part of the lost grain.

The cost of labor, time and facilities available, as well as the value of kafir grain, are factors to be considered when one decides whether or not to head cane and kafir before putting these crops into the silo.

CONCLUSIONS

1. 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.

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

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

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

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