



UNIVERSITY OF
FLORIDA

IFAS EXTENSION

Energy and Milling By-product Feedstuffs for Dairy Cattle¹

B. Harris Jr. and C. R. Staples²

The basic energy and milling by-product feedstuffs have been important to livestock feeders for many years due to their competitive nature and nutritional value. Feedstuffs such as soybean hulls, wheat middlings, hominy feed, rice bran, citrus pulp, molasses, beet pulp, peanut skins and dried bakery products have traditionally been used by dairymen in the southeast. The incorporation of such by-products into animal feeding programs have helped solve disposal problems associated with some industries and reduced the quantity of feed grains required in animal production.

BEET PULP

Beet pulp is the residue from manufacturing sugar from sugar beets. The fiber will range from 15 to 20% and is very digestible. It is a very palatable and bulky feedstuff, containing about 85% of the energy value of corn and about 6.2% crude protein (as fed). It may be fed at the rate of 10 to 20% of the total ration dry matter or 6 to 7 lbs daily per cow. Higher levels may reduce dry matter intake due to the bulkiness in the rumen. The higher level of fiber is helpful in maintaining milk fat percent in cows on low roughage rations.

CITRUS PULP

Citrus pulp is a mixture of peel, inside portions, and cull fruits of the citrus family (orange, grapefruit, etc.) which have been dried to produce a coarse, flaky product. It is relatively high in energy, calcium, digestible fiber and low in protein and is similar to beet pulp in feeding value. Citrus pulp has an unusual and pleasing aroma. Once cows are accustomed to it, citrus pulp is very palatable and may be included at a level of 25 to 30% of the total ration dry matter, 30% of the concentrate portion of the ration, or 8 to 10 lbs daily per cow. A maximum level of 10% is suggested for calves under two months of age.

BAKERY BY-PRODUCTS

Bakery by-products is a term used to refer to a variety of products containing about 11% crude protein and 80% TDN (as fed). The products contain various combinations of bread, crackers, cookies, doughnuts, cakes, and so forth, which are usually dried and ground together. Bakery products may be fed at the rate of 6 to 8 lbs daily per cow or 20 to 25% of the concentrate. Bakery products tend to be high in salt (1 to 3%) and low in fiber, and as such,

-
1. This document is DS36, one of a series of the Animal Science Department, Florida Cooperative Extension Service, Institute of Food and Agricultural Sciences, University of Florida. Original publication date August 1991. Reviewed June 2003. Visit the EDIS Web Site at <http://edis.ifas.ufl.edu>.
 2. Professor and Associate Professor, Dairy Science Department, Cooperative Extension Service, Institute of Food and Agricultural Sciences, University of Florida, Gainesville.

The Institute of Food and Agricultural Sciences (IFAS) is an Equal Employment Opportunity - Affirmative Action Employer authorized to provide research, educational information and other services only to individuals and institutions that function without regard to race, creed, color, religion, age, disability, sex, sexual orientation, marital status, national origin, political opinions or affiliations. For information on obtaining other extension publications, contact your county Cooperative Extension Service office. Florida Cooperative Extension Service / Institute of Food and Agricultural Sciences / University of Florida / Larry R. Arrington, Interim Dean

frequently depress fat test when fed at higher levels or in rations containing lower amounts of roughage.

CANE MOLASSES

Cane molasses is the most common liquid supplement fed to dairy cattle. More recently a variety of molasses products are available to livestock feeders. Among them are cane molasses, citrus molasses, beet molasses, masonex and a number of products resulting from the production of alcohol. Most of the by-products are palatable and are frequently used in concentrate mixes at the rate of 4 to 7% to control dustiness. Molasses products vary considerably in energy content with cane molasses containing about 65% TDN (as fed). Suggested levels for maximum feeding are 2 to 3 lbs daily per cow.

WHEY

Whey is the residue from cheese production and consists primarily of lactose, minerals and water. It can be fed dry or as a liquid. The liquid is termed sweet whey and acid whey. Sweet whey comes from the manufacture of cheddar and mozzarella cheese and acid whey results from the production of cottage cheese and is less palatable than sweet whey. Dried whey contains about 12 to 14% protein and 80% TDN. Liquid whey contains only 6 to 7% solids and must be fed rather soon or it will spoil. The pH of sweet whey (pH 6.0) is higher than the pH of acid whey (pH 4.5), but both will drop to about pH 3.5 or lower within two days. Cows will consume about 20 gallons (172 lbs) of liquid whey daily and as expected, will increase their output of urine. Cows require a period of up to about 4 weeks to become accustomed to liquid whey. Since liquid whey is corrosive, suitable containers must be used such as plastic, stainless steel, glass or wood. Dried whey may be used in lactating cow rations at a rate of 5 to 10%. Fermented ammoniated condensed whey (Lacto Whey) is produced with the addition of ammonia. The product is marketed to contain about 44% crude protein. Lacto Whey is similar in appearance to molasses but has a higher viscosity. Rate of feeding recommended is about 2 lb daily per cow. Up to 3 to 4 lb daily may be used when in combination with high bypass protein feedstuffs such as brewers' and distillers' grains.

