International Journal of Food Science and Nutrition
ISSN: 2455-4898; Impact Factor: RJIF 5.14
Received: 03-01-2019; Accepted: 05-02-2019
www.foodsciencejournal.com
Volume 4; Issue 2; March 2019; Page No. 04-08

The nutritional value of a novel Syrian bread

Dr. Samira Alzughayar[1], Dr. Salam Harfoush[2], Adel Harfoush[3]
[1] Syrian Private University (SPU), Faculty of Pharmacy, Damascus, Syria
[2] National Dental Center, Damascus, Syria
[3] Atomic Energy Commission of Syria, Chemistry Department, Damascus, Syria

Abstract
In this study, a novel bread was manufactured. This bread consisted of mixture of different whole grains flours (75% wheat, 10% soybean, 10% barley and 5% corn) which were purchased from local market whereas the conventional pita bread (which is regularly consumed in the Arabic world) is made totally from wheat flour. When comparing this bread with the novel bread, it had higher amounts of certain nutrients which are important for healthy status such as carbohydrates, proteins, vitamins, fibres and minerals. The novel bread had higher content of protein, and fibre (21.9%, and 58.2% respectively) and it was higher in most minerals such as Calcium (22.5%), Iron (7.14%), and Zinc (6.7%). The vitamin content was also increased considerably. Vitamin B1, B2, B3, B6 and E increased by 73.8%, 44.4%, 69%, 243.3%, and 145%. There was an increase in Ca and Zn content and a decrease in Na. The pretreatment of some components was made for the first time, by an innovative way, in order to eliminate undesirable ingredients. This bread is nutritionally convenient for all age groups and more specifically for the vulnerable groups that do not have the means of securing the food resources other than bread. The novel bread was also acceptable in terms of taste, smell, texture and consistency.

Keywords: pita bread, novel bread, soybean, whole wheat, barley, corn, nutritional value

1. Introduction
The origin of bread can be linked to the cultivation of wheat and barley in an area described as the "Fertile Crescent" which extends from the Nile Valley of Egypt to Jordan, Syria, Lebanon, Tigris and the Euphrates Valley [1]. Bread was considered the main food item of that region and is still an essential component in human nutrition [2]. Wheat was eaten unmilled mixed with water. However, it tasted better when baked and the origin of bread was discovered [3]. Early breads were unleavened and flat. The Egyptians were accredited with discovering fermentation, a revolution in bread-making. This discovery spread throughout the Mediterranean region, especially to Italy, where the fermentation process was improved considerably. The Romans later removed yeast from the surface of fermenting wine and used it to leaven bread. What one consumes daily, from his young age and throughout his life, has a lasting influence on his nutritional, health status and aging. The food is a complex chemical, enters the cells and changes their structure and dictate their activity [4]. Nutrients in food strengthen the immune system in order to prevent damage caused by time and other factors. If foods are deficient in the necessary elements, the body's ability to resist damage can be reduced [5].
The major ingredients in the production of Pita or Arabic bread are wheat flour, yeast, salt and water. Other ingredients, such as sugars, oils or improving agents, are optional. It is therefore limited in nutritional value due to the removal of bran. It is also a burden for many who suffer from health disorders such as constipation, diabetes and obesity [6].
The nutritional value of the pita bread varies from country to another and depends on the type of flour used [7]. However, the proximate analysis of pita bread is shown in Table 1:

Table 1: The chemical analysis of conventional unenriched pita bread

Nutrient	Amount in 100 g
Energy (kcal)	275
Carbohydrates (g)	55.7
Total sugars (g)	1.4
Protein (g)	11.9
Lysine (mg)	0.08
Leucine (mg)	0.1
Fats (g)	1.2
Cholesterol (mg)	0.00
Fibre (g)	0.7
Ash (g)	1.2
Vitamin B 1 (mg)	0.27
Vitamin B2 (mg)	0.1
Vitamin B3 (mg)	2.14
Vitamin B6 (mg)	0.03
Vitamin E (mg)	0.00
Calcium (mg)	86
Iron (mg)	1.4
Zinc (mg)	0.84
Sodium (mg)	538

Soybeans are one of the best and richest sources of plant and animal proteins.
Soybean is unique because it is a rare source of high concentrations of a kind of miraculous drug, called jentin. The two classes are effective, anti-oxidant and are widely active anti-aging and anti-cancer activities [8].
In other anti-aging fronts, the jentin works to maintain arteries, because when it inhibits the proliferation of cancer cells, it also impedes the proliferation of smooth muscle cells in artery walls. Soy beans contains 25 - 45% protein, 16 -

23% oil, 30% carbohydrates and 5% ash. This high protein content in soybean seeds is what distinguishes it from other grains and even vegetables. Soya protein has special characteristics because it contains lysine. Its oil contains a very low value of saturated fatty acids (15%) and high of unsaturated (80%), which contains a high value of linoleic acid [9].

