NOTE

The Total Dietary Fiber Content of Wheat, Corn, Barley, Sorghum, and Distillers' Dried Grains with Solubles

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Distillers' dried grains with solubles (DDGS), the major by-products in the fermentation of whole grains to alcohol, have been proposed to be suitable as an ingredient in human-grade food. The high-protein and neutral detergent fiber (NDF) contents of DDGS made from wheat have been reported (Dong and Rasco 1987, Rasco et al 1987). The purpose of the present study was to determine the total dietary fiber (TDF) contents of DDGS made from three types of whole wheat, pastry flour, corn, barley, and sorghum using the enzymatic, gravimetric method of Prosky et al (1984, 1985).

MATERIALS AND METHODS

DDGS were prepared as described by Dong and Rasco (1987) and Rasco and co-workers (1987). Hill 81 wheat (a variety of soft white winter wheat), corn (grade no. 1 yellow dent), a red wheat blend (grade no. 1 baker's blend of 2/3 Weston, a variety of hard red winter wheat, and 1/3 hard red spring wheat from the varieties Fremont, Pilot, or Bannock), Tyee (a soft white winter club wheat), pastry flour (70% extraction soft white wheat flour), barley (Steptoe cultivar), and brown sorghum (blend of several varieties) were processed to make DDGS.

Total dietary fiber assay kits (TDF-100) were purchased from the Sigma Chemical Co. (St. Louis, MO). The procedure outlined by Prosky et al (1985) was followed except that the sample size was decreased to 500 mg for the unfermented grains and to 200 mg for the DDGS to aid filtration. Data were analyzed by one-way analysis of variance and Duncan's new multiple range test (Steel and Torrie 1960).

TABLE I
The Total Dietary Fiber Contents of Wheat, Corn, Barley, Sorghum, and Distillers' Dried Grains with Solubles (DDGS)[a]

	Percent (Dry Weight Basis)		
Sample[b]	$\bar{x}$[c] ± SD	*n*	C.V.[d]
Wheat			
Hill 81	10.5 ± 0.4	3	4
DDGS	34.6 a ± 3.0	3	9
Tyee	11.6	1	···
DDGS	33.9 a ± 3.1	3	9
Red wheat blend	9.9	1	···
DDGS	34.8 a ± 3.5	3	10
Pastry flour	1.6	1	···
DDGS	14.4 b ± 3.5	3	25
Corn	12.1	1	···
DDGS	32.0 a ± 7.8	3	24
Barley	21.7	1	···
DDGS	84.7 c ± 1.3	2	2
Brown sorghum	10.1	1	···
DDGS	67.8 d ± 3.0	2	4

[a]Total dietary fiber determined by the procedure of Prosky et al (1985).
[b]See Materials and Methods for a complete description of the grains.
[c]Means followed by different letters are significantly different ($P < 0.01$).
[d]Coefficient of variation = (standard deviation/mean) × 100.

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RESULTS

The TDF contents of wheat, corn, barley, brown sorghum, and the DDGS are shown in Table I. The TDF levels in the whole wheat DDGS and corn DDGS ranged from 32 to 35% on a dry weight basis. DDGS from brown sorghum contained 68% TDF, which was significantly higher in TDF than either wheat or corn DDGS. However, the highest concentration (85% TDF) was found in barley DDGS.

Because of the conversion of starch to ethanol that occurs during the fermentation process and the subsequent removal of ethanol in the production of DDGS, TDF was concentrated approximately three to four times in whole wheat, corn, and barley DDGS. TDF was concentrated six to seven times in brown sorghum DDGS and nine times in pastry flour DDGS. The coefficients of variation of the TDF measurements were 10% or less for all DDGS except for those made from corn and pastry flour.

DISCUSSION

It has been proposed that the partial substitution of DDGS for flour in food products could significantly increase the dietary fiber content. This study indicated that approximately one-third of the dry weight of DDGS made from whole wheat or corn is dietary fiber. About 68% of the weight of sorghum DDGS and 85% of the weight of barley DDGS is composed of dietary fiber.

It has been estimated that wheat products contain little soluble fiber (Neilson and Marlett 1983, Patrow and Marlett 1986), so the contents of TDF and NDF in DDGS should be equivalent. The present study confirms this hypothesis. A comparison of the TDF values for wheat and corn DDGS obtained in this study to the NDF levels reported previously (Dong and Rasco 1987) indicates similar values when NDF was isolated with sodium sulfite. If a laboratory is seeking a simple, rapid, and inexpensive method for measuring dietary fiber in wheat products, then the NDF assay (with sodium sulfite) appears to be the method of choice. This study reconfirms our previous hypothesis that DDGS is a rich source of dietary fiber and has potential as a food ingredient.

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