Use of Animal Fats in Rations for Beef Cattle[1]

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THE feeding of animal fats in livestock rations, particularly in beef cattle rations, will perhaps aid in the consumption of very large quantities of the surplus supply. In recent years the surplus of animal fats has been steadily increasing. The competition of synthetic products with animal fats as raw material for the manufacture of many items has been largely responsible for the surplus. Consequently the price of animal fats has declined to a point where they have little or no value as a by-product of the fattened animals. Edible and inedible fats constitute a sizable portion of the by-products from slaughtered animals. The lack of market and low price of animal fats undoubtedly have had some reflection on the price of the fat animal. This undesirable market situation directly or indirectly affects the livestock producer, the packer, and the consumer. An outlet for a major portion of the current and future surplus stock of animal fats is vitally important.

The value of fats in ruminant nutrition has not been given as much attention as proteins, minerals, vitamins, and carbohydrates. This lack of interest in fat may be accounted for by a number of reasons. There is conclusive evidence that body fat and milk fat can be made from dietary carbohydrates and nutrients other than fats. In view of this knowledge perhaps more emphasis has been focused on the other nutrients. Furthermore responses to feeding of high levels of fat to certain farm animals were disappointing in some of the early investigations. In swine feeding studies, for example, it was shown that soft pork was produced when a high level of certain types of fat was fed in the ration. In cattle feeding experiments it has been shown that digestive disturbances result, particularly when the level of fat exceeds more than one pound per 1,000 pounds body weight (4). Relatively high levels of fats have affected keeping qualities of feeds, making them unpalatable when stored under certain conditions for extended periods.

Under usual conditions in livestock feeding, carbohydrates furnish energy more cheaply than fats. Within recent years, due to economic conditions and changes in manufacturing processes, the proportions of nutrients in certain livestock feeds have been altered. The fat content in particular has been reduced. Since a unit of fat has approximately 2.25 times as much gross energy as a unit of carbohydrate, the reduction in fat content reduces the gross energy content of the feed. Whether or not this affects metabolizable energy is not definitely known. According to results obtained recently at the Texas Experiment Station (7), the addition of vegetable fat to a low-fat ration increased the efficiency of feed utilization and increased the gains made by fattening cattle. A Canadian report (2) showed that the addition of 5% animal fat to a poultry ration increased gains and improved the quality of fat in the carcasses. Very recent reports by the American Meat Institute (5) also show the benefits of animal fats in broiler chick rations and in dog foods.

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Plant and animal fats contain different proportions of saturated and unsaturated fatty acids (3). The fatty acid distribution apparently has an influence on the digestibility and absorption of fats. For example, a report by Seshan (6) indicates that steers digested unsaturated fats better than the saturated fats. In another interesting study Allen (1) found that feeding butterfat to milk cows raised the milk fat percentage more than an equivalent amount of vegetable fat in the ration. The explanation given is in the fact that the gland is presented with exactly the same fatty acids which it needs for its secretion.

The lack of information on the use and value of animal fats in cattle rations and the existing condition of surplus fats were the reasons for undertaking this experiment.

Experimental Procedure

Choice Hereford yearling steers included in this test were purchased in the fall of 1951 and used in wintering experiments during 1951 and 1952. They were grazed on brome or brome and alfalfa pasture during the summer. The steers came off pasture about October 1 and were fed in dry lot on alfalfa hay and about 6 pounds of corn per head daily until the start of the experiment.

The tallow pellets fed to the steers in the experiment contained the following ingredients:

%, by weight	Ingredients
68.14%	Ground corn cobs, 3/16 in.
14.73%	Soybean oil meal (43% protein)
9.20%	Blackstrap molasses (liquid)
5.53%	Beef tallow
1.31%	Urea (DuPont's 262)
1.08%	Feeding bonemeal
99.99%[a]	

[a] 8.5 pounds of commercial trace mineral mixture including manganese, potassium, iodine, cobalt, sulfur, iron, copper, and zinc were added to each ton of the above mixture.

All the ingredients except the beef tallow were thoroughly mixed. Then the melted beef tallow (150°) was gradually added to the mixture and pelleted. The pellets were one-half inch in diameter. Sodium bentonite was added at the rate of about 75 lbs. per ton of pellets as a binding agent.

The pellets remained palatable throughout the 150-day feeding period. The beef tallow pellets did not become rancid as did the pellets in which refined corn oil was substituted for beef tallow and fed to the steers in one of the lots.

The steers were started on 2 lbs. of tallow pellets, 4 lbs. of ground ear corn, and brome hay free-choice. The pellets and ground ear corn were gradually increased so that by the end of 2 weeks the steers were consuming 12 lbs. of pellets and 8 lbs. of ground ear corn daily. Brome hay consumption was decreased to about 1 to 2 lbs. per head daily. The pellets were placed in the feed bunks and then the ground ear corn was spread over them. A dry, free-flowing vitamin A supplement was sprinkled over the ground ear corn at a rate which supplied approximately 30,000 units per head daily. After the steers had been on

feed 45 or 50 days symptoms of vitamin A deficiency were observed. The vitamin A supplement was doubled to furnish approximately 60,000 units daily and was maintained at this level for the remainder of the feeding period.