Vitamins of soybean contain vitamin B1 and other B vitamins (riboflavin, niacin, pantothenic acid), carotene (a precursor of vitamin A), and vitamin E [10].

Barley is the oldest plant known as food to humans, and the first used by Hippocrates as a medicine, which was used in the treatment of infections and diets. Barley cereals have a higher nutritional and health value than many other crops [11, 12]. It contains carbohydrate, lipids, proteins and vitamins, especially (B) and (E). Barley cereals are rich in minerals (magnesium, selenium, phosphorus, iron and calcium) and are also rich in tuna, which is less available in other plant products This element is very important in stimulating the immune system [13]. It also has a chromium component that is less readily available in other plants as well [14]. This ingredient (chromium) is of great importance in the prevention of diabetes (recently, a Japanese doctor discovered a medicine to treat diabetes made from barley leaves). Barley is also characterized by containing a protein in the form of Hordinine, which used to be injected under the skin or doses in the treatment of dysentery and inflammation of the intestine [15]. Barley cereals are also useful in helping to remove constipation. Barley is used as a general and special tonic for the nerves, a tonic for the liver and a reduction of blood pressure. It is also described in cases of impaired stomach and intestines. Therefore, barley flour is made from nutritious bread and consumed in many parts of the world, but it is rough because it does not contain enough gluten [16]. Corn grain is an important food crop for humans, and it depends on bread production in rural communities. It is described as highly nutritious, tonic, building, and regulating thyroid function, which is quick to digest and chase gas. Many industries are based on maize crop, such as extracting corn oil rich of vitamin E, the antidote of atherosclerosis and cholesterol inhibitor [17].

The corn grains contain the components of hemi-cellulose of the type of pentosane, containing the compound of xylan and about 10-13% protein, and amino acids such as threonine, valine, lucine, lysine, methionine, phenylalanine and tryptophan, containing the compound zeatin, a plant hormone that works as Start cell division in plant tissues. It also contains B vitamins and important minerals [18].

Based on the above, our aim of the work was to find a new bread by choosing a variety of grains such as soybean, barley and corn with typical food qualities that ensure healthy growth and balance [19]. Substantial alternative bread is also a food security task, and the issue of diversification is a feature of contemporary taste and economic requirements. A significant part of this importance can be included in the framework of health awareness.

The purpose of this study is to compare the nutritional value of the novel bread and the unenriched conventional pita bread in terms of macro and micronutrients contents.

2. Material and Methods

The novel bread is produced in different ingredients which pita bread has been produced from. The entire ingredients were from whole flours as follows: 75% wheat, 10% barley, 5% corn and 10% processed soybean. The mixture was subjected to a simple sieving process (using a 1 mm x 1 mm sieve). The dough was prepared in the same way as conventional pita bread, including the addition of water, salt and yeast using a 5 kg electric mixer. The baking process for both kinds of breads was done in regular electric ovens and baking process was followed in the same manner for both types of bread.

Nutrients analysis

The following analysis were done to determine various nutrients in both conventional unenriched pita bread and the novel bread according to (AOAC, 2002) [20].

a) Moisture assay

One of the most fundamental and important analytical procedures that can be performed on a food product is an assay of the amount of moisture.

Three grams were weighed into steel plate placed in forced draft oven for 3 hours at 105˚c depending on the food sample and it's pretreatment.

b) Ash analysis

Ash refers to the inorganic residue remaining after either ignition or complete oxidation of organic matter in a food stuff.

Five grams were weighed into porcelain crucibles then placed in the muffle furnace for 5 hours at 550˚C.

The ash content is calculated as follows:

Where: dry matter coefficient = % solids /100

c) Fat analysis: by Soxhlet method

Its semicontenuous solvent extraction, the solvent builds up in the extraction chamber for 5-10 min and completely surround the sample, then siphons back to the boiling flask.

