

## XV. WASTE IN FEEDING WHOLE GRAINS TO CATTLE

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One purpose of research is to find more economical or more efficient methods in the various enterprises carried on by mankind in the interest of human welfare. From the dawn of written history to the present day, civilized races have been dependent upon herds and flocks of domestic animals as important sources of food and raiment. Feed for livestock was one of the original gifts of Nature during the Garden of Eden era. As men and animals multiplied, and the demands for food and feed became greater, improved methods of production and more efficient utilization of food and feed became an essential part of man's problems.

Last year one of us reported original work before the Academy, showing how an extreme deficiency of a certain mineral element (phosphorus) seriously interferes with growth, milk yield, and production of body fat, even tho all of the other food compounds necessary to normal life of the dairy cow are supplied in the ration. This year we wish to review the subject of the waste involved in feeding whole grains to cattle, and add thereto our contribution to this field made within the past year.

The exact time when grains were first ground for use as food, is not recorded in written history. Among the relics of the ancient red man, are the stone mill and grinder. Abraham (Genesis, 18: 6) asked Sarah, his wife, to make ready fine meal, knead it, and make cakes upon the hearth, which were served with butter and milk. The tombs of the Pharaohs reveal the fact that ground grains long have been in common use.

### *Review of Literature*

Rations of cattle during the winter months usually consist of both seeds and vegetative parts of plants. The seeds or grain and milling by-products are used to furnish digestible nutrients in concentrated form, while the more bulky portion of the plants comprise the common coarse hays, fodders, and succulent feeds such as silage made from corn, the sorghums, sunflowers, and so forth. It is a universal practice to put the entire plant into the silo, and hence our problem divides naturally into two parts, namely:

1. Whole grains in the concentrated part of the ration, and
2. Whole grains in silage.

Shaw and Norton (6) observed the losses of whole oats and corn when fed to mature dairy cows, yearling heifers, and calves, and found that younger animals utilized whole grains more efficiently than did mature cows. Less loss occurred in feeding whole oats than whole corn, as shown in Table I.

Table I. Percentage of whole grains passing thru cattle utilized.

Class of Animals	Loss of Corn %	Loss of Oats %
Mature cows	22.75	12.06
Yearling heifers	10.77	5.48
Calves	6.28	2.98

Chemical analyses of the original grain, and of the grain voided in the manure showed "that practically no nutriment is taken from the grain which passes through the system without mastication." In fact, 4.3 per cent of the corn and 10.6 per cent of the oats still had power to germinate.

Lane (4) compared the value of ear corn with corn-and-cob meal in a dairy ration, and found that cows were able to produce 9.3 per cent more milk from ground corn than from an equal quantity of whole corn.

McCandlish (5) compared cornmeal with shelled corn in feeding dairy cows, and found the whole grain to have 16 per cent less feeding value than ground corn.

Losses of whole grain in the feeding of silage have long been observed by practical cattle feeders, but until recently no definite steps have been taken to study the relative importance of such losses. Cave and Fitch (2) first investigated these losses from sweet sorghum (cane) silage. They used two cows, and secured data over a five-day feeding period. By counting the number of seeds in samples of silage, and in aliquot samples of manure, they calculated that 90 per cent of the cane seed in silage passes thru the cow unutilized.

The writers (1) conducted a feeding trial with eight dairy cows over a ten-day period, studying the losses of grain from feeding both kafir and cane silage. The total quantities of grain present in the silage and in the manure, were separated by the use of sieves, water and an electric fan. It was found that one-third of the cane seed in cane silage, and over two-fifths of the kafir grain silage passed thru the cow unutilized. Chemical analyses showed that very little change had occurred in the composition of these whole kernels while they were exposed to action of the digestive juices.

More recently, unpublished data obtained by LaMaster and Morrow (3) on the losses of grain in cane and corn silage, have corroborated our results. They found that 1.86 per cent of corn grain, and 26.27 per cent of the cane seed in these silages were voided in the manure. Very little change was noted in the composition of these whole grains after passage thru the cow's digestive tract. This investigation is still in progress the above data being furnished the authors thru courtesy of the investigators.

#### *Conclusions*

From the above review of experimental work on the waste that occurs when whole grains are fed to dairy cattle, the recommendation to feed only ground grains to mature cows seems justified. Since calves utilize whole grains so efficiently, the small saving which results may not pay the cost of grinding for animals of this age.

Losses of grain in feeding corn silage are insignificant. With silage containing smaller and harder seeds, such as the sweet and grain sorghums, the losses of these whole grains into the manure are perhaps of economic importance.

Chemical analyses show that whole grains passing into the manure both from the silage and from the concentrates, are changed but little in composition, and that the animal has derived no benefit from them.

These losses from the feeding of whole grain to older cattle, are of sufficient importance to justify the serious attention of the feeder of cattle.

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