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Handling Potato Waste For Beef Cattle Feeding

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Waste products from potato processing are a disposal problem for the processor but a source of feed for livestock. Approximately 35% by weight of potatoes received for processing are usually separated and sold as cattle feed. Since about 5 billion pounds of potatoes are processed annually in Idaho, potato wastes potentially represent more than 125,000 tons of feed on a dry matter basis.

Potatoes and potato wastes are high in energy and low in protein. Composition of potato waste is quite variable depending on the processor, the type of waste, the length of time spent in the clarifier tanks, the amount of sediment in wash water entering the settling tanks and the amount of peeling waste included.

Feeding potato waste to beef cattle requires good feed management and certain precautions.

Storage and Feeding of Potato Waste

Filter cake contains fine particles of potato pumped from settling or clarifier tanks through a vacuum drum filter to remove part of the water. It has approximately 20% solids of which 60 to 75% is starch. Average crude protein content is 4.8%, ash 2.2%, fiber 1.6% and fat 2.4% on a dry matter basis.

The starch content of filter cake changes rapidly during storage in open pits. Starch is broken down by enzymatic and microbial action. Typical losses during simulated pit storage at room temperature are shown in Table 1.

Table 1. Starch loss and pH change in filter cake during simulated pit storage.

Storage time	pH	Mg starch/g	Starch loss (%)
Start	6.5	593	—
1 day	5.0	580	2.2
2 days	4.5	565	4.7
4 days	4.0	537	9.4
1 week	3.5	481	18.9
2 weeks	3.5	352	40.6
3 weeks	3.5	280	52.8

Nutrient losses occur as starch is broken down to simple sugars which in turn are used for bacterial growth. This produces acids and quantities of carbon dioxide which escape into the air. The microflora of fresh filter cake is highly variable. Total bacterial counts of fresh filter cake range from 10 to 100 million/g, generally divided about equally between those that require air and those that do not. Mold counts range from 1 to 10 million/g in fresh samples and multiply rapidly on the surface areas during storage.

Certain species of bacteria and molds produce toxins during growth that will cause problems in cattle fed the filter cake. Other species are pathogenic to animals when present in large enough numbers. Generally, numbers of pathogens are low in fresh filter cake but occasionally storage conditions develop which favor one species at the expense of others. If the favored species is a pathogen, the result could be sick or dead cattle in the feedlot. Acidosis in cattle can also result from the acidity caused by bacterial growth during storage of filter cake.

Filter cake is handled as a slurry. For feeding, it is usually mixed with the ration's dry ingredients which absorb the excess moisture from the potato waste. The complete ration can then be augered into feeders.

Lye Peeling Waste is the residue from potato peeling operations which use a sodium hydroxide (lye) dip followed by mechanical action to remove the peel from potatoes. Lye peel contains about 14% solids. Starch content ranges from 50 to 65% of dry matter and is gelatinized due to the concentrated alkali and heat used in the peeling process. Average crude protein is 5.6%, fiber 7.6%, ash 6.9% and fat less than 1.0% of dry matter.

Lye peel is very alkaline (pH 12 to 14) and must be neutralized before it can be fed. When stored by itself, lye peel is quite stable microbiologically and has little loss of feeding value as long as the pH remains high. When 10 to 20% of chopped potatoes, filter cake or beet pulp are mixed with lye peel, pH drops rapidly (Table 2).

Table 2. Starch loss and pH change in lye peel with 20% added filter cake during simulated pit storage.

Storage time	pH	Mg starch/g	Starch loss (%)
Start	12.5	532	—
1 day	8.5	509	4.3
2 days	7.0	487	8.5
4 days	5.0	431	19.0
1 week	4.5	354	33.5
2 weeks	3.5	284	46.6
3 weeks	3.5	233	56.2

Microbial counts in lye peel are much lower than in filter cake but numbers build up rapidly when the two are mixed (Table 3). Bacterial numbers remain essentially static when lye peel is stored without mixing with other products. The high pH of lye peel prevents bacterial multiplication but some survive. The survivors include a high proportion of spore-forming bacteria. Some species of anaerobic spore-forming bacteria produce potent toxins which cause cattle to go off feed and can cause death losses.

Table 3. Microbial build-up in potato waste during simulated pit storage at room temperature.

Storage time	Microorganisms/g		
	Lye peel	Lye Peel + 20% filter cake	Filter cake
Start	6 thousand	1 million	57 million
2 days	8 thousand	320 million	1 billion
4 days	5 thousand	1 billion	8 billion
1 week	5 thousand	9 billion	10 billion
2 weeks	6 thousand	12 billion	10 billion
3 weeks	5 thousand	12 billion	13 billion

Most cattle feeders store lye peel in pits with filter cake or other potato waste products. The lower pH resulting from this mixing allows bacterial fermentation to take place. During the fermentation process, starch is broken down and goes off into the air as carbon dioxide, thereby reducing the feeding value of the potato waste. This starch loss is also shown in Table 2.

Screening Waste and Cull Potatoes

Screening waste consists of cull or whole potatoes discarded because of size and small amounts of peeling. Screening waste has about 20% dry matter. This material can be handled like cull potatoes for feeding and storage. Cull potatoes can be fed fresh or ensiled by mixing with chopped hay to absorb excess moisture. However, they should not be left in piles where they can freeze during winter. Feeders should crush cull potatoes before feeding so cattle will not choke on them.

Dried Potato Products

Variable quantities of dried waste are produced by processors of dried potato products (potato flakes, granules etc.). These potato wastes can generally be included in beef cattle rations without difficulty.

Feeding Potato Waste

When feeding potato waste to cattle, remember:

1. Potato waste is a highly variable feed ingredient. Variability is usually caused by the condition and time of storage. Dry matter, ash, starch and microbial content can change during storage. Due to the variability, adapt cattle slowly to potato rations and, once they are on feed, do not change rations rapidly.
2. Large amounts of potato waste can be fed to beef cattle after cattle have been adapted to such rations. University of Idaho research has indicated that 50% potato waste in finishing rations resulted in acceptable performance of beef steers. When 80% potato waste was fed to finishing steers, dry matter intake and rate of gain were reduced. Feeders using potato waste should make sure feed intake (on a dry basis) is adequate for acceptable animal performance.
3. Potato waste is valuable principally as a source of energy. Open pit storage may greatly reduce the starch content in a short time, thus reducing its feeding value. Inventory of potato waste should be rapidly turned over to reduce losses due to fermentation in storage.
4. While the price per ton of potato waste may be low, remember that you are buying and hauling between 80 and 90% water. On a dry matter basis, fresh potato waste has about the same energy value as barley. The dollar value of potato waste depends upon transportation considerations, storage costs, dry matter content and nutrient losses during storage. Consideration must also be given to protein and mineral content.

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