This method provides a soaking effect of the sample and does not cause channeling. Seven grams were weighed into extraction thimble then covered with glass wool.

Fat content is measured by weight loss of the sample or by weight fat removed.

d) Protein analysis: (Kjeldahel method)

In the kjeldahel procedure, proteins and other organic food components in a one gram of sample are digested with sulfuric acid in the presence of catalysts. The total organic nitrogen is converted to ammonium sulfate. The digest is neutralized with alkali and distilled into a boric acid solution. The borate anions formed are titrated with standardized acid, which is converted to nitrogen in the sample.

The results of analysis represent the protein content of the food since nitrogen also comes from non-protein components.

e) Carbohydrates: (by difference)
Carbohydrates = 100 – (% protein +% fat + % ash + % moisture) according to (AOAC, 2002) [20].
Vitamins and minerals determination:

1. Vitamin E, several B complex vitamins (B2, B1 niacin and B6) and some amino acids (lysine and leucine). High performance liquid chromatography (HPLC) was used to determine these vitamins and minerals [21].
2. Calcium analysis. Flame photometer was used.
3. Phosphorus, Magnesium and Iron content. Atomic absorption Spectrophotometer was used [22].

Statistical analysis
The statistical analysis was done using SPSS software version 24 in order to examine if there was any significant differences between the novel and conventional pita bread. The significance difference was set at $P < 0.05$.

3. Results and Discussion
The data obtained from this study are presented in Tables 2, 3, 4 and 5. The data are showing the analysis results of the main components of both conventional unenriched pita bread and the novel bread. The results have revealed that there were significant increases in the most nutrients in the novel bread compared with the conventional unenriched pita bread which are going to have nutritional and physiological importance and could be a convenient alternative.
The comparison between nutrients was made using a portion size of 100 g. There was no significant difference in energy content (kcal/100 g) between conventional pita bread (280 kcal) and novel bread (275 kcal) as shown in Table 2 and Figure 1.

Table 2: Nutrients comparison between novel and conventional unenriched pita bread.

Nutrient	Novel bread	Pita bread White unenriched	Difference	%
	Amount in 100 g	Amount in 100 g		
Energy (kcal)	280	275	5	1.8
Carbohydrates g	53.5	55.7	- 2.2	3.9
Total sugars g	1.3	1.4	- 0.1	7.7
Protein g	15.5*	11.9	3.4	21.9
Lysine mg	0.124*	0.08	0.044	55
Leucine mg	0.134*	0.1	0.04	28.9

* Significant difference $P < 0.05$.

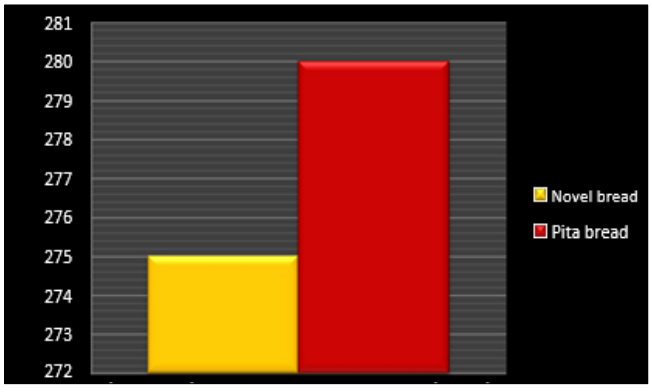

Fig 1: Calorie content of novel and conventional pita bread

There was a drop estimated at 2.2% in carbohydrates between conventional unenriched pita bread and novel bread and this can be explained by not adding any amount of sugars during dough making as it has been practiced when making conventional unenriched pita bread. Total sugar has been also reduced by 7.7% between novel bread and conventional pita bread.
A significant increase in protein content in novel bread compared with conventional pita bread. This increase estimated at 21.9% and this difference was statistically significant at $P < 0.05$ as shown in Table 2 and Figure 2.

