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Feeding Whole Cottonseed to Cattle

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Currently, there is considerable interest in feeding whole cottonseed to cattle in the cotton producing states of the South. Whole cottonseed has both a high crude protein content (21-23%) and a high energy content (90% TDN) due to its high oil content (22-23%). That oil is highly digestible, containing 2.25 times more energy than our typical carbohydrate sources from grains such as corn which has an 80% TDN content. However, major constraints to feeding high dietary levels of cottonseed are possible gossypol toxicity and polyunsaturated oil content.

Gossypol Toxicity

A major constraint to the use of high levels of cottonseed in the diets of livestock is the presence of a toxic substance in the seed called gossypol. Gossypol is a yellow pigment occurring in the pigment glands scattered throughout the seed. Like many toxins present in plants, gossypol serves an important function by protecting the cotton plant against insects and pests. The gossypol is toxic to them, reducing their appetite for the cotton plants and thus serving as a natural insecticide. Glandless cotton (cotton without gossypol) requires excessive use of pesticides for plant protection. To protect our environment, we certainly do not want to breed plants that require more chemical pesticide protection. However, a plant breeding program is underway to develop a line of cotton that has gossypol in the plant but not in the seed.

Cottonseed meal is not fed to poultry because the gossypol causes the egg yolks to turn olive green, after a reasonable storage time. High levels of consumption of gossypol from whole cottonseed or cottonseed meal can cause reduced growth and feed intake. Over a prolonged period, it causes damage to the heart, liver and lungs resulting in cardiac irregularity, cardiac failure (heart attack), pulmonary edema, and labored breathing. High levels of gossypol can also cause anemia by tying up available iron in the diet.

An interesting development with gossypol is the experimental use of it as a male contraceptive since, in humans, at lower than the toxic levels, it blocks sperm production. Thus, its use as a male birth control pill is currently being studied. There are no apparent fertility problems in livestock fed reasonable levels of cottonseed or cottonseed meal.

Some of the gossypol in cottonseed meal is bound during the heating process, rendering the meal less toxic than the whole cottonseed. For swine, no more than 9% of the ration should come from cottonseed meal. Cattle are more tolerant of cottonseed than swine or poultry, but high levels over prolonged periods can result in the aforementioned toxicity symptoms.

Oil Content

Whole cottonseed contains about 23 percent oil, much of which is removed to make cottonseed meal. It is a valuable oil for use in many areas of commerce, especially the cosmetics industry. The oil in cottonseed contains a high degree of unsaturation (polyunsaturated oil). The microbes in the rumen of cattle are sensitive to high fat or oil levels in diets and are especially sensitive to polyunsaturated oils. At high levels, the microbes become less effective in digesting the other feeds they are consuming.

Feed Recommendations

Whole cottonseed is a potentially valuable feedstuff for dairy and beef cattle. It contains about 23 percent crude protein, 23 percent fat or oil, and 17 percent fiber. Dairywomen like to use whole cottonseed in dairy rations because of the high protein, energy and the added fiber content. In dairy cattle rations (larger breeds), a maximum of 8 lbs/head/day is recommended. In smaller dairy breeds with less rumen capacity, this amount should be lowered according to the body weight and, thus, rumen capacity.

For beef cattle, a research study in Texas determined that the most effective level of whole cottonseed in diets of beef steers was between 15 and 20 percent of the total ration. If we assume that a 1,000 lb beef cow is consuming about 2.5 percent of her body weight as dry matter and that 18 percent whole cottonseed is the maximum effective level, we would recommend a maximum of 4.5

lbs/head/day of whole cottonseed supplementation for that cow. Following is a chart that uses the aforementioned assumptions to calculate the maximum intakes for different bodyweight cattle:

Body Weight	Maximum Intake
500 lbs.	2.25 lbs/hd/day
600 lbs.	2.70 lbs/hd/day
700 lbs.	3.15 lbs/hd/day
800 lbs.	3.60 lbs/hd/day
900 lbs.	4.05 lbs/hd/day
1,000 lbs.	4.50 lbs/hd/day
1,100 lbs.	4.95 lbs/hd/day
1,200 lbs.	5.40 lbs/hd/day
1,300 lbs.	5.85 lbs/hd/day
1,400 lbs.	6.30 lbs/hd/day
1,500 lbs.	6.75 lbs/hd/day

Young cattle do not like the taste of cottonseed, so it may have to be top dressed with grain to get them to eat it. Do not feed it to calves under 3 months of age. Whole cottonseed should be stored in a dry shed and can be stored on the ground.

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