Results and Discussion

Ten yearling steers, averaging approximately 850 pounds per lot, were fed for 150 days from November 14, 1952, to April 13, 1953. The 3 lots reported in this article were fed the following daily ration:

Lot 1 (check lot): 17.1 lbs. ground shelled corn, 0.9 lb. soybean oil meal (43% protein), 2.97 g. vitamin A supplement, and 2.8 lbs. brome hay.

Lot 2: 12.2 lbs. beef tallow pellets, 9.4 lbs. ground ear corn, 4.03 g. vitamin A supplement, and 2.0 lbs. brome hay.

Lot 3: 11.9 lbs. corn oil pellets, 9.2 lbs. ground ear corn, 3.78 g. vitamin A supplement, and 1.8 lbs. brome hay.

The feed-lot and other data pertinent to the experiment are shown in Table I.

TABLE I

Summary of the Experiment [a]
(Results based on one average steer)

	Lot Number		
	1 (Soybean Meal)	2 (Beef Tallow Pellets)	3 (Corn Oil Pellets)
Initial weight, lbs.	855	859	852
Final weight, lbs.	1172	1159	1113
Total gain, lbs.	317	300	261
Average daily gain, lbs.	2.11	2.00	1.74
Daily feed consumption:			
Ground shelled corn, lbs.	17.1	.....	.....
Ground ear corn, lbs.	.....	9.4	9.2
Beef tallow pellets, lbs.	.....	12.2	.....
Corn oil pellets, lbs.	.....	.....	11.9
Vitamin A supplement, g.	2.97	4.03	3.78
Brome hay, lbs.	2.8	2.0	1.8
Soybean meal	0.9	.....	.....
Feed consumed per cwt. gain:			
Ground shelled corn, lbs.	807.9	.....	.....
Ground ear corn, lbs.	.....	469.3	528.4
Beef tallow pellets, lbs.	.....	608.3	.....
Corn oil pellets, lbs.	.....	.....	683.1
Vitamin A supplement, g.	140	202	217
Brome hay, lbs.	134.7	101.7	103.8
Soybean meal	43.2	.....	.....
Feed cost per cwt. gain [b]	27.67	26.49	31.96
Market weight, lbs.	1113	1098	1058
Selling price per cwt.	$20.25	$20.25	$20.25
Dressing % (warm wt.)	62.96	60.24	60.44
Carcass grade	choice	choice	choice

[a] Data taken from Final Summary Sheet of Nebraska Cattle Progress Report 219.

[b] Feed prices per lb., corn @ 3c; ear corn @ 2.4c; beef tallow pellets @ 2.28c; corn oil pellets @ 2.61c; vitamin A supplement @ $1.30; and brome hay @ 75c.

Several interesting observations were made in this feeding experiment, but before any recommendations can be made in adding animal fats to cattle rations, a more thorough investigation is needed. It was interesting to find in the experiment that cattle would eat a ration containing an ingredient such as beef tallow. Also the quantity of fat consumed in the daily ration was surprising. Near the end of the feeding period the steers consumed about ¾ lb. of beef tallow daily. No digestive disturbances were observed throughout the feeding period in Lot 2 fed the beef tallow pellets. However it was difficult to maintain the cattle in Lot 3 on a full feed. Probably this was due to the development of rancidity and strong odor in the corn oil pellets. It should be pointed out however that vitamin A deficiency symptoms developed after the steers had been on feed about 50 days in Lots 2 and 3. This was alleviated after the vitamin A supplement allowance was doubled. When rations high in fat are fed, the utilization of vitamin A seems to be impaired or reduced, probably due to destruction of vitamin A by peroxides in the fats. This problem should be fully explored. The carcasses graded from low choice to high choice.

Summary

Choice yearling Hereford steers were fed pellets containing 5.53% edible beef tallow, 68.14% ground corn cobs, 14.73% soybean oil meal, 9.20% blackstrap molasses, 1.31% urea, and 1.08% feeding bonemeal. In addition to the pellets, the steers received ground ear corn, brome hay, vitamin A supplement, and trace minerals. The steers receiving this ration gained 300 pounds in a total feeding period of 150 days for an average daily gain of 2.0 pounds. Comparable steers on a standard ration consisting of ground shelled corn, soybean oil meal, brome hay, vitamin A supplement, and trace minerals gained 317 pounds with an average daily gain of 2.11 pounds. Another group of steers were fed corn oil pellets. These steers gained 261 pounds per head or an average daily gain of 1.74 pounds.

No digestive disturbances were observed throughout the feeding period in Lot 2 fed the beef tallow pellets. There were no apparent differences in carcass quality when the animals were slaughtered.

The beef tallow pellets were prepared to have approximately 75% as much energy as corn, assuming that one pound of fat contributed 2.25 times more energy than a pound of carbohydrates. In this feeding test the economy of gain was in favor of the group of steers fed the beef tallow pellets.

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