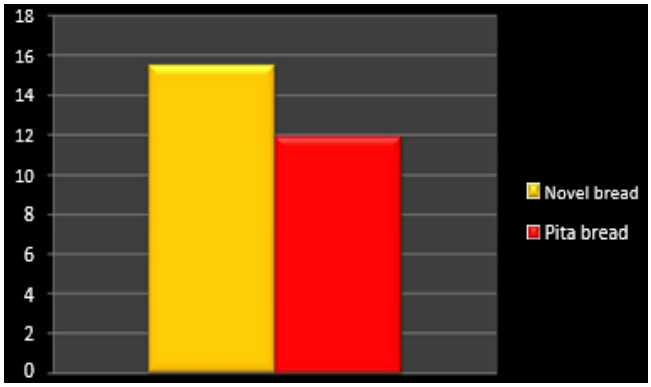

Fig 2: Protein content of Novel bread and Conventional bread

The results have shown an increase in Lysine and Leucine content in the novel bread compared with conventional pita bread by 55% and 28.9 % respectively and the difference was significant.
Surprisingly, fat content was 50% less in the novel bread comparing with conventional pita bread. Both types had negligible amounts of cholesterol which is an indicator of healthy bread. This finding is demonstrated in Table 3 and Figure 3.

Table 3: Fat, Cholesterol, fibre and ash content of Novel and Pita bread.

Nutrient	Novel bread	Pita bread White unenriched	Difference	%
	Amount in 100 g	Amount in 100 g		
Fats	0.6*	1.2	- 0.6	50
Cholesterol mg	0.00	0.00	0	0
Fibre g	1.7*	0.7	1	58.2
Ash g	1.98*	1.2	0.78	39.4

* Significant difference $P < 0.05$.

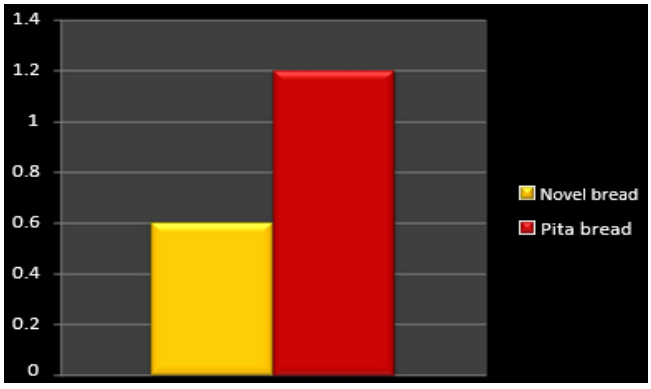

Fig 3: Fat content of novel and pita bread

The novel bread had higher amount of dietary fibre 1.7 g/100 g (58.2 %) whereas the conventional pita bread had 0.7 g/100 g and the difference was significant at $P > 0.05$ as shown in table 3 and Figure 4.

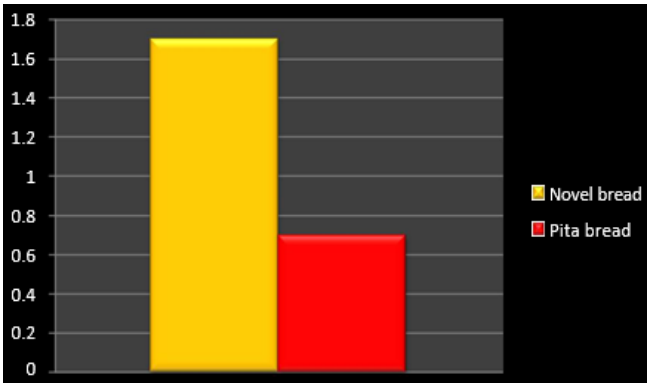

Fig 4: Fibre content in Novel and Pita bread

The data collected from this study have demonstrated that the highest increases were in the vitamin content of the novel bread. The novel bread showed higher contents of vitamin B1, B2, B3, B6 and vitamin E. This can be explained by using vitamins rich sources especially whole grains such as barley, soy beans and wheat [23]. The differences were statistically significant at P > 0.05 and they were 73.8 %, 44.4 %, 69 %, 243.3 %, and 145% for B1, B2, B3, B6, and vitamin E respectively. These results are shown in Table 5 and Figure 4.

