

Sludge Evaluation

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Story in Brief

Metabolism experiments were conducted with four mature steers in a crossover design experiment, to evaluate the digestibility of sludge, the residue of a process which recycles cattle waste to generate methane. Sludge was fed at 15 or 30 percent ration dry matter. At either level, animals were very reluctant to consume feed. Apparent digestibility of sludge dry matter, organic matter, acid detergent fiber and nitrogen was 30, 45, 17 and 25 percent, respectively. In another study, the digestibility of sludge in the rumen was estimated. This technique estimated sludge organic matter and fiber digestibilities at 38 and 41 percent.

Introduction

As conventional roughage supplies become increasingly scarce and costly, the search for alternative fiber sources increases in importance. One potential option is the fibrous residue from generation of methane gas. This sludge is the by-product of an anaerobic fermentation process for which feedlot waste is the starting ingredient. Sludge is made up of two components: 1) screenings, the residue obtained as the waste material is sifted through a series of sieves prior to being fermented to methane and 2) centrifugate, the solids, principally microbial, obtained from high speed centrifugation of the fermented liquor.

Materials and Methods

Sludge used in the present study was obtained from a methane generation plant at Guymon, Oklahoma. Nutrient digestibility of the material was estimated following two procedures: 1) by feeding to steers and 2) by suspending the material in the rumen for digestion. Four 900 lb steers were used in a crossover design experiment in which sludge was fed at 15 or 30 percent of total ration dry matter. Ingredient composition of the experimental diets is shown in Table 1. Steers were fed 5 lb of dry matter from their respective diets twice daily. Test periods lasted 15 days with fecal sampling the final five days.

For the ruminal digestibility study, sludge disappearance was compared to that of corn silage. Fresh samples (as fed basis) of sludge or corn silage were placed in dacron bags (approximately 100 mesh) and incubated simultaneously in the rumen of a mature fistulated steer maintained on prairie hay. Bags containing samples of each material were removed at 5 hr intervals for 30 hours. Sludge digestibility was estimated at that point when 70 percent of the corn silage dry matter had disappeared. All samples were analyzed for dry matter, ash, acid detergent fiber and nitrogen.

Results and Discussion

The composition of methane generator sludge in comparison to corn silage and alfalfa hay is shown in Table 2. The sludge material has a relatively high ash and fiber content. Animal digestibility of dry matter, organic matter, acid detergent fiber and protein was 30, 45, 17 and 25 percent respectively. Corresponding estimates for ruminal digestibility of organic matter and acid detergent fiber were 38 and 41 percent (Table 3).

Table 1. Ingredient composition of experimental diets (DMB).

Item	Diets	
	1	2
	---- % ----	
Sludge	15	30
Cracked corn	80	65
Urea supplement	5	5

Table 2. Composition of methane generator sludge, alfalfa hay and corn silage.

Item	Dry Matter	Ash	Fiber	Protein
	---- % of Dry matter ----			
Sludge	35.7	24.0	59.3	14.2
Corn silage	33.0	6.6	24.4	8.1
Alfalfa hay	90.0	8.9	26.6	17.9

Table 3. Sludge nutrient digestibility.

Item	Dry matter	Organic matter	Fiber
	-----%-----		
Animal ^a	30 ± 7.5	45 ± 8.3	17 ± 11.4
Ruminal	---	38	41

^aMean ± standard error of estimate.

Although the sludge no longer retains a characteristic fecal odor, acceptability of the material by animals was very poor. After nearly one month adaptation with *ad libitum* access to feed, maximum intake of a diet containing 15 percent of its dry matter as sludge by one steer was less than 9 lb per day. In the light of the high ash and fiber content, low digestibility and poor animal acceptability, it appears the methane generator sludge currently is not suitable as an alternative roughage source for ruminants. If intake problems were solved, the material might prove useful at a low level for maintaining cows.