

There Are Substitutes for Whole Cottonseed

By Marshall E. McCullough

Feeding whole cottonseed has expanded far beyond the cotton growing areas.

But, the demand for whole cottonseed sometimes results either in shortages or very large variations in local prices. For these reasons, I frequently am asked if it is possible to put together a substitute.

At first glance, the answer would seem to be “yes.” After all, whole cottonseed contains no unique nutrient or unusual combination of ingredients. In the digestive system, they are just a combination of protein, fat, fiber, carbohydrates and minerals.

Although whole cottonseed sometimes is referred to as a “high energy” feed, using it to replace corn and soybean meal in the total ration actually results in a small rise in net energy for milk (NE-l). On a dry matter basis, corn has a NE-I of 0.89 mega-calories per pound and whole cottonseed, 1.01.

If we replace 5 pounds of corn with 5 pounds of cottonseed in a ration that is being consumed at the rate of 50 pounds per day, we actually boost NE-l by less than 1 mega-calorie. Assuming a total ration NE-I of 38.0 mega-calories, the gain is almost insignificant.

However, whole cottonseed does add not only crude protein, but more un-degradable crude protein than soybean meal. It also contributes ADF which generally is accepted as being digestible.

What is it then that makes whole cottonseed so popular? From a nutritional point of view, it may well be that the oil is released slowly in the rumen, thus making it a choice source of the first unit of added fat.

At the moment, nutritionists tend to divide the fat in dairy rations into three categories.

1. First are the fats and oils in feeds such as corn, Oil meals, distillers' grains, forages, and so forth. These usually provide cows with 1 to 1-1/2 pounds of fat.
2. The second unit of fat comes from heat-treated soybeans or whole cottonseed and adds another 1 to 1-1/2 pounds of fat.
3. The use of pure fat or fatty acid products that contain 80 to 100% fat are third. These are used when maximum energy density is required.

The critical item in the use of the last two sources of fat is ability to get the fat through the rumen without harm to the bacteria and other microorganisms.

Possible Cottonseed Replacements			
	Mixture		
Feed Ingredient*	1	2	3
Distillers' grains	45	31	0
Barley	28	0	0
Corn	0	41	0
Blood meal	0	0	5
Soybean meal	0	0	25
Cottonseed hulls	10	10	17
Soybean hulls	0	0	35
Urea	3	4	0
Molasses	0	0	3
Fat	14	14	15
*percentage of the total mix			

Since the rumen bacteria derive no nutrition from fat and we want the fat to be digested in the lower digestive tract, there is no reason for the fat to be metabolized in the rumen. There is, in fact, a very good reason for it not to be changed....the needed growth and development of rumen bacteria.

If all we are concerned with is having a feed with similar composition to whole cottonseed, formulating a replacement is easy. In the table, I have listed three.

What is missing? The fat is present in a free form and can be expected to become well mixed with the rumen contents. What is needed is a means for getting the oil or fat through the rumen with minimum change. Researchers at the University of Idaho recently reported some excellent research on this. A whole cottonseed replacement was developed by a local feed company and used by the researchers in three feeding trials.

The mixture was 58% rapeseed fines, 15% wheat midds, 12.5% safflower, 7.4% sunflower hulls, 3.2% animal fat, 2.5% molasses and 1.4 % sunflower meal.

The mix was pelleted....this may well have been the secret to the good results of the feed. The pellet was used as a replacement for whole cottonseed in total mixed rations containing 80% grain and 40% forage.

In the first experiment, 32 cows were divided and fed rations containing either whole cottonseed or the replacer pellet. Those fed the pellets averaged 67 pounds of milk, and those fed whole cottonseed averaged 65 pounds of milk.

In a second trial, the averages were 69 and 65 pounds of milk. A third trial gave similar results.

The researchers concluded that a pelleted substitute could replace whole cottonseed in early lactation diets, provided substitution is on a caloric or energy basis. My conclusion is that the research appears to support the idea that pelleting is a useful method for getting fat and oil through the rumen without damage to rumen bacteria.

Reproduced by permission
from October 10, 1992 of Hoard's Dairyman,
copyright 1992, W. D. Hoard & Sons Company, Ft. Atkinson, Wisconsin