Table 4: Vitamins and minerals content of Novel and Pita bread

Nutrient	Novel bread	Pita bread White unenriched	Difference	%
	Amount in 100 g	Amount in 100 g		
Vitamin B 1 mg	1.03*	0.27	0.76	73.8
Vitamin B2 mg	0.18*	0.1	0.08	44.4
Vitamin B3 mg	6.9*	2.14	4.76	69
Vitamin B6 mg	0.076*	0.03	0.073	243.3
Vitamin E mg	0.154*	0.00	0.145	145
Calcium mg	111*	86	25	22.5
Iron mg	1.5	1.4	0.1	7.14
Zinc mg	0.9	0.84	0.06	6.7
Sodium mg	487	538	-51	9.8

* Significant difference $P < 0.05$.

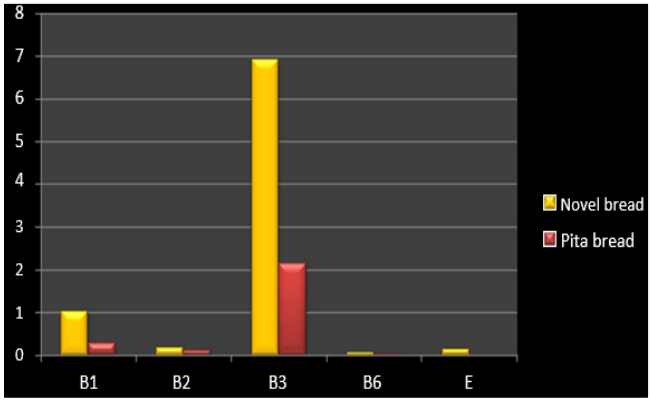

Fig 5: Vitamin content of Novel and Pita bread

The difference in calcium content was also significant. Novel bread had higher amount of calcium by 22.5%. This increase came as a result of using bread ingredients which are rich in calcium such as soybean as shown in Table 4 and Figure 6.

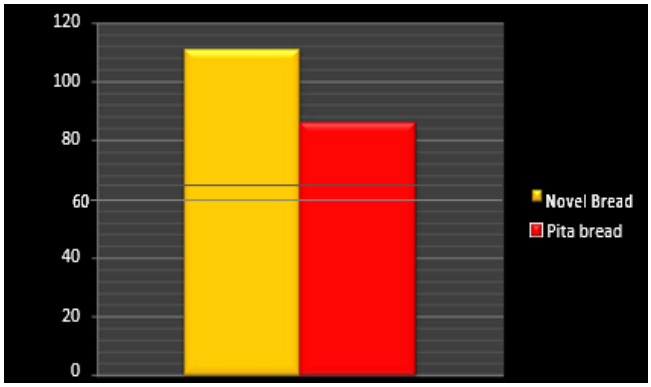

Fig 6: Calcium content of Novel bread and Pita bread

Table 5: Results of sensory testing of Novel and Pita bread

Type of bread	Novel bread	unenriched white Pita bread
Taste	9	8
Appearance	9	8
Texture	10	8
Color	8	9
Total	36	33

This bread was produced by the plate oven, where the shape was not satisfactory, and then using the automatic oven, the result was good. In both cases, a delicious and tasteful bread was produced.

To determine the role of time in changing the taste and mechanical properties of the bread, a set of samples was tested. A sample was left in a nylon bag at different temperatures (i.e. 25°C to 30°C) for 5 days. There was no variations in its physical and sensory properties as the taste and the conditions of the bread remained in its cohesive strength and did not suffer from hardness or moulds. Another sample was placed in a sealed plastic bag and was left in the freezer at 0°C for an entire month. After moving it to room temperature, no change was observed in the taste and the bread looked good in terms of consistency and appearance.

The product was consumed for a period of a month by a panel, and left a distinct and encouraging impression. In this study, we have also tried the bread on some people with digestive problems, they observed a complete disappearance of symptoms especially constipation and gas at the end of the first week after consuming this bread.

4. Conclusion

The novel bread, compared with the conventional unenriched pita bread consumed in the Arabic world, contains significant increases in the important nutrients that are essential for the body's growth and strength and maintaining an optimal health balance. The novel bread is considered convenient for all age groups and necessary, especially in communities that do not have the possibility to secure the food intake required through the consumption of food other than bread. This bread can help in preventing many health problems such as obesity, GI disorders and diabetes due to its fibre content (soluble and insoluble) and it also can promote and improve the immune system because of its content of functional ingredients such as beta glucan from barley and isoflavones from soy beans. Furthermore, the cost of production the novel bread is almost

Similar and affordable and equal to the costs of conventional bread.

