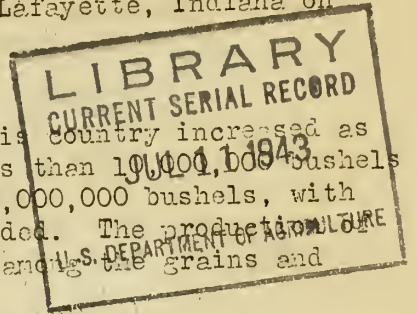


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SOYBREAD - A BREAD ENRICHED WITH MINERALS AND VITAMINS

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Seldom has the production of a potential food in this country increased as rapidly as has the soybean. Up to 1930 considerably less than 19,000,000 bushels were harvested in any one year. This year's goal is 125,000,000 bushels, with the probabilities that this figure will be greatly exceeded. The production of soybeans, both in yield and in farm value, is surpassed among the grains and seeds only by corn, oats, wheat, and barley.

Probably no food has had, in recent years, more merited favorable publicity than soybeans and the products made therefrom. It is now being quite generally recognized that soy flour is exceptionally rich in many of the essential nutritional factors such as high-quality protein, minerals, and vitamins. All this applies equally well to the three kinds of soy flour -- full-fat, medium-, and low-fat. All three types have excellent nutritive value. Soy flour is 15 times as rich in calcium as is patent wheat-flour, 7 times as rich in phosphorus, 10 times as rich in iron, 10 times as rich in thiamin, 9 times as rich in riboflavin, and 5 times as rich in niacin, (nicotinic acid) besides being 4 to 5 times as rich in protein and 10 times as rich in total minerals.

Much has been said already about enriched flour and bread. It is not intended to go into the history of this subject in detail. Suffice it is to say that England, after having considered the pros and cons of this subject for two years and more, has finally given up the whole idea of flour enrichment by use of synthetics and has gone on to an 85 percent wheat-flour extraction basis. Canada and Australia have never favored the use of chemicals to enrich flour but preferred to use some of the millstreams, found to be especially rich in the B vitamins, in addition to and in conjunction with the regular flour. Canada has even gone so far as to stigmatize as "adulterated" any flour to which a synthetic vitamin has been added. This is just the reverse of what the legislatures of two of our Southern States have just done, viz., made it unlawful for anyone to sell white flour, or bread, unless enriched either by the use of synthetic vitamins and iron or, in the case of bread, by the use of yeast that has been thus enriched.

Probably, a still better method to enrich flour is to use, with white flour or whole-wheat flour, some such product as soy flour, peanut flour, cottonseed flour, wheat germ, etc. The use of 20 percent of soy flour with 80 percent of clear flour makes a bread which is full three-fourths as rich in thiamin as is whole wheat bread, 85 percent as rich in iron, 70 percent as rich in phosphorus and 50 percent as rich in niacin. Such a bread, made with 6 percent skim milk powder, is even richer in calcium and riboflavin than is whole wheat bread.

Normally, 100 pounds of wheat yields 72 pounds of flour. The losses which result in the milling process are significant, viz., an average of over 80 percent of the total minerals, besides approximately an equal amount of the vitamins. Wheat contains some 15 to 20 different minerals, depending upon the presence of these elements in the soil. In the process of milling wheat to flour, 70 to 90 percent of each of these minerals is found in the offal. The enrichment program calls for the addition of one mineral only, viz., iron.

In wheat are found 10 to 12 vitamins of which, so far as our knowledge goes at present, thiamin, niacin, riboflavin, pyridoxine, pantothenic acid, and vitamin E are the most important. Many more vitamins may be discovered in, and isolated from, the wheat in the future. However, according to our present knowledge, from 50 to 95 percent of each of the known vitamins is removed in milling and is found in the feed. The enrichment program calls for the addition of two vitamins, viz., thiamin and niacin.

The use of wheat germ, soy flour, peanut flour, cotteseed flour, dried yeast, dried skim milk, etc., all rich in B vitamins as well as in minerals, would enrich white flour in a balanced manner, because each of those enriching substances would not only add thiamin, niacin, and iron to a flour deficient in most vitamins and minerals, but all of the minerals and the B vitamins in amounts and in proportions naturally found in those enriching substances.

The amount of calcium, phosphorus, and iron and of thiamin, riboflavin, and niacin present in one-half pound of bread made from patent, clear, and whole wheat flours, as well as from mixtures of 20 percent soy flour with 80 percent wheat flour (all bread doughs containing 6 percent of skim milk solids) has been compared to the daily requirement of these essential food factors. According to the National Research Council, the average adult requires daily 0.8 g. of calcium, 12mg. iron, 1.8 mg. thiamin, 2.7 mg. riboflavin, 18 mg. of niacin. Nutritionists generally assumed that approximately 1.5 g. of phosphorus is required daily per adult. On the basis that the average per capita consumption of bread is approximately one-half pound per day, that amount of bread made with 20 percent soy flour and 80 percent clear would supply 29 percent of the calcium, 35 percent of the phosphorus, 41 percent of the iron, 33 percent of the thiamin, 16 percent of the riboflavin, and 30 percent of the niacin required per day. One-half pound of bread made from a similar mixture of soy flour and whole wheat flour would supply 32 percent of the calcium, 54 percent of the phosphorus, 59 percent of the iron, 46 percent of the thiamin, 18 percent of the riboflavin and 56 percent of the niacin of the daily requirement. In other words, bread containing 20 percent of soy flour and 80 percent of clear wheat flour would be approximately 63 percent richer in calcium than the present patent flour enriched bread, 100 percent richer in phosphorus, 150 percent richer in iron, 70 percent richer in niacin, but only 20 percent richer in thiamin and 40 percent richer in riboflavin.