HOMINY FEED

Hominy feed is a by-product from the manufacture of pearl hominy, hominy grits or tablemeal from corn. It is similar in appearance to ground corn, has slightly more energy and protein, and has similar feeding characteristics. Hominy feed is very palatable to dairy cattle and may be fed in quantities as one would use corn meal.

PEANUT SKINS

Peanut skins consist of skins from processed peanuts, broken nuts and nuts that may have been rejected during the preparation of peanuts for human consumption. Peanut skins are high in fat, containing some salt and oil, and 16 to 18% crude protein. Since peanut skins contain a fairly high level of tannin and are a lower energy by-product, skins should be limited to about 5 to 8% of the ration. Tannin acts in the gut by binding dietary protein and making it unavailable for digestion or absorption. As the level of tannin increases in the diet, the amount of protein lost in the feces increases.

RICE BRAN

Rice bran is composed of the bran layer and germ of the rice which are removed in milling rice for human consumption. Rice bran contains about 12% protein, 12% fat, 10% crude fiber and 60% TDN. High fat rice bran frequently becomes rancid when stored for long periods. Solvent processed rice bran is low in fat and keeps quite well. Rice bran is palatable to dairy cattle and may be used at levels of 10 to 15% for high producing cows and at higher levels for lower producing cows. The lower energy content of rice bran limits its usage for maximizing energy intake in early lactation. Rice bran is high in phosphorus and low in calcium.

SOYBEAN HULLS

Soybean hulls are a by-product of soybean processing for oil and meal production. Since soybean hulls have urease activity, a problem may develop in rations containing urea. Heat treatment destroys the urease activity. Soybean mill run is heat treated soybean hulls. The products contain about 11 to 12% protein, 32 to 34% crude fiber, and 65% TDN

(as fed). Soybean hulls are very palatable for dairy cattle and are frequently used at the rate of 20 to 25% of the total ration dry matter or 8 to 9 lbs daily per cow. Soybean hulls add bulk to finely textured rations and the high fiber content is highly digestible and low in effective fiber (14%).

WHEAT MILLFEEDS

The wheat millfeeds (bran, millrun, middlings, shorts, red dog) are by-products produced during the milling of wheat for flour. They consist of varying amounts of bran, germ, and flour. Wheat middlings (also called midds) are a common ingredient in cattle feeds and have been very competitively priced in recent years. They have about 92% the energy value of corn and contain more protein (16%). They are a palatable feedstuff and can be included at a level of about 15 to 25% of the total ration dry matter. Higher levels maybe used for lower producing cows and heifers. Also, higher levels tend to reduce milk production as shown in the experiment in Table 1.

RICEMILL BY-PRODUCT

Rice mill by-product is a low-energy, high-fiber (28%) feedstuff that consists of rice hulls, rice bran, rice polishings and broken rice grains. In contrast to soybean hulls, the fiber content is low in digestible energy. Rice mill by-product or rice mill feed contains 6 to 7% protein, 42% TDN and only 12% effective fiber. Since it is not a good source of fiber and is a low-energy feedstuff, it should be fed to replacements, dry cows, and low producing cows when there is an economic advantage.

Table 1. Responses of cows fed rations containing different amounts of wheat midds (wheat midds percent of concentrate).

	Trial 1			Trial 2		
		20%	40%		40%	60%
	Control	Midds	Midds	Control	Midds	Midds
DM intake (lb/d)	44.7	43.6	44.9	44.4	45.8	44.2
Milk yield (lb/d*)	67.8	64.9	64.9	57.6	57.0	54.6
Fat test (%)	3.3	3.2	3.4	3.6	3.7	3.7
Weight change (lb/d)	0.51	0.37	0.39	0.95	1.63	1.69
* Significant linear and quadratic effects (P<.005) for Trial 2 Aalfa hay was 40% of ration.						