

Soluble and Total Dietary Fiber in White Bread

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ABSTRACT

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On a 38% moisture basis, white breads made with 10 different flours contained $2.5 \pm 0.3\%$ total dietary fiber (TDF), which included $1.0 \pm 0.2\%$ soluble fiber. Bread ingredients contributed 2.0% TDF. Thus, TDF

increased by 0.5% during breadmaking. Most of this was soluble fiber, likely represented as resistant starch.

A commercially produced white bread recently analyzed (Ranhotra et al 1987) was found to contain 3% total dietary fiber (TDF) of which one-third was soluble fiber (SF). Based on these values, six 1-oz. slices of white bread would provide over 5 g of TDF and about 2 g of SF in our diet.

Soluble fiber is reported (Anderson 1986) to reduce elevated blood cholesterol, triglyceride, and glucose levels. Whereas peas and beans, fruits and vegetables, and oats are good sources of SF in our diet, refined wheat-based products such as white bread may also be a significant source. This study was undertaken to more extensively examine the content and makeup of TDF in white bread made with different flours.

MATERIALS AND METHODS

Ten flours obtained from different varieties of hard wheat were used to make white bread. The breads were made by the sponge and dough method (fermentation time, 3.5 hr) and, in addition to flour, contained dry yeast (1%, flour basis) and a whey-soy blend (2%) as sources of fiber in the bread formula; water was added at 63% (flour basis) level. All breads were baked the same day, cooled (1 hr), bagged, sliced after two days, air-dried, finely ground, and then frozen until needed for analysis. TDF in flour, yeast, whey-soy blend, and the resultant breads was determined by the method of Prosky et al (1985). Modifications in the filtration and precipitation (with ethanol) steps in the method allowed separate determination of SF and insoluble fiber (IF). Moisture was determined by the standard AACC (1983) method.

RESULTS AND DISCUSSION

On a 38% moisture basis, the TDF content of test breads averaged 2.51 g/100 g (Table I). Soluble fiber ranged between 31.3 and 49.2% (average, 41.1%) of the TDF values. This confirmed our earlier observation (Ranhotra et al 1987) that at least one-third of the TDF in white bread is SF.

Test flours averaged 2.69 g TDF/100 g (range, 2.36-3.08 g) of which 39% was SF and 61% IF. In an interlaboratory collaborative study of the TDF method (Prosky et al 1984), white flour was found to contain 3.1 g TDF/100 g. Yeast contained 26.5 g TDF/100 g, of which 3% was SF and 97% IF. The whey-soy blend used contained 14.2 g TDF/100 g, of which 7% was SF and 93% IF. Thus, the yeast and the whey-soy blend contributed little SF to the finished products.

Based on its amount in the bread, flour (along with yeast and whey-soy blend) contributed an average of 1.99 g TDF (SF, 0.66 g; IF, 1.33 g) per 100 g (Table II). Bread, however, contained an average of 2.51 g TDF (SF, 1.03 g; IF, 1.48 g) per 100 g. This represents an increase of 26% TDF during breadmaking (Fig. 1). In

Sweden, a study recently reported that bread contains 20% more TDF than the corresponding flour (Siljestrom and Asp 1986). Resistant starch (and browning reaction products) is likely the primary source of this additional fiber. When resistant starch is subtracted from processed foods, raw and processed foods have

TABLE I
Total, Soluble, and Insoluble Fiber in White Bread

Flour	Bread		
	Total Fiber ^a (g/100 g)	Soluble Fiber (% of total)	Insoluble Fiber (% of total)
1	2.26	46.5	53.5
2	2.46	49.2	50.8
3	2.58	43.4	56.6
4	2.82	47.5	52.5
5	2.54	41.3	58.7
6	2.25	38.2	61.8
7	2.35	41.3	58.7
8	2.78	31.3	68.7
9	2.99	34.5	65.6
10	2.08	38.0	62.0
Average	2.51	41.1	58.9
SD	0.29	5.8	5.8

^aOn 38% moisture (in bread) basis.

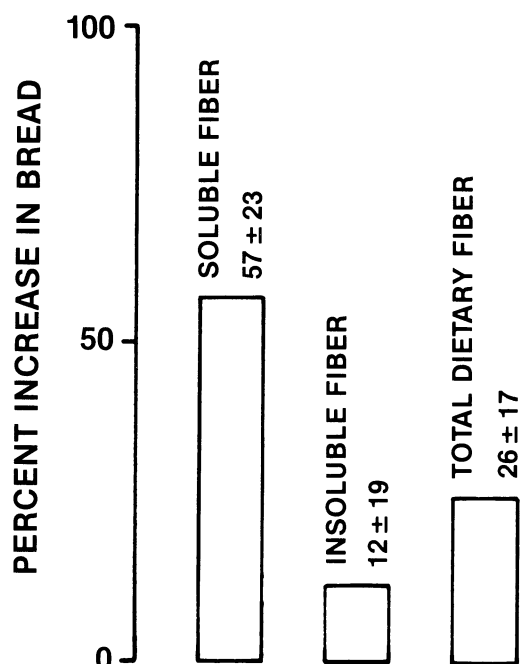


Fig. 1. The increase in fiber during breadmaking.

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TABLE II
Content of Soluble and Insoluble Fiber in Bread^a

Parameter	Soluble Fiber (g/100 g)		Insoluble Fiber (g/100 g)	
	From Flour ^b	In Bread	From Flour ^b	In Bread
Range	0.48-0.89	0.79-1.34	1.20-1.44	1.21-1.96
Average	0.66	1.03	1.33	1.48
SD	0.13	0.17	0.08	0.26

^aOn 38% moisture basis.

^bIncluding yeast and the whey-soy blend used in the bread formula.

been shown (Englyst and Cummings 1987) to have identical dietary fiber values. Although resistant starch remains largely undigested in the small intestine, its inclusion as a component of dietary fiber is being debated (Berry 1986, Englyst and Cummings 1987).

The increase in TDF during breadmaking varied substantially from bread to bread (Fig. 1). Variation also occurred in the makeup of the increased TDF. While SF increased by 57%, the increase in IF was only 12% (Fig. 1). If this holds true for other baked products, refined baked products may also be a good source of SF in our diet. This may be especially valid if we increase our consumption of complex carbohydrates (starches), and if resistant starch can be classified as a component of dietary fiber.

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