In Table 1 are shown the percentages of the daily requirements of minerals, (calcium, phosphorus, and iron) and vitamins (B₁, B₂, and niacin).

Not only can very satisfactory and nutritious bread be made from mixtures of 20 percent soy flour and 80 percent wheat flour, but, relatively speaking, equally nutritious cake, pie crust, macaroni, pretzels, biscuits, and cookies can likewise be made with such mixtures. Baking powder biscuits, e.g., made from a 50 to 50 mixture of soy flour and clear grade of wheat flour contain over five times as much minerals, including calcium and iron, five times as much thiamin and riboflavin, four times as much phosphorus, and three times as much niacin, as do biscuits made from plain white flour only.

The consumption of soy flour-clear flour bread would supply each year 1-1/2 lbs. more minerals than would the ordinary enriched bread, besides 1-1/4 ounces of calcium, 3-1/2 ounces phosphorus, 1.2 g. iron, 48 mg. thiamin, 54 mg. riboflavin, and 972 µg. of niacin. These are appreciable quantities when it is considered that the daily requirement of thiamin is only 1.8 mg., that of riboflavin, 2.7 mg.; and that of niacin, 18 mg. These figures become all the more significant if applied to the 16 to 18 years of the growing period of a child, for, during this period most children eat no bread except white bread.

Slides

- (1) Bread from different kinds of soy flour.
- (2) " " " amounts of soy flour.
- (3) " " 15% soy flour and 85% whole wheat.
- (4))
- (5)) Composition and vitamin content of soy flour and of wheat flour.
- (6) Components and vitamins in $\frac{1}{2}$ lb. of biscuits.
- (7) " " " " " " bread.

Table I. - Percentages of the Daily Requirements ^{1/} of Minerals and Vitamins in One-half Pound of Bread. ^{2/}

<u>Bread made from:</u>	<u>Calcium</u>	<u>Phosphorus</u>	<u>Iron</u>	<u>Vitamin B₁</u>	<u>Vitamin B₂</u>	<u>Niacin</u>
Plain patent flour	17.5	17.2	13.3	9.2	11.9	13.9
Enriched " "	17.5	17.2	16.6	27.7	11.9	16.0
Optional Enriched " "	35.0	17.2	16.6	27.7	24.0	16.0
Plain clear "	18.6	24.2	27.1	24.5	13.3	24.9
Whole Wheat "	22.4	47.5	48.2	42.3	15.3	59.9
80% plain patent flour 20% soy flour	27.7	29.0	30.9	20.0	15.4	20.4
80% plain clear flour 20% soy flour flour	28.6	34.6	41.2	32.7	16.7	29.5
80% whole wheat flour 20% soy flour	32.1	54.0	58.6	46.4	17.8	56.1

^{1/} National Research Council - Daily requirement: Ca, 0.8 g.; (P, 1.5 g.); Fe, 12 mg.; B₁, 1.8 mg.; B₂, 2.7 mg.; niacin 18mg.

^{2/} Bread formula: 315 g. flour, or 252 g. flour plus 63 g. soy flour.
 19 g. dried skim milk.
 8 g. compressed yeast.
 6 g. salt
 190-220 cc. water.

Table 2. - Amount of Food Factors in $\frac{1}{8}$ lb. of Biscuits (5.6 oz. flour)

Biscuits made from:	Protein grams	Salt-free Minerals grams	Calcium milligrams	Phosphorus	Iron	Thiamin	Riboflavin	Niacin micrograms
Plain Patent flour	16.3	0.66	28.7	146.6	1.15	73.2	65.1	1474.5
Enriched " "	16.3	0.66	28.7	146.6	2.14	586.0	65.1	2157.0
Whole wheat " "	18.6	3.19	78.2	673.5	5.94	776.7	184.9	10454.0
50 Plain Clear " "	45.7	4.44	251.1	651.2	6.73	558.0	339.4	6020.0

$\frac{1}{8}$ Daily Requirement 70.0 800.0 1500. 12. 1800 2700 18000

Percentage of Daily Requirement in $\frac{1}{8}$ lb. Biscuits.

Biscuits made from:

(1) Plain Patent flour	23.3	3.6	9.8	9.6	4.1	2.4	3.2
(2) Enriched " "	23.3	3.6	9.8	17.8	32.6	2.4	12.0
(3) Whole Wheat " "	27.7	9.7	44.8	49.5	43.1	7.7	58.0
(4) 50% Plain Clear 50% Soya	65.3	31.4	42.1	56.1	31.0	12.6	33.4
(4) greater (2) by %	800	325	229	-5	420	180	

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