5. Disclaimer

The authors claimed that there was no a conflict of interest while performing this study.

6. Acknowledgment

The authors would like to express their sincere thanks to Professor Louay Labban for his constructive criticism, proofreading and comments that improved the manuscript.

7. References

1. Jack R, Harlan JMJ. de Wet. The compilospecies concept. International journal of organic evolution. 1963; 17(4):497-501.
2. Al-Dmoor HM. Flat bread: ingredients and fortification. Quality Assurance and Safety of Crops & Foods. 2012; 4:2-8.
3. Qarooni J, Wootton M, McMaste rG. Factors affecting the quality of Middle East bread – additional ingredients. Journal of the Science of Food and Agriculture. 1989; 48:235-244.
4. Shahidi F, Yeo JD. Insoluble-Bound Phenolics in Food Molecules. 2016; 21; doi: 10.3390.
5. Karacabey K, Ozdemir N. The Effect of Nutritional Elements on the Immune System. J. Obes. Wt Loss Ther. 2012; 2:152. doi: 10.4172/2165-7904.1000152.
6. Indrani D, Rao V. Effect of chemical composition of wheat flour and functional properties of dough on the quality of south Indian parotta. Food Research International. 2000; 33:875-881.
7. Izydorczyk MS, Chornick TL, Paulley FG, Edwards NM, Dexter JE. Physicochemical properties of hull-less barley fibre-rich fractions varying in particle size and their potential as functional ingredients in two-layer flat bread. Food Chemistry. 2008; 108:561-570.
8. Launert E. Edible and Medicinal Plants of Britain and North Europe, Hamylon, London, 1981.
9. Kakade M, Siomons N, Liener I, Lambert J. Biochemical and nutritional assessment of different varieties of soybeans. Journal of Agricultural Food Chemistry. 1972; 20:87-90, ISSN 0021-8561.
10. Zhang X, Shu XO, Gao YT, Yang G, Li Q, Li H, Jin F. Soy food consumption is associated with lower risk of coronary heart disease in Chinese women. J. Nutr. 2003; 133:2874-2878.
11. Watanabe DJ, Ebine HO, Ohda DO. Soybean Foods. Kohrin Shoin, Tokyo, 1971.
12. Bressani R. The role of soybeans in food systems. J. Am. Oil Chem. Soc. 1981; 58:392.
13. Torun B, Viteri FE, Young VR. Nutritional role of soya protein for humans. J. Am. Oil Chem. Soc. 1981; 58:400.
14. Carroll KK. Hypercholesterolemia and atherosclerosis: Effects of dietary protein. Fed. Proc. 1982; 41:2792.
15. Koeie B, Ingversen J, Andersen AJ, Doll H, Eggum BO. Composition and nutritional quality of barley protein. International Atomic Energy Agency (IAEA): IAEA, 1976.
16. Dhingra S, Jood S. Organoleptic and nutritional evaluation of wheat breads supplemented with soybean and barley flour. Food Chemistry. 2002; 77:4.
17. Williams PC, Preston KR, Norris KH, Starkey PM. Determination of Amino Acids in Wheat and Barley by Near Infrared Reflectance Spectroscopy. Journal of food science. 1984; 491.
18. 1991, م. نزار حمد، تقانة تصنيع الأغذية وحفظها
19. Winton AL, Winton KB. In: Structure and Composition of Foods, p. 512, Wiley, New York, 1932.
20. AOAC. Official Method of Analysis. 16th Edition, 2002, DOI: 10.4236/oalib. 1100932 1, 052.
21. Lebensm Unters Forsch Z. Methods for determination of vitamins by means of high performance liquid chromatography (HPLC). 1978; 166(3):151-2.
22. Clésia Nascentes C, Marco Arruda AZ, Ana Rita A. Direct determination of Cu and Zn in fruit juices and bovine milk by thermospray flame furnace atomic absorption spectrometry. Talanta. 2004; 64:15.
23. Farvili N, Walker CE, Qarooni J. The effects of protein content of flour and emulsifiers on tanoor bread quality. Journal of Cereal Science. 1997; 26:137-143.
24. Franz KB, Kennedy BM, Fellers DA. Relative bioavailability of zinc from selected cereals and legumes using rat growth. The Journal of Nutrition. 1980; 110:2263-2271.