RESULTS OF COTTONSEED MEAL FEEDING INVESTIGATIONS

The first use of the cotton plant other than for the lint was for the oil The British West Indies made one of the early attempts to extract and use the oil in 1667. Approximately one hundred years later, investigations concerning the various oleaginous seeds and their by-products began. The Royal Society of Arts of London in 1783 was the first to see the real value of cotton seed cake. However, inducements offered by procuring oil and cake did not bring the desired results. The South Carolina Agricultural Society in 1785 offered similar premium but not until 1819 was a patent taken out for preparing cattle feeds, and not until the middle of the 19th century was oil expressed on a commercial scale. Since then the growth of the industry has been phenomenal, especially in America, and with this growth, perplexing problems have arisen concerning the feeding of the cotton seed cake or meal.

Previous Work

European feeders were the first to show their appreciation of cottonseed cake, but difficulty was encountered in feeding it in large quantities. Voelker in 1859, reported injurious effects. Many cases have later been reported and attempts to solve the problem have led to numerous conclusions. The injuries have been variously ascribed to cholin, betain, high protein content, fibrous material, parasitic organisms, carelessness on the part of feeders, high oil content, phosphorous compounds, and other causes more lately gossypol, a constituent found principally in the kernel of the seed. Much valuable work has thus been contributed towards solving a complex problem.

Experiments have consistently shown that there is great variability in the effect of cottonseed meal on both large and small animals. Due to these facts and to the ever increasing importance of cotton seed meal in the South as a sole concentrate for fattening beef cattle and for furnishing protein in the rations for dairy cattle, work was started in 1915 on large animals (dairy cows). In general, our objective was to find a supplement or supplements which would retard or correct the injurious effects. Prior to this time, considerable work has been done with beef cattle, showing that corn silage had an astonishing effect on retarding the injurious effects of cottonseed meal.

In steer feeding trials extending over 165 days ten animals weighing 1,000 lbs. were fed as high as 10½ lbs. of cotton seed meal daily, with corn silage as roughage and these cattle were finished and sold in excellent condition. But those receiving cottonseed hulls as roughage with all other factors the same, could not withstand the condition. This still left the

effect of heavy cottonseed meal feeding on growth, reproduction and lactation as unknown factors.

Original Work

The study of these latter factors has pointed more closely toward a definite solution of the problem. Contributing toward this were 25 cows, which were fed as follows:

Group 1—5 cows—cotton seed meal
cotton seed hulls
Group 2—5 cows—cotton seed meal ½
crushed corn ½
cotton seed hulls
Group 3—5 cows—cotton seed meal
cotton seed hulls ½
corn silage ½
Group 4—5 cows—cotton seed meal
copper sulphate solution
cotton seed hulls
Group 5—5 cows—cotton seed meal
cotton seed hulls ⅓
beet pulp ⅔

The grain in all of these groups was fed at the rate of 1 lb. daily per 100 lbs. of live weight and the roughage was fed in quantities that the animals would consume readily.

Results

Those on meal and hulls, that is, the first group, all died in less than 226 days after the experiment started.

In the second group, those on a mixture of corn and cottonseed meal with hulls for roughage, two died within 208 days and the other three had to be taken off feed to save them.

In the third group, those on cottonseed meal, hulls and silage, none died but all had to be taken off this ration because of their weakened condition at the end of about eight months.

In the group receiving copper sulphate, along with cottonseed meal and hulls, there were also two deaths, and it was necessary to stop the experiment to save the remaining cows.

In the last group, getting beet pulp, along with meal and hulls there were two deaths. The remaining cows were taken off feed to save them.

Out of these 25 cows, 11 died in less than nine months, one aborted and only three calved, but none of the three calves lived.

Present Work

The more detailed observations of this work indicated that a ration of cottonseed meal and hulls was insufficient to maintain a cow for a period long enough to secure any data on reproduction. When the present reproduction and lactation studies were begun, after the preliminary trial, just described, corn was included with the meal and silage and stover with

the roughage. The 20 heifers used in this work made good gains and appeared to be doing well. They had, however, access to a lot where there was a small amount of grass. It became evident that this small amount of grass, even though cropped very short, was having its effect. The cattle were then moved to new quarters where dry lots had been prepared for a thorough prosecution of the experiment.

Some of the cows aborted, some dropped deformed calves, some were soft boned, others were blind and still others developed fits and died. Calcium carbonate was then added to some of the rations and bone meal to others. This seemed to improve certain rations but still others appeared to be inadequate.

The data and observations by this time pointed toward nutritive deficiencies in the rations rather than so-called poisonous factors. With this in view, the rations were further supplemented with different combinations, as follows:

Casein	10	lbs. approx. aver. amt. fed per cwt. grain
Granular yeast	5	lbs. approx. aver. amt. fed per cwt. grain
Wheat embryo	9	lbs. approx. aver. amt. fed per cwt. grain
Butterfat	2½	lbs. approx. aver. amt. fed per cwt. grain
Cod liver oil	2½	lbs. approx. aver. amt. fed per cwt. grain
Dried Brewers yeast	2	lbs. approx. aver. amt. fed per cwt. grain
Mineral steam bone meal	2	lbs. approx. aver. amt. fed per cwt. grain
Alfalfa	7	lbs. approx. aver. amt. fed per cwt. grain
Common salt	1	lb. approx. aver. amt. fed per cwt. grain
Calcium carbonate	2.8	lbs. approx. aver. amt. fed per cwt. grain

The results of these supplements have been astonishing. Cows receiving cotton seed hulls for roughage, and a grain ration containing from 80 to 90 per cent of cottonseed meal have produced apparently normal calves. The calves have grown normally on their mother's milk and the cows have produced a milk flow not far below the average for the State. This was altogether contrary to the results secured in the original experiment.

These cows not only remained alive, but they dropped live, apparently normal calves and the calves have grown on the milk produced by the cows. There were no spasms or unusual conditions of this kind. The rations which had the most complete and complicated supplements have given the better results so the problem is not solved. As our work progresses, however, and we review the data, presented in older experiments, the "toxicity" or poisonous idea recedes and the "deficiency" idea moves forward.

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