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Cooperative Extension Service  
*South Dakota State University*

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# Extension Extra

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Foods and Nutrition

SOUTH DAKOTA STATE UNIVERSITY / U.S. DEPARTMENT OF AGRICULTURE



## Using Distiller's Dried Grain from Corn in Baked Goods

### What Is Corn Distiller's Grain and How Is It Made?

Distiller's grain is produced during the process of making ethanol from corn. This very complex process is simplified as described in the adjoining diagram.

To make ethanol, corn is cooked with starch-degrading enzymes. This process breaks the starch in the corn to sugar. Yeast is then added to the mixture. As the yeast ferments the sugar, carbon dioxide (CO<sub>2</sub>) and ethanol are produced. The CO<sub>2</sub> is vented off, and the ethanol is removed from this slurry. The slurry that remains can be separated into distillers wet grain and a thin liquid called sweetwater. The wet distiller's grain may be sold "as is" for animal feed or it may be dried and sterilized into a food-grade product and sold as distiller's dried grain (DDG).

This by-product of ethanol production is an excellent dietary addition to baked goods.

### Food Safety and Distiller's Dried Grain

At the Corn Utilization Conference in June 1992, it was noted that Distiller's grains were cleared for unrestricted use in human food by the FDA as long as the grain used for manufacture was suitable for human consumption. The DDG manufacturing facility must also be approved for food production. At SDSU, the DDG is washed, freeze-dried, steam/pressure sterilized, oven toasted and ground to make a wholesome food-grade product.

### The Process

GROUND CORN



- Cook in water with starch degrading enzyme at 90° C for 1 hour

CORN MASH



- Incubate with sugar-producing enzyme at 60° C for 4 hours and then add yeast
- Take off (distill) the ethanol
- Take off CO<sub>2</sub>

DISTILLER'S WET GRAIN & LIQUID (SLURRY)  
(the corn residue after ethanol production)



- Remove liquids

WET DISTILLER'S GRAIN



- Dry the grain

DISTILLER'S DRIED GRAIN (DDG)

- May be used in baked products

## SDSU Research and the Future

Ethanol is a growing South Dakota industry. The use of corn by-products such as DDG by the food industry could make ethanol production an even more important part of the South Dakota economy.

Numerous studies have demonstrated that DDG, at varying levels, can be substituted for a portion of the flour or added in leavened products, baked goods, biscuits, cookies and batters. The use of DDG in baked products enhances the fiber and protein content of the food product. DDG contains approximately 40 percent fiber and 36 percent protein. This corn by-product has higher fiber and protein content than any natural whole grain.

Increasing fiber intake to about 25-30 grams per day is one of the U.S. dietary goals. One cup of distillers dried grain contains approximately 30 grams of dietary fiber. As a comparison, a person would need to eat 30 cups of corn flakes to equal the fiber in 1 cup of the corn distillers dried grain. DDG products could also be used as a protein supplement in the diet of the world's malnourished population.

### SDSU Research DDG Recipe

This research recipe contains DDG - distiller's dried grain. When the recipe calls for "DDG/flour mixture," the content of the mixture is 98 percent all-purpose flour and 2 percent DDG.

#### DDG Oatmeal-Raisin Cookies

- 1/2 cup soft shortening
- 1 1/4 cup sugar
- 2 eggs
- 6 tbsp. molasses
- 1 3/4 cup sifted DDG/flour mixture
- 1 tsp. salt
- 1 tsp. cinnamon
- 2 cups rolled oats
- 1/2 cup chopped nuts
- 1 cup cut-up raisins

Nutritional Information for the cookies is available upon request from the Nutrition Food Science Department at SDSU, P.O. Box 2275-A, Brookings, SD 57007.

NOTE: Corn DDG is not currently available for commercial or retail use.

## Comparison of Distiller's Dried Grain with Corn.

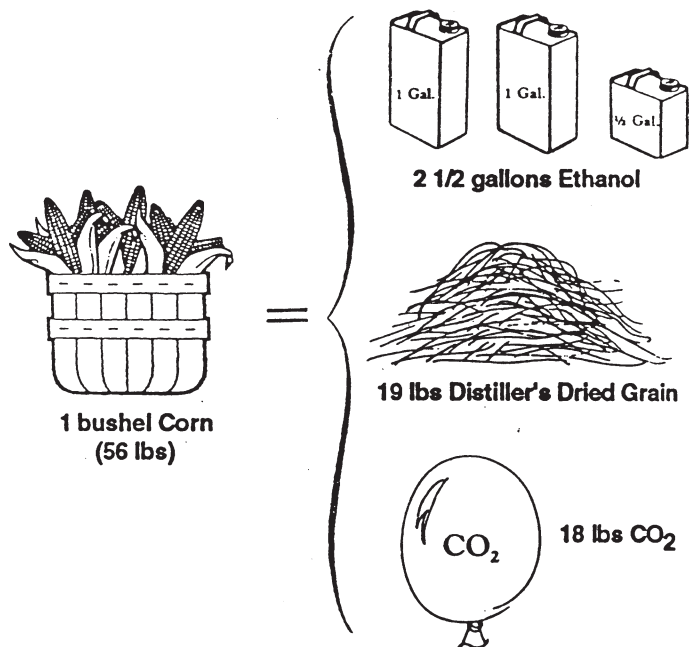
Constituent 100 grams dry weight	DDG <sup>1</sup>	CORN <sup>2</sup>
Protein	36.4%	7.5%
Oil	9.7 <sup>4</sup>	3.8
Mineral	1.7	1.2
Total Dietary Fiber	40.4	16.4
Carbohydrates	11.8 <sup>3</sup>	71.1
TOTAL	100.0%	100.0%
Moisture	3.9%	10.2%

<sup>1</sup> As analyzed at SDSU.

<sup>2</sup> Rasco et al 1987 expressed as a dry weight basis.

<sup>3</sup> By calculation.

<sup>4</sup> Can be reduced to fat free.



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